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A Climate Change : Center of Attention

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Abstract

The rise in CO_2 and Green houses gases (GHGs) originated from fossil fuels emissions and deforestation is only due to human activity. Intergovernmental Panel on Climate Change (IPCC) has measurable scientific evidences in its fourth report on climate change (2007) and they have become clearly accepted universally. Climate change is commonly understood to be one of the drivers of extinction, affecting biodiversity in nearly every corner of the planet. Climate change is one of the major problems and placed in the queue of other hazardous influence which disturbs the earth balance. The rise in average temperature is only one indicator of broader changes also translating into extreme temperatures, drought, flooding, storms, rising sea levels, impacts on food production, and infectious diseases. Although the scientific community has been aware of the link between greenhouse gases (GHGs) and climate change for many years, world leaders have been slow to react and implement measures to mitigate the risks. New research initiatives should focus on collecting high-quality, long-term data on climate-related health outcomes with the dual purpose of understanding current climate–health associations and predicting future scenarios. The global warming issue and challenge has focused on the lightening of greenhouse gases based on international environmental conventions such as IPCC and Kyoto Protocol. The warm effect of global warming affects not only ecological systems but also human life; it has become an important issue both nationally and internationally so need to study.

Keywords : Climate change, health, global warming, Climate Variability

Introduction

Present time climate change concluding both global warming and its consequences on Earth's weather patterns. There have been previous circumstances of climate change, but the rapid changes in climate are rapidly moving and obviously its not due to natural causes.[1] For the years that the international community has engaged on climate change, it has the UN Framework Convention on Climate Change (FCCC)[2] and its Kyoto Protocol,[3] to show for it. The emission reduction commitments made under these agreements are inadequate [4] and inadequately implemented.[5] Instead, they are caused by the emission of greenhouse gases, mostly carbon dioxide (CO2) and methane. Burning fossil fuels for energy use creates most of these emissions. Agriculture, steelmaking, cement production, and forest loss are additional sources.[6] Greenhouse gases are transparent to sunlight, allowing it through to heat the Earth's surface. When the Earth emits that heat as infrared radiation the gases absorb it, trapping the heat near the Earth's surface. As the planet heats up it causes changes like the loss of sunlight-reflecting snow cover, amplifying global warming.[7] Due to its effect the earth temperature rises twice as fast as global temperature resulted into the area of deserts increases so the heat waves and wildfires occurs more common .[8] There is now convincing scientific evidence that human activity is altering the global climate (IPCC 2007). Although questions remains about the timing and impact of climate change, it is already clear that there are risks of significant adverse consequences.[9] Although low- and middle-income countries are responsible for only a small percentage of global greenhouse gas emissions, the adverse health effects associated with climate change will likely fall disproportionately on their populations. This inequity will further exacerbate global health disparities. High-risk areas include those already experiencing a scarcity of resources, environmental degradation, high rates of infectious disease, weak infrastructure, and overpopulation .[10-13] In particular, tropical regions will experience significant changes in human–pathogen relationships because of climate change.[14] Changing temperatures and precipitation patterns linked to climate change will further affect health by changing the ecology of various vector-borne diseases, such as malaria, dengue, chikungunya, Japanese encephalitis, kala-azar, and filariasis. [15-16]

Challenges of Climate Change

Climate change is arguably the most severe challenge facing our planet during the 21st century. The spatial and temporal extent of the climate challenge deeply connects it to ethical questions as well. These arise both from the fact that the poorest people on Earth are not significantly contributing to global emissions, but may well feel the impacts most severely, and from the long-term commitment to future warming and climate change impacts – like sea level or the partial melting of the large ice sheets – which will be felt by future generations. In essence, past and future greenhouse gas emissions seriously affect a large fraction of the still growing human population on our planet and profoundly shape the environment in which our children and grandchildren will have to live in. Humanity therefore has a moral obligation to address the climate challenge. This will have to combine successful negotiations on a binding and effective international climate agreement and bottom-up initiatives from individuals or communities. There is a wide range of global threats that certainly require humanity's urgent attention.(17) But climate change cannot be considered isolated from other challenges. Indeed, climate change is a truly cross-cutting issue affecting many sectors and connected to other global challenges. For example, climate change has the potential to impact global water supplies, agricultural production, human health, and our energy infrastructure. (18) In turn, the way in which we produce our energy and food has a profound effect on the Earth's climate system. Finally, the impacts of policies in one of the fields on the other challenges need to be explored if truly sustainable solutions to global problems shall be achieved. These close connections – and the societal and technical challenges of climate mitigation (IPCC 2014b) and adaptation (IPCC 2014a) – require interdisciplinary and transdisciplinary thinking; we hope that our new journal Global Challenges can serve as a highly visible forum for research bridging classical scientific disciplines, for ideas which have the potential to directly influence future climate policy and for discussions about new research and different policy options.[19] Within the climate change focus of Global Challenges, we therefore invite submissions related to climate change of the highest quality, with a clear focus on the global view of the climate problem and with relevance for (global) climate policy or bottom-up initiatives which are a significant step towards a solution of the climate challenge.[20] Indoor air pollution presents yet another major health threat, with 32% of deaths in South Asia attributable to the burning of solid fuels in poor, small, unventilated houses [21] these health risks will be exacerbated as a result of climate change is yet to be determined, but cobenefit interventions aimed at reducing the health impacts associated with indoor air pollution, decreasing the release of green house gases from the burning of solid fuel, and preventing deforestation by introducing alternative, more efficient stoves and fuels will have serious implications for health and society.

Conclusion

In this paper we were studied the cause of climate change and its adverse effect in all over fields and here we concluded that the climate change is having adverse effect and it collapses number of species which having measurable numbers. It is clear that climate change is a security problem for some states and its due to emission of CO_2 which must be controlled by the countries but, what does it serve us to speak of climate change in these terms and what are the implications of doing so? The rise in the amounts of greenhouse gases cause climate changes. It discusses the evidence that the concentrations of these gases in the atmosphere have increased and are still increasing rapidly and progressively, and thus that most of the recent change is almost certainly due to emissions of greenhouse gases caused by human activities. Untill and unless if we not prohibited the rise in concentration green house gases , their consequences will be uncontrollable. There remains a range of estimates of the magnitude and regional expression of future change, but increases in the extremes of climate that can adversely affect natural ecosystems and human activities and infrastructure are expected. Citizens and governments can choose among several options in response to this information: they can change their pattern of energy production and usage in order to limit emissions of greenhouse gases and hence the magnitude of climate changes; they can wait for changes to occur and accept the losses, damage, and suffering that arise; they can adapt to actual and expected changes as much as possible; or they can seek as yet unproven solutions to counteract some of the climate changes that would otherwise occur. Different nations and communities will vary in their vulnerability and their capacity to adapt. There is an important debate to be had about choices among these options, to decide what is best for each group or nation, and most importantly for the global population as a whole.

The options have to be discussed at a global scale because in many cases those communities that are most vulnerable control few of the emissions, either past or future. Our description of the science of climate change, with both its facts and its uncertainties, is offered as a basis to inform that policy debate. In 2008 India developed the National Action Plan on Climate Change, promising further enhancement of ecological sustainability as part of India's development path, signaling their involvement in the international discussion on climate change. Countries like India have a tremendous opportunity to guide our future trajectory regarding sustainable development and adaptation to climate change, but it will take the combined effort of policy makers and scientists from around the world to address the complex challenges associated with climate change and human health. In conclusion, innovative, multidisciplinary investigations using environmental epidemiologic methods to elucidate health risks posed by climate variability—and subsequent climate change—in regions such as India are possible. However, such work will require expanded partnerships among researchers, governments, and communities to develop a cobenefit strategy that addresses public health challenges and risks associated with climate change. Adoption and implementation of these research initiatives will provide the necessary tools and infrastructure to pose interesting scientific questions and design effective solutions to the complex issues imposed by climate change. Health outcomes of interest, for which such data should be collected, include total morbidity and mortality and noncommunicable diseases such as cardiovascular, respiratory, and circulatory diseases and asthma, as well as infectious diseases such as cholera, malaria, tuberculosis, typhoid, hepatitis, dysentery, tick-borne encephalitis, and other vector-borne and waterborne diseases. Such monitoring also requires the collection of appropriate climatic (e.g., temperature and precipitation) and nonclimatic data (e.g., ozone). And finally if you save your 'EARTH', 'EARTH' will always save you.

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Study of Cyanophyceae Diversity of Mandwa Lake Near Dharni (Melghat) Tahsil, District Amravati (M.S.), India

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Abstract

The Mandwa Lake is principal fresh water body located in Mandwa village of Dharni tahsil in Amravati district of Maharashtra state. Dharni is a tahsil place and it is 148 km north west side of Amravati and 80 km east side from Burhanpur, Madhyapradesh It is situated at about 500 m above the mean sea level. A Study of Cyanophyceae was undertaken during Jan 2021 to Dec 2021 One Year to assess the types of Cyanophyceae present in this water body. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation. The Cyanophyceae is important group of fresh water blue green algae. They include some of the most common species which are important both ecologically and scientifically. During the present study 7 species of Cyanophyceae were found at all three sites A,B,and C of Mandwa Lake
Keywords: Mandwa lake, Cyanophyceae diversity.

Introduction

The cyanophyceae means blue green algae may be unicellular organism or in the form of chain or filaments is called as trichon.

Cyanophyceae one of the most significant algal group among phytoplankton and it is also founded abundance in water bodies. The freshwater blue green algae occur in the unpolluted as well as polluted water body generally it exhibits a characteristic cyclic growth.

In Present investigation Mandwa lake is 4 km south east side from Dharni Tahsil at about 500 m above mean sea level and is at 76°55'49''E longitude and 21°31'28'' N latitude. Mandwa Lake receives the water from the surrounding catchment areas during the monsoon period. The area of Mandwa Lake is spread over 500 acres. The depth of water is 38 feet during the monsoon and 15 feet during the summer season. The water of this lake is primary used for washing, bathing, fishing activities, agriculture and other domestic purpose but now it is at a transitional state with respect to degradation.

Material And Method

Sample for planktonic study were collected monthly from three sites of lake. The samples were collected in the morning hours between

8.30 a.m. to 10.30 a.m. 50 Lt. of water sample was filtrated through the plankton net made of bolting silk number 25 with mesh size 64 lime the collected samples were allowed to settle down by adding Lugol's Iodine. Normally sedimentation requires 24 hrs. after which supernatant was removed and concentrate was made up to 50 ml. depending the number of plankton and preserved in 5% formalin for further studies.

For the quantitative study the concentrated sample was shaken and immediately one drop of sample was taken on a clear micro side with the help of standard dropper the whole drop was then carefully covered with the cover glass and observed. Plankton identification up to genera and whenever possible upto species level was classified according to keys given by Prescott (1954), Edmonsonic (1959), Sehgal (1983), Adoni (1985), and APHA (1985) and standard analysis was undertaken as per Zar (2005).

Quantitative study of plankton was done by Sedgwick – Rafter Cell method

Sedgwick – Rafter Cell Method

The Sedgwick – Rafter Cell is a special kind of slide similar to the Haemocytometer. The cell has a 50 mm x 20 mm × 10 mm rectangular cavity that holds 1 ml. sample. The cell is moved in horizontal direction on the stage of an inverted microscope and plankton species encountered in the field are enumerated.

A number of replicate samples are enumerated to calculate plankton/lit.

Plankton (units/lit) = n x c/v

Where,

n = number of plankton in 1ml c = Volume of concentrate

v = Volume of sample in lit.

Result And Discussion:

In Present investigation a Total 7 species wered recorded the lake under study,

In site A, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . In site B, Cyanophyceae were represented by 6 species in Jan 2021 to Dec 2021 . and site C, Cyanophyceae were represented by 7 species in Jan 2021 to Dec 2021 .

Shirsat, et.al., (2004) observed 6 species of Cyanophycaea from freshwater pond in Dharmapuri in Beed District, Maharashtra.Tiwari and Chauhan (2006) founded 21 species of Cyanophyceae from Kithan lake of Agra, Uttar Pradesh. Jayabhaye, et.al., (2007) revealed 7 species of Cyanophyceae from Parola dam of Hingoli, Maharashtra. Aijaz, et.al.,(2009) reported Cyanophyceae contributed 10 species from Wular lake. R. Prathap Singh and G.S. Regini Balasingh (2011) observed 14 species of Cyanophyta in Kodaikanal lake of Dindugal District. D.S. Malik and Umesh Bharti (2012) reported 7 species belong to Cyanophyceae in Sahastradhara stream at Uttarakhand. M.R. Abdar (2013) observed seven taxa of Cyanophyceae from Morna lake of Shirala (M.S.), Sachinkumar R. Patil, et.al., (2015) founded 1 species belongs to Cyanophyaceae in major freshwater bodies of Ajara Tahsil in Kolhapur District (M.S.). R. Prathap Singh and G.S. Regini Balasingh (2012) reported 18 species of Cyanophycaea in Kodaikanal of Dindigul District, Tamilnadu. Patil Alaka A. (2015) recored 5 species of Cyanophyceae in Sangli, Maharashtra. Priya Gopinath, T. and Ajit Kumar, K.G. (2015) observed 7 genera belong to Cyanophyceae in the fresh water lake in Thiruvananthapuram.

In Present investigation in site A, during Jan2021 to Dec 2021, 6 species are recorded among which Oscillatoria sp. (122 no./lit) is dominant followed by *Microcystis sp.* (120 no./lit), *Agmenellum quadruplicatum* (55 no./lit), *Nostoc sp.* (51 no./lit), *Anabaena sp.* (43 no./lit) and *Spirulina sp.* (34 no./lit).

In site B, during Jan2021 to Dec 2021, 6 species were recorded among which Microcystis sp. (145 no./lit) is dominant followed by *Oscillatoria sp*. (67 no./lit), *nostoc sp.* (49 no./lit), *Anacystis cyanea* (41 no,/lit), *Agmenellum quadruplicatum* (34 no./lit) and *Anabaena sp.* (34 no./lit).

In site C during Jan2021 to Dec 2021 ,7 species were recorded among which *Microcystis sp.* (198 no./lit) was dominant followed by *Oscillatoria sp*. (196 no./lit), *Nostoc sp.* (143 no./lit), *Agmenellum quadruplicatum* (75 no./lit), *Spirulina sp*. (36 no./lit), *Anabaenasp.* (34 no./lit) and *Rivularia sp.* (12 no./lit).

Among the different species of Cyanophyceae in site A, *microcystis sp*. was dominant followed *by Gleotrichia echinulata, Nostoc sp, Oscillatoria sp, Agmenellum quadruplicatum, Anabaena sp.* and *Spirulina sp.* in site B of lake *Microsystis sp. was dominant followed by Oscillatoria sp Nostoc sp. Anacystis cyanea, Anabaena sp.* and *Agmenellum quadruplicatum* in site C, of lake *Microsystis sp.* was dominant followed by *Oscillatoria sp, Nostoc sp., Angmenellum quadruplicatum, Gleotrichia echinulata and Anabaena sp.*

According to Harris and James (1974) presence of *Microcystic sp.* the toxin producing the blue green algae in abundance is a significant feature of tropical. Parmashivam and Sreenivasan (1981) recorded the polluted water bodies having heavy growth of the blue green algae. M.R. Abdar (2013) observed presence of organic pollution indicator algal species like *Microcystis aeruginosa, Oscillatoria limnetica,* at Morna lake Shirala (M.S.). Mischke and Nixdorf (2003) have observed that the presence of *Anabaena* and *Oscillatoria indicates* beginning of biological pollution.

Kamat, *et.al.*, (2006) was of the opinion that blue green algae occurred continuously in the contaminated tank while occasionally in less unpolluted tank. They reported frequent existence of species like *Microcystic, Oscillotoria* and *Anabaena* in the contaminated tanks of Shimoga District, Karnataka. Jindal and Gusain (2007) founded the presence of *Microcystis sp., Oscillotoria sp.* and the *Spirullina sp.* as a pollution indicator species of Bichorli pond, Rajasthan. Shashi Shekhar, *et.al.,*(2008) and Baruah and Bhaswati Kakati (2012) observed that *Microcystis aeruginosa* is related with highest degree of pollution and may be considered as the best single indicator of the organic pollution in any water bodys.

In the present investigation the Cyanophyceae was maximum during in winter season and minimum during in the monsoon season. Pendse, *et.al.*, (2000) observed the maximum population of in blue-green algae during winter season. Mazher Sultana and Dawood Sharif (2004) noted the maximum of blue-green percentage during winter season and minimum during in monsoon. D. S. Malik and Umesh Bharti (2012) founded that Chlorophyceae were maximum during in winter season and minimum during monsoon season in Sahastradhara stream at Uttarakhand. In the present investigation, the dominant of *Microcystis sp.* and *Oscillotoria sp.* in site A and site B and site C showed the polluted nature of the three sites shows lake is highly polluted.

Conclusion:

In the present investigation, the maximum amount of Cyanophyceae during in winter due to favourable sunlight, increase in domestic sewage, human generated pollution, an minimum quantity during the monsoon season is probably due to increase in water quantity

Table 1: Yearly variation of Phytoplankton from sites of Mandwa Lake during year Jan 2021 to Dec 2021.

Sr. No.	Parameters	A	B	C	Total
1	Cyanophyceae	35.42	30.83	57.33	**45.00**
		±	±	±	±
		37.63	**14.12**	**21.93**	**3.93**

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Ethno medicinal plants used by Munda Tribe for their primary healthcare system and their conseravation in and around Tamar Block of Ranchi District, Jharkhand

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Abstract
The tribal people depend on forests for their livelihood and most of rural people depend on traditional medicine as a primary health care source. Traditional medicines remained as the affordable and easily accessible source of treatment in the primary health care system among Tribes of ***Tamar Block****. The paper highlights' the rich plant resources and the vast wealth of ethno medicinal information available with the Tribes especially* ***Munda Tribe*** *of the* ***fifteen(12) revenue villages*** *of Tamar Block of Ranchi District. This study focus on the comprehensive ethno medicinal investigation in an attempt to safeguard the deteriorating ethno medicinal knowledge. The main objective of present work is to give information and documentation of medicinal plants used by tribal of the study area. The ethno medicinal information was gathered from interviews with living elders, Baidhyas and knowledgeable person belonging to Munda Tribe of the study area. The present work on ethno medicinal plants used in the primary healthcare systems of Tribe (Munda) in 12 villages was carried out from Tamar Block of Ranchi District. These ethno medicinal plants are very useful, hence an essential conservation should be needed.*

Keywords*: --- Ethno medicinal plants, documentation, Tamar Block, Munda Tribe, Conservation etc.*

Introduction
Medicinal plants have great contribution in the primary healthcare system of local communities as the main source of medicine for the majority of the rural population especially Munda Tribe. Out of the total 4, 21,500 flowering plants reported from the world more than 40,000 are used for medicinal purposes. About 60% of the world population &80% of developing countries rely on traditional medicine. According to Bhatt et al. more than 4.5 billion people in the developing world rely on ethno medicinal plants as components of their primary healthcare.

Tamar Block of Ranchi District is very rich in ethno medicinal plants as well as Schedule Tribe population. The Munda Tribe was totally dependent on indigenous medicine for traditional healthcare, but now this is practiced only in the remote rural areas. Where the hospital facilities were available, that region's person were not depends upon the ethno medicinal plants, because they had no more knowledge about this field. The Ethno medicinal studies in various areas of Tamar Block have been carried out. It is believed that such studies can constitute the starting point for the development of new herbal medicines and other useful substances.

The present study was aimed at investigating the traditional utilization of plants of Tamar Block. Tamar Block has eighty one (81) revenue villages. The study area is the richest biodiversity centre and a source of ethno botanical knowledge. There is no any ethno botanical studied has been carried out in this region. The main **Munda tribe** containing villages **are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal**. The main objective of the present study were: - (1) to identify and explore plant species that are used locally for the treatment and presentation of various diseases, (2) to document traditional recipes from medicinal plants including methods of preparation, dosages, and the mode of administration, (3) to point out the main Baidhyas of the area by which suffer person can be treated easily, and (4) to assess the plants conservation issues of the study area.

Materials and methods
Study Area
The present study was carried out in Tamar Block of Ranchi District**.** The Block is with an area of 513.91km² and forest area is 148.71Km ²(29%) and is situated between 23°3`21``N and 85°39`44`` E. The main

Munda containing villages are Murpa, Jaradih, Jojodih, Poradih, Kasam Burudih, Agra, Bandu, Sirkadih, Deori, Basukoncha, Birdih and Kubasal. Many villages are situated on forest top and near forest. All forest areas having many ethno medicinal plants. The Munda Tribe is about 43% and Oraon Tribe is about 7% according to 2011 population census. Climate of this block is subtropical in nature. The annual rainfall is ranges between 230 mm to 1390 mm and the temp. Are ranges between 6-43°c with highest in the month of May and June? The November to January is the coldest months.

The population of the block is 1, 32,702(One lakh thirty two thousand seven hundred two), in which **Munda** Tribe is about 43% and **Oraon** Tribe is about 7%. The livelihood is depends mainly on smallholder agriculture and livestock production.

There are many ethno medicinal as well ethno botanical plants which are used by specific **Munda Tribe** and **Oraon Tribe** for the ailment of different types of diseases. Some of them are ***Abrus precorius, Achyranthes aspera, Acorus calamus, Ageratum conyzoides, Aloe vera, Allium sativum, Asparagus racemosus, Azadirachta indica, Boerhaavia diffusa, Butea monosperma, Calotropis procera, Cassia tora, Curcuma longa, Eclipta alba,Emblica officinalis, Ficus bengalensis, Gloriopsa superba, Holarrhena antidysenterica, Lawsonia inermis, Madhuka longifolia,Ocimum sanctum, Phyllanthus nirurii, Phyla nodiflora, Rauvolfia serpentina,Scleichera oleosa, Shorea robusta, Sida cordifolia, Terminalia arjuna, T. bellirica, T.chebula, Tinospera cordifolia, Tridax procumbens, Vitex negundo etc.***

Data collection methods: ----

The authors have conducted an extensive field survey in the tribal belts and other **Munda** and Oraon Tribe containing villages, adjoining forest area in the Block to collect ethno botanical lore. First hand information was gathered through interactions with tribal and rural knowledgeable person and Baidhyas. The local Baidhyas were invited to tap the information of medicinal plants commonly used by questionnaire. Medicinal properties of plants were learned through in formal interviews. A number of group discussions were also conducted during the period of investigation.

Ethno botanical information was collected from 28 informants (24 male &4 female).Among the 28 informants, 20 informants were selected with the Munda Tribe and 4 informants were selected with the Oraons Tribe. Semi –structured interviews with 28 informants and group discussions (total of 5 groups discussed with average number of 7 per groups) were administered in the local language (Munda) to collect basic information on the local names and traditional description of the medicinal plants species , diseases treated or collected ,parts used conditions and method of preparation , routes of remedial administration , dosages used ,and locally marketable medicinal plants . Besides, practical observations session in preparation of remedies and some observation of traditional

Treatments given to the patient by traditional healers were conducted. To ascertain the uses of these ethno medicinal plants the earlier published scientific literature sources referred to are Sharma et al.(1985-86), Jain (1991), Kirtikar and Basu (1991), Ambasta et al. (1992), Chopra et al.(1996) . Photographic, digital cameras were used for graphic documentation. Specimens were collected and numbered on the spot, later indentified using taxonomic keys in the relevant Book, Hains flora-Bihar and Orissa (vol-I-VI), Flora of Hazaribag etc (BSI).

Results

The data on ethno medicinal plants, which was collected from inhabitants of study areas, Baidhyas and knowledgeable person in and around Tamar Block of Ranchi District were pooled and analysed. The investigation revealed the medicinal plants of 53 species and 47 genera belonging to 31 families, which are commonly used for various ailments by Munda Tribe of different villages of Tamar Block of Ranchi District.

Sl.No	Botanical name of plants	Family	Common name of plant	Therapeutic uses of ethno medicinal plants
1	*Abrus precatorius* L.	Fabaceae	Gunja	Leaves are grind with roots and mixture is given with orally to prevent pregnancy.

2	*Achyranthes aspera* L.	Amaranthaceae	Chirchiti	Leaves are grind & make paste. This paste is applied externally for paralysis. In case of painful delivery the piece of stem may be chewed. Chewing of stem, also gives relief from toothache.
3	*Acorus calamus* L.	Araceae	Vacha	Old ghee processed with Brahmi juice and shankhapuspi alleviates insanity and epilepsy.
4	**Ageratum conyzoides** L.	Asteraceae	Sahadevi	The aqueous extract of leaves exhibits anti fungal and crude plant extract antibacterial properties.
5	*Aloe vera* Mill.	Liliaceae	Ghrikuwari	In syphilis, apply its pulp on the affected area. It cures syphilis. For diabetic patient, give 5 gm pulp of Aloe vera with 500 mg guduchi extract. It cure diabetes. Leaf pulp is given with honey for 7 days to cure irregular menstruation.
6	*Allium sativum* L.	Liliaceae	Lahsun	The bulb is used as a brain tonic in epilepsy and psychic disorders. The Lahsun is also used for upper respiratory tract infections & catarrhal conditions.
7	*Amophophallus campanulatus* (Roxb.) Blume	Araceae	Zamikand,Ol	Zamikand is prescribed in bronchitis, asthma, abdominal pain, dysentery, enlargement of spleen, piles and rheumatic swellings.
8	*Andrographis paniculata* (Nees.)	Acanthaceae	Kalmegh	The powder of Kalmegh is mixed the powder of black pepper and taken to the malarial patient. It controls the malaria completely.
9	*Asparagus racemosus* (Willd.)	Liliaceae	Shatawari	Shatawari powder taken with milk is increases the flow of breast milk. In night-blindness, tender leaves of shatawari cooked in ghee and taken to the patient.
10	*Azadirachta indica* A. Juss.	Meliaceae	Neem	Grind Margosa leaves with half the amount of phitkiri and prepare the tablet of 500mg each. Give one tablet with sugar syrup. It cures all types of fever & is especially beneficial in malarial fever.
11	*Boerhaavia diffusa* L.	Nyctaginaceae	Punarnava	Fresh root powder of punarnava mixed honey should be used as eyes disorder.
12	*Bombax ceiba* L.	Bombacaceae	Semal	Tap root of young plant, barks and flowers are diuretic.
13	*Butea monosperma* (Lamk.) Taub.	Fabaceae	Dhak, Palas	Decoction of root bark is given internally for blood pressure, crushed stem bark with tilt el(sesame oil) is filtered and administered for antifertility.
14	*Calotropis procera* R. Br.	Asclepiadaceae	Akwan. Madar	The root is used for cleaning teeth and for relieving toothache. Latex mixed with cow milk & given orally in rabies. Fresh leaves slightly roasted &pounded are bandaged to painful rheumatic joints, headache and swelling.
15	*Cardiospermum helicacabum* L.	Sapindaceae	Hathisundi	An extract of the leaves is used as an antiseptic to dress wounds.
16	*Cassia tora* L.	Caesalpiniaceae	Chakor	Paste of roots is applied on scabies & ringworm. Decoction of leaves is given to the children having fever while teething.

17	*Calocasia esculenta (*L.) Scott.	Araceae	Kachu	Crushed petiole is applied on fresh cuts and wounds to stop bleeding.
18	*Curcuma longa* L.	Zingiberaceae	Turmeric (Haldi)	Mix 5gm turmeric in butter milk and give to the patient twice a day. Within 5 days, it cures jaundice. Mix 5gm turmeric and 20 gm powder of Neem leaves with butter and apply on the affected are. It makes the skin soft and glowing. It also cures scabies disorder.
19	*Curcuma amada* Roxb.	Zingiberaceae	Amahaldi	A paste is prepared from the rhizome of the plant and dissolved in it water and drink to cure diarrhoea.
20	*Cyperus rotundus L.*	Cyperaceae	Nagarmotha	The rhizome is mainly used in rheumatism, inflammations, dysuria and obesity.
21	*Dalbergia sissoo L.*	Fabaceae	Shisham	In gonorrhoea, give 15 ml juice of its leaves thrice a day, it control gonorrhoea. Prepare squash of 5gm powder and give this to the patient. It cures blood impurities and blood disorder.
22	*Eclipta alba* (L.) Hassk.	Asteraceae	Bhringraj	Take each of Bhringraj, triphala, anantmool and seed of mango. Prepare their paste. Take 10 gm mandoor paste and 500 ml oil. Mix them all and add one litre water and cook the mixture till only oil is left. Strain the oil and apply on the hair. It cures all types of hair disorders.
23	*Emblica officinalis* Gaertn.	Euphorbiaceae	Amla	Take 30 gm of dried amla, 10 gm baheda, 50 gm mango seed and 10 gm iron vashma. Soak all the elements in a vessel overnight. Apply this on hair every day. Prematurely grey hair turns black with this treatment.
24	*Euphorbia hirta* (L.)	Euphorbiaceae	Doodhi	Paste of root is mixed with honey & given nursing mother to increase milk. Latex used in warts and skin diseases like leucoderma spots.
25	*E. neriifolia* (L.)	Euphorbiaceae	Sehund	The latex is used to cure skin diseases and body pain. Luke warm latex and common salt is taken with water for curing whooping coughs and leprosy.
26	*Ficus bengalensis* L.	Moraceae	Banyan Tree	Take 6 pieces of fresh leaves or its aerial roots and grind them with 15 gm of masoor dal. Apply the paste on the face. It cures all types of skin problems. Prepare decoction of its soft leaves and give to the patient with sugar, mixed in it. It controls vomiting.
27	*F.religiosa L.*	Moraceae	Peepal	Give 3 gm powder of its fruits, with milk, thrice a day. It promotes potency and physical strength. Give its ripe fruits to eat. It cures kapha, pitta &blood disorders. It also cures burning sensation and vomiting. In constipation, patient would eaten 7 fruits regularly. After one month constipation cured completely.
28	*Gloriopsa superba* L.	Liliaceae	Vachhnag	Powder of dry leaves is mixed with buffalo's milk (butter milk) & given internally in jaundice. 3 gm paste of tuber of Vachhnag with 1 gm paste of

				peppers is prescribed once a day for twenty one days as a cure for rheumatism.
29	*Guizotia abyssynica* L.	Asteraceae	Surgunja	Equal quantity of roots of surgunja and sarson is crushed & powdered. One pill is made by 10 gm of powder. One pill is taken in empty stomach for five days after menstruation. It is permanent birth control.
30	*Holarrhena antidysenterica* (Roth.) DC.	Apocynaceae	Kutaja, kurchi	In diarrhoea, boil 40 gm of its seeds in water. Give this water with honey, mixed in it to the patient, thrice a day. Grind its 15 gm of the fresh bark in butter milk & give this to the dysentery patient. It immediately controls dysentery.
31	*Lantana camera* L.	Verbenaceae	Putus	15ml, decoction of plant is taken for the treatment of tetanus & there is strict prohibition of taking of sour food during treatment. In malarial fever, the decoction of leaves is taken twice a day for a week after food.
32	*Lawsonia inermis* L.	Lythraceae	Mehendi	Paste of leaves mixed with butter milk &applied externally on face itching during monsoon & wounds for fast healing. Decoction of the leaves is also used as a gargle for sore throat.
33	*Madhuka longifolia* (Koenig)	Sapotaceae	Mahua	Nectary honey collects from flowers &is taken continuously 7 days for cures of piles.
34	*Mangifera indica* L.	Anacardiaceae	Mango, Aam	The juice from the bark is used for diarrhoea and dysentery. Take 2.5 gm of powder made from shade-dried soft leaves of mango, every day. It is very helpful in controlling diabetes.
35	*Mimosa pudica* L.	Mimosaceae	Lajwanti	In piles, give 5 gm powder of its leaves with milk, thrice a day. Give 30 mg juice of its leaves, it cures indigestion. For diabetic patient, they take 100 ml decoction of its roots, regularly up to 15 days & after 15 days; they take 10-15 ml of decoction regularly.
36	*Moringa pterygosperma* Lam.	Moringaceae	Sahjan	Mix 2 gm ginger root in 10 gm juice of its root and give this to the patient every morning and evening, it enhances the digestion power. In intestinal worms- cook its pod and give this to the patient. It kills the intestinal worms.
37	*Ocimum grattissimum* L.	Lamiaceae	Ban tulsi	The leaf juice is used to treat infantile cough, cold, catarrh, dysentery and skin diseases.
38	*O. sanctum* L.	Lamiaceae	Tulsi, Holy basil	Grind tulsi leaves in lemon juice and apply the paste on the affected area of skin. It helps cure eczema, gout, derma toes etc. Take powder of its root or seeds and add equal amount of jiggery in it. Give 2 gm of this mixture with cow's milk regularly. It cures the sexual disorders in one month to six weeks.
39	*Phyllanthus nirurii* L.	Euphorbiaceae	Bhui amla	In jaundice, grind 10 gm of its root and give it with 250 ml milk every morning and evening on empty stomach. In diabetes, give 15 gm whole plant powder with 20 black peppers three times a day. It cures even chronic diabetes.

40	*Phylla nodiflora* (L.) Greene	Verbenaceae	Jalpipal	3 ml decoction of root with un boiled egg (2 mg) is given to women to promote sexual desire.
41	*Psidium guajava* L.	Myrtaceae	Amrud	In vomiting, give 1o gm decoction of guava leaves. It indigestion ,take 10 gm juice of its soft leaves & mix sugar in it .Give this to the patient daily ,once in the morning .It gives relief within 7 days .
42	*Rauvolfia serpentina* L.	Apocynaceae	Sarpagandha	The extracts of roots are valued for to treat intestinal disorders. The leaves extract is also used to control hypertension.
43	*Schleichera oleosa* (Lour.) Oken	Sapindaceae	Kusum	The oil is applied externally in skin eruption. The seed oil is also used for massage in rheumatism & applied in alopecia, inch & acne.
44	*Shorea robusta* L.	Dipterocarpaceae	Sal tree	Fruit paste is prescribed in diarrhoea. In sal resin an essential oil is found, which is antiseptic. This is used for skin diseases.
45	*Sida cordifolia* L.	Malvaceae	Nilatutti, Balaa	Decoction of roots is used for the treatment of rheumatism & neurological disorder (facial paralysis, Sciatica etc). The leaves are demulcent, febrifuge & used in dysentery.
46	*Terminalia arjuna* (Roxb).Wight & Arn .	Combretaceae	Arjuna	In heartbeat, when normal rate of heartbeat increases from 72 to 150 take one glass juice of tomato & add 1 teaspoonful of powder of Arjuna bark in it . Give this to the patient regularly. It normalizes the heartbeat for complete benefit, prepare the decoction in milk. It cures disorder like injured heartbeat, angina pain, and anxiety.
47	*T.bellirica* (Gaertn.) Roxb.	Combretaceae	Beheda	Mix equal amount of beheda and sugar. Take this mixture every day. It improves eye power. Take 4 gm powder of fruit after meals. It enhances digestion power & cures loss of appetite. It also strengthens the stomach.
48	*T. chebula* (Gaertn) Retz.	Combretaceae	Harad, Hartaki	Give 5 gm harad powder with equal amount of sugar candy mixed in it, every morning and evening after meals. It improves the digestion power
49	*Tinospora cordifolia* (Willd.) Hook. F. &Thorns.	Menispermaceae	Giloy, Guduchi	Mix 50 ml bitter oil in 15 gm Tinospora juice and give this to the patient every morning on empty stomach. It cures elephantiasis. In arthritis—give 5 gm of its powder with milk three times a day. It cures arthritis and acidity in urine.
50	*Tridax procumbens* L.	Asteraceae	Jayanti, Akala kohadi	The leaf juice exhibits antiseptic, insecticidal, and parasiticidal properties. It is used to check haemorrhage from wounds, cuts, and bruises, also for restoring hair growth.
51	*Nitex negundo* L.	Verbenaceae	Nirgundi	Oil cooked with the juice of root & leaves of Nirgundi is useful as in take an ointment & filling in sinus, kustha, vatavyadhi, eczema & scrofula.
52	*Withauia somnifera*	solanaceae	Aswagandha	On whom takes powder of Aswagandha roots in late winter mixed with honey & ghee along with milk re gain youthfulness even if old. In bronchial asthma, the ash of Aswagandha should be taken with honey and ghee.

53	*Ziziphus jujuba* L.	Rhamnaceae	Ber	Leaves are astringent and diaphoretic. Stem bark is also astringent and used in diarrhoea. The paste of leaves and twigs are applied to abscesses, boils and carbuncles.

Conclusions:-

In conclusion, Tamar Block has plenty of ethno medicinal plants and the people (especially Munda Tribe) of the region are highly dependent on these plants for their primary healthcare system and other ethno botanical purposes. The people of the region have tremendous traditional knowledge regarding the utilization and preparation of various ethno medicinal remedies. They are using some medicinal plants for multipurpose and posing great pressures on certain medicinal plants like ***Aloe vera, Azadirachta indica*** and ***Dalbergia sissoo***. Hence natives should be educated regarding the sustainable usage of medicinal plants. The persistence of traditional knowledge is more among old people; however as a matter of concern, young people are taking less interest in such knowledge due to multiple reasons. Hence studies on ethno medicinal plants and also documentation may be extended to other areas for protection of traditional knowledge. The Baidhyas or knowledgeable person are giving different types of ethno medicines for curing of different diseases, hence clinical trials are therefore recommended in order to evaluate the authenticity of ethno medicines to scientific standards. Now all these mentioned medicinal plants as well as others plants are very useful for all of us, hence, there should be essential to conserve these all plants.

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Awareness of Globlal Warming And E-Waste Among Urban And Rural School Students.

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Abstract

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals and E-waste is the issu of electronic garbage its also harm of living animals Objectives:1] To find out the awareness and knowledge about global warming among the school students 2]. To find out the awareness and knowledge about E-waste among the school students. Materials and Methods: Self administered questionnaire was used to collect information from 1050 randomly selected school students of three different medium. Statistical analyses were performed with the perceantage of each quetions Ethical clearance, informed consent and assent were obtained. Results: a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste d) 28% of the student have high level of awareness of global problem. e) 25.1% of the student have high level of awareness of global warming and e-waste in total. Conclusion:. Periodic health education regarding global warming and e-waste is still needed to increase awareness and knowledge among the school students.

Keywords: *Environment,Global warming, E-waste,Awareness, Green House gases, electronic materials, Knowledge, School students.*

Introduction

Global warming means average increase in the earth's temperature and is considered as a major health issue of the 21st century and E-waste is the issu of electronic garbage its also harm of living animals Modern society has been growing concern about global global warming issues. The developing countries are experiencing complex, serious and fast-growing pollution problems of their own. Global warming pollution is more than just a health issue; it is a wider social issue Pollution has the potential to destroy homes and communities. Pollution problems are also closely tied to the mode of development in developing countries Despite this, many developing countries either have not developed global warming pollution control measures or have not provided adequate implementation structures to ensure that policies are effective its also one of the major problems of e-waste that has become an immediate and long term concern as its unregulated accumulation and recycling can lead to major global warming problems such as in air, water, soil and also including physical, chemistry, biology, geology, meteorology, oceanography sociology and human health

In this study, the awareness of electronic waste and global warming are discussed among school students.

Need for the research: -

All living and non-living things. Lives in the atmosphere and chooses air, land and water Uses resources to meet needs. The pressure that comes on the earth.This exceeds the conductivity of the global warming, which can lead to serious global warming degradation The water level in the water is getting higher than the water level, you may think so Can lose. From the very beginning, of the global warming has been called 'Awakening' It needs to be created And potential dangers to all species of living beings.

Understand the underlying causes and consequences

1. To study and find out the problems of population,health etc.The way to solve the problem.
2. Considering the need for sustainable use of natural resources.
3. To develop appreciation of caste and habitat management techniques
4. Understanding the feelings of human beings.

Objectives

1] To find out the level of awareness of e-waste among school students.

2) To find out the level of awareness of global warming among school students

3] Suggetion for the proper implementation of government rule for global warmingal issues

Hypothesis

1. Awareness of global warming among school students.
2. Awareness of E-waste pollution among school students.

Methodology

Since the present research is related to the present time , the survey method will be used.

population and sample of the study

The population for the present study consist of all school students. of Aurangabad District.1050 students from 100 schools, Aurangabad District were selected through Random sampling Technique for the study.The overall response Rate was 82%

Tools Used for the Study

For the presented research, the Author has chosen the survey method as the problem is related to the present time. Questionaries and document will be used among the various tools for the data collection for the survey method. to collect information, school students from aurangabd district were considered. The quetionaries will be filled by the students to get the information. Also the information about the school students. who have aware about the pollution and percentages will be useed to anylyze the information obtained and conclusions will be drawn based on it.

Data Analysis

Percentage,Mean,Standard Deviationand t-test. This statstical dimention will be used to analysis the information in present research

Findings

1.

a) 22.9% of the student have high level of about the knowledge of the global warming and e-waste
b) 25.9% of the student have high level of awareness about the causes of the global warming and e-waste
c) 27.6% of the student have high level of awareness about effect of the global warming and e-waste
d) 28% of the student have high level of awareness of global problem.
e) 25.1% of the student have high level of awareness of global warming and e-waste in total. (From Table no 1)

2.

a) 26.7% of the urban college student have high level of knowledge about global warming and e-waste and 20.1% of the rural student have high level of knowledge about global warming and e-waste
b) 24.7% of the urban student have high level of awareness about the causes of the global warming and e-waste and 26.8% of the rural student have high level of awareness about the causes of the global warming and e-waste
c) 29.8 % of the urban student have high level of awareness about effect of the global warming and e-waste and 26.0% of the rural student have high level of awareness about effect of the global warming and e-waste
d) 31.5% of the urban student have high level of awareness of global problem and 25.4% of the rural student have high level awareness of global problem
e) 27.6 % of the urban student have high level of awareness of global warming and e-waste in total and 23.3% of the rural student have high level of awareness of global warming and e-waste in total.(From Table 2)

3. There is no significant difference between urban student and rural student in their awareness towards global warming and e-waste in total and its dimensions- about the knowledge of the global warming and e-waste, awareness about the causes of the global warming and e-waste, awareness about effect of the global warming and

e-waste and awareness of global problem content, whereas there is significant difference between urban and rural student in the dimension- of awareness of global warming and e-waste in total..(From Table 3)

Table 1. Level of awareness of school students towards global warming and E-waste and its dimensions

Dimensions	Low		Moderate		High	
	N	%	N	%	N	%
Knowledge	257	23.8	576	53.3	247	22.9
Cause	279	25.8	521	48.2	280	25.9
Effect	289	26.8	493	45.9	298	27.9
Global Problem	322	29.8	456	42.2	302	28.0
Awareness of global warming and E-Waste of students in total	278	25.7	531	49.2	271	25.1

Table no 2 Level of awareness of school students towards global warming and E-waste and its dimensions in terms of locality of the school

Dimensions	Locality	Low		Moderate		High	
		N	%	N	%	N	%
Knowledge	Urban	110	24.0	225	49.2	122	26.1
	Rural	147	23.6	351	56.3	125	20.1
Cause	Urban	120	26.3	224	49.0	113	24.7
	Rural	159	25.5	297	47.7	167	26.8
Effect	Urban	116	25.4	205	44.6	136	29.5
	Rural	173	27.8	288	46.2	162	26.0
Global problem	Urban	126	27.6	187	40.9	144	31.5
	Rural	196	31.5	269	43.2	158	25.4
Awareness of global warming and E-Waste of students in total	Urban	121	26.2	210	46.0	126	27.6
	Rural	157	25.2	321	51.5	145	23.3

Table 3 Significant difference between urban and rural school student in their awareness towards global warming and E-waste

Dimensions	Nature of the school	Mean	SD	Calcuiated 't' Value	Remark at 5% Level
Knowledge	Urban	26.13	5.131	1.402	NS
	Rural	25.71	4.806		

Cause	Urban	23.97	5.037	0.343	NS
	Rural	26.08	5.178		
Effect	Urban	20.74	4.676	1.467	NS
	Rural	20.31	4.804		
Global problem	Urban	11.13	2.72	2.056	S
	Rural	10.77	2.803		
Awareness of global warming and E-waste of students in total	Urban	84.02	13.462	1.901	NS
	Rural	82.44	13.559		

Discussion:

The Author selected the study of global warming awareness and electronic waste among school students. in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness of in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students. through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized in the district of Aurangabad. The problem was thoroughly studied and objectives were set. Collected information through Aadhaar content collection tools related to the problem presented. The information obtained with the help of this statistical technique was analyzed and interpreted Statistical tables were used to study the global warming awareness in the context of and electronic waste among the school students in the district of Aurangabad and drew conclusions based on that.

Awareness of the students through the questionnaire regarding the research problem and hence the breadth of the research problem was noticed and thus the need and usefulness of the presented problem was realized.

Recommendations

1] School administrators should arrange short term training programs for teachers, students and society for global warming awareness and electronic waste awareness.
2] At the primary and secondary level, the issue of global warming should be kept as a separate unit. Therefore, this subject should be included in the syllabus offered by the State of Maharashtra.
3] There is a need to create e-waste awareness program to educate the society on how to manage e-waste
4] Scientists, NGOs, government representatives and corporate bodies. The e-waste disposal system proposed by them can help projects that are successfully implemented

Conclusion

In the present case the Author has summarized the research. And the important part of this case is that the findings obtained by analyzing and interpreting the information from above given. According to that conclusion, the hypothesis has been examined and based on the findings, some difficulties have been noticed and some recommendations have been suggested accordingly. Also the questionnaire and list used for research in the reference section

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Diversity of Macrophytes present in the Vicinity of Kapsi Lake, Kapsi Dist. Akola. M.S. India.

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Abstract:-

The present study has been undertaken in Kapsi lake, Kapsi situated in Akola district, Maharashtra State, India. The main objective of this study is to evaluate the quantitative characters of the aquatic macrophytes viz., frequency, density, abundance, and importance value index (IVI). During the whole study period, a total of 50 macrophytic plants species belonging to 27 families were found distributed in the lake. Aquatic plant species recorded were grouped into different egoriesed viz., submerged (5 species),free floating (8 species) and submerge (33 species) respectively.Hygrophylla auriculata,Ipomoea aquatica ForskIpomea carnea Jacq.Marsilea minuta L, Nymphoides aquatica, Nymphea pubescens,Azolla sp. Typha aquistata,Phyla nodiflora were the dominant species found to occur in all the study sites during the entire study period.and Amarathus species, Gangea maderaspatana, Xanthium, Sphearanthus species, Cassia species, Delonix ragia, Ipomoea species, Cyperus species, Ceratophyllum species, Phylla nodiflora, Commellina benghalensis, Euphorbia species, Phyllanthus amarus, Acalypha indica, Albizia lebeck, Ludwigia species and Polygonum species. The analysis of variance (ANOVA) for all the aquatic macrophytes reported from the lake indicates that there is no significant variation within the four study sites in terms of distribution. However, F-test result indicates significant variation in the quantitative characters between the different macrophytic plant species of the lake.

Keywords:- *Diversity, vicinity, macrophytes, quantitative, Kapsi Lake , India.*

Introduction

Macrophytes usually includes any plants which are observable by the naked eye and always identifiable when observed (Homes & Whitton, 1977). Macrophytes are an important component of the aquatic and terrestrial ecosystem and major changes in the abundance of individual species and community composition usually provide valuable information on the reason on how and why an ecosystem might be changing. Macrophytes are also valued as an important means for indirectly monitoring the water quality for instance, eutrophication can bring about change in the species composition and a loss of species diversity. At the same time, macrophytes also affect the physical, chemical and biological characters of the lake, and are affected by a group of factors such as lake Morphometry, water chemistry and biological characters of the lake (Lacoul & Freeman, 2006).

The Maharashtra state has been included under deciduous diversity of the world along with Kapsi Lake, Dist. Akola, India. The assessments of the Physico-chemical characteristics of the freshwater environment are essential to understand the distribution and productivity of aquatic macrophytes in the freshwater ecosystems. Some of the earlier studies on Phytosociology, Biomass and Primary Productivity, Physico-chemical characteristics of water are not adequate enough to compile a composite ecological database of the freshwater ecosystems of the country. Some of the relevant earlier works which have been carried out by a number of researchers at national and global levels are Devi, (1993), Melzer, (1999), Hanlon, et al., (2000), Devi, (2007), Devi, (2008), Usha & Sharma (2008), Cheruvelil & Soranno, (2008), Nurminen & Horppila, (2009), Mormul, et al., (2010), Usha, et.al., (2010a, 2010b), Singh, et. al., (2010a, 2010b, 2010c), Singh, et. al., (2011), Singh & Sharma, (2012), Singh, K.K. et. al., (2012), Soranno, et. al., (2011), Usha, et. al., (2012), Kanninen, et al., (2012), Singh & Sharma, (2013) etc.

This study would serve as an important prerequisite for assessment of the distribution of the aquatic macrophytes of the lake. The present study has been carried out with the main objectives to evaluate the quantitative characters like frequency, density, abundance, abundance by frequency (A/F) ratios and importance value index (IVI) of the aquatic macrophytes found in the lake at regular intervals during the study periods.

Methods

For the present investigation, the lake was divided into three study sites representing as Site I, II, and III. The aquatic macrophytic plant samples were collected at regular monthly intervals during the period July

2012 to June 2014 from the different study sites. The sampling technique used for diversity of the aquatic macrophytes was the standard method as described by Curtis (1959) and Misra (1968). The quantitative analysis comprises frequency, density, abundance, abundance to frequency ratio, relative frequency, relative density, relative abundance and importance value index (IVI).Assessing of the different quantitative characters were done by using a square quadrat of 25 cm × 25 cm in dimension and in each study site not less than 20 quadrat were sampled randomly.

2.1. Description of the Study Site

Kapsi Lake is one of the oldest lake in Akola district, situated about 20 kms from the district place and existing since the British regime. The lake is one of major drinking water source in the area. The people in the vicinity are also using the lake water for agriculture purposes, household acts, fishing, and other necessary things like washing of animals, clothing etc. Therefore, it is essential to know the water quality parameters to avoid the major hazardous conditions and health hazards. Keeping all this in view, the present investigation was planned to analyze various physiochemical parameters of Kapsi lake with special reference to the algal diversity of the lake.

2.2. Calculation of Quantitative Characters

$$\text{Frequency (\%)} = \frac{\text{No. of quadrats in which the species occurs}}{\text{Total number of quadrats studied}} \times 100$$

$$\text{Density/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Abundance/quadrat} = \frac{\text{Total number of individuals of a species in all the quadrats}}{\text{Total number of quadrats in which the species occurs}}$$

$$\text{Abundance of a species A/F Ratio} = \frac{\text{Abundance of a species}}{\text{Frequency of the same species}}$$

Importance Value Index (IVI)/300 = Relative Frequency (%) + Relative Density (%) + Relative Abundance (%).

Figure 1.Map of Kapsi Lake, India

FIgure 2.-Google Map of Kapsi Lake

Results:-

A total of 50 aquatic macrophytes belonging to 27 families were found distributed in the lake. Out of total 50 species recorded, Poaceae family has shown the presence of maximum number of species i.e. 12 species contributing to 23.92% which was then followed by families like Cyperaceae, Nymphaceae and Polygonaceae with 3 species each contributing to 4.95%. Other families like Alismataceae, Amaranthaceae, Convolvulaceae, Hydrocharitaceae, Lemnaceae and Salvinaceae had 2 species each contributing to 3.70%. The remaining families viz., Apiaceae, Araceae, Asteraceae, Azollaceae, Characeae, Commelinaceae, Lemnaceae, Marsileaceae, Mimosaceae, Nelumbonaceae, Onagraceae, comprised 1 species each constituting 1.85% . The aquatic macrophytes found in the lake were categorized into four main sub-categories viz., (a) submerged (b) rooted with floating leaves (c) free-floating groups. Under submerged group 5 species (10.67%) were reported. C Hydrilla verticillata, Utricularia exoleta, Utricularia flexuosa were restricted to shallow areas where light is abundantly available upto the bottom and such plants usually have long stems with disLemnaceae sected leaves. Altogether 6 species belonging to rooted with floating leaves were reported viz., Nymphoides cristatum, Nymphaea stellata, Trapa bispinosa etc. In the free-floating category 8 species were recorded viz., Azolla pinnata, Ceratopteris thalictroides, Eicchornia crassipes, Neptunia prostrata, Pistia stratiotes, Salvinia cucullata etc. The maximum numbers of 33 species were recorded under the emergent group viz., Echinochloa stagnina, Enhydra fluctuans, Ludwigia adscendens, Hygroryza aristata, Ipomoea aquatica. Zizania latifolia, Phragmites karka, Pseudoraphis minuta etc. The percentage compositions of the different macrophytic species were found maximum in submerged species (77.42%). the, which was then followed, by the free-floating species (13.47%) and . The lowest percentage (9.21%) was contributed by rooted and floating leaved species

Table 1. ANOVA of Aquatic Macrophytes in the different study sites of Lake Kapsi, Maharashtra, India.

Parameter	Study Site	N	Mean± S.E	95% Confidence Interval Lower Bound	Upper Bound	Minimum	Maximum	F	P-Value
Frequency	1.	50	13 ± 2	9	17	0	51	0.222	0.877
	2.	50	12 ± 2	8	16	0	49		
	3.	50	14 ± 2	10	18	0	51		
	Total	150	13 ± 1	11	15	0	51		
Density	1.	50	15.26 ± 3.15	8.94	21.58	0	111	0.087	0.967
	2.	50	16.00 ± 3.28	9.42	22.59	0	89		
	3.	50	17.00 ± 3.41	10.17	23.84	0	122		
	Total	150	15.76 ± 1.63	12.55	18.96	0	122		
Abundance	1.	50	49.53 ± 8.74	1.99	67.06	0	324	0.233	873
	2.	50	50.05 ± 9.25	31.50	68.60	0	251		
	3.	50	55.13 ± 8.89	37.29	72.97	0	324		
	Total	150	49.81 ± 4.46	41.02	58.60	0	325		
AF/ratio	1.	50	0.09 ± 0.011	0.07	0.11	0	0.26	0.504	0.68
	2.	50	0.08 ± 0.012	0.05	0.10	0	0.27		
	3.	50	0.10 ± 0.012	0.07	0.12	0	0.34		
	Total	150	0.09 ± 0.006	0.07	0.10	0	0.39		
IVI	1.	50	4.60 ± 0.78	3.08	6.12	0	25	0.022	0.995
	2.	50	4.87 ± 0.86	3.15	6.59	0	22		
	3.	50	4.80 ± 0.72	3.35	6.25	0	246.47		
	Total	150	4.74 ± 0.40	3.94	5.53	0	29		

Note: S.E. = standard error; C.I. = Confidence Interval; Units-(Frequency - %; Density and Abundance- Plants m/sq.)

Discussion

The quantitative characters which comprises the estimation of frequency, density, abundance, abundance by frequency (A/F) ratio and importance value index (IVI) of the different macrophytic species in the different study sites of the lake, recorded higher values during rainy season which influenced the growth of the macrophytes and favouring good climatic conditions. The rainy season seems to be most favourable season for the germination of buried seeds of the perennial emergents like Cyperus species and other mud-growing species like Eclipta, Enhydra, Ipomoea, Caesula species etc (Rai & Munshi, 1982). Similarly, high values during the rainy season were recorded from a number of lakes and wetlands viz., Hokarsar wetland, India (Kumar & Pandit, 2005), Manasbal Lake, India (Rather & Pandit, 2006), Awangsoipat Lake, India (Devi, 2007), Oksoipat Lake India (Devi, 2008), Poiroupat Lake, India (Usha, et. al., 2010b) etc. It was observed that the maximum numbers of aquatic macrophytic plant species were recorded at the onset of the summer season and the rainy season due to the favourable warm temperature while the lowest numbers of species were recorded during the winter season. Hogeweg & Brenkert (1969) and Verma et al., (1982) earlier recorded luxuriant growth of the aquatic macrophytes, in the tropics during the rainy season. It is evident from the survey of the aquatic macrophytes distributions in the different lakes and wetlands in record that the Lake Kapsi is comparatively intermixed mats representing heterogeneous composition and distribution. Such heterogeneous compositions of species were also recorded earlier by Swindale & Curtis (1957) and Schmid (1965) in the submerged vegetations of U.S.A. and Seshavatharam & Venu (1982) in the Kolleru Lake, India.

The statistical analysis reveals that there is no significant variation with respect to frequency, density, abundance, A/F ratio and IVI of the different aquatic macrophytes recorded from the lake in the four study sites of the lake. The analysis of variance within the different species of the aquatic macrophytes indicated significant variation with respect to the quantitative characters. Comparable findings were reported from Manasbal Lake, Kashmir Himalaya, India (Rather & Pandit, 2006), Itaipu reservoir, Brazil (Mormul, et al., 2010) and Poiroupat Lake, India (Usha, et.al., 2012).

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A Study Of Global Biodiversity Change With Respect To Biodiversity Loss

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Abstract:

Global biodiversity change the very known and one of the most burning environmental issues of the present time. Inspite of the the various components we are discussing the two important components of biodiversity change—one is biodiversity alterations and the other is biodiversity loss.Here we briefly assess the impacts that modern humans and their ancestors had on biodiversity and discuss the recent declines and the changes in biodiversity. We evaluate the direct pressures on biodiversity change, change in habitat, overexploitation, the exotic species, pollution, and climate change. We discuss the root causes, such as demographic growth and resources used, and review existing scenario projections. We identify successes and impending opportunities in biodiversity policy and management, and highlight gaps in biodiversity monitoring and models. Finally, we have discussed how the ecosystem conceptual framework can be used to identify undesirable biodiversity change and to distribute conservation efforts.

Keywords : extinctions, species, abundance, range, land-use, climate

Introduction:

Biodiversity is commonly defined as the variety of life on Earth in all its forms that includes the diversity of species, their genetic variations, and the interaction of these lifeforms. it is also the sum of all "plants, animals, fungi, and microorganisms on Earth, their variation, (**2**). Biodiversity is multidimensional, and no single measure of biodiversity can capture all its dimensions (**3**). It is responsible for ecosystem services, including nutrient cycling, climate regulation, food production, and the regulation of the water cycle, and it is therefore intimately linked with human well-being(2,3,4). This foundation is now becoming endangered as the human footprint on the planet increases and biodiversity declines. Species are becoming extinct at rates higher than in the fossil record of the past few million years, including the peak extinction rate owing to the mega fauna disappearance at the end of the Pleistocene (**6**). Several other dimensions of biodiversity are also declining, such as the extent of tropical forests and the mean abundance of wild bird species (**7**, **8**). The human appropriation of Earth's natural resources is not only leading to biodiversity loss but also to large alterations of biodiversity distribution, composition, and abundance. In short we can say Biodiversity underpins human life. Halting biodiversity loss and restoring degraded ecosystems is therefore an essential element of sustainable development pathways. Failure to scale up action to address biodiversity loss will come at a significant cost to economies, businesses and more generally to human well-being.

Although biodiversity loss is as great a challenge as climate change, it has received substantially less attention on the political agenda. The focus of the 2019 G7 meeting on biodiversity is a positive step forward. Here, we review our current understanding of global biodiversity change and its underlying drivers. We start by scoping our definition of global biodiversity change, which includes both biodiversity loss and biodiversity alterations. Next, we briefly review human-induced global biodiversity change.

1) **HABITAT DESTRUCTION :** Ever more people need ever more space. Damaging human activity continues to encroach on natural environments, thereby destroying the habitats of countless species. As our numbers rise, cities, infrastructure and cropland (see 'Agricultural Intensification' below) are growing and merging into each other, fragmenting the remaining habitat and leaving isolated "islands" of natural populations of plants and animals too small to survive. According to IPBES, only one quarter of land areas and one third of oceans remain relatively undamaged by human activity.

2) **OVEREXPLOITATION :** Ever more people need ever more things. Humankind's relentless consumption of resources such as timber, oil and minerals is continuing to destroy natural habitats around the globe. We are also putting enormous pressure on populations of wild species, both by bushmeat hunting in the developing world and by large-scale industrial fishing in our seas. Wildlife poaching and trafficking still present a huge threat to many species, including rhinos, tigers and pangolins(13).
3) **CLIMATE CHANGE :** Ever more people produce ever more climate emission . Our planet is on the verge of a climate crisis due to our endless production of greenhouse gases including carbon dioxide and methane. We are headed for a 3-4 °C warmer world by the end of the century if nations' current climate ambitions are delivered on. We are already seeing species decline due to global temperature increase(10). Every half a degree of warming has a huge knock-on effect on ecosystems, with mobile species running out of areas to migrate to and temperature-sensitive organisms like corals undergoing massive die-offs. When keystone species like reef-building corals disappear, the rich and complex ecosystems they support collapse as well.
4) **POLLUTION :** Ever more people produce ever more waste and pollution. As populations increase, the disposal of waste from households, agriculture and industry, becomes an increasingly serious issue. Our oceans are becoming choked with plastic waste which is killing millions of animals, from sea turtles to whales. (**10**)The Ellen MacArthur Foundation estimates that by 2050, there will be more plastic than fish in the sea. As well as affecting the lives of humans, noise, light and chemical pollution all damage the health of wild species.
5) **AGRICULTURAL INTENSIFICATION :** Ever more people need ever more food. Agriculture deserves a special mention here as it is a primary driver of habitat destruction, climate change and pollution. Agriculture takes up 50% of all habitable land on Earth, 80% of extinction threats to mammal and bird species are due to agriculture, and our modern food systems are also the biggest contributor to climate change, responsible for around a third of all greenhouse gas emissions, with more than half of these coming from animal agriculture. In order to meet the unsustainable consumption patterns of the Global North and feed our huge population, humanity has developed agricultural systems which rely on monocultures, artificial fertilisers and pesticides. Monocultures are increasingly susceptible to disease so require widespread pesticide use which destroys insect populations. Intensive farming leads to soil depletion and runoff from farms pollutes water bodies and causes harmful algal blooms and the collapse of fish stocks.
6) **INVASIVE SPECIES :** Ever more people means ever more travel. Human travel across the world has a very large emissions footprint but it has also allowed the spread of invasive species, both accidental and intentional. As a consequence of the introduction of non-native species to some areas, such as rabbits and cats in Australia, goats on St. Helena, and American mink in Great Britain, we have put many vulnerable ecosystems at risk, threatening native species and diminishing biodiversity.
7) **GENETIC DIVERSITY IN DOMESTICATED AND WILD SPECIES :** Of the four biodiversity dimensions analyzed here, we have the least information at the global level for changes in genetic diversity. Studies of loss of genetic diversity can be classified into two categories: studies of genetic diversity of domesticated species and studies of genetic diversity of wild species. Studies of domesticated species can further be divided into plant genetic resources (12) and animal genetic resources (14).

Over the past few decades, the worldwide adoption of modern crop varieties adapted to high-input systems has led to the reduction in the area farmed with local crop varieties (14). This change in agricultural practices has raised concerns: For instance in China, the number of rice breeds in production is reported to have declined since the 1950s from 46,000 to 1,000, and most of the 10,000 traditional corn breeds are no longer in production (9). Still, there are many farm communities that, although exposed to modern varieties, choose to maintain, at least in portions of the farm, traditional varieties (8). The picture of allelic diversity change is also complex. Although

some studies report declines in allelic diversity of modern varieties over the past few decades (9), a meta-analysis of 44 studies has found no significant overall

Solutions to biodiversity loss

Dealing with biodiversity loss is tied directly to the conservation challenges posed by the underlying drivers. Conservation biologists note that these problems could be solved using a mix of public policy and economic solutions assisted by continued monitoring and education. Governments, nongovernmental organizations, and the scientific community must work together to create incentives to conserve natural habitats and protect the species within them from unnecessary harvesting, while disincentivizing behaviour that contributes to habitat loss and degradation. Sustainable development (economic planning that seeks to foster growth while preserving environmental quality) must be considered when creating new farmland and human living spaces. Laws that prevent poaching and the indiscriminate trade in wildlife must be improved and enforced. Shipping materials at ports must be inspected for stowaway organisms.

Developing and implementing solutions for each of these causes of biodiversity loss will relieve the pressure on species and ecosystems in their own way, but conservation biologists agree that the most effective way to prevent continued biodiversity loss is to protect the remaining species from overhunting and overfishing and to keep their habitats and the ecosystems they rely on intact and secure from species invasions and land use conversion. Efforts that monitor the status of individual species, such as the Red List of Threatened Species from the International Union for Conservation of Nature and Natural Resources (IUCN) and the United States Endangered Species list remain critical tools that help decision makers prioritize conservation efforts. In addition, a number of areas rich in unique species that could serve as priorities for habitat protection have been identified. Such "hot spots" are regions of high endemism, meaning that the species found there are not found anywhere else on Earth. Ecological hot spots tend to occur in tropical environments where species richness and biodiversity are much higher than in ecosystems closer to the poles.

Concerted actions by the world's governments are critical in protecting biodiversity. Numerous national governments have conserved portions of their territories under the Convention on Biological Diversity (CBD). A list of 20 biodiversity goals, called the Aichi Biodiversity Targets, was unveiled at the CBD meeting held in Nagoya, Japan, in October 2010. The purpose of the list was to make issues of biodiversity mainstream in both economic markets and society at large and to increase biodiversity protection by 2020.

Loss of Biodiversity Solution

The solutions to Loss of Biodiversity are:

Protection of Species: Hunting of animals and poaching of birds should be restricted. But, unfortunately, to fulfil our greed, we kill animals and ignore the consequences of our actions.

Protection of Habitat: Due to the increase in human population, we need more space to survive and agriculture, which leads to the destruction of natural habitats of many animals and plants. Therefore, we should take measures to control the population to protect the habitat of animals and plants to keep them safe from extinction.

Prevention of Deforestation: Many animals, plants, and tiny organisms stay in tropical rainforests. However, these species are endangered due to deforestation, which will have a negative chain impact. So, we should make sure that we can save our forests and preserve them and keep the species safe.

Controlled Usage of Natural Resources: We should keep control of the usage of natural resources by using alternative options of cooking, fuel, and mineral usage.

Prevention of Species Invasion: We should stop the invasion of species because they will lead to the displacement of local species from their habitat, and this will cause the extinction of many species.

Pollution Control: We should control pollution levels as it affects the biodiversity in adverse and high pollution may lead many species to extinction.

Government Regulatory: Government should make laws that can protect or conserve the natural variety of plants and animals from getting extinct.

Education: People should be educated about the importance of the ecosystem and the preservation of biodiversity. They should also know the consequences of declining biodiversity so people can seriously take part in the growth of healthy biodiversity.

Conservation of Species: Species of the various living organisms should be preserved by In-situconservation by protecting them in natural habitats for growth and Ex-situ conservation by protecting the species outside their natural habitat.

Summary

Biodiversity loss is a significant worry in the present time. It creates a negative impact on the environment. It results in loss of habitat, extinction of species, and increase in natural calamities droughts etc. The present work gives a glance of the causes of biodiversity loss and its consequences. That's why it is necessary to preserve our ecosystem, for this we should find more effective solution to protect all the species and other important biological elements of the ecosystem.

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A brief Study of Forest and Wildlife Conservation

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Abstract :

This Review highlights the major issues about deforestation, wild life extinction and conservation. Forest conservation is the practice of planting and maintaining forest areas for the benefits and Sustainability of further generations. Along with that wildlife conservation is also mandatory. It is necessary to know current scenario about wildlife protection and conservation at national and international level. Habitat conservation is the key solution to conserve biodiversity. Lots of efforts has been done in many areas. Similarly by discouraging the pet trades, over shooting as well as hunting by applying different banes, marine pollution by different lows and regulation. And public awareness are the main concerns.

Introduction :

Forest and wildlife resources are indispensable four the provisions as ecosystem goods and services; as well as spiritual and cultural values in rural area. Now a days, conservation of biodiversity is the great challenge. There is a great need of different planning strategies for protection, conservation and minimizing the loss of natural resources, wildlife and forest cover. Forest may vary significantly in size and have different classifications according to how and of what the forest is composed. Tree forests cover approximately 9.4 % of the Earth's surface (30% of total land area). Forests are central to all human life because they provide a diverse range of resources and multiple benefits too. As we conserve the forest i.e. habitat of wildlife, wildlife conservation also done side by side. Cooney et. al. (2018) state that wild animals are essential part of biodiversity and source of food and recreation. However, forest and wildlife resources are disappearing at an alarming rate, across the globe. The degradation of forests has gradually led to loss in biodiversity, acsthetic view at landscapes and ecological functions including the provisions at goods and services of human needs.

History of forest and wildlife conservation :

The scheme of biodiversity and encompassing unique and representative ecosystems are identified and designated as Biosphere Reserves to facilate conservation in India's immense biological diversity which is estimated to be over 47,000 plant species and 81,000 animal species, respectively about 7 % of world's flora and 6.5% of world's fauna respectively. Nearly 15,000 flowering plants are endemic to country and in case of fauna, the extent of endemism is estimated at about 62 %.

The scheme of biodiversity conservation was initiated during 1991-92 to ensure co-ordination among various agencies with dealing with issues relating to conservation of biodiversity, and to review, monitor and evolve adequate policy instruments for the same. Pursant to ratiflaction of the conservation on Biological Diversity by India on 18th February 1994, several steps have been initiated to meet the commitments under the conservation and to realize the opportunities offered by convention. These efforts aim at bringing the legislative administrative and policy regimes in tune with the tree – fold objectives of conservation.

Methods of conservation :

Ways to conserve forests :

Forests serve as a natural resource and habitat for wide variety of living organisms on the Earth. Millions of animal species take shelter in forests. Conservation of forests is one of major steps to be taken to bring book sustainability in ecosystem. Use of following way can help to conserve forests and promote sustainability.

a) Controlling and regulating deforestation :

Industrialization and urbanization have cause a huge loss to forests and wildlife. One of the ways to conserve forests by controlling and regulating the cutting of forests. Shelter wood cutting, selective cutting, and clear – cutting methods may be employed to regulate the felling at trees.

b) Afforestation :

The most effective and promising way of conserving forests is afforestation. With afforestation, we can not only increase the overall forest cover but also recover the land due to deforestation.

c) Control Forest Fires :

One of the most significant causes of the loss of forests is forest fires. Although forest fires aid in replenishing essential nutrients form deal organic matter. In the soil, they cause a huge loss. The two types of forest are natural and artificial. Artificial forest fires are when complete forest land is set on fire. To convert the land for agricultural purposes. Artificial forest fires should be avoided completely. And, innovative forest fires fighting techniques should be discovered and implemented to stop natural forest fires.

d) Proper care :

Forest trees are also supplied with pesticides to protect them from harmful pests and diseases. This is when most trees get impacted negatively. The use of chemical substances poses a huge threat to the whole forest. Therefore proper care should be taken while safeguarding the plants from harmful pests and diseases.

Various Act of Protection and Conservation of Forest :

The important forest legislation in India are :

1) The Indian Forest Act, 1927
2) The Wildlife Protection Act, 1972
3) The Forest Conservation Act, 1980
4) The Scheduled Tribes and other Traditional Forest Dwellers Act, 2016

Ways to conserve wildlife :

Plants and animals are interdependent to each other. Plants supports animal's existence and vice-versa. some of them are fundamental to maintaining ecological balance. Here is some of the ways to conserve wild life.

a) Prevent deforestation :

Deforestation is one of the leading cause of the loss of wildlife. Wildlife can be protected and conserved with the help of afforestation.

b) Develop Protective areas :

Developing protective areas for animals to live is another promising way to conserve. Wildlife some of the example of protective areas include wildlife sanctuaries, national parks, zoos and so on.

c) Protecting critically endangered species :

Safeguarding the vulnerable and critically endangered animals from becoming extinct is another way of promoting wildlife. There critically endangered or vulnerable species many be brought to safer places such as zoos where they can breed and reproduce.

D) Ban on wildlife hunting :

Introducing strict rules on banning wildlife hunting is critical to stop further loss of wildlife.

Importance of Conservation :

Forest and animal are the most important aspects of our lives. We value them for many reasons, some utilitarian, some intrinsic. This means we value biodiversity both for what it provide to humans and for the value it has in its own right. Utilitarian values include the many basic needs human obtain from forest and also from animals. More than 33% of our drug needs are obtained from wild plants. The forest gives incredible breadth to leap forwards in the field of clinical science and innovation alongside the necessities for the huge scope if assembling anti-infection agents and different medications for medicinal use. A forest keeps up with temperatures universally, accordingly batting against the impact at greenhouse gases. Forests also aid in forestalling the ocean levels to rise strongly. Plat and animals are interdependent on each other.

Plant support animal's existence and vice-versa. Both of them are fundamental to maintaining ecological balance. The Forest is a natural habitat for. Many animal species. Thousands of animal species reside in these immense forests. Micro-organisms in wildlife fix the nitrogen levels, thereby promoting soil fertility. Forest as well as wild animals have importance in human life.

Various Act of Protection and Conservation of Wild Animals :

The important wild life legislation in India are :

1) Wild life Protection Act, 1972
2) Wild Life (Stock Declaration) Central Rules, 1973
3) Wild life (Transactions and Taxidermy) Rules, 1973
4) Wild Life (Protection) Licensing (Additional Matters for Consideration) Rules,1983
5) Wild Zoo Policy, 1998
6) Declaration of Wild Life Stock Rules, 2003
7) National Board for Wild life Rules, 2003
8) National Tiger Conservation Authority (Salaries, Allowances and Other Conditions of Appointment) Rules, 2006
9) Recognition of Zoo Rules, 2009

Conclusion :

In this way, this paper conclude that, individuals as well as governments can do their part in presenting the forests of the world. Knowledge about the importance of forest and wild animals needs to be spread so that people become aware of the danger to everyone and everything on the earth by deforestation and extinction of animals. People's participation in conservation of forests is of vital importance. So that people must get involved in this national task. Methods, strategies and measures mentioned here for the conservation of forests and wild life are very simple so that every individual could follow them and act at their own level in order to achieves the goal of conservation of forest as well as wild creatures. If people starts now and act now, it might get too late for the cause of conservation of forests and wildlife.

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Conservation and Use of Wild Medicinal Plants Problems, Progress, and Prospects

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Abstract:

In India, the research works on wild plants and agriculture is meager as compared to developed countries. There are numerous methods being used to study the agriculture of wild pants and their uses in herbal medicine and cosmetics industry. Therefore, the focus of this article is to explain the methods and their potential utility to the researcher, with a special emphasis on how Indian scientific communities can utilize the simple and feasible methods of collection of wild medicinal plants and explain their uses for the society. Ocimum americanum belongs to the family Lameaceae and have an aromatic and medicinal importance. In application of advanced method like GC-MS computational techniques plays an important role in the development of drug of interest concerning the study of O. americanum contents. Four compounds were identified in aerial parts of leaves of Ocimum americanum. These four compounds identified in ethanolic extract are 3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl)ethyl ester (Butanoic acid), Diacetato[1,2-bis(diclohexylphosphino)ethane, Osmium dibromi(E) [tetrakis(trimethylphosphine)],10,10'-diselenodi-(Decanoic acid)). It was observed that in the different sites of Nagpur region, the constituents of Ocimum americanum differed in quantity, which may be due to the local geographical differences. Aromatic oil found in 3gm of dry weight of powder of leaves of Ocimum americanum is 5%.

Keywords *- Ocimum americanum (L.), GC-MS, Compounds, Agriculture.*

Introduction

Medicinal plants are valuable sources of new drugs [1–4]. Up to 80 % of people in developing countries are totally dependent on herbal drugs for their primary health care, and over 25 % of prescribed medicines in developed countries are derived from wild plant species [4].According to world health organization (WHO) variety of drugs are obtained from medicinal plants.In developed countries almost 80% of individuals depends on compounds derived from medicinal plant.In this regard properties,saftey & efficiency of them should be investingated.[5]. The study of indigenous food production and local medicinal knowledge may have practical implication for developing sastainble agriculture and discovery of new medicines.Medicinal and herble plants also encourage an awarness of the link between biodiversity and culture diversity as well as a sophisticated understainding of the mutual influence of plants mutual influence of plants and human. The conservation and sustainable use of medicinal plants have been studied extensively [6, 7]. Various sets of recommendations have been compiled regarding their conservation, including the establishment of systems for species inventorying and status monitoring, The Global strategy for Plant consevation is a catalyst for working together at all levels-local national,regional and global-to understrand,conserve and use sustainbly the worlds's immense wealth of plant diversity whilst promoting awareness and building the necessary capcities for its implention.Gas chromatogrphy and Mass spectrum is one of the best method for to identify the plants chemical components. *Ocimum americanum* contain essential oil which is volatile organic strong smell substance and have great importance in pharmaceuticals as well as cosmatics industries.

Fig- *Ocimum americanum*

Methodology

Collection of plant material

Ocimum americanum leaves were collected from Panjabrao Deshmukh Krushi Vidyapeeth (PDKV) forest of Nagpur district. The plant was identified by the Plant systemic laboratory Department of Botany,R.T.M.University Nagpur Maharastra.GC-MS Analysis - The test plant extracts were subjected to GC-MS analysis at laboratory's (IIT Bombay) Sophisticated Analytical Instrument Facility (formerly RSIC), Indian Institute of Technology, Powai, Mumbai.

Result And Discussion

The present investigation was carried out on plant *Ocimum americanum* of Lamiaceae family to study the presence of medicinally active phytochemicals in the leaves.The leaves of *Ocimum americanum* (L.) Poit collected from campus and PDKV forest which experienced different climatic and geographic circumstances, were determined by GC-MS. It has been already reported by various workers. As seen in the table- 1, different compounds were determined from the leaves of *Ocimum americanum*. The present investigations concluded that the leaf *Ocimum americanum* contains chemical compounds. These chemicals are widely used in Ayurvedic traditional and herbal medicines as well as cosmetics industry.Decanoic acid is used in the manufacture of esters for artificial fruit flavours and perfumes. Problematically some wild plant resource is becoming scarce and threatened by over harvesting It needs substantial investment before and during production Uncontrolled harvesting leads to the extinction of ecotype and species. In progressively, the natural way access resource without investment it relieves harvesting pressure on rare and threatened species. It is natural resource and free from pesticides It can keep genotypes being standardized or improved

Ocimum americanum in chemical compounds and herbal ingredients,and it has been said that 70-80% of the world's population relies on some from of non-conventional medicine[4] and around 25-40% of all prescription drugs contain active ingredients derived from plants in theUnited States[5].

Medicinal Importance of *Ocimum americanum*

- In traditional medicine, *O.americanum* holy basil is used for several ailments.
- Decoctions are used for coughs; pounded leaves are placed on the forehead to relieve catarrh or on the chest for respiratory problems.
- The whole plant is used in baths to treat rheumatism, renal colic and calcifications.
- More recently, the plant has been listed as a potential medicine against cancer.
- Aromatic oil is found in 5% in 3gm of dry weight of powder of leaves of *Ocimum americanum.*
- An essential oil can be extracted from plants leaves of *O. americanum* are used in soap and cosmetics. It has been reported to exhibit fungi toxic properties (without phototoxic side-effects).The oil contains camphor, and methyl-cinnamate.
- *O. americanum* has been planted on a large scale in the Common wealth of Independent States, Kenya and Pakistan for the production of camphor, which has medicinal and industrial applications (celluloid, fireworks).
- *O. americanum* used to treat inflammatory and allergic conditions.
- The leaves pest is used in tretment of skin deaseses,it is also appplied on wound and burns that are not healing well.

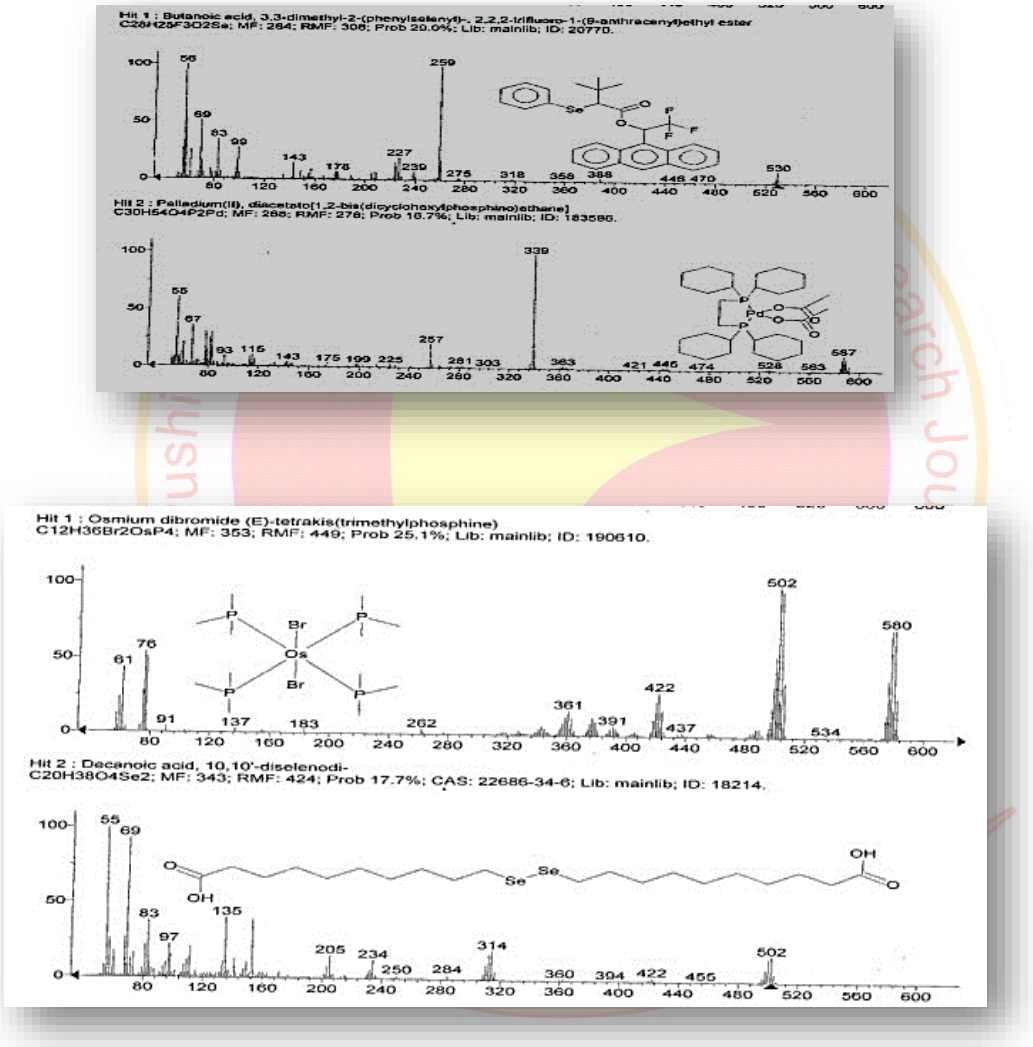
Table 1- Uses of Plants species, life forms and Percentage of plant parts used

Life form	Leave	Flower/bud	Fruit/seed	Bark	Root	Whole plant
Herb	High	High	High	Low	Medium	High

Table No.:2 The Chemical Composition of *Ocimum americanum*

S. N.	Name of compound	Molecular formula	Biological activity	Peak Area
1	3,3-dimethyl-2-(phenylsenyl)-,2,2,2-trifluoro-1-(9-anthracenyl) ethyl ester. (Butanoic acid)	$C_{28}H_{25}F_3O_2$	Antioxidant activity	141200
2	Diacetato[1,2-bis(diclohexylphosphino)ethane]	$C_{30}H_{54}O_4P_2$	----	141200
3	Osmium dibromi(E) (tetrakis(trimethylphosphine	$C_{12}H_{36}Br_2O_4$	Anticancer Compounds	66375
4	10,10'-diselenodi-(Decanoic acid)	$C_{20}H_{38}O_4$	Antioxidant activity	66375

Graphical Representation of *Ocimum americanum*



Conclusion:

The study concluded that *Ocimum americanum* and its habitat less but its own reproductive strategies. In spite of the existence of various sets of recommendations for the conservation and sustainable use of medicinal plants, only a small portion of these have achieved adequate.

Protection of medicinal plant resources through conventional conservation in natural reserves.

Most of the medicinal claims are centered on flowerand inflorescence of the plant. The whole plant and l eaves,are also administered in a few specific clinical conditions.Theanalysis of all the claims clearly indi

cates the,potential of the plant to be an excellent analgesic, antipyretic and anti inflammator drug whi ch needs to,be,validated.The present GC-MS screening are an essential tools for confirmation of the results and it may serve as pavements for the researcher to select a group of plants having similar chemical constituents and their detailed investigation regarding their chemistry and functions is required, so that they can be used in allopathic or in Ayurvedic medicine as well as cosmatics industry.

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Qualitative phytochemical study of Certain Ficus Species from Manora Tehsil.

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Abstract

Family Moraceae (fig family) one of the angiospermic plants family can be found throughout the world bearing about 38 genera and over 1100 species with cosmopolitan distribution. Ficus is a genus of more than 850 species in the Moraceae family. Generally, there are five species of Ficus in Maharashtra's Washim District: Ficus hispida L., Ficus benghalensis L. Ficus glomerata L., Ficus religiosa L.., Ficus benjamina L. are more commonly found having a diversified habitat. The presence of active phytochemicals in various parts of the plants gives these Ficus species their traditional therapeutic use. The present work is focused on the comparative preliminary phytochemical analysis of above selected five Ficus species from Manora tehsil of Washim District, (M.S.) India. It is observed that Ficus species have rich but diverse phytochemicals in their different parts.

Keywords: Moraceae, Ficus, Phytochemicals, traditional medicine, Manora.

1. Introduction

For thousands of years, plant have provided to human beings many basic and important materials required for their day-to-day life. Plants are also considered as biochemical factories, as involved in the production of various chemical components for the utilization of mankind.

Natural products have found use in antiquity as folk remedies, soaps and essences. They include drugs and other medicinal products, dyestuffs, feedstocks for chemical industries (gums, resins, rubber) and a variety of substances used to flavor food and drink. In recent years, however, it has become increasingly evident that many natural products do have significant ecological functions, such as protection against microbial or insect attack. (Hopkins, 1995).

Different traditional literatures are literal witness that *Ficus* are having many ethnomedicinal values. (Babu K, 2010).

In this present work, it was attempted to give a comparative phytochemical from five selected Ficus species i.e. Ficus hispida L., *Ficus benghalensis L. Ficus glomerata* L., Ficus religiosa L.., *Ficus benjamina* L. and their some traditional ethnomedicinal uses.

2. Materials And Method

2.1 Collection of plant materials:

Plants and plant materials selected for the study were collected from different localities of Manora tehsil, Washim district specially from villages, Abhaykheda, Kolar,Kondoli, Dapura, Vitholi, Manora region. Firstly, the plants were spotted in different localities, identified them using different floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002. A specimen copies of selected plant is submitted to the herbarium of Department of Botany, M.S.P. Arts, Sci. & K.P.T. Comm. College Manora, Dist. Washim (MS).

Photographs of five Selected *Ficus* Species:

Ficus hispida L. ***Ficus benghalensis L*** ***Ficus glomerata*** **L. Ficus religiosa L.** ***Ficus benjamina*** **L.**

The leaves and stems of the plants were picked and washed with tap water and then distilled water. Then the material is shade dried for 10-15 days and grinded well to obtain homogenous fine grade powder. a 4-gm powdered sample soaked for 1 hour in each of 40 ml Methanol, Petroleum ether, and distilled water, Preliminary phytochemistry was conducted after the solvents were filtered.

2.2 Preliminary phytochemistry: Preliminary phytochemistry was done as method given by Harborne (1973), and Krishnaiah et al, (2009). **..**

Preliminary phytochemistry was done for 11 group of secondary metabolites i.e. Alkaloids, Cardiac Glycosides, Phenolic compounds, Flavonoids, Terpenoids, Saponin, Steroids, Reducing Sugar & Tannins.

3. Result And Discussion:

Table No. 1 - Comparative preliminary phytochemical analysis of five *Ficus* Species (Leaves extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	-	-	+	+
3.	Phenol	+	+	+	+	-
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	+	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	+	+	+	+	+
8.	Reducing sugar	+	+	+	-	+
11.	Tannins	+	+	+	+	-

Table No. 2 – Comparative preliminary phytochemical analysis of five *Ficus* Species (Stem extract).

Sr. No.	Phytochemicals	Ficus hispida L.	*Ficus benghalensis L.*	*Ficus glomerata L.*	Ficus religiosa L.	*Ficus benjamina* L.
1.	Alkaloids	+	+	+	+	+
2.	Cardiac Glycosides	+	+	-	+	-
3.	Phenol	+	+	+	+	+
4.	Flavonoids	-	+	-	+	+
5.	Terpenoids	-	+	+	+	+
6.	Saponin	+	+	+	+	+
7.	Steroids	-	+	+	+	+

8.	Reducing sugar	+	+	+	+	-
11.	Tannins	-	+	+	+	-

4. Conclusion:

Methanol, petrolium ether, and distilled water were utilised as solvents for preliminary phytochemistry. Methanolic leaf extracts of Ficus hispida L, *Ficus benghalensis L.*, *Ficus glomerata* L, and Ficus benjamina L contain alkaloids and reducing sugar.

Ficus benghalensis L., Ficus hispida L., and *Ficus benjamina* L. all contain steroids, but *Ficus benghalensis L.*, Ficus hispida L., and *Ficus benjamina* L. do not.

Glycosides were found in the petroleum ether leaf extracts of Ficus hispida L., Ficus religiosa L., and Ficus benjamina L. *Ficus benghalensis L.*, *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L. all contain terpenoids, as do *Ficus glomerata* L., Ficus religiosa L., and Ficus benjamina L.

The aqueous leaves extract of Ficus hispida *L*, *Ficus benghalensis L.*, *Ficus glomerata* L. and Ficus religiosa L. shows the presence of Phenol and Saponins, Steroids, while it shows the presence of Flavonoids and Tannin are found *Ficus benghalensis L.*

Alkaloids and phenols can be found in Methanolic stem extracts from all of the plants studied, while Flavonoids can be found in *Ficus benghalensis L.* and Ficus religiosa L.

Glycosides can be found in the petroleum ether stem extracts of Ficus religiosa *L.* and *Ficus benghalensis L.* Reducing sugar is detected in the aqueous stem extracts of *Ficus hispida* L, *Ficus benghalensis L.*, *Ficus glomerata* L, and *Ficus religiosa* L., whereas Phenolics, Terpenoids, Saponin, and Steroids are present in *Ficus glomerata* L and Ficus religiosa L.The phytochemical study of the above plants shows that the plants of the selected *Ficus* species have the common secondary metabolites viz. Alkaloids, Glycosides, Terpenoids, Steroids, Saponins, reducing sugar, Tannins, and a variety of other phytochemicals are found in abundance in almost all members of the family. These phytochemicals are studied for the various medicinal properties and has been probed used again various diseases such as diabetes, fever, tuberculosis, renal tubular disease, malaria, intestinal diseases, etc. These plants' natural phenolic compounds performed an essential part in cancer prevention. (Singla and Pathak, 1993; Munshi et al., 1993; Omale and Emmanual, 1997; Ravichandran et al., 2012).

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Diversity of Selaginella in Melghat forest , Amravati district, Vidharbha region of Maharashtra.

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Abstract

Melghat lies on the Southern shoot of the Satpuda range of hills. This part of Satpuda is known as Melghat; consists of hills and vallies . The most prominent geological feature of Melghat is the Gavilgad range of hills which is abundantly rich in biological diversity.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

In Melghat forest Pteridophytes flourishes naturally very well. Selaginella species well flourishes in Melghat. Key Words – Melghat, Pteridophytes, Selaginella.

Key words- Pteridophytes, Selaginella, Melghat forest.

Introduction

Pteridophytes formed a dominant part of Earth's vegetation in the historic past.Although they been largely replaced by the spermatophytes in the modern day flora.The present day lycopods like Lycopodium, Selaginella and Equisetum are the mere relicts of the mighty lycopsid and sphenopsid group.

Forest of Melghat is Dry deciduous type of Forest.The entire area of Melghat is covered by the forest of the Dry deciduous Teak Forest. Tectona grandis is the most important and dominant species distributed in the entire area. The Melghat forest composed of Gugamal national Park with 361.28 sq.km. area, Melghat sanctuary with 788.75 sq.km area and Multiple use area with 526.90 sq.km. area.

Materials and Methods

Pteridophytes division of vascular plants which do not produce seeds. It include Ferns, Club mosses and Horse tail. In Melghat under shady and damp places, along waterfalls, road sides of Ghats, in association with Angiosperms and Gymnosperms.

The plant specimen of Selaginella was collected in every stage of their growth and habitats and reproduction from different localities of Melghat Forest area. The plants were collected in tin vasculum. The plants are pressed flat, before their wilting. They are pressed after the day's visit.

The Selaginella was pressed between the sheets of news or blotting paper. These sheets were alternated between sheets of news or blotting paper. The plant became dry by transferring their moisture into the blotting papers.

After drying of plant material, the plant specimen were mounted on herbarium sheets of standard size . The specimens are labeled as per all data. The Selaginella specimen were preserved in 4% formaline solution.

Observation –

Selaginella blatteria

Selaginella blatteria found along the road sides in moist condition. It is distributed from August to October. The sporophyte observed from September to October.

The sporophyte herbaceous, dorsiventral prostrate, 6-16 cm long . Stem herbaceous, dichotomously branched, solid, prostrate, green, smooth and glabrous. The hairs unicellular. Leaves microphyllous, heterophyllous. Each leaf traversed by single unbranched mid-rib. The leaf with ligule, ligule arises from the base of each leaf.

Ligule delicate green with entire margine and acute apex, tongue shaped. A mature ligule has a prominent basal portion called the glossopodium. The ligule is a secretary structure which secretes water and mucilage. The leaves from four side of the stem. The larger leaves on the ventral side of the stem in opposite decussate manner.

Rhizophore leaf less, positively geotropic organ bears roots at the swollen end. A single rhizophore comes out downward from the rhizome. A rhizophore is an organ intermediate in structure and function between the stem and root, it is root like in appearance and behavior but has no root cap.

Rhizophores grow down to the soil and true roots emerge from them. Roots adventitious originate from the tips of rhizophores, dichotomously branched. The roots have root cap and bear root hairs.

Strobilus- The spore bearing organ is known as Strobilus. Sporangia bearing organ is sporophyte. The sporangia develop in the axil of leaves called as Sporophylls. The sporophylls are similar to photosynthetic vegetative leaves. There are two types of sporangia. The microsporangia, the sporophyll bearing microsporangia called microsporophyll. The megasporangia, the sporophyll bearing megasporangia called mega-sporophyll. The strobilus always terminal in position. The sporophylls ligulate which are present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous or the cone.

Selaginella repanda

Sporophyte observed from August to October . The strobilus from September to October.The sporophyte is terrestrial erect, dichotomously branched, 1.4 to 2.0 cm long . Leaves dorsiventral heterophyllous and alternate, leaves are of two kinds in four vertical rows, dorsal two rows are small, ventral two rows are large , ligulate. Ligule arise from the base of leaf, delicate green with entire margin and acute apex. The stem dorsi-ventral , dichotomously branched, solid. The rhizophore white coloured, 0.5 -1.0 cm long.

A rhizophore is an organ intermediate in structure and function between the stem and root; it is root like in appearance and behavior but has no root cap. Roots are adventitious, produced from the ends of the rhizophores.

The spore bearing organ is known as strobilus.Sporophylls are spirally arranged at the tips of the lateral branches forming strobilus. The sporophyll develop in the axil of leaves called as sporophylls. There are two types of Sporangia, The microsporangia, The sporophyll bearing microsporangia called microsporophyll. The megasporangia , the sporophyll bearing megasporangia called megasporophyll. The strobilus always terminal in position. The sporophylls are ligulate which present between the sporangium and the base of sporophylls. The strobilus also called the sporangiferous spike or the cone.

Result and Discussion

The pteridophytes are considered as a first vascular plants that colonized the terrestrial habitat. In the course of evolution they reached upto arborescent habit that has resulted into a gigantic and thick forest in Siluro-Devonian period. Pteridophytes have well developed conducting system. The plants are with feather like fronds.

The living members are represented by living taxa widely distributed over the surface of the global part . In Melghat Forest area Selaginella with two different species distributed in different climatic conditions. *Selaginella blatteri* and *Selaginella rependa*. Selaginella distributed on rock at moist condition with creeping stem, spirally arranged leaves, sporangia arranged in terminal strobilus.

Selaninella shows ecological succession in forest ecosystem.

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Diversity of Insect pest on Banana plant in Pandhari region,Anjangaon surji

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Introduction

Banana is a globally important fruit crop with 97.5 million tons of production. In India, it supports livelihood of millions of people. Banana occupies 20% area among the total area under crop in India and contributes 37% of the total fruit production and ranks second in importance next to mango with a total annual production of 16.91 million tons from 490.70 thousand hectares with national average of 33.5 T/ha. Bananas were originally found in South East Asia, mainly in India.

Banana, the fruit of a plant of the genus -Musa (family- Musaceae) is basically cultivated for food, and secondary for the production of fibers, and also for producing tissue-thin tea bags. Besides this, bananas are also cultivated for some ornamental purposes in various regions of the world. They are also known as Bananier Nain, Canbur, Curro and Plantain. These creamy, rich, and sweet fruits are favourite among the people of all ages right from infants to elders. Bananas consist mainly of sugars (glucose, fructose and sucrose) and fiber. They provide instant energy as they are the rich sources of Vitamin B6.

Origin of Banana

Musa species grow in a wide range of environments and plantains of the tropics to cold-hardy fiber and ornamental plants. These large, perennial herbs, 2-9 m in height, is evolved in Southeast Asia, New Guinea, and the Indian subcontinent, developing in modern time secondary loci of genetic diversity in Africa, Latin America, and the Pacific.

Musa species attained a position of central importance within pacific societies, the plant is a source of food, beverages, fermentable sugars, medicines, flavorings, cooked foods, silage, fragrance, rope, cordage, garlands, shelter, clothing, smoking material and numerous ceremonial and religious use.

Botanical Description

Banana plants are fast-growing herbaceous perennials that grow at 6 to 7.6 meters (20-25 feet) tall, from a corm. The banana has an underground stem with adventitious roots. Below is the brief botanical description of the banana plant.

Plant

They are herbaceous plant with an apparent trunk that bends without breaking. The "trunk" or pseudostem is not a true stem, but only the clustered, cylindrical aggregation of leaf stalk bases. This is the largest of all herbaceous plants having its leaves arranged spirally which can grow 2.7 metres (9 feet) long and 60 cm (2 feet) wide. There are 5-15 leaves on each plant, with 10 considered the minimum for properly maturing a bunch of fruit and approximately 44 leaves will appear before the inflorescence

Flowers

The inflorescence shooting out from the heart in the tip of the stem appears above the last leaves in an upright position, and consists only of a large, purple, tapered bud. As the bud opens, the narrow, nectar- rich, tubular, toothed, white flowers are revealed. They are then clustered in whorled double rows along the stalk, each cluster covered by a thick, purple, bract. The flower stalk begins to droop down under its own weight after opening; the flowers are negatively geotropic, and turn upright during growth

Pollination

Bananas are male sterile, and those of the Cavendish group are female sterile as well; fruit is set parthenocarpically

Fruits

The fruit (technically a berry) turns from deep green to yellow or red, and may range from 2-1/2 to 12 inches in length and 3/4 to 2 inches in width. The flesh, ivory-white to yellow or salmon-yellow, may be firm, astringent, even gummy with latex when unripe, turning tender and slippery, or soft and mellow or rather dry and mealy or starchy when ripe. through the literature we came to know the major and minor pest on banana tree viz.

Spondoptera litura (Cutworm) chaetanaphothrips signipenn (Banana thrips) , Nacoleia octasema (Banana scab moth) Apterona helicoidella (Hard scale)

In present study aimed to collect the data of minor pests of banana from selected banana field.

These minor insect causes the harm to banana tree and damage the banana leaves and some pest spread the diseases.

Thrips- Distinctive reddish brown oval stains on the finger, which can extend the entire length. In severe cases peel splits and the exposed flesh quickly discolors.

Aphids- Banana leaves are bunched into a rosette appearance with leaf margins becoming wavy and upward rolling thereby reducing the growth and vigour of plant. Severely infected plants do not produce bunches and act as a vector of bunchy top disease.

In addition,the climate change exerts a profound effect on the intensity of pest problem. Hence, there is considerable shift in insect pest problem and crop losses(Arora and Dhaliwal,1996;Dowens,et al.,2007 and Ramamurthy et al.,2009).

Banana plantation suffers number of pest: The minor pest and diseases affecting bananas are follows-

Viral diseases-Banana bunchy top virus is also known Banana virus,cucumber mosoic virus.

Fungal diseases-Panama disease,Singatoka diseases caused by fungus: Mycospheaerella musicola, Black Sigatok.

Insect pest-Banana stem weevil, banana pseudo stem borer, Odeoiporus longicollis, Oliver, banana rust thrips, Fruit rust thrips, Hard scale-Aspidiotus destructor, Cut worm. Nematods have been growth and yield through its damage to the roots and corm. The parasitic nematodes feed, multiply and migrate to roots.

Material and Method

There are different types of methods are available for collecting banana pest like pitfall trap method, handpick methods, light trap method, net swapping method, above methods are used for the collection of the banana pest.

In this reserch used the hand-pick methods for the collection of banana pest, firstly selected a specific agricultural land for the collection of banana pest, this agricultural land is in Amravati district in Pandhari village. This agricultural land visited on dated 13/9/2014 for the collection, near about 20 to 30 different types of pest collected and preserved in 70% alcohol. Later took photographs of each and every pest for their identification.

The specific field which were selected for the collection of pest is of 4 hectares. On these agricultural there are 4000 banana trees and each row contains 100 banana trees, having distance between two trees of 2.5 feet and distance between two rows is of 5 feet respectively.

Collection Time : The insects were collected between 11am-5pm. The owner of the land gave lots of information about banana trees and, his agricultural land was fully developed as compared to other farmers land. The survey was carried out 5-6 times for the observation of pests and were observed that there are some pests having an side effect on the banana trees and causing harmful effects on the yield of banana.

The study Area-Anjangoan surji is situated in Amravati district in Maharashtra, selected for study area because in these area more production of banana crop. The agriculture field of this area is developed for banana crop

Observation and Result

Total 40 to 50 individuals of various groups of insects were collected from the selected banana field and stored in70% alcohol later brought to laboratory. After sorting the minor pests are identified through available literature. Five minor banana pests are selected for the study and observed and their biology werestudied .

1) Cut worm - *Spondoptera litura*
2) Banana Scale Moth –*Nacoleia octasema*
3) Hard scale - *Aspidiotus destructor*
4) *Chaetanaphothrips Signipennis*

1) *Spondoptera litura*(Tobacco Caterpillar/ Cut worm)

classification
Kingdom: Animalia Phylum:Arthropod
Class :Insecta
Order :Lepidoptera Division:Ditrysia
Family:Noctuidae
Genus :Spodoptera
Species:litura

It is commonly called the cut worm or tobacco caterpillar and it is the type of Moth.

The lipidopteran pest Sondoptera Litura is a serious pest of banana,it has been recorded on several other crops like tobacco, cotton,mulberry.the full grown caterpillar are the most varacious feeders and cause extensive damage by defolication.

Identification- It having greenish brown with dark making, yellow and purplish spot in the sub marginal areas. It having forewing-stout moth with wavy white marking on the brown. Hind wing-white having a brown patch along margin.

Nature of damage

1)Young larvae feed by scrapping the leaves from ventral surface.
2)Later on feed voraciously at night on the foliag.

Fig-*Spondoptera litura*

Fig-*Spondoptera litura* (larva)

Result and Discussion

In the present study 40 to 50 banana pest were collected from selected agriculture field. The pestswere identified later minor pest were sorted out from collection. The minor banana pests are *Spondoptera litura* known as Banana scale moth, *Aapidiotus destructor*, known as Thrips, Bag worm , these are identified minor banana pest.

Many workers reported works on banana pest. Banana rust thrips(*chaetanaphothrips signipennis)* (Bagnall) (Thysanoptera:Thripidae) are present in parts of Australia and central America ,Brazil, Fiji, sri Lanka ,and India and also established in Florida caused severe damage to banana. The banana rust thrips is similar in appearance to two other introduced *Chaetanaphothrips species* the anthurium thrips,*C.orchidii*(Moulton) (Hara *et al.*,2002) and C.leeuweni (karny),which also share the samehosts,including banana, and anthrium .Banana rust thrips can be differentiated from two species by clear differences in body features. Gold(1998) and Umesh *et al*.,(2002) reported banana weevil and other insect such as moth, bag worm. The banana weevil has been identified as the most important insect pest of banana plantain in Africa.

The major pests found in Sri Lanka are banana weevil , stem weevile, banana aphid, banana thrips and fruit fly. However, diseases are more damaging as they reduced yield of banana more than insect pests. The major virus diseases recorded in Sri Lanka are banana tract mosaic virus, banana steak virus and cucumber mosaic virus.

Ariyarantna and Liyanage , (2002) reported that 82% and 59% of the cultivated banana are infected with banana bract mosoic and banana streak virus, respectively.

Plantain and banana cultivation is constrained by problem of pests and diseases.The minor pests namely banana fruit scarring beetle thrips, bag worm were reported from India. Shivayogeshwara et al.,(1991) reported spondoptera litura is becoming gradually an important insect pest crops including banana in India and many other countries.There have been a number of studies on the biological parameters of S.litura on different host plant under different environmental condition,particularly in India.Seasonal incidence of spondoptera litura on banana under South Gujarat conditions was studied by(patel et al.,1987)

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जैव विविधता : एक अमूल्य धरोहर

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अंतर्राष्ट्रीय प्रकृति संरक्षण संघ (IUCN) एक विश्वस्तरीय संगठन है जो विभिन्न प्रजातियों के संरक्षण, निगरानी और प्रबंधन ***का कार्य*** *करता है। अंतरराष्ट्रीय प्राकृतिक संरक्षण संघ के अनुसार जीवो को विलुप्त, घोर संकट ग्रस्त, संकटग्रस्त, असुरक्षित और संकट मुक्त जीवो की श्रेणी में बांटा गया है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा संकटग्रस्त प्रजातियों को लाल सूची या रेड डाटा बुक के अंतर्गत सूचीबद्ध किया* ***जाता*** *है। अंतरराष्ट्रीय प्रकृति संरक्षण संघ के द्वारा लगभग 40,000 से अधिक प्रजातियां घोर संकटग्रस्त जीवो की श्रेणी में दर्ज की गई है। जिसमें 41% उभयचरी जीव, 21% सरीसृप, 26% स्तनधारी जीव, 13% पक्षियों, 33% कोरल रीफ, 34% कोनिफर, 63% साइकेड है।*[1] *अगर यह जीव पृथ्वी से विलुप्त हो जाते हैं तो परिस्थितिक तंत्र में धीरे-धीरे असंतुलन बढ़ता जाएगा और एक दिन ऐसा आएगा जिससे मानव का अस्तित्व खतरे में पड़ जाएगा।*

1. प्रस्तावना

जैव विविधता प्राकृति के द्वारा, मानव को दी गई रक्षा कवच के समान है। जो लाखो सालो की प्रतीक्षा के बाद बरदान स्वरूप मिला है। जैव विविधता शब्द जीवन एवं विविधता के संजोग से निर्मित है। जिसका शाब्दिक अर्थ है पृथ्वी पर मौजूद जीवो की भिन्न-भिन्न प्रजातियाँ। हमारी थाली में मौजूद संतुलित आहार चावल, रोटी, दाल, सब्जी और फल इत्यादि जैव विविधता के उत्तम उदाहरण है। **(Figure 1).** जैव विविधता से ही हमारे जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। चावल, दाल रोटी से हमें ऊर्जा की पूर्ति होती है। तो फल व सब्जियों से हमें विटामिन्स और खनिज की प्राप्ति होते हैं। जिससे **हमारी** शारीरिक और मानसिक शक्ति का विकास होता है और रोग प्रतिरोधक क्षमता बढ़ती हैं। इस तरह हम कह सकते हैं कि जैव विविधता से मानव जीवन की आधारभूत आवश्यकताओं की पूर्ति होती है। जरा सोचिए चावल की प्रजाति में अगर बासमती चावल विलुप्त हो जाए तो क्या हमारी आने वाली पीढ़िया सुगंधित पुलाव खा पाएंगे। फलों का राजा आम की लगभग 1000 किस्में भारत में उगाई जाती है।[2] जैसे मालदा, लंगड़ा, फजली, दसहरी, बैगनपल्ली, नीलम, तोतापुरी, चौसा, केसर, अलफोसो, बादामी, आम्रपाली इत्यादि। अगर इनमे से लंगड़ा और दसहरी आम का पृथ्वी से लोप हो गया होता तो हम लंगड़ा और दसहरी आम का स्वाद कभी नही चख पाते।

दुर्भाग्य की बात है कि हम अपनी इच्छाओं की पूर्ति हेतु जैव विविधता के रूप में प्राप्त अपना सुरक्षा कवच तोड़ रहे हैं। उन्नत किस्म की प्रजाति प्राप्त करने की अभिलाषा में हम जंगली (wild) किस्म की प्रजातियों का संरक्षण नहीं कर पाते हैं। जबकि हम यह भूल जाते हैं कि उन्नत किस्म के पौधों का आधार जंगली (wild) किस्म की प्रजातियां ही होती हैं। जंगली (wild) किस्म की प्रजातियों का पैदावार भले ही कम होता, लेकिन उनमे रोग प्रतिरोधक क्षमता ज्यादा होती है। इसीलिए हमे विकास की दौड़ में आगे बढ़ने के लिए, जैविक संसाधनों का संरक्षण करना पड़ेगा, ना कि जैविक संसाधनों का क्षरण। तभी जीवो जीवस्य जीवनम की संकल्पना सार्थक होगी।

Figure 1. **भोजन की थाली में जैवविविधता का समागम**

2. वन एवं वन्य जीवो का विदोहन के प्रभाव

भारतीय परिदृश्य में वन और वन्य जीव का क्षरण का मुख्य कारण मानव आधारित विकास की दुहाई, प्रदूषण, विदेशी प्रजातियों का समागम, **प्राकृतिक आवास** का विच्छेदन, व्यापारिक विदोहन, ठेकेदारों और वन कर्मियों की मिलीभगत आदि प्रमुख है। हमारी 80% सुविधाओं का भरण पोषण वन और वन्य जीव से ही होता है। लेकिन संसाधनों के आवंटन में वन्य और वन्यजीवों को नीची वरीयता दी जाती है जिसके कारण उनके संरक्षण के किए गए उपाय गौड़ सा प्रतीत हो जाते हैं। मध्य प्रदेश का बैतूल जिला सीताबलड़ी 1818 में दुर्गम वन के रूप में जाना जाता था जहां आवागमन के साधन विकसित नहीं थे। 19वीं सदी के बीच में रेल मार्गों का निर्माण शुरू हुआ तो सरकार और ठेकेदारों की मिलीभगत से इमारती लकड़ियों की मांग पूर्ति के लिए साल और सागौन के पेड़ों की अंधाधुन कटाई की गई। जबकि पहला भारतीय वन अधिनियम 1818 में बन चुका था। इसी तरह की स्थिति देश के अन्य भागों में देखने को मिलती है। जंगलों की अंधाधुंध कटाई से बहु प्रजातियां **वनजीव** विलुप्त होते चले गए और उनका स्थान एक प्रजाति वन**जीव** ले लिए। पशुओं की बढ़ती आबादी का दबाव और मानव की आवश्यकता की पूर्ति के लिए एकल प्रजातीय वन, जैविक दबाव नहीं सह सकते हैं। **जिसके फलस्वरूप,** एक ही प्रजाति के गुणों का विकास **होता है, जो** आग, बीमारी, कीड़े, सूखे का मुकाबला करने में सक्षम नहीं होते हैं **जिससे** पारिस्थितिक संतुलन बिगड़ने लगता है। यह बहुत ही दुख के साथ कहना पड़ रहा है कि वन का हमारी राष्ट्र की जीडीपी में अहम योगदान होते हुए भी वन को आय का साधन नहीं माना जाता है।[3]

दूसरी तरफ स्वास्थ्य सेवा, पशु चिकित्सा और कृषि विज्ञान में सुधार होने के कारण पशुओं और मनुष्य की मृत्यु दर में कमी आती गई जिससे जीवितो की संख्या बढ़ने लगी। इनकी खाद्यान्न पूर्ति के लिए वनों को अनियंत्रित ढंग से काटा गया फलस्वरूप वनों को काट के कृषि योग्य भूमि और रहने योग्य मकान बनाए गए। विकास की परियोजनाओं ने, वनों के संरक्षक आदिवासियों को भी प्रभावित किया। (**Figure 2**). संथाल जिन वनों में रहते थे उन वनों के विनाश से झारखंड आंदोलन पैदा हुआ। चिपको आंदोलन **भारत के उत्तराखंड राज्य में ठेकेदारों द्वारा वनों की कटाई के विरोध में हुआ जिसमे लोग पेड़ो से चिपक जाते थे।**[4]

Figure. 2 **वनों का कटाव और वनों के बीच सड़क बना कर प्राकृतिक आवास का विखंडन**

3. **धार्मिक मान्यताओ के** पीछे **जैव विविधता संरक्षण**

धर्म हमेशा से प्रकृत के मूल सिद्धांत और मनुष्य के बीच सामंजस्य बनाए रखता है। हिंदू धर्म की हर मान्यता के पीछे जैवविविधता संरक्षण का संदेश छुपा रहता है। भगवान विष्णु का मत्स्य (मछली), कूर्म (कछुआ), वराह, नरसिंह (आधा आदमी और आधा शेर) और वामन अवतार सभी जीवो का सम्मान करना सिखाता है। हिंदू धर्म के हर त्यौहार में जीव या पादप का संरक्षण के लिए किसी न किसी रूप में पूजा की जाती है। वातावरण को शुद्ध बनाए रखने के लिए नवमी में आंवले के वृक्ष की पूजा, वट सावित्री बरगद की पूजा, शमी वृक्ष की पूजा और पीपल वृक्ष की पूजा की जाती है। चूहा और हाथियों के संरक्षण के लिए भगवान गणेश की पूजा, शेरों को बचाए रखने के लिए मां दुर्गा की **पूजा**, सर्पों के संरक्षण के लिए भगवान शंकर की माला के रूप में प्रतिनिधित्व **होता** हैं। महाग्रंथ रामायण में भगवान रामचंद्र के 14 साल वनवास के समय जामवंत, जटायु, नल नील वानर एवं हनुमान जी, **हिरन, गिलाहरी,** संजीवनी बूटी, कुंभकरण, देव और दानव का उल्लेख जैवविविधता **को प्रदर्शित** करता है। लेखक का मानना यह है कि भगवान राम की सेना में जैवविविधता होने से ही लंका पर विजय प्राप्त हुई क्योंकि आज का आधुनिक विज्ञान भी इस बात को साबित कर चुका है कि जिस परिस्थितिक तंत्र **में** जैव विविधता ज्यादा होती है वह पारिस्थितिक तंत्र ज्यादा स्थिर **और सफल** होता है। भगवान कृष्ण ने गोकुल वासियों से गोवर्धन पर्वत की पूजा करवा कर जैवविविधता को संरक्षित करने का **उपदेश** दिया था। समुंद्र मंथन के उपरांत प्राप्त सभी रत्नों **का** संरक्षण जैवविविधता को संरक्षित **करने** का संदेश **देता है**। बचपन की कहानियों में वन्य देवता **और** वन्य देवी की पूजा की मान्यता के पीछे वनस्पतियों को संरक्षित करने का **ही उद्देश्य होता** है। आज भी हम **ग्रीष्म**ऋतु में पक्षियों के संरक्षण के लिए जगह जगह पर अन्न और जल का प्रबंध करते हैं। मछलियों को दाना देना, चीटियों को आटा खिलाना, गौ पूजा करना पर्यावरण संरक्षण से ही जुड़ा है। बोधिवृक्ष पीपल के नीचे अमृत्व का ज्ञान प्राप्त करने वाले भगवान बुद्ध और महात्मा गांधी ने हिंसा और बलि प्रथा को जघन्य अपराध माना था। ईसाई धर्म में क्रिसमस ट्री और इस्लाम में खजूर का पेड़ को शुभ माना जाता है।[5]

4. **भारत सरकार का जैवविविधता संरक्षण अधिनियम**

भारत सरकार 2002 में **जैव**विविधता संरक्षण अधिनियम **बनाया गया** जिसका मुख्य उद्देश्य स्थानीय समुदायों के साथ उचित और न्याय संगत तरीके से जैविक संसाधनों का संरक्षण एवं प्रबंधन करना है। अधिनियम को लागू करने के लिए भारत सरकार ने 2003 में राष्ट्रीय जैव विविधता प्राधिकरण (एनबीए) स्थापित किया गया **है**। यह एक वैधानिक स्वायत्त निकाय है जिसका मुख्यालय चेन्नई में है। इसके तहत भारत के 29 राज्यों में जैव विविधता बोर्ड (एसबीबी) और स्थानीय निकाय के लिए 31,574 जैविक प्रबंधन समितियों निर्माण किया गया हैं। कोई भी विदेशी व्यक्ति या गैर सरकारी संस्थान, एनबीए की अनुमति के बिना जैविक संसाधनों पर अनुसंधान या बौद्धिक संपदा संरक्षण के लिए आवेदन नहीं कर सकता है। यदि कोई व्यक्ति अधिनियम के प्रावधानों का उल्लंघन करता है, तो उसे एक से पांच साल तक कारावास या दस लाख रुपये तक का जुर्माना या दोनों एक साथ हो

सकता है। इस अधिनियम के तहत जैव विविधता को नुकसान पहुंचाना गैर-जमानती और संज्ञेय अपराध माना गया है।[6] जैवविविधता संरक्षण अधिनियम के अलावा, भारत सरकार ने पर्यावरण और जीवों के संरक्षण हेतु विभिन्न अधिनियम बनाए हैं जो निम्नवत है

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5. निष्कर्ष

धरती पर मौजूद जल, जंगल, जमीन के संरक्षण से ही मानव का अस्तित्व की कल्पना कर सकते है। मानव को मानवता तभी प्रदर्शित होगी जब मानव जैविक सम्पदा को प्रदूषित और क्षीण होने से बचायेगा क्योकि जल, जंगल, जमीन पर सभी जीवो का अधिकार है। **संरक्षण अधिनियम** और धार्मिक मान्यताये से **जीवो जीवस्य जीवनम** की संकल्पना को संबल मिलता है। मानव का यह उत्तरदायितव है कि जो जैविक सम्पदा को अपने पूर्वजो से प्राप्त कर उपयोग किया है उसे उसी मूल रूप में अपनी संतति हो हस्तांतरित करे।

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Co-relation of BMI with Nutritional Status Observed in Tribal People of Chikhaldara Region (Melghat)

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Abstract

The present cross-sectional study was undertaken among the tribal people of Chikhaldara region (Melghat) Dist. Amravati. This study used to investigate body mass Index (BMI) among male and female tribes of Chikhaldara region. Total 254 males and 288 females were taken for examination commonly used indicators. i.e. weight (wt), height (ht) and body mass index (BMI) were used to evaluate nutritional status. Results also reveal that prevalence of under nutrition among these peoples of both sexes. Tribal people are mostly illiterate and malnourished.
Key words – Body Mass Index (BMI), nutritional status, Tribes, Chikhaldara, India

Women and preschool children are known to be most vulnerable group for under nutrition, adolescents girls are also being recognized as a potential group during which the nutrient requirements are relatively high under nutrition during adolescence, confounded by childhood marriages, leads to higher mortality and morbidity among women and young children. (Studied carried out by National Nutritional monitoring Bureau. (2003)
World Health Organization (1995) has recommended that anthropometry could be used to assess the nutritional and health status of adults. One such measure now in widespread use in Quetel index which is weight (in kg) divided by height in (m^2). Several scholars have emphasized the importance of body mass index as an nutritional assessment (Gupta et al (1979, (Yadav et al (2011) observed that tribal preschool children of Gond community had low Hb% with low BMI due to certain adverse realities like insufficient food intake, adverse cultural practice, micronutrientdeficiency disorders such as anaemia.

It is established fact that body mass index (BMI) is a useful anthropometric indicator of measuring nutritional status of the population (FAO, 1996) and is specifically suitable for large scale surveys (Ulijaszek and Kern 1999, WHO 1995).

The prevalence of chronic energy deficiency (CED) measured through BMI (James et al (1988) Ferro-Luzzi et al (1992), can be used in the standard of living between population groups Nube et al (1998). The appropriateness of using BMI less than 18.5 kg/ m^2 as under nutrition are validated by many authors to predict poor demographic economic, social and environmental conditions of the population (Pryer and Rogers, 2006), Subramanian and Smith (2006) under nutrition reduces physical capacity James (1994) increases mortality (Harris T.B. 1995), morbidity (khongsdier (2002).
In India, the most underprivileged group is the tribal communities both in terms of socioeconomic condition as well as nutritional status (Basu 1994). Several studies shows these reflection as high under nutrition among tribals across India (Adak et al 2006)

Material and Method :

A cross sectional study was performed to evaluate BMI and nutritional status of tribal people of Chikhaldara region Dist. Amravati.

Hight and weight were measured weight was calculated by weigning balance and height by stadiometer. The nutritional status and background information was collected from each individual through questionnaire as well as tribal community informed consent was obtained for carrying out survey. The age groups were distributed into 0-20, 21-40, 41-60 and 61 respectively.

The BMI was computed using the following standard equation.BMI = Weight (kg)/height (m^2).
Nutritional status was evaluated following BMI cut off points to define trimness. The age and sex specific cut-off values were established based oninternational survey.

This classification categories the prevalence of under nutrition according to percentage of population with BMI under 18.5 low, medium and very high critical situation (WHO 1995).

Result and Observation :

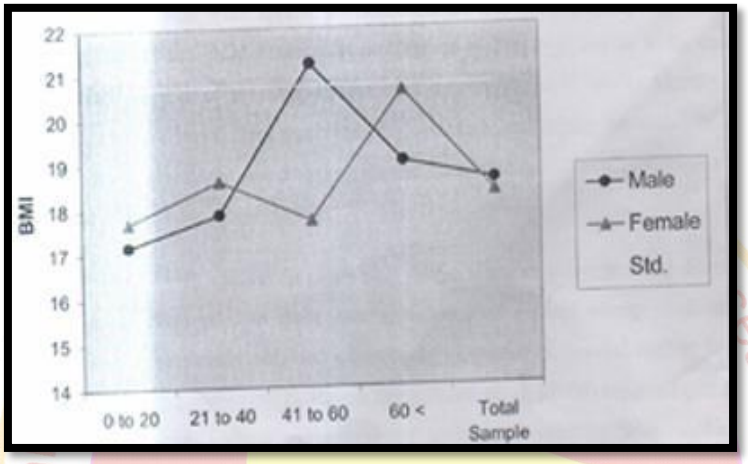
Table 1 BMI observed in male and female tribes of Chikhaldara (Melghatregion)

Age Group		Df	Pm	M	SD	SE	T
0 to 20	Male	54	20.7	17.15	4.596	0.62	**5.74****
	Female	85	20.7	17.68	4.438	0.48	**6.31****
21 to 40	Male	108	20.7	17.86	2.472	0.24	**11.99****
	Female	140	20.7	18.59	2.925	0.25	**8.58****

41 to 60	Male	51	20.7	21.20	3.718	0.52	**0.98**
	Female	45	20.7	17.71	5.074	0.75	**3.99****
61	Male	38	20.7	19.00	4.593	0.74	**2.31***
	Female	15	20.7	20.58	4.407	1.10	**0.11**
Total Sample	Male	254	20.7	18.56	3.889	0.24	**8.77****
	Female	**288**	**20.7**	**18.29**	**3.937**	**0.23**	**10.41****

(*-Significant at 0.05; **-Significant at 0.05 & 0.01 level of significance)

(Critical values for 15 df; $t_{0.05}$ = 1.7530, $t_{0.01}$ = 2.6025, for 38 df; $t_{0.05}$ = 1.6859, $t_{0.01}$ = 2.4286, for 45 df; $t_{0.05}$ = 1.6794, $t_{0.01}$ =2.4121, for 51 df; $t_{0.05}$ = 1.6753, $t_{0.01}$ = 2.4017, for 54 df; $t_{0.05}$ = 1.6736, $t_{0.01}$ = 2.3974, for 85 df; $t_{0.05}$ = 1.6630, $t_{0.01}$ = 2.3710, for 108 df; $t_{0.05}$ = 1.6591, $t_{0.01}$ = 2.3614, for 140 df; $t_{0.05}$ = 1.6558, $t_{0.01}$ = 2.3533, for 254 & 288 df; $t_{0.05}$ = 1.285, $t_{0.01}$ = 1.967)



Result & Discussion : Co relation of BMI with nutritional status observed inTribal Males and Females

The above table-1 reveal that the calculated T values between standard range mean and Obtained BMI mean for various groups i.e. 0-20, 21-40, 41-60, 5.74, 11.99, 0.98, 2.31 and 8.77 respectively, for male. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance. Hence there is a significant difference in BMI and standard range of male except for age group 41-60. From the table it is also observed that in all the groups BMI range is within 17 to 19, which is quite less than the standard range mean value for men 2C.8 except for age group 41-60 i.e. 20.3 which is above average.

For different groups of female i.e. 0-20, 21-40, 41-60, above 60 and total sample the calculated Y values are 6.31, 8.58, 3.99, 0.11 and 10.41 respectively. All these values are greater than critical values of 't' at 0.05 and 0.01 level of significance except for age group 61 which is non-significant. Hence there is a significant difference in BMI and standard range mean of female. From the table it is also observed that in all the groups BMI range is within! 7.8 to 18.8, which is quite smaller than the standard range mean value for female 20.8 except for age group of 61 i.e. 20.8 which is required value of BMI for females.

Hence from the table and graph it is concluded that, the BMI in both male and female tries of Chikhaldara region is below the standard range mean.

Discussion:

Malnutrition was wide spread phenomenon in tribal area Carlson and Waterlaw (1991) have studied the child malnutrition problem at global, regional as wells country level. (Khandare, et al 2008) studies on tribals of Thane district of Maharashtra, India. The result revealed that majority of population belonging to schedule tribe community were malnourished. Socio-economic factors have been contributory to malnutrition.

Meghadas (2010) studied on nutritional status of Korku tribes in Betul district of Madhya Pradesh observed that there was prevalence of protein energy malnutrition anemia, because Korku tribes obtained mean intake of nutrients. Several studies Sonwal CJ. (2010), Dhore and Joshi (1988), Rajesh Sing, Preeti Singh (2008) reported that tribal children suffered from highest percentage of severe malnutrition with inadequate nutrition.

Sing Bhupinder (1994), Nagdda B.L. (2004), examine and assess the tribal health situation which is related to their economic pursuit, nutritional availability medicines etc. Nutritional anemia is major problem for women in India and so morein rural and tribal belt.

International center for research on women (ICRW) studies sting was highly prevalent in adolescent boys and girls, ranging . In contrast the rate of low body mass indices indicative of current under nutrition under nutrition in early childhood may diminish a person's even tautly body size malnourished children are typically shorter and lighter than their well nourished peers at the end of adolescent growth, s Cameron (1996). Several studies from India (yadav et al (1999), Gogoi and Sengupta(2002) have utilized BMI to study nutritional status of tribal populations. The basic causes of under nutrition in developing countries are poverty, poor hygienic conditions and little access to preventive and health care Mitra(1985), WHO(1990,1995).

Conclusion:

Therefore BMI has strong association with nutritional status in present study low level of BMI and under nutrition was observed which may be responsible for life threating diseases, higher ratio of maternal mortility. Also poverty illiteracy, very less facilities for health, blind beiefs, socio, economic status was affecting each and every as part of tribal people of Chikhaldara region.

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Comparative Preliminary Phytochemical Analysis Of *Capparis Decidua (Forsk.)* And *Capparis Zeylanica Linn.*

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Abstract

The present study was aimed to evaluate the phytoconstituents of the leaf extracts of Capparis decidua Forsk. and Capparis zeylanica Linn. plants of an ethno-botanical importance belonging to the family Cappariceae using ethanolic extracts. The result reveals the presence of bioactive compounds (phytoconstituents) such as anthraquinones, terpenoids, flavonoids, saponins, tannins, alkaloids, and cardiac glycosides. Both the Capparis species have an ethno-medicinal importance such as being anti-inflammatory, analgesic, antioxidant, antipyretic and antimicrobial properties. The results showed the dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants. So, further research is necessary to isolate and determine the identity of the bioactive compounds present in this plants species.

KEYWORDS: *Phytochemistry, Capparis spp. and Medicinal uses.*

Introduction

According to the World Health Organization (WHO), more than 80% of the world's population relies on traditional medicines for their primary health care needs (Trivedi, 2006). These chemical elements of plants can be therapeutically active or inactive and are referred to as phytochemicals or secondary metabolites. Alkaloids, phenolic glycosides, flavonoids, steroids, terpenoids, amino acids, and glycopeptides are some of the phytochemicals found in vegetables, fruits, flowers, leaves, stems, bark, and roots that work with and protect against diseases more effectively (Rangari, 2006). Many species of Capparaceae are used as ethno-medicinal purposes (Bokhad *et. al*., 2013). So, here we select two species of *Capparis* for phytochemical analysis.

The genus *Capparis* comprises 250 species, including shrubs, trees, and woody climbers. *Capparis zeylanica* Linn. (Capparaceae) is a many-branched, thorny, sub-scandent climbing shrub. Plants are 2-3 m in height, armed with 3-6 mm long recurved thorns, branched, leaves are elliptic or broadly lanceolate, base rounded, apex mucronate; flowers are profuse, pinkish-white, later turning pink, berries are globular or ellipsoid, 3-4 cm in diameter, and seeds are globose, embedded in the white pulp. It is medicinally used for snake bites, to cure swelling of testicles, smallpox, boils, cholera, colic, hemiplegia, neuralgia, sores, etc (Chopra *et. al*., 1956; Joshi, 1997 and Satyanarayan *et. al*., 2008). Whereas, *Capparis decidua* (Forsk.) plant height 5 m high, or occasionally a small, branched, Leaves are very minute 2 mm long. Flowers are pink in color and red-veined, in small groups along with the leafless shoots, in the axils of the spines. Fruits are small, many-seeded, ovoid or sub-globulous (Padhan *et. al*., 2010). It shows some medicinal properties like hypercholesterolemic, anti-inflammatory, analgesic, antidiabetic, antimicrobial, antihypertensive, antihelmintic, and purgative activities (Deshmukh *et. al*., 2010 and Bokhad *et. al*., 2013).

Due to these medicinal properties, it is necessary to investigate and compare phytochemical analysis of these plants.

Materials And Methods

A] Identification and Collection:

Frequent field visit were conducted in nearby forest area of Yavatmal and Wardha District (Maharashtra) for the collection of plant materials. The Collected plant specimens were identified using available standard floras (Ugemuge, 1986; Karthikeyan & Kumar, 1993; Naik, 1998 and Singh & Karthikeyan, 2000).

B] Extraction Methods:

The collected plant leaves were dried and made into powder for further analysis. The powder was then subjected to soxhlet extraction with different solvents (petroleum ether, benzene, acetone, chloroform, ethanol and water) according to their increasing polarity. Only ethanolic extract of the plants under study were analysed for the presence of different phytochemical constituents (Kokate *et al*., 2005).

C] Qualitative Phytochemical Analysis:

It involves testing of different classes of compounds. The methods used for detection of various phytochemicals were followed by qualitative chemical test to give general idea regarding the nature of constituents present in crude drug (Wallis, 1990; Harborne, 1998; Kokate, 2005 and Sadashivan & Manickam, 2005). The extracts were analyzed for the presence of phytoconstituents like carbohydrates, alkaloids, anthraquinone, cardenolides, flavonoids, phenolics, steroids, terpenoids and saponin.

Observations

Table-1: Comparative phytochemical study of ethanolic extract of *Capparis spp.* (Leaves)

S.N	Compound / test	*C. decidua*	*C. zeylanica*
1	Alkaloids	+	+
2	Anthraquinone	_	+
3	Cardenolides	_	+
4	Flavonoids	+	+
5	Phenolics	+	+
6	Saponins	+	+
7	Steroids	_	_
8	Carbohydrates	+	_
9	Terpenoids	_	_

Results And Discussion

In the present investigation, there are dominantly presence of alkaloids, flavonoids, phenols and saponins in both plants which having the major applications in medical and pharmaceutical sciences (Kakpure & Rothe, 2012). The ethanolic extract of ***C. zeylanica*** shows dominantly the presence of alkaloids, anthraquinone, cardenolides, flavonoids, phenolic compounds and saponins. Whereas, steroids, carbohydrates and terpenoids were absent. However, ***C. decidua*** shows the the presence of alkaloids, flavonoids, phenolic compounds, carbohydrates and saponins. (Table-1). These types of studies have a vital role because of their commercial uses and research interests. Further research is necessary to isolate and determine the identity of these bioactive compounds for its quality control.

Conclusions

This research work has revealed further potentials of these selected *Capparis* spp. in the area of pharmacology as potential source of useful drugs. This study therefore has provided some biochemical basis for ethno-pharmacological uses of these plants in the treatment and prevention of various ailments. The qualitative phytochemical screening shows that, the leaves of the *C. decidua* and *C. zeylanica* are rich in alkaloids, flavonoids, phenols and saponins which are popular phytochemical constituents.

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Avifaunal Diversity With Relation To Ecology Around Borgaon Dam, India

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Abstract:
This study was carried out around Borgaon Dam in Pandharakawada forest Division of Maharashtra state from June 2020-April 2021. The present study was made to find out the avian diversity with reference to ecology. We estimate the avian fauna in terms of species richness and diversity of Borgaon aquatic habitat. Total 71 birds belonging to 21 families were observed of which 38 was resident, 14 were local migrant and 19 were migrant. The favorable ecological conditions like availability of food, wetland and roosting places were attracting the various birds. There is need to retain a proportion of natural habitat of aquatic ecosystem as to conserve the biodiversity.
Keyword: *Avian diversity, birds, Borgaon*

Introduction:

India has a numerous diversity of plants and animals both domesticated as well as wild in variety of habitats and ecosystems. Biodiversity has central importance in the study of ecology. It is likely to play an important role for ecosystem functioning (Loreau et al., 2001). The change in number of assemblage of species affects the nature of habitat. Recent global changes are likely to have strong negative impacts on biodiversity of terrestrial ecosystem (Sala et al., 2000). Today a greatest threat to wildlife is loss of habitat which is widely recognized by ecologists. Most are primarily endangered by habitat loss and degradation (Sodhi and Smith, 2007). Among all the fauna, birds are use as bio-indicators. The bird species are adapted to a specific plant species, community and use to describe the vegetation condition, consequently the ecosystem situation (Jansen & Roberstrom, 2001). The bird populations are usually limited by limiting factors including food supplies, nest and refuge site, competitors, natural enemies and weather (Andrewartha & Birch, 1984, Begon et.al 2006; Brambilla et al: 2010). There are growing evidences that climate change will become one of the major diverse of species extinctions in the 21 st century. Numbers of published studies have documented a variety of changes attributable to climatic change (1PCC, 2007).

To stop the threats to biodiversity and mass extinction, meaningful information that could contribute to conservation planning and management is needed to maintain or improve the structure of aquatic ecosystem. So we selected aquatic ecosystem which is first ever scientific attempt to study avian diversity with aspect to ecology.

Material and Methods:

Study Site:

The study was carried out around Borgaon dam in Pandharkawada forest division which is situated of Yavatmal district of state Maharashtra adjoing the Adilabad distict of state Telangana Pradesh.

Materials used for study:

For each census, a map and aerial photographs was use to identify sites. So that camera Nikon was used of 45x zoom and 12.6 megapixels. A Tape recorder was also utilized during each survey to record the particular calls, which were later analyzed and used to identify the species. For watching, counting and identifying birds, Binocular (10x50), Telescope (25-40x), Notebook, Pen, pencil, Compass, Observation sheet, metal or wooden stakes, Handheld GPS was used.

Bird Survey:

The bird survey was conducted according to a standard point count method (Reynolds et al., 1980; Bibby et al., 2000).We involved visual and voice hearing methods for bird identification within fixed or variable radius plots (Blondel et al., 1970; Hutto et al., 1986). The data collected from the surveys was used to estimate populations of birds, density, diversity and relative abundance or richness of bird species in different habitats. The bird surveys were carried out from June 2018 to April 2019 for 1 year. We used a 25-m/50-m fixed-radius point count method to census the avifauna at each count station (Hutto et al. 1986). Surveys were conducted four days in a week, either from sunrise to 4 hours after sunrise or from 4 hours before sunset until sunset depending on weather conditions. Each count was conducted for 10 minutes, which was further divided into 3 minutes, 2 minutes and 5 minutes respectively.

Identification, Classification and Data analysis:

For identification and field diagnosis of birds, colored plates of All and Ripley (1983), Ali (1996). Grimrnett et al.,(1998) were used. Classification of birds was made in accordance with lnskipp et.al (1996). We

followed Whittaker (1976) to measure diversity of birds as alpha, beta and gamma diversity. All the diversity of birds was analyzed using biodiversity analysis online software alyoung.

Observation and Result:

The basic factor to be studied in this on avifauna distribution with aspect to ecology is climate, topography and vegetation. Thus Geology, climate, soil and vegetation types with altitude, latitude and surface topography of particular sites were studied.

Finding of birds:

Total 71 birds belonging to 21 families was observed of which 38 was resident, 14 were local migrant and 19 were migrant with family corvidae comprising more bird species following Passeridae and accipitridae.

Diversity of Bird Community:

The species richness Index i.e. Menhinick index (RI) of forest was 1.06 and Margalef richness index (R2) was 15.71. The overall Shannon-Weiner index was found 4.R7 while the Dominance index was 0.017. The two different Evenness measures were calculate namely Shannon evenness (El) and Sheldon evenness (E2) to measure the evenness of species-abundance which is complimentary to the diversity index concept. The Shannon Evenness (El) was found 2.21 and Sheldon Evenness (E2) was 0.083. The Similarity Indices were also calculated between the different habitats of the sanctuary namely Jaccard Index and Sorenson's index which was found 0.03 and 0.06 respectively. The abundances of bird were found higher in July 2020-June as compared to July 2021. The higher diversity of birds (H′) was found (4.87) in first year than in second year (4.45). The Simpson index was found 0.029 and 0.022.

Discussion And Conclusion:

In present study, Bird communities vary among forest types and functional groups. Different vegetation types as well as abundant food resources might be played a greater role in difference in habitat preference by bird species. The rich and high vegetation might be providing heterogeneous and suitable site of nesting, roosting and foraging of bird. Similar finding reported regarding vegetation diversity and richness of wetlands on the bird population richness. Water birds like. Lesser whistling teal, Little cormorant, bite-breasted kingfisher, Black-winged Stilt, Red-wattled Lapwing. Cattle egret and Indian pond-heron were the common species inhabiting the water bodies, while Purple Heron (Ardea purpurea) were rarely sighted. The passage migrant Rosy starling (Sturnus roseus) was found everywhere before and after the winter season. The birds like Demoiselle crane, common crane and Barr headed groose which are generally seen at wetlands were not found or recorded. An important reason for high bird diversity may be the existence of a varied topography coupled with a mosaic of forest types including scrub forest, tall riparian forest hilltop forest and dry deciduous forest. Conversion of the native vegetation-scrub jungle and grasslands to monoculture plantations is detrimental to bird diversity. There is need to conserve the avifauna' bio-diversity of this area by protecting its habit conditions especially, the water bodies, riparian areas, edges and streams. Also there is need to generate awareness about the conservation value and ecological role of avifauna and maintainace of natural habitat conditions and ecological balance of forest. Conservation awareness programmes among the local peoples is required to conserve it for future generations.

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Traditional knowledge of wild edible plants used in the Yavatmal District, Maharashtra State, India.

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Abstract

Use of wild plants as a food source is an integral part of the culture of indigenous people that dwell in the remote forest areas. These people consume wild edible plants as food source and depend on these resources to meet their food needs particularly in periods of food crisis. The wild edible plants are also used as supplements to the cultivated crops and as famine foods.

The diversity in wild species in the district offers variety in edible plants and contributes to household food assurance. The present ethnobotanical explorations conducted in forest areas of Yavatmal resulted in the information on about traditional plant uses of53plants species belonging to 35 Angiospermic families. Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species). Information gathered from Yavatmal district indicates that the tribal's and other village people of this region possess good knowledge of wild edibles but their continuous and progressive exposure to modernization may result in extinction of the such rich heritage of knowledge in the course of time. Majority of edible parts are from fruits (29 species), leaves (14 species), seeds (6 species), Flower (2 species) and some are of underground parts like rhizome, tuber, etc.

Key words:*Traditional Uses, Wild edible plants, Yavatmal.*

Introduction

District Yavatmal is situated in the eastern part of the Maharashtra between north latitudes 19º23` and 20º48`and longitudes 77º 19` and 79º 07` It occupies an area of 13,582 Sq. Km with forest cover of 2956 sq. Km. Average rain fall is 1089.7 mm. The district is inhabited by several tribes. These are Andh, Banjara, Bahurupi, Bhil, Chitrakathi, Gond, Gopal, Kolam, Kolhati, Rajgond, Pardhan, Panchal, Tambatkar and Wadar. Kolam tribe is on the verge of extinction; in 2001 the population was only 900. Population of Bhil is also decreasing

Forest Dwellers:

Wild plants even after the availability of variety of food crops constituted an important part of the human diet particularly in remote forest dwellers. Recent regional studies, from the different parts of country[1,2,4,5,6,8,9,10,12,13,14,15,16,17] have shown that the several wild plants have nutritive potential and are being used all over. Now a day's people are giving more attention to wild food plants as the present day food crops are not meeting the need of complete required nutrients.This work is an attempt to provide a data on food plants collected from Yavatmal district.

Methodology

Ethnobotanical studies in Yavatmal with respect to wild food plants were carried out during 2019 to 2021. Different parts of the district were frequently visited, and information on indigenous knowledge about food plants was gathered from knowledgeable people in the district. Data was collected using semi-structured questionnaire and group discussions based on the standard procedures [7]. Detailed information regarding the part eaten and various preparation made was noted. Plants were identified using relevant scientific literature [3,11] Following table gives the detailed information such as, plant name, family name which followed by local name and uses.

Sr. No	Botanical Name / Family	Local Name	Use
1.	*Aegal marmelos* (L.) Corr. (Rutaceae)	Bel	Ripe fruit pulp is eaten. 'Sharbat' is made by fruit pulp during summer.
2.	*Aerva lanata* (L.) Juss. (Amaranthaceae)	Tandula	Curry is made by leaves.
3.	*Alangium salvifolium* (L.f.)Wang.(Alangiaceae)	Ankol	Ripe fruits are eaten.
4.	*Alternanthera sessilis* (L.)R. Br. (Amaranthaceae)	Chibuk Kata	Curry is made by tender stem and leaves.

5.	*Amaranthus spinosus* L. (Amaranthaceae)	Kat e – math	Curry is made by tender leaves.
6.	*Basella alba* L. (Basellaceae)	Mayalu	Curry is made by leaves and 'Pakodi' made by leaves.
7.	*Boerhavia diffusa* (L.)Hook. (Nyctaginaceae)	Punarnawa	Curry is made by leaves.
8.	*Buchanania lanzan* Spreng. (Anacardiaceae)	Charoli	Ripe fruit pulp eaten. Seeds are used in sweet dishes made by using milk.
9.	*Canavalia ensiformis* (L.)DC. (Fabaceae)	Abai	Curry is made by fruits.
10.	*Canthium parviflorum* Lam. (Rubiaceae)	Karbit	Ripe fruits are eaten.
11.	*Capparis zeylanica* L. (Capparaceae)	Waghati	Curry is made by unripe fruits.
12.	*Cassia fistula* L. (Caesalpiniaceae)	Bahava	Curry is made by flowers.
13.	*Cassia occidentalis* L. (Caesalpiniaceae)	Tarwad	'Chutney' is made by tender leaves.
14.	*Cassia sophera* L. (Caesalpiniaceae)	Jangali takla	'Chutney' is made by leaves.
15.	*Chlorophytum tuberosum* (Roxb.) Baker (Liliaceae)	Safed Musli	Tubers are eaten.
16.	*Coccinia grandis* (L.)Voigt. (Cucurbitaceae)	Tondli	Curry is made by unripe fruits.
17.	*Colocasia esculenta* Schott. (Araceae)	Chamkura	Curry is made by leaves and 'Pakodi' made by leaves.
18.	Commelina benghalensis L. (Commelinaceae)	Kena	'Pakodi' made by leaves.
19.	*Cordia dichotoma* Forst. f. (Boraginaceae.)	Bhokar	Ripe fruits are eaten.
20.	*Dioscorea bulbifera* L. (Dioscoreaceae)	Dukkar Kand	Tubers are boiled and eaten, curry is prepared from bulbils.
21.	*Diospyros melanoxylon* Roxb. (Ebenaceae)	Tembhurni	Ripe fruit pulp is eaten.
22.	*Embli ca officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruit s. Murrabba Prepared from fruits.
23.	*Euphorbia heterophylla* L. (Euphorbiaceae)	Nivdung	Curry is made by tender leaves.
24.	*Ficus bengalensis* L. (Moraceae)	Wad	Ripe fruits are eaten.
25.	*Ficus carica* L. (Moraceae)	Anjeer	Ripe fruits are eaten.
26.	*Ficus hispida* L. f. (Moraceae)	Umber	Ripe fruits are eaten.
27.	*Ficus racemosa* L. (Moraceae)	Umber	Ripe fruits are eaten.
28.	*Grewia hirsuta* Vahl. (Tiliaceae)	Dhaman	Ripe fruits are eaten.
29.	*Hygrophila auriculata* (K. Schum.)Heine. (Acanthaceae)	Talim Khana	Curry is made by tender leaves.
30.	*Lablab purpureus* (L.) Sweet.(Fabaceae)	Waal Pawta	Curry is made by pods.
31.	*Leucas aspera* (Willd.) Link. (Lamiaceae)	Gumma	Curry is made by leaves.
32.	*Limonia acidissima* L. (Rutaceae)	Kauth	Ripe fruits are eaten, 'Chutney' is prepared from fruits.
33.	*Madhuca longifolia* (Koen.) Mac Bride. Ver: *latifolia* (Roxb.) Chev. (Sapotaceae)	Moha	Flowers are eaten.
34.	*Merremia gangetica* (L.)Cufod. (Convolvulaceae)	Undirkani	Curry made by leaves.

35.	*Momordica dioica* Roxb. Ex Willd. (Cucurbitaceae)	Kartoli	Curry is made by unripe fruits.
36.	*Morus alba* L.(Moraceae)	Tuti	Ripe fruits are eaten.
37.	*Mukia maderaspatana* (L.) Roem. (Cucurbitaceae)	Bilavi	Unripe fruits are eaten.
38.	*Nelumbo nucifera* Gaertn. (Nelumbonaceae)	Kamal	Tubers are boiled and eaten, curry is also prepared from tubers.
39.	*Olax psittacorum (*Willd.)Vahl. (Olacaceae)	Harduly	Ripe fruits are eaten.
40.	*Opuntia stricta* (How.)How. (Cactaceae)	Phadya Nivdung	Ripe fruits are eaten.
41.	*Emblica officinalis* Gaertn. (Euphorbiaceae)	Awala	Fruits are eaten. 'Chutney' is made by fruits.
42.	*Pithecellobium dulce* (Roxb.) Benth. (Mimosaceae)	Wilayati Chinch	Seed kernels are eaten.
43.	*Semecarpus anacardium* L.f. (Anacardiaceae)	Bibha	Ripe fruits hypocarp and seed s are eaten.
44.	*Solanum nigram* L. (Solanaceae)	Kangani	Ripe fruits are eaten.
45.	*Solanum virginianum* L. (Solanaceae)	Kateringani	Curry is made by unripe fruits.
46.	*Sterculia urens* Roxb. (Sterculiaceae)	Kandol	Fruits are roasted and seeds are eaten.
47.	*Strychnos potatorum* L.f. (Loganiaceae)	Nirmali	Fruits and seeds are eaten.
48.	*Synantherias sylvatica* Schott.(Araceae)	Jangli suran	Curry is made by tuber.
49.	*Syzygium cumini* (L.)Skeels. (Myrtaceae)	Jambhul	Ripe fruits are eaten.
50.	*Terminalia bellirica* (Gaerth.)Roxb. (Combretaceae)	Behada	Seed cotyledons are eaten by Children.
51.	*Trianthema portulacastrum* L.(Aizoaceae)	Wasu	Curry is made by leaves.
52.	*Ziziphus mauritiana* Lam. (Rhamnaceae)	Bor	Ripe fruits are eaten. Fruits are also used to made chutney.
53.	*Ziziphus oenoplia* (L.) Mill. (Rhamnaceae)	Burgi	Ripe fruits are eaten.

Results and discussions:-

As there is increase in demand of food materials, such as, cereals, pulses and vegetables, etc. since several decades emphasis was given increase the yield by using different chemical fertilizers and pesticides. This resulted in the common occurrence of pesticide and chemical residues in food plants. Same time, no attention was given to keep the optimum level of micro and macro nutrient in the plants, which is a requirement of healthy food.

After realization of all these facts the people from developed and developing countries have been choosing the wild edible which may fulfill their requirements, of nutritive foods.

Since the ages the human societies residing in remote areas are using several wild plants for edible purposes. Information gathered from Yavatmal reveals that a treasurer of edible plants remains untouched in these areas.

A total of 53plant species belonging to 35 families were recorded after conducting survey Moraceae recorded highest number of species (5 species) followed by Amaranthaceae, Caesalpiniaceae, Euphorbiaceae and Cucurbitaceae are (3 species).

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Phytochemical Analysis of *Cassia Grandis*

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Abstract:

Plants are recognized in the pharmaceutical industry for their broad structural diversity as wellas their wide range of pharmacological activities. The plant Cassia Grandis is a widely cultivated ornamental plant . The trees is also known as pink showerCaro and stinking toe. It is a plantae- plant belonging to the order- Fabales, family – Fabaceae-Pea, and genus – Cassia L.Cassia. The phytochemical study on the leaf extract of Cassia Grandis is done. Fresh leaves were collected, shade dried, and a crude extract was prepared using soxhlet extraction method and the preliminary phytochemical analysis on the leaf extracts of Cassia grandis were conducted. The solvents used for extraction namely Aqueous, Ethanol and chloroform is chosen based on their increasing polarity. The extractive value is highest with Aqueous. Phytochemical studies revealed the presence of phytochemicals such as carbohydrates, phenols, flavonoids, steroids, saponins, alkaloids, tannins, and cardiac glycosides,Terpenoids.

Keywords:*Phytochemical analysis, Soxhlet extraction, Extraction solvents, Cassia Grandis leaf.*

Introduction

Herbalism is a type of traditional medicine that uses plants and plant extracts to treat ailments. There is a legal duty to maintain track of all traditional medicine research on paper. As a result of this disadvantage, it's vital to verify that the plant and its components that will be employed as medication are uniform.The objective of this work was to evaluate the phytochemical constitution of the Herbal plantcassia gradis.To collect the leaves of the plant and extraction is carried out different solutions like Water, ethanol and chloroform by soxhlet extractio method.To analyse the overall phyto chemicals Present in this plant leaves.

Materials And Methods

Sample Collection

The leaves were collected from near the garden.The leaves were sundried and then finely powdered. The powered leaves were stored in an air tight container for future use.

Pytochemistry

Plant Extraction

The collected materials (leaves) were chopped into small pieces separately, shade-dried, and coarsely powdered using mortar and pestle. 5 grams of of powdered leaves were added into 100 ml of the following extracts like aqueous, chloroform and ethanol. After adding them, they were boiled for few minutes, filtered in whattman filter paper & then stored in a reagent bottle for future use.

Detection of Phytochemicals :

All the extracts were subjected to preliminary phyto chemical tests followed by the methods of Harborneand Evans (2006).

TestforAlkaloids:

Wagner's test: Extract were treated with 3-5 drops of wagner's reagent. (Wanger's reagent – 1.27 g of iodine with 2 g of potassium idodide in 100 ml water. The Formationofbrown/reddishPrecipitateindicates thepresenceof alkaloids

Test for Carbohydrates:

Fehling test : Filtrates were hydrolyzed with diluted HCL, neutralized with Alkali and heated with fehling A & B solution. Formation of red precipitate indicates the presence of reducing sugars.

Test for Cardiac Glycosides:

The extract is treated with glacial acetic acid and also adding few drops of ferric chloride solution underplayed with 1 ml of concentrated sulpuric acid.The brown ring at the interphase indicates the presence of dexoy sugar characteristics.

Test for Flavonoids:

Alkaline Reagent test :Extracts were treated with few drops of 10% sodium hydroxide solution. Formation of intense yellow color which becomes colorless on addition of dilute acid indicates the presence of flavonoids

Test for Phenols:
Ferric chloride test: Extracts were treated with 3-4 drops of 1% of ferric chloride solution. Formation of bluish black color indicates the presence of phenols.

Test for phlobatannins :
The extract is boiled with 1 % of hydrochloric acid. The formation of blue- purple colour indicates the presence of phlobatannins.

Test for Saponins:
Foam test: 0.5 g of extract was shaken with 2ml of water. If foam produced persists for 10 minutes , it indicates the presence of saponins.

Test for Sterols and Triterpenoids:
The extract is treated with few drops of chloroform, acetic anhydride and concentrated sulphuric acid. The formation of reddish pink colour immediately indicates the presence of sterols and triterpenoids.

Test for Tannins:
Gelatin test :To the extract , 1% gelatin solution containing sodium chloride solution was added. Formation of white precipitate indicates the presence of tannins.

Test for quinones:
The extract is treated with concentrated hydrochloric acid, The formation of yellow precipitate indicates the presence of quinones.

Test for oxalates :
The extract is treated with glacial acetic acid. The formation of greenish black colour indicates the presence of oxalates.

Test for Treterpenoids :
Sankowski's test : The extract is treated with 1 ml of chloroform and concentratedSulphuric acid.The formation of reddish brown precipitate indicates the presence of treterpenoids.

Extraction Results :

Extract	Colour under visible light	Colour under UV light	Texture
Water + Powdered leaves	Mustard Yellow	Light gray	Dry, Shiny appearance
Ethanol + Powdered leaves	Peacock Green	Dark Pink	Completely Dry
Chloroform + Powdered leaves.	Brown	Dark Pink	Sticky

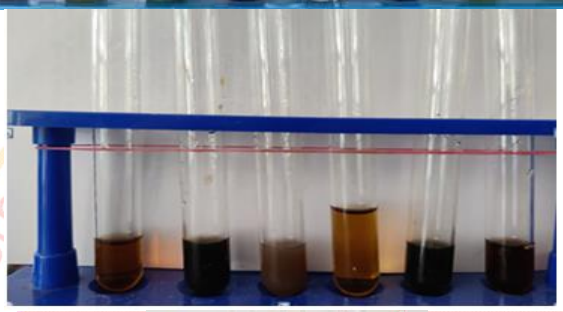
Phytochemical Screening Tests And Results :

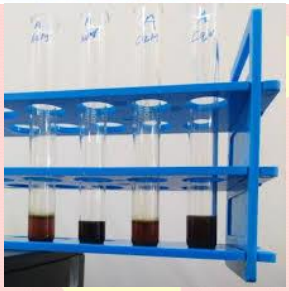
TESTS	DIFFERNET SOLVENTS		
PHYTOCHEMICALS	**AQUEOUS**	**ETHANOL**	**CHLOROFORM**
ALKALOIDS	-		-
CARBOHYDRATE	+++	++	-
CARDIAC GLYCOSIDES	+++	++	-
FLAVANOIDS	-	+	-
PHENOLS	+++	+++	-
PHLOBATANNINS	+	+	-
STEROLS AND TRETERPHENOIDS	+	++	-
TANNINS	+++	++	-
QUINONES	-	+	-
OXALATES	+	-	-
SAPONINS	+	-	-
TERPENOIDS	+++	+	-

(" +++ ") : Phytochemicals present in high quantity.
("++ ") : Phytochemicals present in medium quantity.
(" + ") : Phytochemicals present in low quantity.
(" – ") : Absence of Phytochemicals.

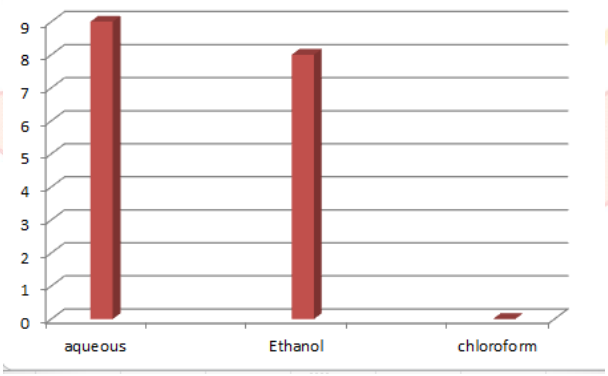
Results:

The results for preliminary phytochemical screening of various extracts of the leaves are given in the table such as alkaloids, Carbohydrate, Cardiac Glycosides, Flavanoids, Phenols, Saponnins, sterols and triterpinoids, Tannis, Terpenoids, Quinones, Oxalates and phlobatannins. The extract were carried out phytochemical screening process. Based on the results the yield calculations was made and the percentage of yield was significantly high Aqueous > Ethanol> Chloroform. The phytochemical screening was conducted for twelve phytochemicals.Carbohydrate, Cardiac glycosides, Phenols, Strerols, Tannins and Terpenoids were found in high quantites. The presence of phytochemicals always nil in chloroform extract. The oxalates are completely absent. Flavonoids, Alkaloids, Saponins, Quinones are present in few amounts.





Grphyical Representation of Phytochemical Tests:



In Aqueous extract : High amount of phytochemicals are present.
In Ethanol extract : Medium amount of Phytochemicals are present
In chloroform extract : Absence of Phytochemicals

Discussion:

Phytochemical screening of medicinal plants is very important in identifying newsources of therapeutically and industrially important compounds. Kamboj (2000) stated that the bioactive extract should be standardized on thebasis of phytochemical compounds. It is imperative to initiate an urgent step forscreeningofplantsforsecondarymetabolites.Theresultsofpreliminaryphytochemicalscreening of leaves showed the presence of alkaloids, carbohydrate, cardiac glycoside, flavonoids, phenols ,paleobotanies, Sterols, terpinoids, tannins, quinones, saponins, terpenoids. Many of these phytochemical have different medicinal properties and it is used for making anti-inflammatory agents, anti-microbial agents, antiseptic, etc. Due to the presence of these compounds, the extracts revealed itsmedicinal potential to develop novel therapeutic agents.

Conclusion:

From the phytochemical screening results the carbohydrate, Cardiac glycosides, Phenols, Sterols, Tannins andTriterpenoids are present with high quantitates phytochemicals are consist high anti- inflammatory agents and prevent heart failure also. Anti – Inflammatory agents can reduce redness, swelling and pain in our body and also block certain substances in the body that cause inflammation. So, we can prefer this for making anti-Inflammatory ointment or ayurvedic drugs against inflammation.

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Isolation And Identification Of Bacteria From Local Market Fresh Water Crab *Paratelphusa Jacquemontii* From Amravati District, Maharashtra, India

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Abstract
The present study was conducted to evaluate the hygienic quality and freshness of crab Paratelphusa jacquemontii (Rathbun) through the investigation of the occurrence of bacteria which is an indicator for crab quality. Crabs were collected every week from local crab market. Carapace and gills of the crab was examined. Escherichia coli, Proteus vulgaris, Bacillus subtilis, Klebsiella pneumonia, Pseudomonas aeruginosa, Vibrio parahaemolyticus and Staphylococcus aureus were identified by Biochemical tests (IMViC Tests). The result of this study revealed that raw crab sold in local crab market has high contamination of human pathogenic bacteria, so strongly suggested that there is need for innovative measures to discourage the local population from eating improperly cooked crabs.
Keywords: *P. jacquemontii, Bacterial isolation, Fresh water crab.*

Introduction
Fresh water crab provides high quality protein and it also contains Omega-3 fatty acids that afford potential health benefits. Crab meat contains several essential vitamins and minerals, such as vitamin B12, which is necessary for proper nerve function. These crustaceans are rich in the minerals, zinc and copper, which are important for various vital bodily functions. Consumption of infected crab may cause diseases due to infection or intoxication. Some of these diseases are caused by the microorganisms present on the external surfaces including carapace, gills and the gut of the crab. In water microorganisms are kept away from invading by the normal defense mechanism of crab, when they are alive. Outside the water or on death, the microorganisms or the enzymes they secrete are free to invade or diffuse into the body parts where they react with complex mixture of natural substances present resulting in a well- defined sequence of changes in odoriferous and flavourous compounds. The bacteria present on the crab are normally associated with those found in their natural environment and influenced by the season and the harvesting conditions (ICMSF 2007). The outlined and discussed the hazards and challenges associated with handling crab during farming, capture and the environmental contaminants in seafood that may pose a risk to human health (Yagoub 2009). The quality of the raw crab (fresh or iced) at markets varies so widely that there is an obvious need for developing quality standards. There is no study on Microbial identification of these crabs. Therefore this study was carried out to identify certain microbial analysis to assess the quality and freshness of raw crab (*P.jacquemontii*) sold at a market in Amravati, Maharashtra, India.

Materials and methods
Laboratory analysis
Crab samples
Crabs (P.jacquemontii) were collected from a local crab market in Amravati. Totally 10 numbers of sample animals were collected every week from November 2019 to February 2020. The collected samples were aseptically and immediately transported in a thermal bag to the laboratory and processed within 3 h of acquisition, and samples were kept in the refrigerator (4–8 °C).

Sample preparation
The 10 g of the crab body parts sample was cut with a sterile knife. The cut body parts were crushed into small pieces in a sterile mortar with about 10 ml sterile water. From the crushed sample, 1 ml aliquot volume was measured out and homogenized in a clean, dry sterile beaker containing 9 ml of distilled water giving a 1:10 dilution. This was done for the 10 crab samples.

Isolation and identification bacteria form crab body sample of *P.jacquemontii*
The collected samples were processed in the laboratory according to the standard microbiological methods under complete aseptic conditions. The swabs were inoculated on nutrient agar and incubated at 37 °C under aerobic condition. The isolated bacterial colonies were identified on the basis of their morphological, physiological and biochemical characters. These culture were subjected to various biochemical tests such as gram staining, motility, indole, methyl red, voges proskauer, citrate, Triple sugar ion, oxidase, carbohydrate fermentation, hydrogen sulfide production tests for identification of phosphate solubilizing bacteria using

Bergey's manual of systematic bacteriology (Holt et al.1994). The bacteria such as *E. coli, K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa, Vibrio parahaemolyticus* and *S. aureus* were isolated from the crab samples.

Results and discussion

In bacteria, bio-oxidation reactions are very important. These reactions help bacteria to provide energy by oxidation of organic substances or by fermentation. Based on these reactions, the bacteria were identified and the results were presented in (Tables: 1, 2, 3, and 4)

Table-1: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of November 2019.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*
Gram staining	−	-	−	+
Motility	+	+	−	−
Indole production	+	+	−	+
Methyl red	+	-	−	−
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+
Triple sugar iron	−	+	−	−
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D

+: Positive, −: negative, D: different

Table-2: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of December 2019.

Testing	Microorganisms				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*	*Bacillus subtilis*
Gram staining	−	-	−	−	+
Motility	+	+	−	+	−
Indole production	+	+	−	+	+
Methyl red	+	-	−	+	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	+	−
Oxidase	−	+	−	D	D
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive,−: negative, D: different

Table-3: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of January 2020.

Testing	Microorganisms			
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Proteus vulgaris*
Gram staining	−	-	−	−
Motility	+	+	−	+
Indole production	+	+	−	+
Methyl red	+	-	−	+
Voges-Proskauer	−	-	+	−
Citrates	−	+	+	+

Triple sugar iron	−	+	−	+
Oxidase	−	+	−	D
Carbohydrate fermentation	+	+	D	D
Catalase	+	+	+	+

+: Positive, −: negative, D: different

Table-4: Bacteria isolated from fresh water crab *P.jacquemontii* purchased on first week of February 2020.

Testing	**Microorganisms**				
	Escherichia coli	*Vibrio parahaemolyticus*	*Klebsiella pneumonia*	*Pseudomonas aeruginosa*	*Staphylococcus aureus*
Gram staining	−	-	−	+	+
Motility	+	+	−	−	−
Indole production	+	+	−	+	−
Methyl red	+	-	−	−	−
Voges-Proskauer	−	-	+	−	−
Citrates	−	+	+	+	+
Triple sugar iron	−	+	−	−	−
Oxidase	−	+	−	−	−
Carbohydrate fermentation	+	+	D	D	D
Catalase	+	+	+	+	+

+: Positive, −: negative, D: different

In this study, *E. coli, Vibrio parahaemolyticus ,K. pneumonia, P. vulgaris, B. subtilis, P. aeruginosa* and *S. aureus* were identified from the crab. *E. coli, Vibrio parahaemolyticus* and *K. pneumonia* were found in all the monthly samples (Tables: 1, 2, 3, and 4) Whereas, *B. subtilis* (Tables: 2) and *P. aeruginosa* (Tables: 1 and 3) were identified two times. *P. vulgaris* (Tables: 2 and 3) and *S. aureus* (Tables: 4) was identified. The crabs are highly consumable and prone to vast variations in quality due to differences in species, environmental habitats, and feeding habits. They can also function as carriers of several microbial and other health hazards. Therefore maintenance of quality is most important in production and trade of crab products. Although only a few infectious agents in crab are able to infect humans, some exceptions exist that may result in fatalities. However, the greatest risk to human health due to the consumption of raw or insufficiently processed crabs and crab products. In this study, *E.coli., Vibrio Parahemolyticus,* and *Klebsiella pneumonia* sp. were isolated from all of collected crab samples is of highly importance because this bacterium plays a considerable role as potential pathogenic bacteria for human and as an indicator of food quality as spoilage organism. The consumption of these disease or infected crabs possesses greater health risks than the consumption of apparently healthy ones. The general public and consumers of crabs should therefore ensure that they do not buy or consume disease or injured crabs. Organic materials of any type are suitable foodstuffs for bacteria growth. A case of cholera occurred in a patient in Maryland, who had eaten crab harvested commercially along the Texas coast in October 1984. Findings of *Vibrio sp.* in the tissue of crabs of present studies are considered to be correlated with the epidemiology and transmission of cholera in the aquatic environment.

This is previously mentioned by (Jeyasekaran *et al*. 2006, and Koutsoumanis and Nychas 2000). In this study seven bacterial species were isolated form *P.jacquemontii.* Among the seven bacterial species *E. coli. V. parahaemolyticus* and K. *pneumonia* were found in all the samples and others were not found. Apart from the enteric- organisms, *S. aureus* encountered in this study are known enterotoxin producing agent and a microorganism which is poisonous. This is in agreement with the previous study by some authors in Nigeria and outside Nigeria (Okonko et. al.2008, 2009).

The results from this study and according to published microbiological guidelines as cited by (Gilbert et al.1996) suggest that the microbiological quality of the crab examined is unacceptable and pose a potential risk to public health. The diversity of potential pathogens from the samples of crab is of concern particularly at a time when many in our communities are immunologically compromised as a result of various illnesses (Mhango et al.2010). From this investigation, it can be concluded that these characteristics of water bodies are influenced by seasonal variations. It is recommended that the proper maintenance of the captured crabs is

necessary. Proper sanitation measures and environmental education to public care essential to keep these water bodies clean and safe. There is need for innovative measures to discourage the local population from eating improperly cooked crabs.

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Spider's Diversity in Agro-ecosystems of Murtizapur Tahsil, District Akola (Maharashtra State)

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Abstract

Spiders are widespread and diverse predators that are part of terrestrial Arthropod. Spiders are one of the most diverse animal groups in the World. Spiders play an important role as stabilizing agents or regulators of insect populations in agro, forest and other terrestrial ecosystems. Thus their presence in an ecosystem may well influence the population dynamics of other arthropods present. They mostly feed on insects, even though they may also feed on various other kinds of prey. Spider's predatory capacity can have an effect in decreasing densities of insect pests, when they are used to balance the effect of insecticides and Pesticides. If pesticides are avoided, spiders can invariably take shelter in the fields, feed on the pests and increase the productivity. The role of spiders as generalist predator in an agroecosystems is well recognized.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur, District Akola, during November 2020 to November 2021 in the present study I have reported 148 species of Spiders belonging to 13 Families and 65 genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE, and ULOBORIDAE were recorded during the investigation.

Keywords: *Diversity, Agro-ecosystems, Spider, Murtizapur.*

Introduction

Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. Biodiversity can be simply defined as the variety of all types of living organism. Spiders are among the most diverge group on earth, which received the sixth ranking in global diversity after the sixth largest insect orders. Spiders belonging to the order Araneae, which is one of the major group of creature Spiders are one of the most important Arthropods group in agroecosystems. They colonize almost all habitats and have great ability in resisting to adverse ecological conditions. Spiders are carnivorous creature. Spiders are among the most abundant predators of insects of terrestrial agro-ecosystem.

Spider species abundance in agro-ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem. A survey of Spiders was carried out in Agro-ecosystems of Murtizapur Tahsil, district Akola. Spiders act as natural biological control agent in ecosystem. Some recent workers on Indian spiders include Majumdar and Tikader (1991), Reddy and Patel (1992), Biswas and Biswas (1992), Sadana and Goel (1995), Biswas et al. (1996), Gajbe, U. A. (1999), Biswas and Majumdar (2000), Biswas B. and K. Biswas (2003).

Material and Method:

Study Area:

Murtizapur is located between N20.73° and E77.51° with an elevation on 308 meters. Summer is hot temperate as compared to other Vidarbha regions. The annual rainfall averages 700 mm. The area receives rainfall during southwest monsoon. Average temperature of the district ranges from minimum of 10°C in winter to a maximum of 45°C in summer with the relative humidity varying from 10-17% to 60-90%.

The spider inventory studies were conducted from November 2020 to November 2021 in the ten different localities of Murtizapur, Akola district from Maharashtra state. I have selected Ten microhabitats for observations in the study area viz; agricultural land.

Sampling methods:

Spider Inventory work was conducted at the agro-ecosystems by different groups of workers. Four surveys were conducted per season at all study sites. Five 30 x 30 m quadrates were taken for extensive surveys. All surveys were conducted in the morning hours between 7:00 am to 9:00 am Spiders were collected by adopting standard sampling techniques as described below.

1. Sweep netting: Spiders from herbaceous-shrub-small tree vegetation were collected using standardized insect-collecting net. This method is used to collect the foliage spider by this method from herbs and shrubs.
2. Active searching: Spiders from all three layers were collected using this method. In this method spider specimens were actively searched for 30 minutes per quadrat for active searching.

3. Beating sheets: Spiders from trees and woody shrubs were dislodged and collected on a sheet by beating trees and shrubs with a standard stick 10 beats per tree or shrub were employed in each quadrat.
4. Litter Sampling: Litter i.e. deciduate from the ground was collected by hand and was put in big tray. Litter sampling involved in sorting of spiders.
Collected spiders were photographed in life and later preserved in 70% ethyl alcohol. Identification: Spiders were observed using dissecting stereo zoom microscopes for studying identification keys. All specimens were initially separated from other material and identified to the family level. Spiders were identified upto species level using the standard monographs, Majumder S.C. and Tikader B. K. (1991).

Result:

During the present survey, I have reported 148 species of Spiders belonging to 13 Families and 65 Genera. Spiders of Families ARANEIDAE, CLUBIONIDAE, ERESIDAE, GNAPHOSIDAE, LYCOSIDAE, OECOBIIDAE, OXYOPIDAE, SALTICIDAE, SPARASSIDAE, TETRAGNATHIDAE, THERIDIIDAE, THOMISIDAE and ULOBORIDAE were recorded during November 2020 to November 2021 in my investigation.

Table 1: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Species	Common Name of Spiders	Habitat
01	ARANEIDAE(42)	*Araneus cucurbitinus* ♀	Orb Weaver	Cotton Field
02		*Araneus cucurbitinus* ♂	Orb Weaver	Cotton Field
03		*Araneus mitifica* (Simon) ♀	Orb Weaver	Cotton Field
04		*Araneus mitifica* (Simon) ♂	Orb Weaver	Cotton Field
05		*Araneus pachganiensis* ♀	Orb Weaver	Cotton Field
06		*Araneus pahalgaonensis* ♀	Orb Weaver	Cotton Field
07		*Argiope aemula* ♀	Orb Weaver	Cotton Field
08		*Argiope aemula* ♂	Orb Weaver	Cotton Field
09		*Chorizopes anjanes* ♂	Orb Weaver	Cotton Field
10		*Chorizopes anjanes* ♀	Orb Weaver	Cotton Field
11		*Chorizopes calciope* ♀	Orb Weaver	Cotton Field
12		*Chorizopes calciope* ♂	Orb Weaver	Cotton Field
13		*Cyclosa bifida* (Doleschall)♀	Orb Weaver	Cotton Field
14		*Cyclosa bifida* (Doleschall)♂	Orb Weaver	Cotton Field
15		*Cyclosa confraga* (Thorell)♀	Orb Weaver	Cotton Field
16		*Cyclosa confraga* (Thorell)♂	Orb Weaver	Cotton Field
17		*Cyclosa fissicauda Simon* ♀	Orb Weaver	Sunflower Field
18		*Cyclosa fissicauda Simon* ♂	Orb Weaver	Sunflower Field
19		*Cyclosa insulana* (Costa) ♂	Orb Weaver	Sunflower Field
20		*Cyclosa insulana* (Costa) ♀	Orb Weaver	Sunflower Field
21		*Cyclosa moonduensis* ♀	Orb Weaver	Sunflower Field
22		*Cyclosa moonduensis* ♂	Orb Weaver	Sunflower Field
23		*Cyclosa mulmeinensis* ♀	Orb Weaver	Sunflower Field
24		*Cyclosa mulmeinensis* ♂	Orb Weaver	Sunflower Field
25		*Cyclosa neilensis* Tikader ♀	Orb Weaver	Papaya Field
26		*Cyclosa neilensis* Tikader ♂	Orb Weaver	Papaya Field
27		*Cyclosa simoni* ♀	Orb Weaver	Papaya Field
28		*Cyclosa simoni* ♂	Orb Weaver	Papaya Field
29		*Cyrtophora bidenta* ♀	Orb Weaver	Cotton Field
30		*Cyrtophora bidenta* ♂	Orb Weaver	Cotton Field
31		*Cyrtophora cicatrosa* ♀	Orb Weaver	Cotton Field
32		*Cyrtophora cicatrosa* ♂	Orb Weaver	Cotton Field
33		*Cyrtophora citricola* ♀	Orb Weaver	Tur Field
34		*Cyrtophora citricola* ♂	Orb Weaver	Tur Field
35		*Larinia chloris* (Audouin) ♀	Orb Weaver	Tur Field
36		*Larinia chloris* (Audouin) ♂	Orb Weaver	Tur Field

37		*Neoscona achine* ♀	Orb Weaver	Tur Field
38		*Neoscona achine* ♂	Orb Weaver	Tur Field
39		*Neoscona bengalensis* ♀	Orb Weaver	Tur Field
40		*Neoscona nautica* ♀	Orb Weaver	Jawar Field
41		*Neoscona theis* ♀	Orb Weaver	Jawar Field
42		*Zygiella indica* Tikader ♀	Orb Weaver	Jawar Field
43	CLUBIONIDAE(3)	*Clubiona acanthochemis* ♀	Sac Spider	Cotton Field
44		*Clubiona analis* Thorell ♀	Sac Spider	Cotton Field
45		*Clubiona analis* Thorell ♂	Sac Spider	Cotton Field
46	ERESIDAE(2)	*Stegodyphus sarasinorum* ♀	Colonial Spider	Lemon Field
47		*Stegodyphus sarasinorum* ♂	Colonial Spider	Lemon Field
48	GNAPHOSIDAE(8)	*Drassodes lubrica* Simon ♀	Ground dwelling	Cotton Field
49		*Drassodes sagarensis* ♀	Ground dwelling	Cotton Field
50		*Gnaphosa poonaensis* ♀	Ground dwelling	Jawar field
51		*Gnaphosa poonaensis* ♂	Ground dwelling	Jawar field
52		*Sosticus nainitalensis* ♀	Ground dwelling	Jawar field
53		*Sosticus nainitalensis* ♂	Ground	Jawar field
54		*Zelotes poonaensis* ♂	Ground	Cotton Field
55		*Zelotes sajali* Tikader♀	Ground dwelling	Cotton Field
56	LYCOSIDAE(25)	*Hippasa greenalliae* ♀	Wolf Spider	Cotton Field
57		*Hippasa greenalliae* ♂	Wolf Spider	Cotton Field
58		*Hippasa partida* ♂	Wolf Spider	Tur Field
59		*Hippasa pisaurina* Pocock ♀	Wolf Spider	Tur Field
60		*Hippasa pisaurina* Pocock ♂	Wolf Spider	Tur Field
61		*Lycosa barnesi* Gravely ♀	Wolf Spider	Cotton Field
62		*Lycosa bistriata* Gravely ♀	Wolf Spider	Cotton Field
63		*Hippasa partida* ♀	Wolf Spider	Cotton Field
64		*Lycosa choudhuryi* ♀	Wolf Spider	Cotton Field
65		*Lycosa fuscana* Pocock ♀	Wolf Spider	Cotton Field
66		*Lycosa poonaensis* ♀	Wolf Spider	Cotton Field
67		*Lycosa poonaensis* ♂	Wolf Spider	Cotton Field
68		*Lycosa prolifica* Pocock ♀	Wolf Spider	Jawar Field
69		*Pardosa birmanica* Simon ♀	Wolf Spider	Jawar Field
70		*Pardosa birmanica* Simon ♂	Wolf Spider	Jawar Field
71		*Pardosa timida* (Simon) ♀	Wolf Spider	Jawar Field
72		*Pardosa timida* (Simon) ♂	Wolf Spider	Jawar Field
73		*Pardosa minutus* Tikader ♀	Wolf Spider	Cotton Field
74		*Pardosa minutus* Tikader ♂	Wolf Spider	Cotton Field
75		*Pardosa timida* (Simon) ♀	Wolf Spider	Cotton Field
76		*Lycosa fuscana* Pocock ♂	Wolf Spider	Cotton Field
77		*Lycosa barnesi* Gravely ♂	Wolf Spider	Cotton Field
78		*Lycosa bistriata* Gravely♂	Wolf Spider	Cotton Field
79		*Lycosa prolifica* Pocock ♂	Wolf Spider	Cotton Field
80		*Lycosa choudhuryi* ♂	Wolf Spider	Cotton Field
81	OECOBIIDAE(2)	*Oecobius* marathaus ♀	Tiny Spider	Jawr Field
82		*Oecobius* marathaus ♂	Tiny Spider	Jawr Field
83	OXYOPIDAE(13)	*Oxyopes bharatae* Gajbe ♀	Lynx Spider	Cotton Field
84		*Oxyopes biharensis* Gajbe ♀	Lynx Spider	Cotton Field
85		*Oxyopes burmenicus* ♀	Lynx Spider	Cotton Field
86		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Cotton Field
87		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Cotton Field
88		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Cotton Field

89		*Oxyopes pankaji* Gajbe ♂	Lynx Spider	Cotton Field
90		*Peucetia viridana* ♀	Lynx Spider	Cotton Field
91		*Peucetia viridana* ♂	Lynx Spider	Cotton Field
92		*Oxyopes burmenicus* ♂	Lynx Spider	Jawar Field
93		*Oxyopes chittrae* Tikader ♀	Lynx Spider	Jawar Field
94		*Oxyopes elongatus* Biswas.♀	Lynx Spider	Jawar Field
95		*Oxyopes pankaji* Gajbe ♀	Lynx Spider	Jawar Field
96	SALTICIDAE(23)	*Phidippus pateli* ♂	Jumping Spider	Cotton Field
97		*Marpissa decorata* Tikader♂	Jumping Spider	Cotton Field
98		*Marpissa decorata* Tikader♀	Jumping Spider	Cotton Field
99		*Marpissa dhakuriensis* ♀	Jumping Spider	Tur Field
100		*Myrmarachne maratha* ♀	Jumping Spider	Tur Field
101		*Myrmarachne maratha* ♂	Jumping Spider	Tur Field
102		*Phidippus pateli.* ♀	Jumping Spider	Tur Field
103		*Phidippus paykulli* ♀	Jumping Spider	Tur Field
104		*Plexippus paykullii* ♀	Jumping Spider	Tur Field
105		*Plexippus paykullii* ♂	Jumping	Cotton Field
106		*Rhene indicus* Tikader ♀	Jumping Spider	Cotton Field
107		*Telamonia dimidiata* ♀	Jumping	Cotton Field
108		*Telamonia dimidiata* ♂	Jumping Spider	Cotton Field
109		*Phidippus paykulli* ♂	Jumping Spider	Jawar Field
110		*Rhene indicus* Tikader ♂	Jumping Spider	Jawar Field
111		*Marpissa dhakuriensis* ♂	Jumping Spider	Cotton Field
112		*Phlegra dhakuriensis* ♀.	Jumping Spider	Cotton Field
113		*Salticus ranjitus* Tikader ♂	Jumping Spider	Cotton Field
114		*Thiania* sp. nov. ♂.	Jumping Spider	Cotton Field
115		*Euophrys* sp. nov. ♀.	Jumping Spider	Cotton Field
116		*Harmochirus* sp. nov. ♂.	Jumping Spider	Cotton Field
117		*Harmochirus* sp. nov. ♀.	Jumping Spider	Cotton Field
118		*Salticus ranjitus* Tikader ♀.	Jumping Spider	Cotton Field
119	SPARASSIDAE(2)	*Heteropoda venatoria* ♀	Giant Crab	Cotton Field
120		*Heteropoda venatoria* ♂	Giant Crab	Cotton Field
121	TETRAGNATHIDAE (4)	*Leucauge decorata*♀	Water orb weaver	Tur Field
122		*Leucauge fastigata* ♀	Water orb weaver	Cotton Field
123		*Tetragnatha mandibulata*♀	Water orb weaver	Cotton Field
124		*Tetragnatha mandibulata*♂	Water orb weaver	Cotton Field
125	THERIDIIDAE(4)	*Argyrodes gouri* ♀	Cob web Spider	Papaya Field
126		*Argyrodes gouri* ♂	Cob web Spider	Cotton Field
127		*Theridion manjithar* ♀	Cob web Spider	Cotton Field
128		*Theridion manjithar* ♂	Cob web Spider	Cotton Field
129	THOMISIDAE(17)	*Thomisus pugillis* ♀	Crab Spider	Sunflower Field
130		*Thomisus pugillis* ♂	Crab Spider	Sunflower Field
131		*Thomisus whitakeri* ♀	Crab Spider	Sunflower Field
132		*Tmarus pachpediensis* ♀	Crab Spider	Sunflower Field
133		*Tmarus pachpediensis* ♂	Crab Spider	Sunflower Field
134		*Xysticus jayantius* ♀	Crab Spider	Sunflower Field
135		*Xysticus minutes* ♀	Crab Spider	Sunflower Field
136		*Xysticus minutes* Tikader ♂	Crab Spider	Sunflower Field
137		*Synaema decorata* ♀	Crab Spider	Sunflower Field
138		*Synaema decorata* ♂	Crab Spider	Sunflower Field
139		*Thomisus elongates* ♀	Crab Spider	Sunflower Field
140		*Thomisus elongates* ♂	Crab Spider	Sunflower Field
141		*Thomisus memae* ♀	Crab Spider	Sunflower Field
142		*Thomisus beautifularis*♀	Crab Spider	Sunflower Field

143		*Thomisus pooneus* ♂	Crab Spider	Sunflower Field
144		*Thomisus projectus* ♀	Crab Spider	Sunflower Field
145		*Thomisus projectus* ♂	Crab Spider	Sunflower Field
146	ULOBORIDAE(3)	*Uloborus danolius* ♀	Feather leg Spider	Cotton Field
147		*Uloborus danolius* ♂	Feather leg Spider	Cotton Field
148		*Uloborus khasiensis* ♀	Feather leg Spider	Cotton Field

♀- Female, ♂- Male.

Table 2: Checklist of Spider fauna from Agro-ecosystems of Murtizapur in Akola district of Maharashtra State

Sr. No.	Family	Genera	Species
01	Araneidae	19	42
02	Clubionidae	01	03
03	Eresidae	01	02
04	Gnaphosidae	03	08
05	Lycosidae	12	25
06	Oeceobiidae	01	02
07	Oxyopidae	04	13
08	Saltisidae	11	23
09	Sparassidae	01	02
10	Tetragnathidae	02	04
11	Theridiidae	02	04
12	Thomisidae	07	17
13	Uloboridae	01	03
Total		**65**	**148**

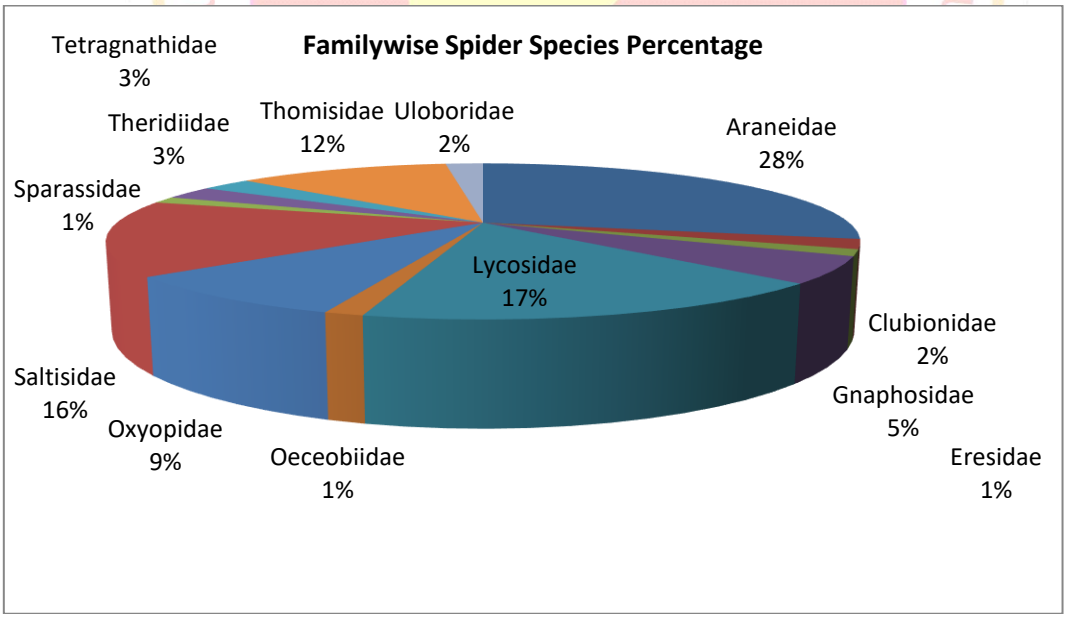

Fig.1. Graph showing Family wise Spider Species Percentage of Agro-ecosystems from Murtizapur, District Akola

Discussion:

In the present study, 148 species of spiders belonging to 65 genera of 13 families in agro-ecosystem of Murtizapur, district Akola collected and identified. These spiders were belonging to the family Araneidae, Clubionidae, Eresidae, Gnaphosidae, Lycosidae, Oecobiidae, Oxyopidae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae, and Uloboridae. In this study two species of spiders were observed,

one is web weaver and another one is non web weaver. The web weaving spiders were belonging to the family Araneidae, Eresidae, Oecobiidae, Tetragnathidae, Theridiidae, and Uloboridae. The non web weaving spiders were belonging to the family Clubionidae, Gnaphosidae, Lycosidae, Oxyopidae, Salticidae, Sparassidae and Thomisidae. The increase in the spider density suggests that spider density in influenced by the increase in prey density. In particular, the interaction of prey and predator shows a constant numerical interaction about these relationships which is fundamental to biological control.

OrbWeaver(ARANEIDAE)>WolfSpider(LYCOSIDAE)>JumpingSpider(SALTICIDAE)> Crab Spider(THOMISIDAE)> Lynx Spider(OXYOPIDAE)

On the basis of Family wise Spider Species the abundance of the Spider Family are represented respectively. In my investigation I have seen that the abundance of Five Family Spiders species were more. The Orb waver spiders of Family Araneidae and Wolf spiders of Family Lycosidae are widely distributed. The Orb waver spiders of Family Araneidae form web and the insect pest entangled in web spiders feeds on them. The members of family Lycosidae and Salticidae spiders they directly capture the insect pest and feeds on it.

Conclusion:

In my investigation I have studied 148 species belonging to 65 genera of 13 Spider Families during November 2020 to November 2021, on the above result and discussion it is clear that the Spiders are very much important creature. Species abundance of spider in agro-ecosystem can be high. The present work includes the Taxonomic position and list of diversified species of spiders. The major families abundant in this agro-ecosystem are ARANEIDAE 42(28%), LYCOSIDAE 25(17%), SALTICIDAE 23(16%), THOMISIDAE 17(12%) and OXYOPIDAE 13(9%). Spiders are act as good Pest controller. Avoid the regular use of pesticides in agricultural fields which decreases the spider populations, so species abundance of spider in agro-ecosystem can be high. Spiders are beneficial bio-control agent of insect pest in agro-ecosystem.

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Flowering Phenology and Histochemical Analysis of Cotton Varieties

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Abstract:

Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors."Flowering Phenology" refers to the seasonal timing of flowering. Another event under phenology is opening of flower, anther dehiscence, pollen presentation and stigma receptivity. Flower opening in all cotton varieties starts during 06.45 to 09.45 hours followed by anther dehiscence, which starts, from 07.00 hours depending on the weather conditions. In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. In histochemical test, Pollen grains of all the varieties of cotton studied showed the presence of both starch and lipids. Thus the Pollen grains of all cotton varieties belong to the class of starchy pollen as in all varieties it showed positive test.

Keywords: *Cotton varieties, flowers, starch, lipids, phenology.*

Introduction:

Cotton is one of the most commercial crops playing a key role in economic, political and social affairs of the world. Cotton is a tropical and subtropical crop grown on a variety of soil. The predominant types of soil on which the crop is grown are the black cotton soil and red sandy loams to loams found in the state of Gujarat, Maharashtra, Madhya Pradesh, Andhra Pradesh, Karnataka and Tamilnadu. The sowing season of cotton varieties differs considerably in different regions for obtaining maximum yield of cotton. The crop yield is depending on reproductive success of the plant. During the process of reproduction the pollen grains plays very important role. Therefore, the Palynological investigations of cotton varieties H-8, NHH-52, BT-162, LRA-5166, Kaveri Kurnel, Ankur-216, Binni and Ajeet-11 were proposed to undertake for the investigations on flowering phenology, pollen histochemistry. Phenology is the study of timing of vegetative activities, flowering and fruiting and their relationships to environmental factors (Mori and Prance, 2005). "Flowering Phenology" refers to the seasonal timing of flowering.

A phenological record depends on parameter chosen by the various investigators and depends on the research levels, the aim of the research, and the type of analysis. The main events are the timing, duration, sequence, intensity and timing of flowering, which can determined by the physical environment factors like temperature, rainfall and day- length (Dafni, 1992). Plants reproductive characteristic can affect the flowering phenology, mode of seed dispersal and fruiting seed set efficiency. A wide variety of environmental factors may select for one or more reproductive characteristic in plant population (Smith *etal*, 1986) and such factors include seasonal climatic events (Schemske, 1977).

Pollen histochemical analysis are carried out for the following reasons i) possible relation between the pollen content and the mode of pollination ii) study of pollinator foraging behavior, nutritional demands, pollination mode, pollen content and iii) composition in relation to phylogeny (Dafni, 1992). Lipids and starch are important constituents of the pollen grains to establish the relations with flower foragers.

Materials and Methods

For the collection of phenological data of selected cotton varieties, field trips were undertaken daily or on alternate days. Events and the changes of the single flower are recorded to study the flowering phenology in relation to geographical (latitudinal and altitudinal) and climatic variables, the time and duration of pollen exposure and the interrelations among environmental variables (temperature and humidity) and flower development were noted.

Plants were observed from the beginning of flowering stage up to the opening of last flower. Flowering period was taken as the period from the opening of first flower up to the opening of last flower. The timing of onset, progress, termination and blooming of selected varieties under study were noted.

For the histochemical tests fresh and mature pollen grains were collected from freshly dehisced anthers. For the test of starch method proposed by Baker and Baker (1979) was followed. Pollen samples were immersed in to IKI solution and examined under the microscope for the change in colour. Dark bluish-black color indicates the presence of starch. For the estimation of lipids pollen sample were kept in freshly prepared stock solution of Sudan IV and treated pollen sample was observed under microscope within 2-3 minute to note the change in colour. A red color indicates the presence of lipid (Baker and Baker, 1983).

Observation:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7. In all varieties the flowering stands to terminate towards the end of month of December .

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

At the full bloom time the plants of cotton variety Ajeet-11 were with maximum height of 111 cm having up to 150 leaves per plant, however, in Ankur-651 height was 72 cm with 80 leaves. The number of leaves, more or less correlates with the height of plant. For each variety parameters like height, number of leaves, number of balls, number of flowers open per day, and number of anthers per flower showed variations for each parameter.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids.

Conclusions:

In all selected varieties of cotton, it is observed that the flowering starts during 1st to 19th of September and full blooming was from 9th October to 28th November. Full blooming in all cotton varieties was observed when the temperature was in the range of 23^0C to 30^0C. The range of % humidity during full bloom period was 74.6 to 82.0 and 55.4 to 87.7 In all varieties the flowering stands to terminate towards the end of month of December.

Flower opening in all varieties starts during 06.45 to 09.45 hours depending on the weather conditions. During cloudy and rainy days flowers starts to open after 07.30 hours depending on prevailing temperature. The anther dehiscence in all varieties was observed during 07.00 to 08.30 hours. The stigmas become receptive before anther dehiscence. The stigmas were viscid and shiny and remained receptive for about 8 hrs. After 03.00 hours it become blackish in colour indicating loss of receptivity. The opened flowers start to withered by the evening on same day.

From the observations on flowering phenology, it is noticed that the flowering phenology is related with seasonal variations and environmental conditions and has an impact of different environmental factors.

From the histochemical tests it was noted that the pollen grains of all cotton varieties contains starch and lipids. Pollen histochemistry is possibly related to pollination mode, pollinator foraging behavior and phylogeny. The nutritive value of pollen also influences the behaviour of flower visitors.

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Phytochemical Screening for Secondary Metabolites from Medicinal Plants of Wan Sanctuary, Akot Wildlife Division,(M.S.)

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Abstract

Phytochemical screening of secondary metabolites in some selected medicinal plants of Wan Sanctuary of Akot Wildlife Division was carried out for to know the presence of medicinally important chemical compounds in the plants. The conventional medicines involve the leaf extracts of various plants having different bioactive compounds which work in the curing of various health problems. Qualitative phytochemical screening of these selected medicinal plants helps to know the presence of different chemicals like phenols, alkaloids, tannins, saponins, anthocyanin,leuco-anthocynin and steroids. By knowing the presence of such different secondary metabolites in plants, these plants will be used for the extraction and isolation of phytochemicals which is use in the curing of various health problems.

Key words- *Phytochemical screening; Bio-active compounds; Medicinal plants; Secondary Metabolites*

Introduction:

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problemsin last few years our interest has been increases in the study of conventional medicine in all over the world. So that the countries have look around for cooperation in investigation and identification of safe positive components used in conventional medicine. [1]

According to World Health Organization (WHO), medicinal plants would be the best source to obtain variety of medicines. About 80% of individuals from developed countries use traditional medicines, which has compounds derived from medicinal plants. However, such plants should be investigated to better understand their properties, safety, and efficiency [2]almost 95% of the prescriptions in our India have been reported to be plant based phytomedicines in the traditional systems of Unani, Ayurveda, Homeopathy and Siddha. [3-4]

Plants can produce different kind of natural products also known as primary metabolites and secondary metabolites they induced effects on other organisms. The primary metabolites are amino acids, simple sugars (glucosides), proteins and lipids are involved in cellular processes. Secondary metabolites are chemically active compounds i.e. (Phenols, flavonoids, alkaloids, steroids, terpenoids, saponins, etc.), which are produced in the response of various kind of stresses with complexity in structure and distributions are more restrictedly than the primary metabolites.[5]

From the ancient time Phytomedicenes are extracted from different parts of Plant are popularly used by local communities for cure from various health problems. These can be obtained from different parts of the plant like bark, stem, leaves, flowers, fruits, seeds, etc. i.e. the bioactive compounds are present in any part of the plant. Such phytochemical screenings of different plants or from the different regions are reported by many researchers and determine the presence of primary and secondary metabolites in plants. They explore the plants in nature for the search of novel medicines, the number of plant having the medicinal components which are therapeutically used in the curing of various health problems. [6 - 7]

Materials And Methods:

Collection and Identification: The dust free and microbes free fresh leaves of 15 different plant species were collected from Wan Sanctuary, Akot Wildlife Disvision (M.S.). Taxonomic identification of plants was carried out by using publishedfloras.

Extraction: The leaves of 15 selected Plants listed in Table 1 were thoroughly washed 3-4 times in running tap water, and then the leaves are shade dried. After complete shade drying, the leaves were grinded in mixer; the powder was stored in small polyethene bags. The powdered material of 5gm was taken by weighing balance and crushed in 50 ml of distilled water then boiled at 50-60˚ C for 30 – 40 minutes in water bath and filtered through Whatman No. 1 filter paper. The filtrate was centrifuged at 2800 rpm for 10 minutes then the filtrate was stored in sterile bottle in deep freezer at 5ºC for further use. The plants studied are listed below in Table 1.

Table 1: Selected Medicinal Plants for Phytochemical Screening.

Sr. No.	Botanical Name	Family	Common Name
1.	*Alstoniascholaris* L.	Apocynaceae	Devil tree
2.	*Oxalis corniculata* L.	Oxalidaceae	Yellow wood sorrel
3.	*Vitexnegundo* L.	Verbenaceae	Five leaved chaste tree

4.	*Polyalthialongifolia* (Sonn)	Anonaceae	Thwaites False ashoka
5.	*Terminalia catappa* Linn.	Combretaceae	Indian almond leaf
6.	*Sizygiumcuminum* L.	Myrtaceae	Jamun
7.	*Achyranthisaspera* L.	Amaranthaceae	Chaff-flower
8.	*Murrayakoenighii* L.	Rustaceae	Curry leaf
9.	*Wedelleawallichi* L.	Asteraceae	Wedellea
10.	*Lantana camara* L.	Verbenaceae	Lantana or wild saga
11.	*Ficusreligiosa* L.	Moraceae	Peepal tree
12.	*Cassia fistula* L.	Caesalpinaceae	Golden shower
13.	*Vernoniacinerea* L.	Asteraceae	Dandotapala, sadodi
14.	*Tinosporacardifolia* (Willd.) Miers.	Menispermaceae	Giloy
15.	*Catharanthusroseus* L.	Apocynaceae	Sadabahar

Phytochemical screening: Preliminary phytochemical screening (qualitative) was carried out by using following methods:

Terpenoids: 2ml of leaf extract was added to 2ml of acetic anhydride and concentrated H2SO4. The blue, green ring is form which shows the presence of terpenoids.[8]

Tannins: 2ml of the leaf extract was added a few drop of 1% lead acetate. A yellowish colour precipitate is formed which shows the presence of tannins.[9]

Saponins: 5ml of leaf extract was mixed with 20 ml dist. water and continuously shake it for 15 min. the foam is form which shows the presence of saponins.[10]

Anthocyanins: 2ml of leaf extract is added to 2 ml of 2N HCL and ammonia. The pink-red colour change to blue-violetcolor which showsthe presence of anthocyanins.[11]

Leucoanthocyanins: 5ml of leaf extract added to isoamyl alcohol. Formation of red colour Upper layer shows the presence of leucoanthocyanins.[11]

Steroids: 1ml of leaf extract was dissolved in 10ml of concentrated sulphuric acid and equal volume of chloroform was added by sides of the test tube. The upper layer turns red in colour and sulphuric acid layer showed the yellow with green fluorescence. Which shows the presence of steroids.[12]

Results And Discussion:

Preliminary Screening of Secondary Metabolites (Qualitative) - The phytochemical screening and qualitative analysis of 15 selected medicinal plants showed the presence of Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids in leaves (Table 2).

Table 2: Result of the Phytochemical Analysis of 15 Selected Medicinal Plants

Sr. No.	Name of plant	Terpinoi-des	Tannins	Saponins	Antho-cyanins	Leucoantho-cyanins	Steroids
1.	*Alstoniascholaris* L.	-	-	-	-	-	+
2.	*Oxalis corniculata* L.	-	+	-	-	-	-
3.	*Vitexnegundo* L.	-	+	+	-	-	+
4.	*Polyalthialongifolia* (Sonn)	+	-	-	-	-	+
5.	*Terminalia catappa* Linn.	-	+	+	-	+	+
6.	*Sizygiumcuminum* L.	+	+	+	-	-	+
7.	*Achyranthisaspera* L.	+	+	+	+	-	+
8.	*Murrayakoenighii* L.	+	+	+	+	-	+
9.	*Wedelleawallichi* L.	-	-	-	+	-	+
10.	*Lantana camara* L.	-	+	+	-	-	+
11.	*Ficusreligiosa* L.	+	+	+	-	-	-
12.	*Cassia fistula* L.	-	+	+	-	-	-
13.	*Vernoniacinerea* L.	+	-	-	-	-	+
14.	*Tinospora cardifolia* (Willd.) Miers.	+	-	-	-	-	+
15.	*Catharanthusroseus* L.	+	+	+	-	+	+

(+ = Present and - = Absent)

Terpenoids are found in 8 plants and Tannins are found in 10 plants out of 15 selected plants. Terpenoids and tannins are mostly used foranti-inflammatory and analgesic activities. Tannins contribute property of astringency i.e faster the healing of wounds and inflamed mucous membrane also inhibited the growth of many bacteria and fungi, viruses and yeast[13 – 14]. Saponins are present in 9 plants out of 15 plants. Saponins have industrial uses as serface active and foaming agent also use in detergent and pesticides and it have many helpfull health effects. Anthocyanins are present in 3plants out of 15 plants and it is use against bacterial and viral infections also it increases the immunity.Leucoanthocyanins are found in only 2 plants out of 15 plants. Steroids are found in 12 plants out of 15 medicinal plants. Steroids are mostly use in pharmaceuticals as aphrodisiac. In most of the plants Terpenoids, tannins, saponins and Steroids are found in the present study.
The presence ofveriuos bioactive compounds shows the medicinal value of those plants.The antioxidants,antibacterial and antifungal properties of various plant extracts have increasing interest in both research and the food industry as they are better than the synthetic components.
The traditional medicinal knowledge is restricted to only few communities so that the phytochemical screenings of medicinal plants are very important in identifying novel sources of therapeutic phytomedicines and industrially important compounds also use in nutraceuticals and pharmaceutical industries.

Conclusions

The plants which are rich source of secondary metabolites are the medicinal plants are widely used in traditional medicine as phytomedicines to cure various ailments. The different extracts of leaves of medicinal plants contained many bioactive chemical constituents including Terpinoides, Tannins, Saponins, Anthocyanins, Leucoanthocyanins and Steroids. The anti-inflammatory, antimicrobial effects can be attributed to the high steroids, tannins, terpenoids, and saponins and present in medicinal plants. It has been used as aphrodisiac, liver tonic, neuroprotecter, astringent, and to treat bronchitis, ulcers, asthma, and insomnia.
While medicinal plants are used in Ayurvedic medicine form ancient time, more clinical and laboratory trials should be conducted to help and support its therapeutic use,which provide strong evidences in search of novel phytomedicines.

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Cestodes Infection In Species *Mastacembelus armatus.*(Histopathological Study) From Nilona Dam, Yavatmal District, M. S.(INDIA)

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Abstract

*The present paper is discussion on histopathological study of cestode infection in species **Mastacembelus armatus** from Nilona Dam, Yavatmal District, M. S. India .Nilona Dam is situated in Akola Bazar road, Sawargaon, Yavatmal, District, Maharashtra 445002. The size of the area is about 5.99 square kilometer. The fish **Mastacembelus armatus** [Lecepede, 1800] Examined for gastrointestinal Ptychobothridian cestode parasitic infections. The histopathological study of the fish tissues shows huge damages caused by the tapeworm .loss of host include destruction and extrusion of the intestinal villi, fibroblast cell and plasma cell. Farther observation shows in T.S. of intestinal tissue showed that cestodes attached to mucosal, sub-mucosal and muscularis mucosa of intestine with scolex and damaged host intestinal villi, invaded deep forming cyst. Cestode Parasite derives nutritive material, required for growth, from host tissue by causing damage to it. Tape worm have also been found to infect many other freshwater fishes and cause pathological effects on the host as irritation, injury or atrophy of tissues and occlusions of alimentary canal, blood vessels or other ducts. Hence author has been needed to study on parasitism.*
***Keywords**: - Histopathology, Mastacembelus armatus, Nilona Dam, Tape worm, Parasitism.*

Introduction

Fishes are playing an important role in nation's economy. As a nutritional point of view, fishes give high content of proteins to us, it said to be Gold in water, earlier study the pathogenicity of cestode adjacent various order described by (Rees, G. in 1967) study of host parasite relationship described in fishes (Mcvicar 1972) Acanthobothrium, Phllobothrium, Echinobothrium, (Murlidhar and Shinde 1987) observed histopathology of ***Acanthobothrium uncinathum*** from the fish ***Rhynchobatus ajeddensis*** (Borucinska and Caira, 1993) Subsequently described the histopathogenicity of two adult Trypanorhynchs from the muscosa of the nurse shark. Never the less quit of few reports on the pathogenicity of cestode on fishes are available i.e. (Sinde1970, Bylund 1972).

The present research work deals with the study of histopathology of Ptychobothridian cestode *Circumoncobothrium chandrabhagae* n.sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae* n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.

Material And Methods

The histopathological study, ***Mastacembelus armatus*** of freshwater fishes were collected from local fisherman of Nilona Dam, Yavatmal District. M. S. India. These fishes were brought to the laboratory, dissected out the intestine, examined for the cestode infections. Some fishes were found to be infected whereas few were not. Both infected and normal hosts intestine were cut and fixed in **Bouin's fluid** to study histopathological changes. The fixative inhibits the post mortem changes of the tissues. Then tissues were washed, dehydrated through alcoholic grades, cleared in **xylene** and embedded in **paraffin wax** (58-62°C). The blocks were cut at **7µ** and slides were stained in Eosin and **Haematoxylin** double staining method. Best slides or sections were selected and observed under the microscope for histopathological study. The photomicrographs were taken with the help of camera. These slides were identified by using keys "Systema Helminthum" (Yamaguti, 1956[8]).

Results And Discussion

After histopathological observational study indicate that some of the intestines were found to be infected with cestode parasite. The (Photograph - A) Shows the healthy intestine, in which villi and all layers are clearly observed, While in (Photograph - B) Infected intestine shows that the worm attached to the mucosal layer of intestine and slowly invades to the deeper layers of the host tissue.

A **B**


Infected intestine

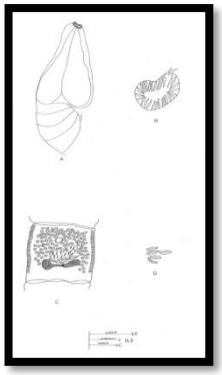

Non-infected intestine

The tape worm ***Circumoncobothrium chandrabhagae*** **n. sp**. is having

1] Scolex large, triangular.
2] Hooks 26-30 in numbers, arranged in single circle.
3] Neck absent.
4] Mature Segment broader than long, with slightly convex margin
5]Testes 120-130 in numbers, Oval in shape, unevenly distributed.
6] Ovary distinctly bilobed transversely placed at posterior margin of the segment.
7] Vitellaria follicular, small, oval in shape, arranged in two rows on each lateral side of the segment.
Host:- *Mastacemballus armatus* (Lacepede, 1800)
n.sp *C. chandrabhagae* n.sp.

Conclusion:-

The present research work deals with the study of histopathology of Ptychobothridian cestode ***Circumoncobothrium chandrabhagae*** n .sp. Intestinal tape worm of host ***Mastacembelus armatus.*** Parasites affect the productivity of the fish in the systems through mortalities, by decreasing growth rate, reducing the quality of the flesh and making the hosts more susceptible to more pathogens. It is concluded that the ***Circumoncobothrium chandrabhagae*** **n.sp.** Cestode contact with host tissue and utilize the nutritive material to the favorable for its nourishment and growth from the host tissue and make host weak affecting the growth of host causing damage to intestinal tissue of host.



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Spider Fauna from the Cotton Fields of Vitala Village Near Wardha River Pulgaon, India

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Introduction;-

In a faunistical investigation in the Indian cotton fields, the most abundant species were belonged to Clubionidae, Lycosidae, Theridiidae, Thomisidae, Heteropodidae, Araneidae, Oxyopidae and Filistatidae families too. The most population of spiders was in September and October. They were one of the important predators in these fields and they play an important role in cotton pest's control.

Before attempting to assess the role of spiders in suppressing pest populations in a given agricultural situation, there must be available sufficient information on their taxonomic diversity and abundance habitat preferences in space and time, hunting strategy, body size of species, predators and prey items and the rate of their consumption, and reproduction. Information on these aspects is essential for the formulations of ecological concepts and conclusions (Berry, 1970; Horner & Starks, 1972).

Because of their high abundance and predominantly insectivorous feeding habits, spiders are suspected to play an important predatory role in agroecosystems, woodlands, and other terrestrial ecosystems (Nyffeler and Benz, 1987; Nyffeler, 2000a,b). They are one of the major groups of generalist predators that are needed in the development of efficient, sustainable, low- input agricultural systems (Ekschmitt et al., 1997).

The population densities and species abundance of spider communities in agricultural fields can be as high as in natural ecosystems. Spiders are important predators of pests on cotton, rice, apple, banana, citrus, soybean, and various other crops and plantations. The use of spiders as biological control agents depends mainly on the conservation and increases in numbers through the use of agricultural practices such as selective spraying rather than on mass rearing and release. The extent, to which spiders can contribute to agricultural pest control, is however limited by the disruptive effect of insecticide applications. The selective use of pesticides to prevent elimination of natural enemies; restricting insecticide usage during crucial periods in the life cycle of the pest; limiting spray application to midday when spiders are less active and shelter; application of pesticides as spot treatments to permit spiders to recolonize in treated areas immediately are important to conserve the predator spiders.

Materials and Methods: Study Area:

In the district Wardha, a village Pulgaon is located at 20°43′34″N to 78°19′01″E at an elevation of 935 ft. A village Pulgaon is well associated with many small villages with dry deciduous forest area. A Pulgaon is well known for the Wardha River which passes through the Pulgaon village and provide suitable environment for the cotton based agricultural field. Vitala village is one of the nearer villege from pulgaon with abundant number of Spiders.

Study Period, sampling and identification

The current study was carried out for a period of eight months from August 2018 to March 2019. Sampling was conducted in six months at the randomly selected cotton field.

Spiders were collected by various methods like insect nets, pitfall trap, visual searching, beating, sweeping, and stroking sticks. Sampling was done in each month by plotting the quadrates method i.e. (1sq. m × 1sq.). Attempts were made to carefully scan the leaf litter surface, tree bark, foliage (Including the under – surface of leaves when traces of webs were found) twigs, and branches of the vegetation (up to 1.5m height) along the transect. Specimens from each quadrate were preserved in 75% alcohol in the field and observed under a stereozoom microscope in the laboratory.

Methodology:

To document spider diversity of agriculture ecosystem:

The detailed descriptions of the collection techniques are as follows.

1) Pitfall Trapping -- Pitfalls will be used to trap the ground dwelling spiders. The pitfall traps consists of a 9 cm wide by 10 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps will be left open for a period of one week, as this allows maintaining the spider specimens in good condition before processing in the laboratory for their identification.
2) Visual Observation – This method of sampling is used to collect the spiders by visual observation.
3) Ground Hand Collecting – Ground Hand collection involves the collection of spider samples from ground to knee level. This method of sampling is used to collect the spiders, which are found to be visible in the ground, litter, in broken logs, rocks etc.

4) Aerial Hand Collecting – Aerial Hand collection involves the collection of spiders samples from knee level to arm length level. This method accesses web-building and free-living spiders on the foliage and stems of living or dead shrubs, high herbs, tree trunks etc.
5) By visual observation of small webs
6) Preservation and Identification of specimens - Collected adult mature specimens will be photographed, analyzed and then will be transferred to 70% alcohol. All adult specimens will be identified at family, genus and species level. Species will be distinguished by examination of external genitalia. Sexes will be matched by colour pattern and somatic features. Identification will be done on the basis of morphometric characters of various body parts.

Results And Discussion

Collected data representing 10 families, 31 genera and 60 species were recorded from agricultural lands adjoining to the Wardha river. Family Araneidae and Thomisidae forms the dominant group (Table 1). i.e. 17 species in both families with 8 and 6 genera respectively. The large number of Thomisidae and Araneidae species found in this region is due to the availability of flowering plants with the deep vegetation at the border of agricultural and forest area. The Saltisidae represent 12 species and 7 genera. Lycosidae and Tetragnathidae also found in decreasing species number which is due to their specific habitation. The analysis of guild structure (Uetz, et al.,1999) revealed six feeding guilds i.e. orb web weavers, Foliage hunters, Sheet web weavers, Ground runners, Stalkers and Ambushers (Table 1). Orb web weavers constituted the dominant feeding guild representing 33% of the total collection. Stalkers and ground runners represent 20% and 17% respectively.
This study brought out the fact that agricultural fields adjoin to the forest has the potential to maintain the richness of spider diversity in the agricultural fields. This rich diversity of spiders indicate useful indicator for the species richness related to agro-ecosystem (Noss, 1990).

SR. NO.	FAMILY	NUMBER OF GENERA	NUMBER OF SPECIES	GUILD	HABITAT
1	Aranaidae	08	15	Orb web weavers	**Tropical forest, foliage, dry forests, ground.**
2	Clubionidae	01	02	Foliage hunters	**Under stones**
3	Eresidae	01	02	Sheet web weaver	**Tree trunk**
4	Gnaphosidae	03	03	Ground runners	**Stones**
5	Hersiliidae	01	01	Foliage hunters	**Under stones**
6	Lycosidae	04	04	Ground runners	**Dunes**
7	Miturgidae	01	01	Foliage hunters	**Foliage**
8	Oxyopidae	1	6	Stalkers	**-Grass land**
9	Saltisidae	7	10	Stalkers	**Tropical forest**
10	Tetragnathidae	2	5	Orb web weavers	**Low**
11	**Thomisidae**	**2**	**11**	**Ambushers**	**Forest grass, Flowering plants**

Table 1. Total number of families, genera and species of spiders with their guild and habitat collected from agriculture lands of Pulgaon, Maharashtra-India.

Family	Genus/ Species
Araneidae	***Aranus mitifica*- male** ***Aranus cucurbitinus*- female** ***Argiope pradhani*-female *Argiope aemula* -Female** ***Cyclosa hexatubulata*- female *Cyclosa mooduesis*-female *Cyclosa spirifera* -Female *Cyclosa insulana* -Male *Cryptophora citricola*-female *Leucange decorate*-female *Neoscona theis*-female *Neoscona excelsus*-male *Neoscona mukergai*-male *Neoscona rumpfi*- Female *Neoscona nautica* –Male** ***Poltys nagpurensis* -Tikader *Female Zygeilla indica*-female**
Clubionidae	***Clubiona drassodes* Cambridge male**

Eresidae **Gnaphosidae**	***Clubiona tikaderi* female *Callilepis rukminiae* female *Stegodyphus sangivani*- female** ***Stegodyphus mirandus*- Pocock Female** ***Gnaphosa pauriensis* Tikader female**
	***Megamyrmecion ashae* Tikader female *Zelotes chandosiensis* Tikader female *Zelotes mandlaensis* Tikader female**

Table 2. Checklist of spiders collected from agriculture lands of Vitala, Maharashtra-India

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Gymnanthemum amygdalinum (Delile) Sch. Bip. ex Walp (Asteraceae): A new distributional record to Adilabad District of Telangana state, India.

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Abstract

The present paper deals with an addition of new taxa of flowering plant to the Adilabad District of Telangana State. Updated information on nomenclature, correct description and locality is provided. This is a new distributional record for this area.

Key Words:*Gymnanthemum amygdalinum Asteraceae, new distributional record, Adilabad District, Telangana.*

Introduction

The genus *Gymnanthemum* was described by Cassini in 1817 and was transferred to *Vernonia* by Candolle in 1836. Many of the taxonomists *viz*., Bentham (1873), C.B.Clarke (1876), Hook.f. (1881) and Gamble (1921) followed the Candolle treatment since 1986. Later, Robinson and Kahn (1986) and Robinson (1999) resurrected the genus based on the studies of pollen grains, chromosome numbers and chemical compounds. At present the genus is distributed in sub-Saharan Africa, Madagascar, Southern Asia with more than 43 species (Robinson & Funk 2014). Of which 2 species *viz*., *G. extensum* (Wall. ex DC.) Steetz and *G. pectiniforme* (DC.) H. Rob. are distributed in India.

Materials and Methods

During the floristic survey of Adilabad district, collection of an interesting specimen belonging to the family Asteraceae has been collected while going through the cross examination with the other species of *Gymnanthemum,* the specimen identified as *G. amygdalinum*. Scrutiny of literatures revealed that this species has been so far reported from Bihar, Madhya Pradesh, Odisha and West Bengal of North India, **Bhattacharjee *et al.* 2013**, from Warangal district of South India, **Swamy. *et al.* 2015** and **Apurba Kumar Das and C. Sivaperuman,2020.** The critical revise of this specimen and pertinent literatures **(Santapau, 1948, Pullaiah *et. al*., 1992;** Martínez's**, 1993; Pullaiah and Chennaiah, 1997; Almeida, 1998; Reddy *et. al*., 2001, Singh & Karthikeyan ,2001, Singh *et. al*., 2001; Raju *et. al*., 2007,**) exposed that the identity of the specimen as *G. amygdalinum.*

The authors concluded it as *Gymnanthemum amygdalinum* which has reports new distributional record for the Adilabad district of Telangana State.

A concise taxonomical description along with phenology, distribution, nomenclature and photographs are provided here. The processed specimen (Voucher No. 289) of the plant is deposited in the Department of Botany, Baliram Patil Arts, Commerce and Science College, Kinwat, Nanded District, Maharashtra, India.

Result and discussion

Taxonomic Description:

The genus *Gymnanthemum* comprises 49 species in the world, genus is commonly distributed in tropical Africa, America, and tropical Asia. In mainland India, the genus is represented by three species *G. extensum* (Wall. ex DC.) Steetz, G. pectiniforme (DC.) H. Rob.

Gymnanthemum amygdalinum(Delile) Sch. Bip. ex Walp., Repert. Bot. Syst. (Walpers) 2: 948. 1843. *Vernonia amygdalina* Delile, Cent. Pl. Afr. Voy. Meroe: 41. 1826; Bhattacharjee *et al.*, Zoo's Print 28(5): 18. 2013. *Keringa amygdalina* (Delile) Raf. Sylva Tellur. 144. 1838. **(Figure-1).**

Large shrubs or small trees to 3-5 m high; branches terete, densely glandular pubescent. Leaves alternate, elliptic, elliptic-lanceolate, ovate, obovate, higly variable, 5-20 x 2-6 cm, cuneately attenuate at base, acuminate, mucronulate rarely obtuse at apex, serrate or entire along margins, adaxial surface dark green when

dry, sparsely puberulent; abaxial surface pale green, glandular, densely puberulent and hairy along veins; lateral veins 5-15 pairs, slightly curved; petioles up to 4.5 cm long, densely puberulent. Inflorescence terminal corymbose panicles, 20 x 15 cm; peduncles densely puberulent and glandular. Heads homogamous, many, 13 x 11 mm; bracteoles 1 or 2, densely puberulent. Involucre campanulate, 6-7 x 6 mm; phyllaries imbricate, 5-seriate, yellowish green with purple tip, concave, 1.2-4 x 0.6-1.2 mm, outer most very short, the inner ones longest, elliptic-oblong, obtuse or rounded at apex, hairy along margins, puberulent above, glabrous- puberulent beneath. Receptacle 2 x 2 mm, flat, foveolate, brown. Florets 16-17 in each capitulum, up to 2 cm long. Corolla creamy-white, 7- 8.5 x 1-1.2 mm, tubular, 5-lobed; lobes 3 x 0.8 mm, rounded at apex. Stamens 5, 5 mm long; filaments glabrous, 2 mm long; anthers 3 x 0.2 mm, sagittate at base, rounded to subacute at apex. Gynoecium 10.5 mm long; ovary 1.5-1.8 x 0.2-0.4 mm, hairy; style 5 mm long, glabrous at base, hairy at apex; stigma subulate, unequal, 3-3.5 mm long, hairy. Achenes 3 mm long, oblong, slightly cuneate at base, 10-ribbed, glandular between the ribs, numerous spreading hairs on the ribs; pappus in 2-series of bristles, white, persistent, outer ones few, *c*. 2 mm long, inner ones *c*. 7 mm long.

Figure No.1*Gymnanthemum amygdalinum.* Habit.,Flowering twigs and Inflorescence.

Flowering & Fruiting: November-April.
Specimens Examined: Old housing board colony, Adilabad District, Telangana State, India.
G.P.S.Location: N "19039'54.91836", E 78031'54.45948"
Collected by: E. Srinivas Reddy and S. R. Shinde on dated 15 December 2020.(Voucher No. 289).
Ethnomedicinal Uses
Two spoons of leaf powder in one glass of milk orally taken for the treatment of diabetes.
The plant is traditionally used in the treatment of diabetes in Africa (Atangwho *et al*. 2012). The plant is also used by the traditional medical practitioners to cure malaria, helminth, laxative, digestion, wounds, appetizer and febrifuge (Ijeh & Ejike 2011).

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Investigation on study of wild relatives of grasses and their importance for grazing habitat of wild Herbivores in Tadoba Andhari Tiger Reserve Maharashtra State

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Abstract:

Wild Relatives of grasses are naturally distributed in the grasslands of TadobaAndhari Tiger Reserve, the wild relatives are the parental genera of cultivated crops, the diversity of wild relatives of grasses variable with the change in soil texture and soil ecology , soil physical properties. The important wild relatives of grasses reported fromTadobaAndhari Tiger Reserve are Setariapumilla , Setariaitalica , Sorghum halpens , Panicumscorbiculatum , Oryzaruphipogon , Elusineindica , Panicummilliaceum , Paspalumcanare , Panicumnotatum , PaspalumPaspalodes , Panicumsumatrense , Saccharumspontanium , Sorghum contraversum , Sorghum deccanense , Urochloapanicoides.wild relatives of grasses identification and conservation by seeds collection and enrichment useful to maintain composition of grasslands in Protected Areas. Wild relatives of grasses are nutritive and having good forage value with reference to grazing habitat of wild herbivores and play vital role in grasslands management.

Key Words: *Wild relatives of grasses ,TadobaAndhari Tiger Reserve , grasslands Management and conserve diversity of wild relatives.*

Introduction:

Grasses are one of the largest and most valuable groups of flowering plants, consisting of 610 genera and 10,000 species (Cope, 1982). Clayton and Renvoize (1986) put the total number of grasses in the world about 10,000 species, 651 genera were recognized and assigned numbers indicating their phylogenic status based upon various evidences. It ranks third in number of genera after the Compositeae and Orchidaceae and fifth in number of species after the Compositeae, Orchidaceae, Leguminoseae and Rubiaceae (Good, 1953). Grasses are widespread than any other family of flowering plants. The great adaptability of different species has enabled them to thrive under the most varied conditions. They form the climax vegetation of the semiarid prairies of the American continent, the steppes of Asia and the savannas of Africa. Grasses exceed all other in the importance of its products. It provides food in the form of cereals for man and forage for most animals. Many species of native and introduced grasses are utilized in improved pastures (Salter, 1952).

A grass is taxonomically defined as any species within the large family (Gramineae or Poaceae) of monocotyledonous plants having narrow leaves, hollow stems, and clusters of very small, usually wind-pollinated flowers. Grasses include many varieties of plants grown for food, fodder, and ground cover (Grass 2014). Grasses are often confused with sedges (Cyperaceae family) and reeds (Restionaceae family. However, sedges do not have a leaf sheath and their leaves are attached directly to the culm—a diagram of grass anatomy is provided in Appendix C. The culms of sedges are also angular, while grass culms are circular. The grass family is the fifth largest plant family on earth with over 700 genera and 9700 species. About ten percent of the grass species worldwide can be found in southern and tropical Africa; the major genera of which are Eragrostis, Pentaschistis, Panicum, Sporobolus, Aristida, Digitaria, Stipagrotis, Setaria, Brachiaria, and Hyparrhenia (Van Oudtshoorn 2009).

Almost all animal species and food chains depend on grass because grass occurs across the world and is almost always edible. The groups of animals that depend most directly on grass for food are birds, insects, rodents, and grazers. There are many bird species, such as Quelea finches, the most common bird on earth with a population of over 1.5 billion in Africa alone, that solely eat grass seeds. Grass provides the only food source for seed-eating birds, and the birds play an integral role in seed dispersal. Insects use grass for both food and shelter. Disruption of these grassland ecosystems can cause a dangerous under or overabundance of insect species. Rodents consume grass seeds or the base of the plant where the most nutrients are stored. Grazers have the largest impact on grasslands and typically graze in large herds which makes spatially expansive impact.. Grazers remove old plant material, stimulate new growth, and provide nutrients in the form of manure. Although predators and decomposers are also ultimately dependent on grass species, it is primary consumers- specifically herbivores- that have the biggest causal relationship with grass species. Herbivores and grass species composition are highly interdependent.

Evaluating a Grassland There are four main measures to evaluate a grassland: grazing value, ecological indicator status, succession stage, and perenniality. Several factors that can help conservation managers determine whether their area is providing valuable grazing material. By identifying grass species in the area, grazing value can be determined. Grazing value is defined as the quality and quantity of material from an individual available for grazing (Van Oudtshoorn 2009).

Grasses inhabit the earth in greater abundance than any other comparable group of plants. Some are adapted to warm, humid and tropical climate while others are established in the polar regions, where the growing season is two months or less and direct sunlight is absent for many months of the year. Some are important elements of marsh and swamp vegetation, and other inhabit desert regions where the annual precipitation is 5 inches or less. Even before the time of recorded history, the grains of grasses provided a staple food supply or the human race (Gould, 1968). The members of this group are present in all the conceivable habitats, suitable for growth of plant communities (Mitra and Mukherjee, 2005). Grasses are used as forage for domesticated, wild animals and soil conservation (Gould, 1968).

TadobaAndhari Tiger Reserve Forest Diversity :

"Tadoba" is taken from the name of the god "Tadoba" or "Taru", worshipped by the tribes who live in the dense forests of the Tadoba and Andhari region, while "Andhari" refers to the Andhari river that meanders through the forest.

Tadoba Andhari Reserve is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometres (241.5 sq mi). This includes Tadoba National Park, with an area of 116.55 square kilometres (45.00 sq mi) and Andhari Wildlife Sanctuary with an area of 508.85 square kilometres (196.47 sq mi). The reserve also includes 32.51 square kilometres (12.55 sq mi) of protected forest and 14.93 square kilometres (5.76 sq mi) of uncategorised land.Tadoba National Park and Andhari wildlife sanctuary together form the Tadoba-Andhari Tiger Reserve. The total area of the Tadoba-Andhari tiger reserve is about 1,727 km^2.

Tadoba National Park was established in the year of 1955. Total area of the park is 116.55 Km^2.The Andhari Wildlife Sanctuary was formed in the year 1986. Total area of the Andhari Wildlife Sanctuary is 508.85 Km^2.

Total core area of the tiger reserve is 625.40 Km^2. Total buffer area of the tiger reserve is 1101.60 Km^2. The reserve also includes 32.51 Km2 of protected forest and 14.93 Km2 of other areas.
The monsoon season begins in June; the area receives heavy rainfall during this season (approx.1275 mm) and humidity around 66-70%.

TadobaAndhari TigerReserve is a predominantly southern tropical dry deciduous forest with dense woodlands comprising about eighty seven per cent of the protected area. Teak is the predominant tree species. Other deciduous trees found in this area include ain (crocodilebark), bija, dhauda, salai, semal and tendu. Beheda, hirda, karayagum, mahuamadhuca (cr epe myrtle), palas (flame-of-the-forest, Buteamonosperma) and Lanneacoromandelica (wodier tree). Axlewood (Anogeissuslatifolia, a fire-resistant species), black plum and arjun are some of the other tropical trees that grow in this reserve.

Aside from the keystone species, the Bengal tiger, Tadoba Tiger Reserve is home to ther mammals,including: Indianleopards,sloth bears, gaur, nilgai, dhole, striped hyena, small Indian civet, jungle cats , sambar,barking deer, chital, chausingha and honey badger . Tadoba lake sustains the marsh crocodile,which was once common. Indian star tortoise, Indian cobra and Russel's viper also live in Tadoba.The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

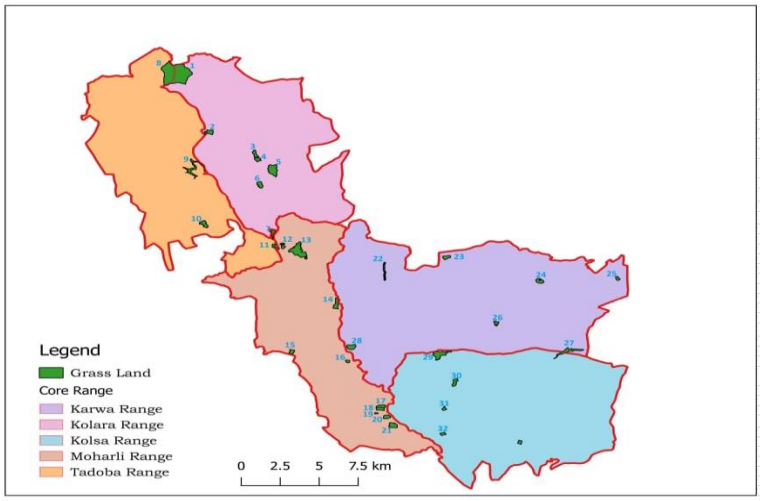
Poaceae is the one of the largest family among the monocotyledons in the world .The grass vegetation broadly divided into two types depending upon their life-span, Ephemeral vegetation consisting mainly of the grasses that complete the life cycle during rainy season or after rainy season. Grasses autumn or long lived vegetation with species that grow with the rains but complete their life-cycle after rains. The species like *Arthraxonlancifolius ,Arundenellapumila, Sporoboluscoromondelianus , Digitariaternata*, are the chief components of farmers category. On the conterary the species like *Heteropogoncontortus ,Andorpogonpumulus , Chrysopogonfulvus , Dicanthiumcaricosum , Setariaforbesiana , Pennisitumhohenackeri* which form the autumn vegetation are either perennial vegetation forming large tufts.

Tadoba-Andhari National Park/Coordinates 20.2484° N, 79.3607° E

Sr. No.	Name of grassland	Area in Hectares
	Kolara Range grasslands	
1	**Navegaon part 1 (Rehabilated Site)**	235 Hectare
2	Kosekanar	10 Hectare
3	Pandharpauni	30 Hectare

4	Jamni**(Rehabilated Site)**	47 Hectare
5	Samadhi	08 Hectare
6	Rampur	12 Hactre
7	Saradh	10 Hectare
	Tadoba Range Grasslands	
1	Navegaon part 2	40 Hectare
2	Tadoba beat Comp. No. 90	33 Hectare
3	Khatoda	10 Hectare
	Mohrli Range Grasslands	
1	Palasgaon (**Rehabilated Site**)	95 Hectare
2	Girghat	58 Hectare
3	Astkoni Com. No. 146	20 Hectare
	Karwa Range	
1	Sukdobodi	10 Hectare
	Kolsa Range Grasslands	
1	Botezari	41 Hectare
2	Kohapari	11 Hectare
	Doni	65 Hectare
	Kolsa (**Rehabilitated village**)	150 Hectare

Map Showing Campa Work Year 2020- 21 in TATR Core area



Rf. No.	Grass Land Name	Area	Actual work done
1	Navegaon Grass Land	235 Ha.	235 Ha.
2	Pandharpaoni G. Land	30 Ha.	30 Ha.
3	Saradh Grass Land	10 Ha.	10 Ha.
4	Samadhi Grass Land	8 Ha.	8 Ha.
5	Jamni Grass Land	47 Ha.	47 Ha.
6	Rampur Grass Land	12 Ha.	12 Ha.
7	Koselanar Grass Land	10 Ha.	10 Ha.
	Kolara Range- Total	**352 Ha.**	**352 Ha.**
8	Navegaon Grass Land Part- 2	40 Ha.	34 Ha.
9	Tadoba beat C.No. 90	33 Ha.	33 Ha.
10	Ghosari Beat C.No. 114	17 Ha.	17 Ha.
11	Khatoda Grass Land	10 Ha.	10 Ha.
	Tadoba Range- Total	**100 Ha.**	**94 Ha.**
12	Palsgaon C.No. 128	10 Ha.	10 Ha.
13	Palsgaon Grass Land	85 Ha.	85 Ha.
14	Ashtkoni C.No. 146	20 Ha.	20 Ha.
15	Andhari C.No. 150	10 Ha.	10 Ha.
16	Andhari C.No. 151	7 Ha.	7 Ha.
17	Girghat C.No. 157	13 Ha.	13 Ha.
18	Girghat C.No. 157	11 Ha.	11 Ha.
19	Girghat C.No.158	2 Ha.	2 Ha.
20	Girghat C.No.158	12 Ha.	12 Ha.
21	Girghat C.No.158	20 Ha.	20 Ha.
	Moharli Range- Total	**190 Ha.**	**190 Ha.**
22	Karwa-II C.No. 251	10 Ha.	
23	Anandgaon C.No. 254	10 Ha.	
24	Piparheti-II C.No. 260	15 Ha.	
25	Pandharwani C.No. 267	5 Ha.	32 Ha.
26	Rantalodhi-I C.No.284	7 Ha.	
27	Sukadi Bodi G. Land	10 Ha.	
28	Zinganat-I C.No. 299	20 Ha.	
	Karwa Range- Total	**146 Ha.**	**32 Ha.**
29	Botezari Grass Land	41 Ha.	
30	Kohapari C.No.311	11 Ha.	
31	Fulzari Lake G. Land	5 Ha.	32.50 Ha.
32	Panghat Hut Road	6 Ha.	
33	Belan Square C.No.342	6 Ha.	
	Kolsa Range- Total	**69 Ha.**	**32.50 Ha.**
	Grand - Total	**857 Ha.**	**700.5 Ha.**

Objectives :

- Identification and Enumeration of Wild Relatives grasses plants.
- To identify the wild grasses plants from open grasslands with the help of morphological study by using regional floras.
- Exploration of plants from forest areas.
- To determine diversity of wild grass plants and its ecological significance in forest ecosystem.
- Floral association in grassland ecosystem and its role in forest Ecology.
- Phenological study of the wild grasses plants.
- Conservation and propagation of plants.
- In-situ conservation of plants , seed collection and enrichment in grasslands
- Ecological and morphological study of plants

Methodology

- To select the sites /area for the study of wild grasses plants present in forest and grasslands ecosystem of Madhya Pradesh State.
- To arrange the regular field visits in three different seasons of the year, Rainy season , Winter season and Summer season.
- To observe the open grassland with special reference to phytosociology .
- G.P. S. study of grasses plants of Madhya Pradesh.
- Grasses distribution and their ecological and environmental study.

- Ecological significance of grasses in forest ecosystem.
- To prepare the photographic album of wild grasses plants.

Recognising the morphology of plant species

By using regional, local and national floras, the data from the herbarium specimens, the accounts on morphological details, diagnostic characters and range of variation studied. The grasses plants are observed at different stages vegetative and reproductive stages of the plants. The roots are observed from morphological point of view , to study the role of grasses in forest ecology and to modify the texture of soil. Observation of morphological characters under dissecting microscopes and magnifying lens. Study of root, stem , leaf and flowers morphology of the plants in specific season. Identification of grasses plants by using regional floras or national floras. To take the GPS coordinates of the plants at the different sites.

Their identity requires a skill in systematic botany. This is perhaps the reason why wild relatives are meagrely represented in the germplasm collections. The wild relatives of crop plants by and large, occur as component of disturbed habitats within the major vegetation types. The information on their occurrence is available from different herbaria floristic accounts, floras, etc

Use of herbaria

Herbaria with large collections of plant genetic resources including wild relatives of grasses assist the explorers in having an idea about the species diversity of a region. Herbarium field notes and associated data such as root , stem , leaf , flowers , fruits morphology and ecological characters with GPS coordinates seed maturity of wild relatives from the locality of collection help in planning the duration of exploration. Since the herbarium specimens are generally collected during flowering, this information can be considered to be optimal for seed collection.

Collection and Conservation of plants

Observations and collection of plants before approaching for the field collection directly. On spot identification of target species and seed collection, drying storage and broadcasting in different grasslands for the insitu conservation purposes in forest ecosystem or new species to the collection ofvaluablegermplasm of wild species for gene bank conservation.

Collection of Wild Relatives

The collection missions are primarily aimed at tapping germplasm variability in Plant Genetic resources of different agri-horticultural Wild relatives of Grasses in the entire genepool. The germplasm is collected on the basis of priority for collection from targeted regions, and of species. The information on ecological distribution with precise location of species helps in collection of targeted gene pool

Study area : Core area grasslands of TadobaAndhari Tiger Reserve .

1. Palasgaon grassland 2. Navegaon grassland 3. Jamnigrassland 4. Pandharpauni grassland 5. Botezari grassland.

Observations:

Finger Millet (EleusineCoracana (L.) Gaertn.)

Finger millet is commonly known as Ragi . It is a staple food for many people. There are two sub species - E. africana and E. coracana. Eleusine having only one wild relative in Madhya Pradesh Eleusineindica (L.)Gaertn. E. indica is the only wild species widely occurring which is morphologically and cytologically similar to E. coracana (Krishnaswamy,1951). E. indica is of Indian origin and may be the immediate ancestor of finger millet (Mehra, 1963)

Prosomillet (Panicummilaceum L.)andLittleMillet (PanicumSumatrense Roth. ex RoemetSchult.)

Prosomillet is commonly called kodo. It is supposed to be one of the oldest grain crops and is grown extensively in India. It is a quick growing drought resistance crop. It has two sub-species psilopodium and sumatrense.It is classified as race- nana and robusta, sub races-laxa,erecta and compacta. In Madhya Pradesh, Panicum maximum Jacq., P. milare L., P. notatum Retz., P. psilopodiumTrin (related to P. milare), P. repens L., are present. Out of these species, P.psilopodium which is similar to the wild forms of P.sumatrense from which the later species might have originated (Anonymous, 1966).

Kodo Millet (Paspalumscrobiculatum L.)Kodo millet is locally called kodokutki. It has three races viz.,regularis, irregularis and variables. In Madhya Pradesh wild related species, Paspalumcanarae (Steud.) Veldk.,P. paspaloides (Michx.) are present

Foxtail Millet (Setariaitalica (L.) P. beauv)

Foxtail millet is considered to be sweet, is used as a sedative to the gravid uterus.The grain is said to possess heating properties and when taken alone sometimes causes diarrhoea. The grain is astringent, diuretic and laxative and is useful externally in rheumatism. It is a popular remedy for alleviating the pains of

parturition (Kirtikar and Basu, 1935). Foxtail millet is locally called as wild baara. It is also known as Italian millet. Cultivation of foxtail millet dated back to the third millennium BC. S. italica is not known in the wild state except as a weed which escapes from cultivation. S. italica is divided into sub species viridis and italica. S. italica is further classified into three races moharia, maxima and indica, viridis is the ancestral form of S. italica on the basis of chromosome number.

Sugarcane (Saccharumofficinarum L.)

Sugarcane is derived from the sanskrit word shakkara.This crop from the east provides a linguistic evidence of Indian origin of sugarcane. In Madhya Pradesh, many sweet based products are prepared from sugarcane. There is only one wild relative Saccharumspontaneum L. is present in TATR.

Echinochloacolona(L) Link , hort. Berol.2: 209. 1833: Blatt. &McC. Bombay Grass.148.1935; Bor, Grass.Ind.308.1960. *Panicumcolonum* L. Syst. Nat. ed. 10.2:870.1759; Hook.f.Fl.Brit.India 7:32. 1896; Cooke, Fl. Pres. Bombay 3: 447.1958 (Repr. ed.).wildnachanigrass.

Herbs, annual, decumbent- ascending; culms 40-90 cm long, rooting at base. Leaves 3-30 x 0.4-2.0 cm, linear – lanceolate, scabrid,apex acute to acuminate. Racemes spiciform, distant, 5-10, 1.5-2.0 cm long.Spikelets c 0.3 cm long ovoid; lower glume ½ as long as lower lemma, broadly ovate; upper glume cuspidate, hairy; lower lemma ovate, hairy;upper lemma polished. (Plate VI, Fig. 35)

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Common weed, best soil binder grass in forest.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

EleusineGaertn. Fruct. Sem.Pl.1:7.1788

Eleusineindica(L) Gaertn. Fruct.1:8. 1789: Hook.f. Fl. Brit. India 7: 293. 1896; Cooke, Fl. Pres. Bombay 3:560.1958 (Repr.ed.); Blatt.&McC. Bombay Grass. 259. 1935; Bor,Grass. Ind. 493. 1960. *Cynosurusindicus* L. Sp.Pl.72.1753. '*Nachni'*.(WILD NACHANI)

Herbs, annual, erect, tufted c 25 cm high; culms slightly compressed. Leaved 8-12 x 0.2-0.3 cm, linear, flat.Spikes 2-7 or more, 4.0.5-5 cm long.Spikelets c 0.3 cm long, ovoid or oblong, green. Grains oblong or globose.

- Palatable grass
- Flowering Season : September – November.
- Fruiting Season : December
- Ecological data : Sporadic annual grass grows in cultivated soil.

Soil pH range required – 7.2 – 7.6

- Rainfall range : 950 mm – 1078 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.
- Humidity required : 51 % - 67%.

Field Note – Grass of dry soil ,non palatable grass found in smaller grasslands.

ORYZA L.Sp. Pl.1:333.1753

OryzarufipogonGriff.Notul.3: 5.1851; Bor, Grass.Bur. Cey.Ind. Pak. 605.1960; Laxmi.in Sharma *et al.* (eds.), Fl. Maharashtra, Monocot. 545. 1996; 151 Moulik, Grass. Bam. India 1: 47. 1997; Naik, Fl. Marathawada 2: 1065. 1998.

Annual, culms 30-70 cm tall, tufted, terete, erect or decumbent, spongy, rooting at lower nodes, nodes glabrous.Leaf sheath 6-09 cm long, tereteorcompressed, keeled, glabrous, smooth. Ligule 15-31 mm long, membranous, Leaf blade 15-30 x 0.6-1.6 mm, flat, linear to ovate, keeled,scabrid on nervesand margins, apex acuminate. Panicles 10-22 cm long.

- Palatable
- Flowering Season : October.
- Fruiting Season : November
- Uses : Seeds edible grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1180 mm.
- Temperature range : 26 ^{o}c – 39 ^{o}c.

- Humidity required : 68 % - 71%.

PanicumantidotaleRetz. Obs. Bot. 4:17. 1786.Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453.1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Annual erect , diffusely branched, 1-2 mtr tall , creeping , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 15-22 cm long , Spikelets ovoid.

- Palatable
- Flowering Season : Septeber – November.
- Fruiting Season : December
- Uses : Seeds edible, Best soil binder grass.
- Ecological data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ºc – 39 ºc.
- Humidity required : 68 % - 71%.

Panicum maximumJacq. Ic. Pl.Rar.1:2, t. 13. 1781-86 7 Coll. Bot. 1:76.1786. Hook.Fl.Brit. India 7: 52. 1896; Cooke , Fl. Pres. Bombay 3:453. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.163.1935. Bor,Grass.Ind.322.1960.

Perennial denslytufted , erect , branched, 1-2 mtr tall , grass. Leaves 10-40 cm long , linear – lanceolate . Panicle 30-55 cm long , Spikelets oblong.

- Palatable cultivated grass.
- Flowering Season : November.
- Fruiting Season : December
- Uses : Fodder grass,
- Ecological Data : Common in marshy places.

Soil pH range required – 7.1 – 7.5

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 26 ºc – 39 ºc.
- Humidity required : 68 % - 71%.

Saccharumspontaneum L. Mant. Alt. 2: 183. 1771. Hook. f. Fl.Brit. India 7: 118. 1896; Cooke , Fl. Pres. Bombay 3:465. 1958 (Repr.ed); Blatt.&McC.Bombay Grass.45.1935. Bor,Grass.Ind.214.1960. **Kans grass Wild relative of Sugarcane**

Perennial rhizomatous tall tufted , 1-2.5 m tall, erect grass. Leaves narrow linear , sheath smooth , ligule ovate.Panicle large , silvery , Spikes with silver hairs, spikelets sessile.

- Palatable grass.
- Flowering Season : October.
- Fruiting Season : December
- Uses : Soil binder grass
- Ecological Data : Distributed in moist, marshy soil along the bank of river.

Soil pH range required – 7.5 – 7.8

- Rainfall range : 950 mm – 1000 mm.
- Temperature range : 28ºc – 39 ºc.
- Humidity required : 68 % - 71%.

Field Note – Grass indicator of wet soil with more water holding capacity.

Setariapumila(Poir.) R. & S. Syst. Veg. 2:481.1817; T. A. Cope in Nasir Ali, Fl. Pak.143:181. 1982. Panicumpumilum Poir.in Lam. Encycl. 4:273.1816. Setaria pallid-fusca (Schumach.)Stapf& C.E. Hubb.in Kew Bull.1930: 259.1930; Bor,Grass.Ind.363.1960.S. glauca non (L.)P.Beauv.1812;Hook.f.Fl.Brit.India 7: 78.1960; Cooke,Fl.Pres.Bombay 3: 435.1958 (Repr.ed.); Blatt.&McC.Bombay Grass.172.1935;bor,op.cit.360. 'Kolu'.

Herbs,20-60 cm high,tufted;culmsmany,spreading,ascending.Leaves 3-10 X 0.2-0.5 cm , linear. Spikes 1.5-5.0 X 0.3-0.7 cm. Spikelets 0.2-0.3 cm long, ovoid or ellipsoid, subacute;upper lemma rugose. Grains plano-convex.)

- Palatable grass
- Flowering Season : August – October
- Fruiting Season : December
- Uses : Fodder grass

- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Field Note – Annual , palatable grass , grains are edible , grass of smaller grassland , distributed in acidic soil.

Setariaverticillata (L.) P. Beauv. Ess. Agrost.51,178.1812; Hook. f. Fl. Brit.India 7:80.1996; Cooke, Fl.Pres. Bombay 3:436 .1958 (Repr.ed.); Blatt.&McC. Bombay Grass .174.1935; Bor, Grass. Ind. 365.1960. PanicumverticillatumL.Sp.Pl.ed. 2:82.1762. (Chiktnagawat)

Annual herbs, 1m high, erect, rooting at lower nodes.Leaves 8-20 X 1.2-4.0 cm, linear or linear-lanciolate .panicals 2.5-9.5 cm long. Spikelets c 0.2 cm long, ovoid, sub acute ; upper lemma finely rugose. Grains 0.2-0.23 cm long, ellipsoid.

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

Setariaitalica(L.) P. Beauv. Ess. Agrost.51,170,178.1812; Hook .f.Fl.Brit.India 7:78.1896; Cooke,Fl.Pres.Bombay 3:437.1958 (Repr.ed.); Blatt.&McC. Bombay Grass.175.1935;Bor,Grass.Ind.362.1960.Panicum italicum L.Sp.Pl.56.1753.

Erect annuals,60-100cm tall. Leaves 15-30 X 0.4-2.5 cm, Linear-lanceolate, minutely scaberulous on both sides and along margin.Panicles 8-12 cm long, compact.Spikelets 0.25 cm long, ellipsoid; lower glumes c 0.05 cm long, ovate,1- nerved, upper glumes c 0.15 cm long, ovate, glabrous,rounded**.**

- Palatable grass.
- Flowering Season : August – October
- Fruiting Season : December
- Ecological data : Soil pH range required – 7.5 – 7.8
- Rainfall range : 950 mm – 1270 mm.
- Temperature range : 26 °c – 39 °c.
- Humidity required : 68 % - 71%.

SORGHUM Moench. Methodus207.1794

Sorghum halepense (L.)*Pers.Syn.Pl.1:101.1805;Blatt.&McC.Bombay Grass.5.1953;Bor,Grass.Ind.222.1960; T.A.Cope in Nasir& Ali, Fl. Pak.143: 295.1982. Holcushalepensis L.Sp.Pl.1047.1753. Andropogonhalepensis(L.) Brot.Fl.Lusit.1:89.1804; Hook.f.Fl.Brit. India 7: 182. 1896; Cooke,Fl.Pres. Bombay 3: 502.1958 (repr.ed.).Sorghum miliaceum (Roxb.)Snowden in J. Linn.Soc. 55:207.1955; Bor, op.cit.223. S. miliaceumvar.parvispiculum Snowden,op.cit.209; Bor,op.cit. 'Boru'.(Ran Jawari)*

- Perennial, 3 m high,erect; culms simple or branched, solid.Leaves 10-45 x 1.5 cm, linear-lanceolate; sheaths striate; ligules short,membranous, ciliate.panicles 15-35 cm long,decompounds. Sessile spikelets 0.4-0.5 cm long,ovoid-lanceolate; pedicelledspikelets as long as sessile but narrower.Grainsterete,dark brown.
- *Flowering Season : August – October*
- *Fruiting Season : December*
- *Ecological Data : Soil pH range required – 7.5 – 7.8*
- *Rainfall range : 950 mm – 1270 mm.*
- *Temperature range : 26 °c – 39 °c.*
- *Humidity required : 68 % - 71%.*

Conservation of wild relatives of crops is the most important task to match the challenges of erosion of species. The existence of these wild relatives are shrinking fast due to various bio-edaphic factors and disturbed habitats. In the present rate of threat of genetic erosion, we must collect all requisite information of the wild relatives to make use of their wider adaptability/tolerance/resistance to diseases and insect-pests, yield, quality attributes and other biotic and abiotic characters. In comparison to the cultivated land races, conservation and utilization.

Wild Relatives of Grasses of TadobaAndhari Tiger Reserve

Sr. No.	Botanical Name	Common Name	Vernacular Name	Flowering Season	Fruiting Season
1	Brachiariareptans	Sawa/ sama	Ran Sama	August	Sept. –Oct.
2	Brachiariadistachya	Sama grass	Ran Sama	August	October
3	Setariaintermedia	Chikta	Ran Bajara	August	October
4	Setariaverticellata	Chikta	Ran Bajara	August	October
5	Sorghum halpens	Wild Jawar	Ban Jawar	September	November
6	Echinochloacolona	Wild sama	Ban sama	August	October
7	Elusineindica	Wild Nachani	Ban Nachani	September	November
8	Panicumsumatrense	Wild kutki	Ban Kutki	August	November
9	Panicumnotatum	Wild Kutki	Ban Kutki	September	November
10	Oryzaruphipogon	Wild Rice	Ban Dhan/ Chawal	August	November
11	PaspalumPaspalodes	Wild Kutki	Ban Kutki	kutki	October
12	Paspalumcanare	Wild kodo	Ban Kodo	August	October
13	Saccharumspontanium	Wild Sugarcane	Ganna origin	September	November
14	Setariapumilla	Wild Bajara	Ban Bajara	August	September
15	Urochloapanicoides	Wild Kutki	Ban Kutki	August	October

Diversity in Wild Relatives

- Finger Millet (*Eleusinecoracana*) – *Eleusineafricana*
- Barley (*Hordeumvulgare*) – *Hordeumarizonicum*
- Rice (*Oryzasativa*) – *Oryzarufipogon*
- Pearl Millet (*Pennisetumglaucum*) – *Pennisetumpurpureum*
- Sorghum (*Sorghum bicolor*) – *Sorghum halepense*
- Broom millet (*Panicummiliaceum*) – *Panicumfauriei*

Results and discussion :

Findings of research work in grasslands of TATR :

In the current exploration of wild relatives of grasses from the different grasslands of TadobaAndhari Tiger Reserve the genetic and species diversity is in the following manner.

Sr. No.	Name of grass genera	Number of spesies
1	*Brachiariareptans* *Brachiariadistachya*	Two species
2	*Setariaintermedia* *Setariaverticellata* *Setariapumilla*	Three species
3	*Panicumsumatrense* *Panicumnotatum*	Two species
4	*PaspalumPaspalodes* *Paspalumcanare*	Two species
5	*Urochloa*	One species
6	*Echinochloa*	One species
7	*Elusine*	One species
8	*Oryza*	One species
9	*Sorghum*	One species

In the present research study it is observed that the species diversity of wild grass genera depends upon the soil texture,moisture , humidity , water holding capacity. The composition and association of grasses also determines the wild relatives of grasses diversity. Generally it is found that the wild relatives of grasses are associated with soft palatable grasses with high percentage of fibre , ash , protein and moisture. The associates of wild relatives of grasses are :*Dicanthiumannulatum* , *Digitariastricta* , *Digitariaabludens* , *Iselimalaxum* , *Cynodondactylon* , *Ischemumindicum* .

The herbivores depend on soft palatable grasses as a primary consumers, Spotted deers , Barking deers , Chousinga , Black bucks mostly feed on soft palatable grasses which play an important role in grazing habitat of soft feeding herbivores.Grazing habitat of soft feeding herbivores associated with composition of grasslands, the grasslands are of three types ; smaller , intermediate and taller grasslands. Wild relatives of grasses shows distribution in smaller and moist grasslands.

Threats to wild relatives of grasslands are : loss of natural habitats due to soil degradation , fragmentation of grasslands , loss of soil moisture due to climate change , changes in composition of grassland , invasion of woody species in grasslands , soil microbial composition and associates which grasses i,e soil mychorhiza and microorganisms which promotes the growth of grasses.

Conservative measures for wild relatives of grasses :

Loss of habitat: Many of the accessions currently held ex situ are from regions that have undergone significant land-use change over the past 50 years. The urban expansion in South and Central America has seen forests, grasslands and savannahs replaced by urban space. The expansion of agriculture, especially in Brazil, has resulted in vast areas of natural forests and grasslands being substituted by intensive production of crops such as soybean and improved monospecific pastures. There are ~ 60 million ha of Brachiariabrizantha cv. Marandu in Brazil, which is a dangerously narrow genetic base highlighting the importance of germplasm diversity. Similarly development and population growth in many parts of Africa have resulted in expansion of cropping and overgrazing of rangelands with associated loss of biodiversity. The changes in the economies and populations across the tropics have made the TSTF germplasm already held ex situ extremely valuable (sometimes irreplaceable) and in need of a particular focus on conservation.

Conservation of wild relatives of grass genetic resources

Secure conservation is at the heart of the Centres' stewardship of their collections and depends on the application of technical practices of high standard, based on an accurate assessment and appropriate management of risks.

The adequacy of the conservation technologies in use is key to meeting the objectives of long-term conservation of genetic diversity:

- As more land is coming under intensive cultivation, much of the natural diversity of species will be lost.
- Demand for use of forage genetic resources for increasing livestock production, as well as to maintain a more sustainable agricultural system, is expected to increase.
- The further study of the conserved germplasm will allow the easier identification of genotypes with potential for livestock feed for specific environments, as well as adequate germplasm to be re-established in degraded areas and also adapted to future climate changes.
- The adequate long-term conservation of germplasm will allow the preservation of essential forage biodiversity for current and future generations as global public goods.

Acknowlwdgement :

Authors are very much thankful to Honourable Field Director and Deputy Director of TadobaAndhari Tiger Reserve to give me permission to carry out research work on wild relatives of grasses of TATR in the core area.

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Diversity Of Diatoms Inwater Reservoirs of Washim District of Maharashtra in India

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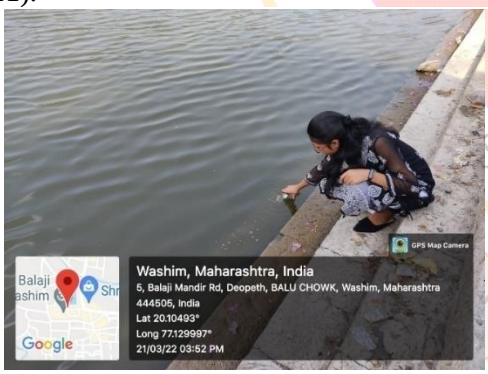
Abstract
Present paper deals with the study of members of Bacillariophyceae collected from different water reservoirsofWashim district, Maharashtra state, India viz. DevTalaw, Narayan Baba Talaw, Ekburji DamandPadmtirthTalaw. This study has shown Identification and presence of eightdifferent diatoms up to genus level. These diatoms are being reported for the first time from the study areas.
Keywords: Biodiversity, algae, diatoms, etc.

Introduction:
Diatoms (Division Bacilliarophyta), one of the largest groups of photosynthetic eukaryotic micro-organism. They occur in almost all wet/damp places with a diverse range of habitats across continents. Diatoms grow as single cells, or form simple filaments or colonies. They form the base of aquatic food webs in marine and freshwater habitats. Diatom communities respond directly to physical and chemical changes in the environment. Diatoms are a very important group of algae as they are the most common producers of organic matter in water bodies. Diatoms are used to track the effect of climate (1). They also often dominate the algal communities in many freshwater systems. During the 19th century, diatoms were studied for the first time in India by Ehrenberg [2]. Subsequent notable works were made by Skvortzow [3], Biswas [4], Krishnamurthy [5],Venkataraman [6], and Sarode and Kamat [7]. The work on Indian fresh water diatoms is still in an early stage.
The main purpose of this study was to examine the diatomdiversity

Materials And Methods:
The study area covered small four different sites viz. *DevTalaw, Narayan Baba Talaw, Ekburji Dam and PadmtirthTalaw* in Washim district in Maharashtra, India. Study area is situated at 20.099928◦N latitude and 77.13338◦E longitude, 20.099899◦N latitude and 77.133352◦E longitude, 20.048256◦N latitude and 77.1014◦E longitude and 20.107783◦N latitude and 77.126652◦E longitude, respectively. Diatom materials were collected in the month of March, 2022 and preserved in 70% ethanol.
Identification of Diatoms upto genus level were made with the help of monograph and relevant literature(8, 9, 10, 11).



DevTalaw

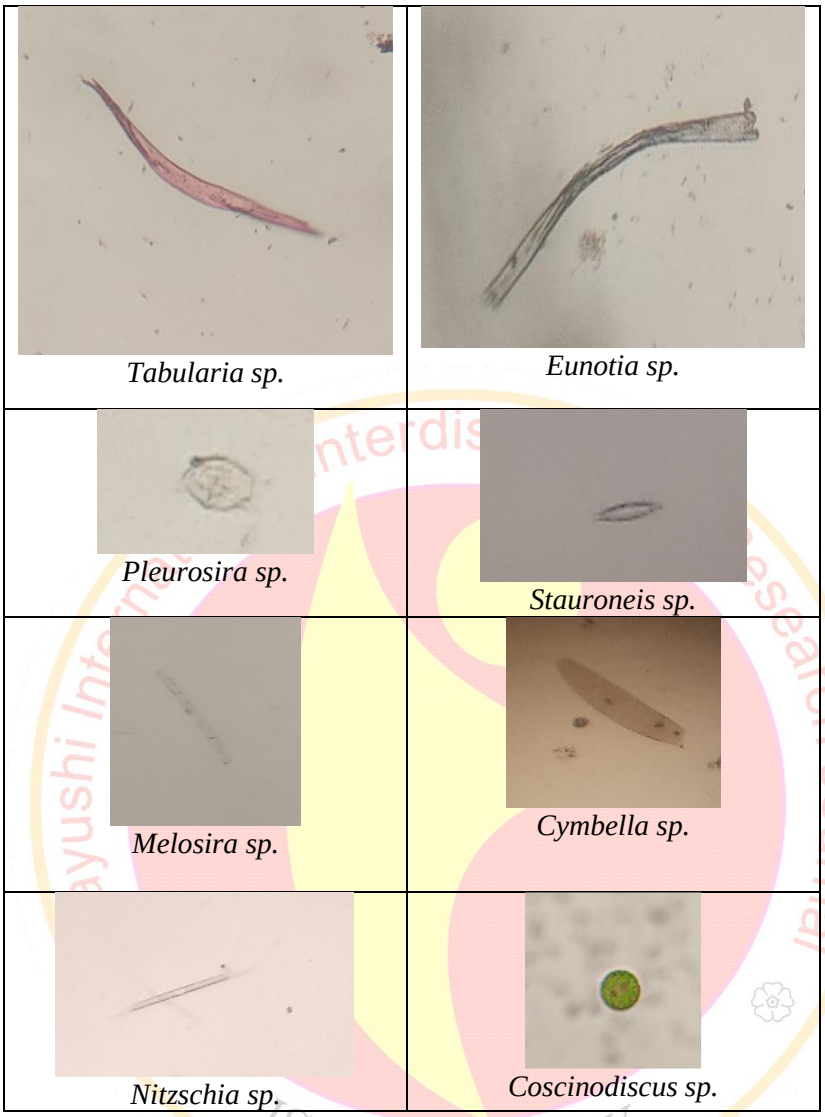
Narayan Baba Talaw

Ekburji

PadmtirthTalaw

Results:

The present investigation is the outcome of Biodiversity of diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. The available diatoms areenlisted in following table.



Tabularia sp. *Eunotia sp.*

Pleurosira sp. *Stauroneis sp.*

Melosira sp. *Cymbella sp.*

Nitzschia sp. *Coscinodiscus sp.*

Disscussion:

The present investigation is the outcome of Biodiversity diatoms. Such taxonomical study of diatoms is basically useful to taxonomists and researchers of algae for future research work. Present study also useful for science and society to know what type of diatoms are available from this area. As diatoms are concerned with pollution it certainly helpful to environmental scientists.

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Economic Interest Of Lac Culture In India – An Overview

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Abstract:
Lac culture is the systematic rearing of lac insects on their host plants for sustainable production of commercial lac. The lac harvested from host plants is then processed by using various techniques to produce different kinds of lac resins, lac dye and lac wax. There are versatile applications in many fields of lac resins and lac byproducts generated while processing raw lac. India is among the topmost country in the world for lac production. Comparatively less investment is required for lac culture, and it provides economic benefit to farmers and livelihood to tribal people. lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, current research for applications of lac.
Keywords: lac culture, host plants, raw lac, lac resin, lac dye, lac wax, etc.

Introduction:

Lac insects are reared systematically on their host plants to produce resin is called lac culture. Lac insects are found throughout the tropical and subtropical regions of the world. However, they are found abundantly in the tropical forest of India, Thailand, China and Vietnam. In European countries, these insects are not found due to the very cool climate during winter[9]. India is among the topmost countries in lac production and contributes about 80%. The production of raw lac in India is near about 20,000 metric tons and earns a huge amount through export about Rs. 120-130 crores of foreign currency per year[7].According to 2018-19 statistics, Jharkhand is the topmost state in lac production followed by Chhattisgarh, Madhya Pradesh, West Bengal, Maharashtra, Odisha and Assam[13]. Lac culture requires comparatively less investment and provides good economic return if it is carried out systematically and scientifically. It is the source of livelihood for tribal people and farmers, it is a side income source with good economic returns.

Lac insects belong to the family Tachardiidae (Kerriidae) and are from the order Hemiptera[8]. Lac insects are parasitic they feed by sucking juices of various plants called host plants. A particular type of lac insect species feeds on the particular host plant. Some species of lac insects in India are listed in the table with the region of occurrence and their host plants. In India, there are 16 species under the genus Kerria and 6 under the genus Paratachardina are recorded[5,7].*Kerria lacca* (Kerr) is the most widely occurring species in India, which produces the bulk of commercial lac. [8]

Sr. No.	Species in India	States	Host trees
1.	*Kerria chmaberlini*	Gujarat West Bengal	*Flemingia religiosa* (Pipal) *Butea monosperma* (Palas)
2.	*Kerria fici*	Panjab	*Adansonia digitata* (Imli)
3.	*Kerria indicola*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
4.	*Kerria brancheata*	Jammu & Kashmir Jharkhand	*Ziziphus mauritiana* (Ber) *Schleichera oleosa* (Kusum)
5.	*Kerria lacca*	Rajasthan Gujarat Maharashtra Jharkhand West Bengal	*Flemingia religiosa* (Pipal) *Ziziphus mauritiana* (Ber) *Acacia arabica* (Babool) *Peltoforum ferrugineum* (Peela Gulmohar) *Butea monosperma* (Palas)
6.	*Kerria sharda*	Orissa	*S. Oleosa* (Kusum)
7.	*Kerria nagoliensis*	Maharashtra	*Schleichera oleosa* (Kusum)
8.	*Paratachardina lobata*	Andhra Pradesh	*Peltoforum ferrugineum* (Peela Gulmohar)
9.	*Kerria communis*	Goa	*Acacia catechu* (Khair)

Lac insects feed by sucking juices from host plant tissues. Lac is secreted by lac insects through specialized glands, to get protected from their predators. Lac resin is viscous at the time of secretion and gets hardens after coming in contact with air formingencrustations around the body of insects. The encrustations on the branches of a tree are then removed by scrapping this lac is known as stick lac, crude lac, or raw lac. It

contains resin, wax, dye, insect body, the bark of host trees as well as other impurities[14]. Stick lac is then processed in various ways to obtain pure lac and different by-products.

This paper provides an overview of lac processing techniques, products and by-products produced by lac culture and their applications, Indian institutes involved in research and development of lac culture, and current research for applications of lac.

Lac processing techniques / Products by- produced

First, the stick lac (raw lac) that is obtained by removing lac encrustations from host plants is processed to obtain seedlac. For this sticklac is dried first to remove moisture. Sticklac cannot be stored for a long time as it contains moisture along with other impurities it forms lumps and hence lowers the crop quality. Followed by drying stick lac is sieved and crushed to obtain sand and dust this process removes sand, dust. This powdered form of crude lac is then washed to remove embedded insect bodies and host trees debris. Decaying bug bodies impart a red color to water this is processed to obtain a by-product that is lac dye. The remaining resin is dried, thresh to gain seedlac. Seedlac is a commercial variety product and can be stored for a long duration. From seedlac by hot filtration purified lac is obtained called shellac. Seedlac is processed by country process or in mechanized factories to obtain shellac. Shell lac obtained by country process (Bhatta) process is called button lac whereas processed from mechanized factories is called machine-made shellac [15].

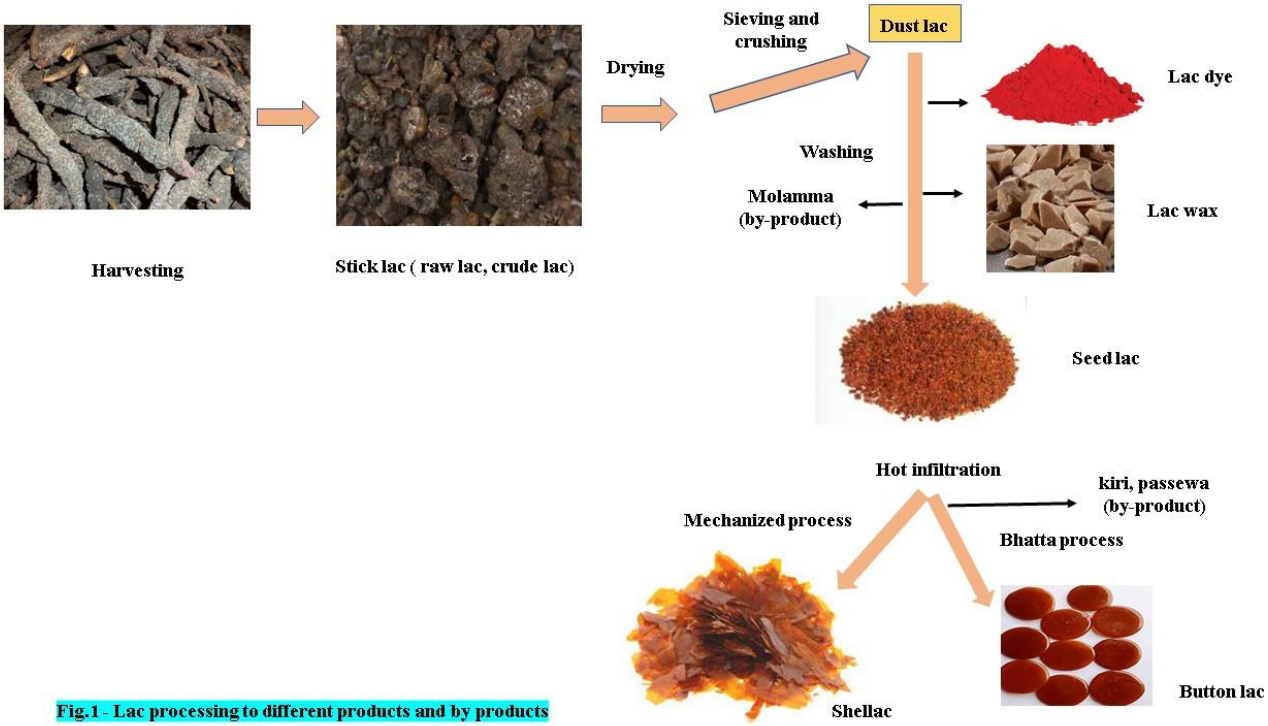

Fig.1 - Lac processing to different products and by products

Seedlac is processed by solvent method to obtain dewaxed decolorized lac (DDL) and bleached lac. For making dewaxed decolorized wax, seedlac is dissolved in cold alcohol to render wax insoluble and filter through a filter press to remove wax and impurities. The color may be removed to any required standard by charging with the activated carbon and then alcohol is recovered. The molten shellac is stretched with a roller. This form of lac has high demand in the western market. For obtaining bleached lac many methods are available but the most commercially adopted method is sodium hypochlorite (NaOCl) with some recent modifications [13,15]. Bleached lac is white. It has specialized demand and is manufactured commercially in two grades- Dewaxed bleached shellac and Waxy bleached shellac. The commercial grades of seedlac, button lac, shellac, dewaxed decolorized lac (DDL) and bleached lac available on market are listed in table 2 [13,15].

Sr. No.	Type of lac	Commercial grades
1.	Seed lac	Ordinary/ Genuine bysakhi, Fine bysakhi, Golden bysakhi, Golden kusumi, Golden bysakhi – bold grain, Golden kusumi – bold grain, Golden kusumi seedlac – Medium, Manbhum fine seedlac.
2.		Lemon one shellac, Lemon tow shellac, Standard one shellac, Superior shellac, Superior kusumi lemon, Kusumi button lac,

	Shellac	Button lac	superior kusumi button lac, light pure button lac, Pure one button lac
		Machine-made shellac.	Orange shellac, Lemon one shellac, Lemon two shellac, standard one shellac, Black T.N. shellac, Kusumi lemon shellac, Orange fine shellac
3.	Dewaxed decolorized lac (DDL)		Dewaxed platina, Dewaxed blonde Dewaxed super blonde, Dewaxed lemon, Dewaxed orange, Dewaxed Garnet
4.	Bleached lac		Dewaxed bleached shellac and Waxy bleached shellac

Applications

Lac is the only resin of animal origin, and it is Nature's gift to mankind. At present, its importance has been raised in industries, pharmaceuticals, food processing, and textiles being an eco-friendly, biodegradable, and self-sustaining natural material. In India lac is used since ancient times for medication. It is profusely used in ayurvedic treatment for treating various illnesses. It is widely used on open wounds for quick healing and tissue generation.A slurry of lac paste in water mixed with butter oil and milk was commonly taken orally by sick or wounded persons. For controlling blood pressure Lac resin was used for oral administration with fresh goat's milk. It forms one of the main ingredients of a medicated oil known as Lakshadi taila which is reputed to bring down chronic fever and cure rheumatic pain. In modern pharmacy, it is commonly employed as a demulcent in preparations which is designed to treat diarrhea, dysentery, coughs, throat irritation and fevers. It serves as an emulsifying agent and gives viscosity to powdered drug materials.

Lac has innumerable applications in various fields. More than 50% consumption of shellac is in the surface coatings in paints and varnishes due to its properties such as forming UV resistance of the film, smooth, decorative and durable films formation in alcoholic solutions, which dry rapidly as well ability to form solution in alkaline medium. Applications of shellac in the various field are enlisted in the table [13].

Fieldof application Specific application area	**Field of application Specific application area**
Pharmaceuticals	Coating for tablets; enteric (digestive fluid proof) coating for tablets, pills, etc. Removing agent for medicinal odor. Enteric pills for sustained release medication
Electronics	Lamps, fluorescent lamps, insulating agent for parts, insulating varnish, PCB coating.
Polishes	Fruits, furniture, floors, shoes, stain sealer, wallboard primer, knot and sap sealer on wood
Food	Chestnuts, healthy foods, glazing agent for chocolates and sweets, protective coating for oranges, lemons, apples, etc. Binding agent for stamp inks for lemons, eggs and cheese. Barrier coating for feeds and seeds. Protective candy coating or glazes on candies. Coating of apples and other fruits. Coating of food materials
Printing ink	Felt pen inks, binder for flexographic inks for paper, cardboard, non-toxic printing ink for food packaging
Paint and varnishes	Wood finishing, metal foil, sealers, leather, rubber, car tyre.
Cosmetics	Additive and binder for manicure, mascara, eye shadow and conditioning shampoo for personal care. Setting agent for hairspray, microencapsulation for perfumes for longer stay
Rub stones	Grinding wheel
Others	Felt hats, pyrotechnics, gunpowder, strippable paints, cards, stiffening felt in hat manufacture and also in textile industries

Lacbyproduct	**Applications**	**Referenceused**
Lac dye	Food grade lac dye in manufacture of skin creams, food and drug manufacturing and technical grade lac dye in textile industries for coloring silk and wool.	5, 8, 13,14
Lac wax	Electrical industry, shoe creams, floor and car polishes, food, confectionery and tablet finishing, lipsticks, crayons and tailor's chalk	8,13
Isoambrettolide	Perfumery industry	5,14
Mollama	For production of standard quality bleached lac	5

Indian institutes involved in research and development of lac culture

Indian Institute of Natural Resins and Gums (IINRG) was formerly known as Indian Lac Research Institute (ILRI)) is a nodal Institute at the national level for research and development in arid, semi-arid, plateau and hilly regions of the country that help to improve the livelihood of local communities[2].It was established at Namkun Ranchi in 1924 with the prime motto of research on lac in India and to increase lac production. Indian Institute of Natural Resins and Gums (IINRG) is then handed over to the Indian Council of Agricultural Research, New Delhi in 1966 [3]. This institution is fully devoted to the research and development of lac and succeed in increasing enormous lac production in India. Institute entailvarying objectives such as lac and other natural gums & resins (excluding production) such as harvesting/ tapping, processing, product development, training, information repository, technology dissemination and national/international cooperation. There is an increase in lac production in several regions of the country through training programs, capacity building programs run by this institution throughout India to make skilled individuals who can do scientific lac cultivation[4]Scientific cultivation with integrated pest management, enhancing exploitation of unexploited host plants, and cultivation through 'Joint Forest Management' program helps cultivars in raising production and gaining good economic returns. This institute also supports by providing financial assistance to lac cultivars. [2]

Current lacresearch

Yan, X., *et al.*, prepared color-changing and self-repairing dual-function paint film with Lac Resin microcapsules and Fluorane microcapsules They found that paint film with lac resin microcapsules had a better crack inhibition effect. The results obtained are useful as a manufacture reference for multifunctional wood coatings[16].

Lu, J et al., et al., extracted Shellolic esters and Lac dyes from methanol extract of the secretions of *Laccifer lacca* and studied their biological activity. They found some of the compounds considerable active against *Bacillus subtilis*, *Escherichia coli* and *Streptococcus aureus* microorganisms.[6]

Chowdhury, S.,put forth the concept of establishment of Brood Lac bank in Chhattisgarh, inspiredbyan idea of preserving and maintaining local biodiversity along with enhancing forest-based livelihoods. The idea of the Brood Lac Bank has been further extended to envision "Lac Clusters" which would not only sustainably produce lac but also add value though local processing, enabling rearers to produce raw industrial lac through local lac-based networks to directly engage with the market [1].

Mohanasundaram, A. *et al.*, evaluated chemical communication between the lac insect-associated products and the lac predators under the laboratory condition. They found that *Eublemma amabilis* showed a great response to lac insect whole-body extract. Another lac insect predator *Pseudohypatopa pulverea* also showed higher response to lac insect whole body extract than resin, wax, crawler and lac insect female extracts. [10] Along with this much research about lac cultivation, pest management, marketing and application based research has been taking place contributing enormous fruitful knowledge to this area [11,12,18].

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Preliminary phytochemical analysis of *Iphigenia indica*

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Abstract:

Present study was carried out to determine the presence of various phytochemical compounds from Iphigenia indica corm. Ethnomedicinal information was obtained from tribal people as well as traditional healers and confirmed the used of plant for various purposes such as, corm used as food, eaten as raw, to get relief from colic and headache. Phytochemical analysis was performed by using a series of solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet extractor. Qualitative phytochemical analysis confirmed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Key words: *Qualitative phytochemical, Iphigenia indica, Ethnomedicinal, soxhlet extractor, crude drugs.*

Introduction:

Human beings have been dependent on plants for medicine to complete their health care needs from the beginning of civilization [(1)]. Medicinal plants naturally contain certain chemical constituents having therapeutic properties [(2)]. Traditional and folklore medicines have a significantly participates in health care practices around the world. Ethnic medicines are highly suitable and comparatively having very less side effects [(3)]. Phytochemical constituents derived from plants are advantageous as such data become valuable for the production of different complex chemical substances [(4)].

Iphigenia indica (L.) belongs to Liliaceae family is mostly occurs on hillside among grassland area. Flowering and fruiting mostly occurs during july to september months. It is an erect herb, which grows up to 10-18 cm tall in height. Its corms are mostly ovoid, subglobose or tunicated shape with presence of brownish sheaths. Leaves are alternately arranged, sessile or subsessile, having linear or linear- lanceolate shape with coriaceous or subcoriaceous texture. Flowers are brown, purple or pale purple in color, axillary and extra-axillary in position on terminal zigzag stems. Fruit is capsule type with elliptic-oblong shape along with presence of groove. Seeds are many, brown in color and globose or subglobose.

Peoples of some tribal communities located in Buldana district use corm of this plant as food and eaten as raw. They also used it to get relief from colic and headache. Hence present investigation was focused on preliminary phytochemical analysis of *Iphigenia indica.*

Materials and Methods:

Collection of plant material:

Plant material of *Iphigenia indica* was collected from rural area of Buldana district, Maharashtra, India. Plant was identified by using various floras [(5,6)] and also from the experts of region. Plant material was brought to the laboratory, thoroughly washed with water to remove foreign matter, shade dried and then grind into fine powdered by using mechanical grinder.

Extraction of plant material:

Grinded fine powder of *Iphigenia indica* corm was subjected to solvent extraction by using series of different solvents such as petroleum ether, chloroform, ethanol and acetic acid by soxhlet apparatus. Each time before extracting with next solvent, the powder residue was dried properly. Extract obtained in each solvent was concentrated, solidified, determined yield percentage and used for preliminary phytochemical analysis.

Phytochemical evaluation:

For preliminary phytochemical analysis, each extract of corm was subjected to various qualitative test and determine the presence of different phtoconstituents.

Preliminary phytochemical analysis was carried out of all the extracts as per the standard methods of Brain and Turner, (1975); Harborne, (1994); Trease and Evans, (1996); Khandelwal, (2006) and Kokate *et al*, (2010).

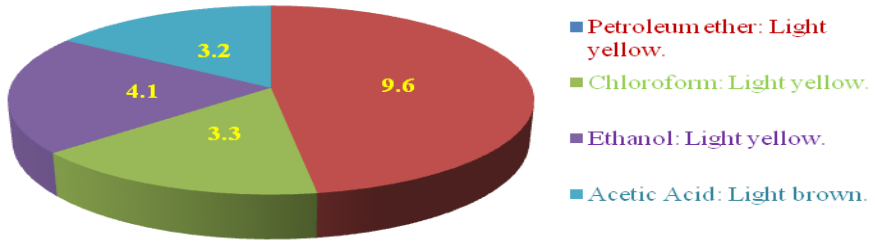
Results and Discussion:

Crude extract of medicinal plants is biologically more active than isolated compounds due to their synergistic effects. Hence phytochemical analysis is very useful in identifying new sources of important compounds like alkaloids, flavonoids, phenolic compounds, saponins, steroids, tannins, terpenoids, amino acid, etc. During phytochemical analysis, yield percentage of successive solvent extracts of *Iphigenia indica* corm were found as; petroleum ether extracts: 9.6%, chloroform extract: 3.3%, ethanol extract: 4.1% and acetic acid extract: 3.2% (as shown in table 1. and fig.1).

Table 1: Successive solvent extracts of *Iphigenia indica* corm

Sr. No.	Solvent extract	Color	Yield percentage
1	Petroleum ether	Light yellow	9.6%
2	Chloroform	Light yellow	3.3%
3	Ethanol	Light yellow	4.1%
4	Acetic Acid	Light brown	3.2%

Fig. 1 Successive extractive values of *Iphigenia indica* corm



Preliminary phytochemical analysis of *Iphigenia indica* corm was carried out in petroleum ether, chloroform, ethanol and acetic acid extracts. Phytochemical screening was revealed the presence of alkaloids, carbohydrates, glycosides, saponins, proteins, phytosteroids and terpenoids, flavonoids, fixed oil and fats, etc. as shown in table 2.

Table 2: Phytochemical analysis of *Iphigenia indica* corm extracts

Sr. No.	Test For Phytochemical	Test	Pet. ether extract	Chloroform extract	Ethanol extract	Acetic acid extract
I	Alkaloids					
1		Dragandorffs Test	+	+	+	+
2		Hager's Test	+	+	+	+
3		Mayer's Test	+	-	+	-
4		Wagner's Test	+	+	+	+
II	Carbohydrates					
1		Fehling's Test	+	+	-	-
2		Molisch's Test	-	+	+	+
3		Benedicts Test	+	-	+	-
III	Glycosides					
1		Borntrager's Test	+	+	+	-
2		Legal's Test	-	+	+	-
IV	Saponin					
1		Foam Test	+	+	+	+
V	Tannin and Phenolic compound					
1		5% Ferric chloride Test	-	-	-	-
VI	Proteins					
1		Millon's Test	-	-	+	+
2		Biuret's Test	-	-	-	-
VII	Amino Acid					

1		Ninhydrin Test	-	-	-	-
VIII	Phytosteroids and Terpenoids					
1		Lieberman-Burchards Test	-	+	-	-
2		Salkowski Test	+	+	+	+
IX	Flavonoids					
1		Alkaline reagent test	-	+	+	+
X	Gums and Mucilage					
1		Alcohol test	-	-	-	-
XI	Fixed oil and fats					
1		Stain test	-	-	+	-

Conclusion:

Presence of various phytochemicals strongly support the medicinal properties of this plants. Hence further investigation is required for isolation, characterization and structural determination of new natural bioactive compounds from this medicinal crude drugs.

Where, **+** = present, **-** = absent.

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Studies on Benthic Macroinvertebrate of Lower Wardha Project, Shahanur Dam, and Ghoddev Dam, Amravati District, (MS), India

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Abstract:-

The present communication is aimed at studies of some benthic fauna at Lower Wardha project, Shahanur dam, Ghoddev dam, District Amravati for one year from August 2015-July 2016.The benthic organisms are reported as main components of the food chain. It was therefore, thought worth benthic species diversity. The present study is focused on biodiversity of the benthic community of lower Wardha project, Shahanur dam, and Ghoddev dam. The present investigations deals with the population density and species diversity of aquatic benthic macro-invertebrate fauna.

Key Words:- Benthic Fauna, Biodiversity, Species diversity, Population diversity.

Introduction:-

Fresh water macro-invertebrate are animals without backbone that live near the bottom of freshwater. The concept of biodiversity includes the entire biological hierarchy from molecule to ecosystem, or the entire taxonomic hierarchy from Allele to Kingdom. The current textbook definition of "biodiversity" is variation of the life at all levels of biological organization (Kevin et al., 2004). Benthic macro-invertebrates are best indicators for Bio-assessment (Kumar 2003). The abiotic environment of water body directly affect in the distribution, population density and diversity of the macrobenthic community (Zweig and Rabeni 2001; Sharma and Rawat 2009, Sharma and Choudhary 2011). Benthic fauna are especially of great significance for fisheries that they themselves act as food of bottom feeder fishes (Sharma et al., 2013). The mollusca component an important component of the macrobenthic invertebrate community of the stream (Bangotra 2012) freshwater macro-invertebrates are generally group by two characteristics; how they feed and how they move within the aquatic environment. The present studies deals with the population density and species diversity of aquatic macro-invertebrate fauna have been discussed.

Materials and Methods:-

Benthic communities along the lower Wardha project Shahanur dam, and Ghoddev dam were sampled collected monthly from August 2015-July 2016. The sample were collected by a bottom kick net (500 µm mesh). The samples were taken from an area of nearly 100 m2 in order to include all possible microhabitats. All the animals collected were immediately fixed in formaldehyde (4%) in the field and then transferred to 70% ethyl alcohol. Collection and identification of Benthic macro-invertebrate with the help of standard books Needham (1969), Pennak (1989), Tonapi (1980), Welch (1998). The organisms were identified from standard taxonomics keys (e.g. Pennak 1989).

Result and Discussions:-

. Benthic macro-invertebrates biodiversity recorded in Lower wardha project(I), Shahanur dam, Ghoddev dam during August 2015 to July 2016. A total of forty six (46) species recorded of Benthic macro-invertebrates fauna belonging three (3) phylum- Mollusca, Arthropoda, ,Annelida 7 (seven) classes-Gastropoda, Bivalvia, Crustacea, Arachnida, Insecta, Oligochaeta, Hiradinea.

In the present study total 46 species of Benthic macroinvertebrate were identified. Out of 46 species Phylum- Mollucans represents 20 species from two classes as Gastropoda, and Bivalvia. Phylum-Arthropoda encompassing 24 species from three classes as Crustacean, Arachnida, and Insecta while 2 species belonged to Phylum- Annelida representing a two class Oligochaeta, and Hiradinea. The dominants class was Insecta representing 13 species and Gastropoda 12 species.

20 species of **Phylum-Mollusca** 12 species **Class-Gastropoda** [Lymnea accuminata, Lymnea auricularis, Lymnea peregra, Lymnea palustris, Lymnea luteola, Melanoides tuberculata, Bellamya bengalensis(Lamark), Gyraulus ladacensis, Thiara tuberculata(Mueller), Gabbia orcula, Pila globosa, Dwarf pond snail(Galba truncatula)]. 8 species **Class-Bivalvia** [Lamellidens corrianus(Lea), Lamellidens marginalis(Lamark), Parreysia cylindrica (Lea), Parreysia favidens(Benson), Parreysia Khadakvaslaensis, Parreysia shurtleffiana, Parreysia corrugate(Mueller), unio] was found.(Table 29).

24 species of **Phylum-Arthropoda** 4 species **Class-Crustacea** [Cancer(Crab), Daphnia, Nauplius,Cyclops]. 7 species **Class-Arachnida** [Araneus, Hydracarina sps., Neoscona sps., Zygeilla sps, Leucage sps., Stegodyphus sps., Hippasa sps.].

13 species **Class-Insecta** [*Notonecta sps,* Orthetrum sps, Chironomus Sp., Dragonfly larvae, Damselfly nymph, Soldiar fly larvae, Mayfly larvae, Anopheles larva, Cybister tripunctatus, Cybister confuses, Erectes sticticus, Hydaticus fabricii, Dineutus indicus] was found.
2 species of **Phylum-Annelida** 1 species of **Class-Oligochaeta** [Pheretima posthuma]. 1 of species **Class-Hiradinea** [Hirudinaria] was found.

Analysis of numerical superiority of macroinvertebrates of all three dams are revealed that Mollusca was dominant [68.40%] followed by Arthropoda [27.82%] and Annelids [3.77%] (Table No 24) (Figure No 17) Dominant species were reported to be the most important ecological indicators as they received the full impact of the habitat for the over longer period and manifest different level of sensitivity. The present investigation is well in agreement with the study Sharma et al., (2013).

Their abundance fluctuation depending upon environmental conditions and physico-chemical parameter of water.

The insect are having the capability of various adaptive habitates due to their extra ordinary structural organization Vinson (1998), Merrites and Cummines (2008) and Tali (2013). Most of the Insect larval forms have been reported to be tolerant too wide range of Physico-chemical parameters (Sarkar -2012). The benthic macro-invertebrates population of Insect was dominated by diptera and Ephemeroptera.

The mollusca fauna of Kishanpura Lake include genera out of which T. Scabra, P. Clarknum, L. Aluminat, vivapora bengalensis dominated the population (Sharma et al, 2007). Sharma (2003) reported 11 genera of mollusca from sirpur Lake Indore. Similar also reported to Oomachan and Belsare (1985); Rosenberg and Resh (1993) and Sharma (2009), and Sharma(2013).

Conclusion :-

This study help in studing aquatic Macro-invertebrate i.e. biodiversity of macro-invertebrates. Biomonitoring is good tool for the assessment of our body.

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Phytochemical Analysis, Antioxidant and Tyrosinase Inhibition Potential of Aqueous Extract of *Lepidiumsativum* L. Seeds.

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Abstract:
The present study was to evaluate the phytochemical constituents, antioxidant and tyrosinase inhibition activities of aqueous extract of LepidiumsativumL. seeds. Phytochemical screening revealed the presence of alkaloids, carbohydrates, flavonoids, glycosides, amino acids, reducing sugars, saponins etc. Antioxidant activity was evaluated by using an in-vitro antioxidant assay model like DPPH assay and percentage of activity of plant sample was calculated. The present study was revealed that LepidiumsativumL.shows significant antioxidant activity. The tyrosinase inhibition activities were also done by using the modified dopachrome method with L-DOPA as a substrate. Assay was conducted in a 96-well microtitle plate and a plate reader was used to measure the absorbance at 417 nm. This study of tyrosinase inhibition assay was clear that seeds of LepidiumsativumL. were shown inhibition activity against tyrosinase. The phytochemical composition of these plantseeds were tyrosinase inhibition activities due to busting the inclusion of an antioxidant composition.
Keywords:*Phytochemical, Antioxidant Assay, Tyrosinase, L-DOPA.*

INTRODUCTION:

*Lepidiumsativum*L. is a yearly herb locally known as halim in India but commonly known as cress. Cress, otherwise known as garden cress, garden pepperwort or garden cress pepper weed, in India in Hindi it is called Halim, Chandrashoor or Asalu. It's a fast growing herb belonging to the family Brassicaceae that is native to Egypt and west Asia but is widely cultivated in temperate climates throughout the world for various culinary and medicinal uses (Gokavi, S. S.et. al, 2004). *Lepidiumsativum* L. Since old times in India, seeds have been used in traditional medicine (McConnell et al., 2007). Numerous studies on plant derivatives suggest that diets rich in phyto constituents and antioxidants have protective roles against various health troubles and diseases (Lampe JW, 1999). Herbal drugs are the oldest form of health care known to mankind (De-Smet and PGAM, 1997). Plants are a rich source of natural antioxidants. Natural antioxidants or phytochemical antioxidants are the secondary metabolites of plants (Sofowora, 1993). These plant derived antioxidants might play an important role in combating oxidative stress associated with many degenerative diseases such as cardiological diseases, diabetes, cancer, Alzheimer's disease, diabetes and aging (Wong SP et.al., 2006; Naczk M and Shahidi F,2006.) In India, the plant is regarded as a cure for asthma, dysentry, bleeding piles, as a diuretic, and to enhance sexual desire (Dymock, Warden and Hooper, 1890; Chopra, Nayar and Chopra, 1956). Herbal drugs are the therapeutic herbs used to prevent and treat diseases and ailments or to support health and healing (Gossell et al., 2006).

Materials And Methods:

Collection of plant material:

The*Lepidiumsativum*L. seeds under investigation were collected from the local villages of Nanded during 2015. The collected seeds were washed thoroughly first in tap water and then rinsed with distilled water. After this, it was sterilized by using absolute alcohol and dried completely in shade at room temperature. The plant seeds were crushed and blended to fine powder in an electronic grinder and stored in a polythene bag till further use.

Preparation of extract:

The seeds of the *Lepidiumsativum* L. were collected, dried, powdered and did soxhlet extraction successively with distilled water. The extract was evaporated to near dryness in a water bath, weighed and kept at 4 °C in the refrigerator until further use.

Phytochemical screening:

The presence of various phytochemicals in the plant extract was determined by preliminary phytochemical analysis as per Thimmaiah (2004).

DPPH radical scavenging activity:

The antioxidant activity of the extracts was measured in terms of hydrogen-donating or radical scavenging ability, using the DPPH method (Brand-Williams *et al*., 2007) with slight modification. Briefly, 2 mL of DPPH solution (0.1mM in methanol) was incubated with 1mL of extract at concentration of (20 mg/ mL). The reaction mixture was shaken and incubated for 30 min.in dark condition and at room temperature. The control was

prepared as above without plant extract. The absorbance of the solution was measured at 517 nm against a blank. The free radical scavenging activity was measured as a decrease in the absorbance of DPPH and was calculated.

Scavenging effect (%) = $[(A_{control} - A_{sample}) / A_{control}] \times 100$.

Ascorbic acid (0.1mM) was used as a reference standard.

Results And Discussion:

Phytochemical screening:

Preliminary phytochemical screening revealed the presence of alkaloids, flavonoids, glycosides, carbohydrates, reducing sugar, saponins and amino acids in aqueous extracts of*Lepidiumsativum*L. seeds. These results exposed that the plant has quite a number of chemical constituents, which may be responsible for the many pharmacological actions. Although their specific roles were not investigated in this study, it was reported that most active components in plants are mostly flavonoids, saponins, glycosides and alkaloids. Further work will be possible to investigate the specific phytoconstituents responsible for these activities (Table- 1).

Table 1: Preliminary phytochemical screening of aqueous seed extract.

Sr. No	Phytochemical test	Aqueous extract	Mucilage extract
1	Alkaloids	++	++
2	Carbohydrates	++	--
3	Flavonoids	++	++
4	Glycosides	++	++
5	Reducing sugars	++	--
6	Saponins	--	--
7	Steroids	--	--
8	Tannins	--	--
9	Amino acids	--	++

++ Presence of constituent; -- Absence of constituent.

DPPH radical scavenging activity (Antioxidant activity):

The DPPH radicals scavenging assay were used for preliminary screening of the aqueous seed extract for the antioxidant activity. The free radical scavenging activity is known as an important mechanism of antioxidants. These results indicated towards the seed extract were found to interact with the stable free radical DPPH, which indicates their potent radical scavenging ability. The aqueous extract exhibited antioxidant properties (71.17%), whereas, Mucilage extract showed (60.84%) and the standard used ascorbic acid showed (86.12%) (Table- 2).

Table 2: Percentage of antioxidant activity of seed extracts.

Sr. No.	Plant Name	% Antioxidant Activity
1	*LepidiumSativum*L. (Aqueous extract)	71.17±0.31
2	*Lepidiumsativum*L. (Mucilage extract)	60.84±0.28
3	Ascorbic Acid (Standard)	86.12±0.22

Values are expressed in means ± S.D. of two separate experiments.

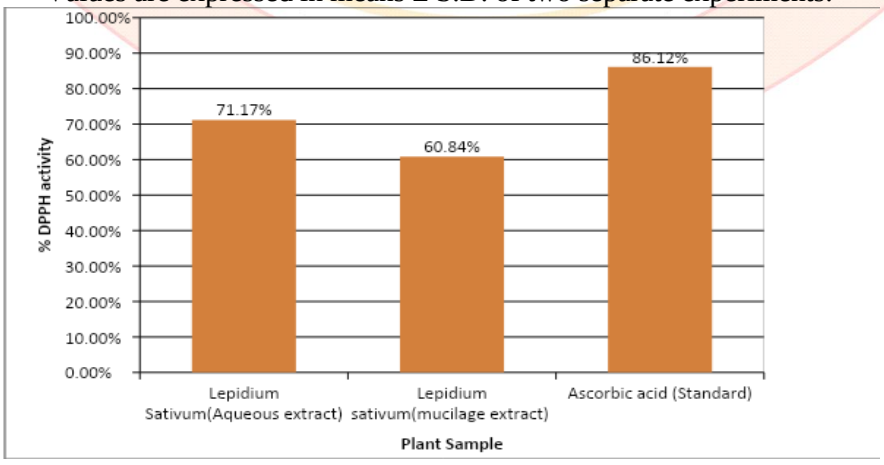

Fig: Graph showing percentage of antioxidant activity of seed extract.

Tyrosinase inhibition:

Tyrosinase involved in the formation of melanins because it facilitates melanin synthesis by catalyzing reaction from tyrosinase to DOPA and from DOPA to DOPA -quinine. Tyrosinase inhibitors have become more important as cosmetic and medicinal products, primarily to control melanin pigmentation. Melanin synthesis inhibitors are typically used for treating localized hyperpigmentation in humans such as lentigo, nevus, ephelis, post inflammatory state and melanoma of pregnancy. Mushroom tyrosinase enzyme was used for the assay because it is gamely available. Since the mode of reticence depends on the structure of both the substrate and inhibitor, L-DOPA was used as the substrate in this experiment, unless otherwise specified. So, the inhibitors discussed in this method are inhibitors of diphenolase activity of mushroom tyrosinase, and their inhibition activity on the enzyme was determined by spectrophotometry, based on dopachrome formation at 417 nm. In the present study the aqueous seed extract exhibited almost a good percentage of inhibition for Mushroom tyrosinase at (31units/ml) (Table- 3).

Table 3: Tyrosinase inhibition activity of seed extract.

Sr No.	Plant Species	% Tyrosinase Inhibition At Conc.(mg/mL)					
		4	**2**	**1**	**0.5**	**0.25**	**0.125**
1	***Lepidium sativum*L.**	81.02±0.12	67.35±0.22	62.12±0.14	56.65±0.30	31.28±0.26	13.85±0.02
2	**Ascorbic acid (Standard)**	85.74±0.21	73.86±0.13	68.23±0.23	60.70±0.32	37.66±0.25	18.23±0.22

Values are reported as means ± S.D. of two separate experiments.

Conclusion:

The present study shows aqueous seed of *Lepidiumsativum* L. could be used as a food supplement in human diet as it possesses potent antioxidant activity. It also helps to reduce oxidative stress in the human body. The tyrosinase inhibitory activity of *Lepidiumsativum* L. seed extract was increased with increasing concentrations. The inhibition of tyrosinase activity might depend on the hydroxyl group on the phenolic compounds of the seed extract, which may form hydrogen bonds with an enzyme site, leading to lower enzymatic activity. Some tyrosinases act through hydroxyl groups that bind to the tyrosinase active site, resulting in altered conformation. Ascorbic acid is an effective tyrosinase activity inhibitor. The antioxidant activity mechanism may also be an important reason for tyrosinase inhibition activity. Further pharmacological and clinical studies are required to understand the actual efficiency of these herbal extracts and in future it may be used for ingredients in the formulations of cosmetics and skin whitening agents.

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Effect of Weed – *Euphorbia Geniculata* L. On Biological Parameters of Chick PEA

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Abstract

In present investigations, the effects of Euphorbia geniculata L. on various biological parameters of chick pea were assessed. The healthy seeds of chick pea were treated with different concentrations of leaf, stem and root extracts of Euphorbia geniculata L. The effects on seed germination percentage, seedling groth and seedling vigour were assessed. The inhibitory as well as stimulating effect of weed extract on various biological paramters could be noticed.
Key words: *Euphorbia geniculata L., chick pea, inhibitory*

Introduction:

A weed is considered as unwanted plant in a particular situation and a plant in a wrong place. The weeds examples are those unwanted plants, which are growing in human-controlled setting such as farm fields. The term weed also is used to desribe any plant that grows or reproduces aggressively or is an invasive outside its native habitat. Besides competing for moisture, nutrients and light, weeds can also affect a crop growth by releasing chemicals into the growing environment (Rice 1984; Kadioglue *et al.*, 2005). All the plant parts of weeds such as root, stem, leaf, flower and fruit have allelopathic potential (Alam and Islam 2002). Different types of effects are exerted by different parts of weeds. Weeds interfere with crop plants through dominance, competition and allelopathy, which lead to decrease in quantity and quality of product of crop plants. The weeds affect the crop plants by releasing the various water-soluble allelochemicals (Batish *et al.*, 2007). These allelochemicals reported to be present in almost all plant parts including stem, leaves, buds, flowers, pollen grains, seeds, fruits, roots and rhizomes (Rice, 1984). Euphorbia geniculata is native to tropical and subtropical America but is now widespread throuhout the tropics. Many herbicides failed to control it and hence it has spread rapidly in many parts of the word. The present studies were undertaken to assess the effect of *Euphorbia geniculata* L. on popularly grown crop plant Chick pea (*Cicer arientinum* L.).

Materials And Methods:

The weed plant material used to study the effects on chick pea was collected and identified with the help of standard flora (Naik, 1998 and Dhore, 2020). Mature leaves of *Euphorbia geniculata* were collected from the agricultural fields in Amravati and aqueous extracts were prepared. Aqueous extracts of various concentrations *viz* 5%, 10%, 20% and 40% (v/v) were prepared. The seeds of chick pea were collected from Krishi kendra in Amravati. Healthy seeds were first prsoaked in distilled water for 6 hours. The presoaked seeds were treated with aqueous leaf extracts prepared freshly. The treatment was given at room temperature on rotatory shaker. The trartment was given for 6 hours. 200 seeds were used for each treatment along with control. The treated seeds along with control were studied for various parameters like germination percentage, seedling height and seedling vigour index. All the calculations were carried out by using standard formulae.

Results And Discussion;

The effects of weed extracts on chick pea are shown in table 1. The germination percentage in control was 80%. The maximum inhibition was observed in 10% treatment. In all treatments, inhibition was recorded. Germination is an important indicator which shows the plnat's response to changes in the environment or any allelopathic stress indicated as a result of allelochemicals released from donor plants (Hussain *et al.*, 2010). Similar inhibitory effects on seed germination were also recorded by Neelamegam *et al.*, 2012 in Paddy variety 5016 due to effect of Ipomea treatments.

Table 1: Effects of aqueous leaf extract of *Euphorbia geniculata* on various biological parameters of chick pea.

Treatment	Seed Germination (%)	Shoot length (Cm)	Root length	Seedling Vigour Index (SVI)
Control	80	17.70	16.70	1336
5%	65	21.60	23.00	1495
10%	50	14.60	12.80	640
20%	55	21.00	17.60	968
40%	65	18.60	10.80	702

Both inhibition and stimulation in root length and shoot length was noticed. Maximum inhibition in shoot length was induced by 10% treatment while maximum stimulation was recorded in 5% and 20% treatments. In addition, the stimulation and inhibition in root length could be observed. Maximum decrease in root length was observed in 40% treatment whereas the 5% treatment stimulated the root length. Stimulation in root and shoot length were also reported in *Oryza sativa* by Prasad and Subhashini (1994). Most of the treatment decreased the seedling vigour index. Only slight stimulation was found in 5% treatment as compared to control. Maximum reduction in seedling vigour index was found in 10% treatment.

Conclusion:

The aqueous leaf extracts of *Euphorbia geniculata* L. has shown both inhibitory and stimulatory effects on chick pea.

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Investigation of Taxonomic Morphology and Phytochemical analysis of *Cassia fistula* L.

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Abstract

The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of ***Cassia fistula L.****shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.*

Keyword: *-Morphology, qualitative,phytochemical,Cassia fistula L.,n-Butanol etc*

Introduction

Medicinal Plants or Medicinal herbs are essence of Traditional medicine practice. Treatment using herbs developed different parts of world in different names. Herbalism is the systematic study of medicinal herbs and its botany. Mainly focusing its medicinal uses. Ethnomedicine is the study of traditional medicine. Researchers identify and separate various active chemicals in the medicinal plants.

Indian medicinal plants or Ayurvedic medicinal Plants are the essence of Ayurveda and Ayurvedic treatments. When used judicially and clocking with the basic principles they produce miraculous effects. Their role cannot be confined to mere curative of disease but they also used to be of human body. Hence, Ayurvedic drugs are rightly called the elixirs of life. Ayurvedic Herbs played important role in Ayurvedic treatment, from ancient time to this most modern time.

History of Medicinal Plants

The uses of medicinal plants can even see in pre historic time from the Sumerian civilization. In Sumerian civilization medicinal plants listed in clay. They mentioned about 100 medicinal plants. Ancient Egyptians documented about 800 medicinal plants in 'Ebers Papyrus'.

'Shennong Ben Cao Jing', is the Chinese pharmacopeia of medicinal plants, which helped Chinese Traditional healers to treat patients. 'Discords' was a Greek physician; he wrote a pharmacopeia of medicinal plants called 'De materia medica'. which described 600 medicinal plants and its various combinations useful in treatments.

Aristotle's and his student, Theophrastus wrote the first systematic botany text called 'Historia plantarum'. That was the first book in botany which classified plants into systematic groups.

In India, various traditional system of medicine is Sidha are well known, now commonly called Indian System of Medicine. Treatments based upon medicinal herbs and herb mineral combination are essence of Ayurveda and Sidha. Medicinal plants listed in Ayurvedic text books or coming under ayurveda listed as Ayurvedic Medicinal Plants. Ayurveda books classified medicinal plants according to its uses and properties. About 800 medicinal plants were listed.

Herbalism

From historical time, medicinal plants used for medical purpose. It is believed that about 50 thousand before herbalism existed. Written history could be seen in sumariencivilization, which was 5000 years old. Herbalism may apply modern standards of effectiveness testing to herbs and medicines derived from natural sources because many modern medicine compounds are derived from plants. It referred as phytomedicine, phytotherapy or Para herbalism. Nutrient supplements prepared from herbs classified under phytotherapy.

According to WHO (World Health Organization) 80 % of Asian and African population uses herbal medicine due to its low expense. About 25% of drugs using in USA derived from medicinal plants. 7,000 medical compounds and 120 active compounds currently isolated from herbs.

Herbal preparations

Single plant or multiple plant combinations are used. It Prepared in many forms. Herbal juice extract, dry powder, tea, decoction, Tinctures, alcoholic preparation and oil or ghee preparations are available.

Ethnomedicine

Ethnomedicine is a study or comparison of the traditional medicine based on bioactive chemicals in the herbs and animals and practiced by various ethnic groups. ethnobotany and medical anthropology are the tools using in Ethnomedicine. The purpose of the research is to identify and develop a marketable pharmaceutical product. From Chinese medicine 'Yu' identified 'Artemisin' named chemical compound useful in Malaria disease.

Phytochemicals

These are chemical compounds synthesized by plants as its part of metabolism, may be part of defensive mechanism. Alkaloids, Glycosides, Glycosides, Terpenes are main Phytochemicals. Alkaloids are bitter-tasting chemicals examples are atropine, scopolamine, hyoscyamine, caffeine, cocaine, ephedrine (Ephedra), morphine. Anthraquinone glycosides are found in medicinal plants such as rhubarb, cascara, and Alexandrian senna. Polyphenols of several classes of chemicals, useful defenses against plant diseases and predators. examples are phytoestrogens and astringent tannins. Terpenes and terpenoids are found in resinous plants such as the conifers.

Present investigation on Taxonomic morphology and phytochemical analysis of Cassia *fistula* L. with following aims and objectives.

Material and Methods

Collection of Plant

Collection of *Cassia fistula* L. plant part were collected from botany garden Manora, washim Maharashtra state, India. Plant part i.e., fruit and leaves cleaned soil dust with tap water. The plant material and specimens were identified by using standard floras like Cook 1907, Dhore 2005, Naik 1989, Yadav and Sardesai 2002.

Preparation of Plant Part Extract

Preparation of plant part leaves dried under shade and prepared fine powder, plant part extraction according to previously method used by Megala, and Elango, 2012, but were used some modified method in which the 5 gram of leaves dried powder extracted with 50 ml of three different solvent i.e. methanol, chloroform and petroleum ether , 24 hrs at room temperature and shaking constant and then filter with whatman filter paper no.1, excess solvent in extract evaporated and extract used for Qualitative evaluation of phytochemicals. The preliminary screening test were performed for the presence of following secondary metabolites such as alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols (Harborne, 1973) and Sofowara (2005).

According to Budhiraja, 2012, leaves powder extract in Chloroform and n-butonol solvent shows positive results of phytochemicals constituent and their activities against the anticancer and antibacterial so were used chloroform and n-butonol solvent.

Qualitative analysis of *Cassia fistula* L.

Alkaloids test

The plant extract was evaporated to dryness and the residue was heated on a boiling water bath with 2% hydrochloric acid. After cooling, the mixture was filtered and treated with a few drops of Mayer's reagent. Formation of turbidity or yellow precipitation showed the presence of alkaloid.

Glycosides

Glycosides are compounds which upon hydrolysis give rise to one or more sugars (glycones) and a compound which is not a sugar (Glycone or Genine). To the solution of the extract in glacial acetic acid, few drops of ferric chloride and concentrated sulphuric acid are added, and observed for a reddish-brown coloration at the junction of two layers and the bluish green colour in the upper layer.

Terpenoids and steroids

Four milligrams of extract were treated with 0.5 ml of acetic anhydride and 0.5 ml of chloroform. Then concentrated solution of sulphuric acid was added slowly and red violet colour was observed for terpenoid and green bluish colour for steroids.

Flavonoids

4 ml of extract solution was treated with 1.5 ml of 50% methanol solution. The solution was warmed and metal magnesium was added. To this solution, 5 – 6 drops of concentrated hydrochloric acid was added and red colour was observed for flavonoids and orange colour for flavones.

Saponins

0.5 g of extracts was added to 5 ml of distilled water in a test tube. The solution was shaken vigorously and observed for a stable persistent froth. The frothing was mixed with 3 drops of olive oil and shaken vigorously after which it was observed for the formation of an emulsion.

Phenols

The extract (50 mg) is dissolved in 5 ml of distilled water. To this few drop of neutral 5% ferric chloride solution are added. A dark green colour indicates the presence of phenolic compounds. 3

Tannins

To 0.5 ml of extract solution 1 ml of water and 1-2 drops of ferric chloride solution was added. Blue colour was observed for gallic tannins and green black for catecholic tannins.


Results and Conclusion

Taxonomic Morphology of Cassia fistula *L*. Plant

Habit: A small tree.

Stem: Aerial, erect, woody, branched, cylindrical, solid and glabrous.

Leaves: Alternate, unipennate par pinnately compound, stipules small, leaflets 4-8 pairs, large, ovate, entire or wavy, acute, base wedge-shaped.

Inflorescence: Long drooping racemes.

Flowers:

1. Bracteate, pedicellate, complete, zygomorphic, bisexual, yellow.
2. Calyx made up of 5 sepals, divided to the base, imbricate, oblong.
3. Corolla made up of 5 petals, clawed, obovate, veined.
4. Stamens 10, the 3 longest stamens are much curled and bear large, oblong, much curled anthers, the 4 median stamens are straight and the 3 remaining are very short and erect, staminodes. Ovary free at the bottom of the calyx, superior, monocarpellary, unilocular, ovules many, marginal placentation.

- **Fruit:** A legume, long, cylindric, pendulous, indehiscent.
- **Seeds:** Ovate, many, imbedded horizontally in sweet, dark-coloured pulp, separated by transverse dissepiments called phragmatas.
- **Flowering and Fruiting Time:** March-July (fruiting throughout the year)

Figure:-Stem(Arial erect woody and Branched

Figure: - Leaves (Bracteate, pedicellate)

Figure:Inflorences (Racemose)

Figure:- flower(Bracteate, pedicellate)

Figure:-Fruit (A legume, long, cylindric)

Figure :- Seeds (Ovate, dark-coloured pulp)

Table No. 1 Qualitative analysis of Cassia fistula L.leaves

Sr. No.	Phytochemical	Plant extract of leaves in		
		Methanol	Chloroform	Petroleum ether

1.	**Alkaloids**	++	++	++
2.	**Glycosides**	++	+	++
3.	**Terpenoids**	+	++	+
4.	**Steroids**	++	+	++
5.	**Flavonoids**	++	++	++
6.	**Saponins**	++	++	++
7.	**Phenols**	++	+	++
8.	**Tannins**	++	++	++

Results taken average of triplicates for different concentration of plant extract.

The qualitative phytochemical studies were carried out in the solvents viz. Methanol, Chloroform and Petroleum ether. The Methanol, Chloroform and n-Butanol Leaves extract of ***Cassia fistula* L.**shows the presence of alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols but high intensity of phytochemicals in leaves showed in table no.1 by twice and petroleum ether extract of leaves.

Conclusion

***Cassia fistula* L**. is the rich source of phytochemicals, alkaloid, glycosides, terpenoids, tannin, flavonoids, saponins, steroid and phenols. Its extraction in petroleum ether solvent shows highest intensity and content of phytochemicals.

So, ***Cassia fistula* L**. of plant presence different phytochemical compounds useful for Further purification, identification and characterization of the active compounds of would be our priority in future studies.

Medicinal uses of Cassia ***fistula* L**.

Cassia species worldwide which are used in herbal medicine systems. These particular families of plants are used widely for their laxative actions. *Cassia fistula* is no exception... it is often used as a highly effective moderate laxative that is safe even for children.

However, in large doses, the leaves and bark can cause vomiting, nausea, abdominal pain and cramps. *Cassia fistula* is also employed as a remedy for tumours of the abdomen, glands, liver, stomach, and throat, for burns, cancer, constipation, convulsions, delirium, diarrhoea, dysuria, epilepsy, gravel, haematuria, pimples, and glandular tumours. In Ayurvedic medicine systems, the seeds are attributed with antibilious, aperitif, carminative, and laxative properties while the the root is used for adenopathy, burning sensations, leprosy, skin diseases, syphilis, and tubercular glands. The leaves are employed there for erysipelas, malaria, rheumatism, and ulcers. In Brazilian herbal medicine, the seeds are used as a laxative and the leaves and/or bark is used for pain and inflammation.

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Diversity of Asterinaceous Fungi from Mahabaleshwar, Maharashtra

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Abstract

The Asterinaceous fungi is the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. The asterinaceous group belonging to order Asterinales and having two families namely, Asterinaceae and Lembosiaceae. The present paper gives the checklist of Asterinaceous fungi from Mahabaleshwar, Maharashtra State, India. The 31 species of genus Asterina, 2 species each from Lembosia and Asterostomella and single species from Asterostomula are arranged in alphabetically.

Key words: *Black Mildew fungi, Asterinales, foliicolous fungi.*

Introduction:

The documentation of biodiversity, its conservation and sustainable utilization is the major theme of research in life sciences. The fungi are the important biotic group in the biodiversity and they are an extremely important part of the ecosystem. They have significant role in recycling of minerals and carbon; as a source of food, medicines and chemicals; as important models in scientific research; and have received much attention by scientific society as they cause plant and animal disease (Hosagoudar, 2012). The microfungi have great diversity in ecosystem but they are less studied because of its inconspicuous nature. Black mildews are one of the neglected group but having large number of species contribution in fungal diversity from tropical and subtropical regions of the world. Most of these fungi are either saprophytic or obligate parasites and residing on the surface of the leaves and producing special organs (haustoria) and opting special adaptation (Hansford, 1946a). These fungi are very specific in their structural characters; produce thin to dense black colonies on the surface of the leaves, contain conspicuous superficial appressoriate mycelium, forming fruiting bodies with asci and ascospores at their maturity (Hansford, 1961; Hosagoudar, 2012).

Among the black mildews, the Asterinaceous fungi are the second largest group of black mildews and are characterized by having shield-shaped thyriothecia, which split radially like a star or either opening by stellate dehiscence or by longitudinal splits; bitunicate asci and transversely uniseptate ascospores; with or without their anamorph. Asterinaceous fungi are usually more or less inconspicuous, superficial, obligate biotrophs, infecting wide range of flowering plants and existed with or without their anamorph. These fungi produce thin to dense black colonies on the surface of the leaves. These are characterized by superficial mycelium with one to two celled appressoria; at the maturity of colony, they formed flattened fruiting bodies with radiating cells known as thyriothecia, which splits radially like a ‘star’ and hence known as ‘Asterinaceous fungi’ or by longitudinal slits (Lembosiaceae); the bitunicate asci formed within the thyriothecium, contain transversely uniseptate ascospores. These are usually flourished with or without their respective anamorph (Hosagoudar, 2012).

Following are the significant taxonomic characters which facilitate the identification and separation of genus and species of this group of fungi.

1.1. Host identity

As the black mildew fungi are obligate parasite and considered as host specific, it is essential to know the correct identity of the host plants, preferably up to species level. This is an important taxonomic tool, used to keyout these fungi (Hosagoudar, 2012). Most of the authors have described the species key for asterinaceous fungi on the basis of families and genus of host plant.

1.2. Colony

Generally, the asterinaceous fungi produce typically thin to dense, dark-black colonies superficially on living leaves of plants. Mostly, the colony formed on leaves (foliicolous), and rarely on soft stem (caulicolous) and on young branches (ramicolous). If the colonies are on the leaves, they may be exclusively on the upper surface of the leaf (epiphyllous), or they may be exclusively lower surface of the leaf (hypophyllous) or they may be on both surfaces of leaf (amphigenous) (**Plate-1, Fig. 1-4**). The nature of the colony may be thin, crustose (crust like) or dense. Colonies grow radially and may be developed solitary (isolated) or scattered or confluent (scattered colonies spread to join together). Radiate growth results in the formation of a more or less circular colony that sometimes becomes confluent with neighboring colonies of the same fungal species. Confluent colonies can form colonization on large leaf surface by a single fungal species. So, the infection site, nature and size (in diameter) of colony are usually uniform in particular species or may not be uniform in different species and are significant for species delimitation (Hosagoudar, 2012). However, features of colony

appearance in combination with other morphological characters can facilitate the identification process at species level.

1.3. Mycelium

The species of asterinaceous fungi develop superficial, dark pigmented, filamentous, septate, branched, appressoriate mycelium or lacking appressoria, invade the host plant surface and form specialized structures for host infection (haustorium). Mycelium consists of brown to black, cylindrical cells with thick cell wall. It may be straight, substraight, undulate or zigzag, flexuous or crooked in nature. The branching may be opposite, alternate or irregular in the arrangement and branched at acute angles (around 45° or less than that) to wide angles (more than 45°) (**Plate-1, Fig. 5-8**). Branched hyphae may be loosely or closely reticulate and form a solid mycelial mat by compactly placing the individual mycelial threads. Therefore, the appearance of mycelium, branching pattern and angle, density of mycelium, length and diameter of hyphal cells are important taxonomic characters for species segregation in Asterinaceous fungi (Hosagoudar, 2012).

1.4. Appressoria

In this group of fungi, generally single to two celled appressoria are formed laterally on hyphae, but, sometimes these are absent (*Asterostomula*). The arrangement of laterally formed appressoria may be strictly opposite or alternate, unilateral or irregular and closely or moderately to distantly placed. These may be straight to curved, antrorse (directed towards the growing tip) to retrorse (turned opposite to growing tip), subantrorse (making more than 45° angle to the mycelium) or spreading (having mixed characters of all these). The lower cells or stalk cells in bicelled appressoria are mostly unicellular and are cylindrical to cuneate in shape. The unicellular appressoria or the head cell of bicelled appressoria may be globose, oblong, ovate, clavate, pyriform and may be entire, angular, sublobate to lobate at margin (**Plate-1, Fig. 9-13**). So, the arrangement, position, nature, size, shape and margin of appressoria are the important criterion for species segregation in asterinaceous fungi.

1.5. Thyriothecia

Thyriothecia of asterinaceous fungi are dimidiate type, flattened and typically circular in outline, orbicular or rarely elongated, L-, Y- or X-shaped. The development of a thyriothecium is initiated by directly below or lateral outgrowths from a surface hyphae and it grows radially. At the maturity, the thyriothecia dehisced or splits stellately at the center or dehisced vertically or longitudinally at the center (**Plate-1, Fig. 14-17**). The shape of the thyriothecia and their dehiscence pattern are an important criterion to delineate families and genera of Asterinales. Hosagoudar *et al*. (2001) used these characters to introduce a new family Lembosiaceae, for the genera having thyriothecia oval to elongate, X or Y shaped and dehisced longitudinally at the center. However, the flattened and typically circular thyriothecium with stellate dehiscence are the characters of family Asterinaceae (Hosagoudar, 2012).

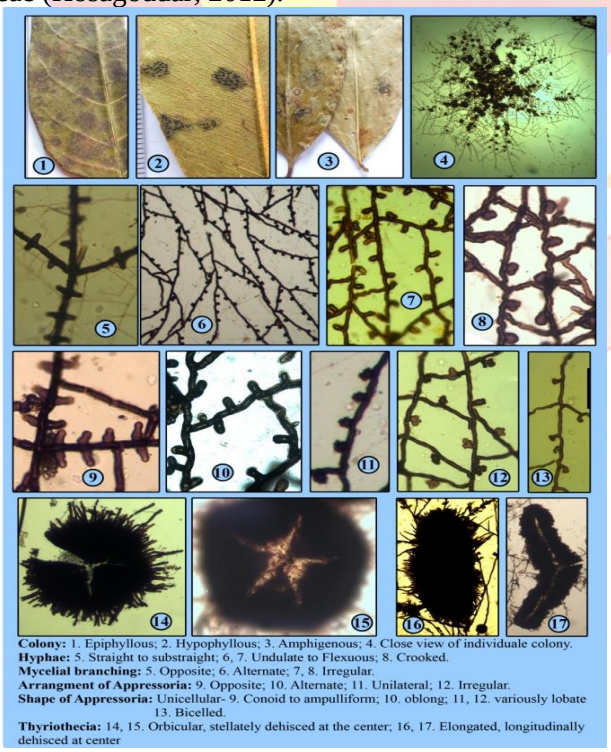

Plate 1. Colony, Hyphae, Mycelial branching, Appressoria & Thyriothecia in Asterinaceous fungi

1.6. Asci

The asci in asterinaceous fungi are bitunicate, globose, subglobose, ovate to broadly clavate. The ascus shape is relatively constant within the particular species of this group (Hosagoudar, 2012). The bitunicate asci have a distinctly thickened endotunica and it can be clearly visible when stained with cotton blue. Generally, thyriothecia are filled with numerous asci and contain 8 ascospores per ascus, more rarely 4 or 6 ascospores (**Plate-2, Fig. 1-4)**. So, the ascus numbers, shape and size are important taxonomical criteria for separation of species of asterinaceous fungi.

1.7. Ascospores

The ascospores of asterinaceous fungi are almost uniformly two-celled with one transversal septum at the center. At the region of the septum, the spores can be more or less constricted and the apices are mostly rounded or slightly acuminate to tapering. In general, the ascospores are almost oblong to ellipsoidal with equal cells or with the upper cell slightly longer and broader. Ascospore size is significant at species level (Hosagoudar, 2012). Ascospores are often pigmented and smooth-walled or more or less distinctly ornamented. The ornamentation pattern varies from warty or verrucose, truncate to echinulate (**Plate-2, Fig. 5-10**). Also, the germination pattern of ascospores is an important character for species segregation (**Plate-2, Fig. 11-13**). However, the ascospore shape, size, colour, absence or presence of ornamentation and its pattern are important criteria for species delimitation in asterinaceous fungi.

1.8. Anamorphic stages

The several numbers of genera of asterinaceous fungi produce anamorphic stages and are thought to be valid and important features in the classification of bitunicate ascomycetes. The asexual states (anamorphs) of several genera of Asterinales are present either along with teleomorph (sexual state) or develop isolated without respective teleomorph, and develop on the same surface mycelium forming conidia known as 'pycnothyriospores' within superficial Pycnothyria. Pycnothyria are always structurally similar to the thyriothecia, but usually smaller in size (Hosagoudar, 2012). The numerous pycnothyriospores are formed within the pycnothyria and are may be spherical, ovate, oblong, cylindrical, pyriform, angular to truncate (**Plate-2, Fig. 14-16)**. So, the presence or absence of anamorph, size and shape of pycnothyria and pycnothyriospores are the important taxonomic characters for species delimitation in asterinaceous fungi.

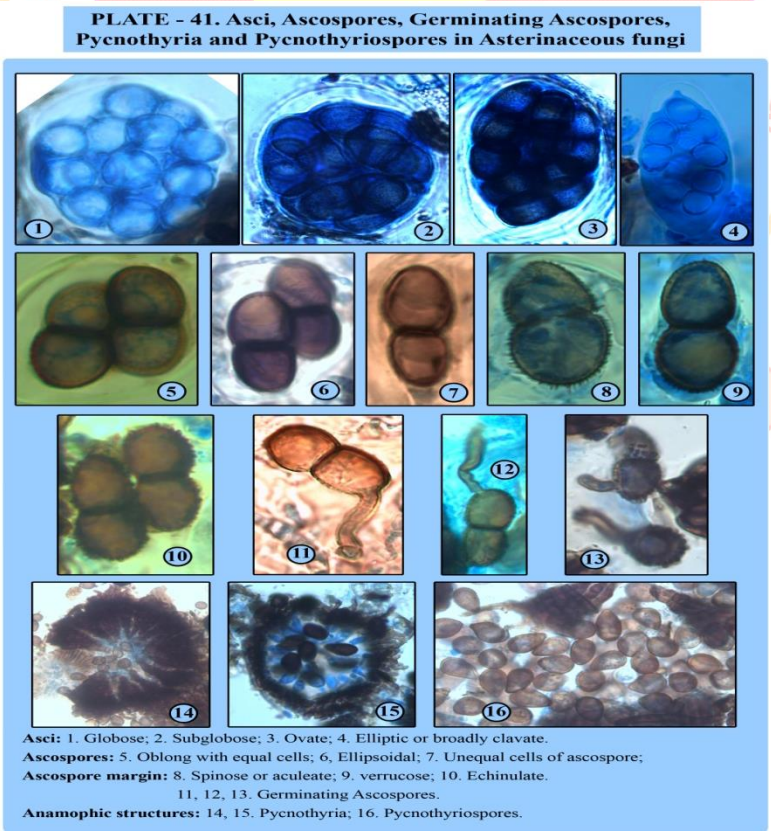

Plate 2. Asci, Ascospores, Pycnothyria & Pycnothyriospores in Asterinaceous fungi

Materials and Methods

The leaves and twigs of plant species infected with black mildew were collected from study area, during winter season (2012–2014). The infected host twigs were collected separately in sterilized polythene bags, tagged with field number, brought in the laboratory and pressed neatly to dry in between blotting papers. The well dried specimens were enclosed in butter paper and preserved in standard size herbarium packets. The host plants were identified by referring the regional flora (Deshpande *et al.*, 1995; Singh *et al*. 2000, 2001). Both macro and micro-morphological characters are used to taxonomical study of collected fungi. The fungal micro–morphological structures were mounted in lactophenol, stained with cotton blue and observed under compound light microscope. To observe mycelial branching and position of appressoria, a drop of peeling solution (Xylene–Thermocol solution) was applied on selected areas of the colonies, and after drying the film was mounted directly in again the same peeling solution. Biometric data were based on at least 10 measurements of structures; illustrations were prepared with Camera Lucida and photographed under Leica DM2000 fluorescence microscope equipped with digital camera. The fungal specimens were identified by using respective standard literature (Hansford, 1961; Hosagoudar, 2012; Patil *et al.*, 2014). Identified fungal specimens were deposited in Herbarium Cryptogamae Indiae Orientalis (HCIO), IARI, New Delhi (India) for their accession. The detail checklist of Asterinales group from Mahabaleshwar, Maharashtra state has been provided in present paper.

Enumerations of species: Family-Asterinaceae

Genus- *Asterina*

1. *Asterina atalantiae* Hosag. & Agarwal, Indian Phytopath. 56: 98, 2003; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.41, 2011; Hosag., Mycosphere 2(5): 642, 2012.

Specimens examined: On leaves of *Atalantia racemosa* Wight (Rutaceae), Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., HCIO 51712; Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 15.03.2014, Bhise M.R., MHB 0602.

2. *Asterina beilschmiediae* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 68, 2015.

MycoBank No.: MB 811704

Specimens examined: On leaves of *Beilschmiedia dalzellii* (Meissn.) Kosterm. (Lauraceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51713.

3. *Asterina casearіae* Hansf., Proc. Linn. Soc. London 156(2): 113, 1944; Hosag., Mycosphere 2(5): 650, 2012.
=*Asterina casearіae* Yamam., Sci. Rep. Hyogo Univ. Agric., Agric. Biol. Ser. 2:35, 1956.

Specimens examined: On leaves of *Caesearia graveolens* Dalz. (Flacourtiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51766; Renoshi forest, 17°47'43.1"N, 73°40'29.5"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51767; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 10.12.2013, Bhise M.R., MHB 0235.

4. *Asterina chukrasiae* Hosag. in Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 40, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala, p.47, 2011; Hosag., Mycosphere 2(5): 653, 2012.

Specimens examined: On leaves of *Aglaia lawii* (Wight) Sald. (Meliaceae), Birmanwadi River side, 17°53'17.8"N, 73°37'20.5"E, elev. 676 m, 14.03.2014, Bhise M.R., HCIO 51768.

5. *Asterina combreti* Sydow, Engl. Bot. Jahrb. 45: 264, 1910; Hosag. & Abraham, Indian Phytopath. 51: 389, 1998; Hosag. & Appaiah, J. Mycopathol. Res. 43:172, 2005; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.55, 2011; Hosag., Mycosphere 2(5): 659, 2012.

Specimens examined: On leaves of *Terminalia elliptica* Willd. (Combretaceae), Par, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 17.02.2013, Bhise M.R., HCIO 51769; Gonoshi forest, 17°55'22.3"N, 73°36'04.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51770.

6. *Asterina disciferae* Hosag. in Hosag., Balakr. & Goos, Mycotaxon 59: 172, 1996; Hosag., Mycosphere 2(5): 670, 2012.

Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'10.6"N, 73°35'06.5"E, elev. 836 m, 10.02.2013, Bhise M.R., HCIO 51651; *Syzygium cumini* (L.) Skeels, Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 14.02.2014, Bhise M.R., HCIO 51653; *Syzygium rubicundum* Wight & Arn., Birmani–Bhairijogeshwari, 17°54'08.2"N, 73°36'45.8"E, elev. 705 m, 10.12.2013, Bhise M.R., HCIO 51454.

7. *Asterina dissiliens* (Sydow) Doidge, Bothalia 4: 287, 1942; Hosag. & Goos, Mycotaxon 52: 467, 1994; Hosag., Balakr. & Goos, Mycotaxon 60: 174, 1996; Hosag., Mycosphere 2(5): 671, 2012.
=*Asterinella dissiliens* Sydow, Ann. Mycol. 22: 425, 1924.
=*Parasterina reticulata* Doidge, Bothalia 1: 200, 1924.

Specimens examined: On leaves of *Maytenus rothiana* (Walp.) Lobreau–Collen (Celastraceae), Par, 17°55'22.3"N, 73°36'02.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB 0162; Mahabaleshwar,

17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 19.02.2013, Bhise M.R., MHB 0208; Kate's point, Nakinda, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 18.10.2013, Bhise M.R., HCIO 51714, MHB 0339; *Maytenus senegalensis* (Lam.) Excell., Bhekawali, 17°56'11.3"N, 73°35'06.6"E, elev. 1251 m, 26.11.2012, Bhise M.R., MHB 0042.

8. *Asterina elaeagni* Sydow, Ann. Mycol. 29: 225, 1931; Hansf. & Thirum., Farlowia 3: 306, 1948.
=*Asterina elaegni* (Sydow) Sydow & Petrak, Hosag., Mycosphere 2(5): 672, 2012.
Specimens examined: On leaves of *Elaeagnus conferta* Roxb (Elaeagnaceae), Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., HCIO 51771; Gonoshi forest, 17°55'22.3"N, 73°36'02.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51772; Birmanwadi Road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0387.

9. *Asterina erysiphoides* Kalch. & Cooke, Grevillea 9: 32, 1880; Doidge, Trans. Roy. Soc. South Africa 8: 256, 1920; Hansf. & Thirum., Farlowia 3: 306, 1948; Hosag., Balakr. & Goos, Mycotaxon 59: 175, 1996; Hosag., H. Biju & Appaiah, J. Mycopathol. Res. 44: 7, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.72, 2011; Hosag., Mycosphere 2(5): 677, 2012.
Specimens examined: On leaves of *Jasminum malabaricum* Wight (Oleaceae), Par, 17°54'82.1"N, 73°35'92.1"E, elev. 720 m, 17.02.2013, Bhise M.R., HCIO 51699; Birmanwadi road, 17°54'08.1"N, 73°36'45.8"E, elev. 712 m, 10.12.2013, Bhise M.R., MHB 0385(b); Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265 m, 11.12.2013, Bhise M.R., MHB 0398(c).

10. *Asterina helicanthis* *sp. nov.*
MycoBank No: MB 811795
Specimens examined: On leaves of *Helicanthes elastica* (Desr.) Danser (Loranthaceae), Mahabaleshwar, 17°55'25.6"N, 73°38'16.5"E, elev. 1289 m, 05.02.2014, Bhise M.R., HCIO 51773; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., HCIO 51774.

11. *Asterina hibisci* (Doidge) Hosag. in Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Zoos' Print J. 21: 2327, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.88, 2011; Hosag., Mycosphere 2(5): 693, 2012.
=*Asterina diplocarpa* Cooke var. *hibisci* Doidge, Botahalia 4: 331, 1942.
Specimens examined: On leaves of *Hibiscus rosa-sinensis* L. (Malvaceae), Pratapgad, 17°56'12.1"N, 73°35'26.2"E, elev. 818 m, 15.03.2014, Bhise M.R., HCIO 51775.

12. *Asterina hosagoudarii* Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 71, 2015. **MycoBank No.:** MB 811705
Specimens examined: On leaves of *Litsea josephii* S. M. Almeida (Lauraceae), Gureghar, 17°55'19.23"N, 73°44'22.79"E, elev. 1284 m, 19.11.2012, Bhise M.R. HCIO 51658 (holotype); HCIO 51657 (Isotype).

13. *Asterina jambolanae* Kar & Maity, Trans. Brit. Mycol. Soc. 54: 438, 1970; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.96, 2011; Hosag., Mycosphere 2(5): 701, 2012.
Specimens examined: On leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Pratapgad, 17°56'12.7"N, 73°35'08.5"E, elev. 825 m, 20.11.2012, Bhise M.R., HCIO 51659; Gonoshi forest, 17°55'22.3"N, 73°36'06.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51660.

14. *Asterina laxiuscula* Sydow, Phillipine J. Sci. 8: 276, 1912; Patil & Pawar, Indian Phytopath. 42: 248, 1989; Hosag., Mycosphere 2(5): 708, 2012.
Specimens examined: On leaves of *Xantolis tomentosa* (Roxb.) Raf. (=*Sideroxylon tomentosa*, Sapotaceae), Gonoshi forest, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51776.

15. *Asterina litseae* Yates, Philippine J. Sci. 13: 373, 1918; Hosag., Balakr. & Goos, Mycotaxon 59: 180, 1996; Hosag., Mycosphere 2(5): 710, 2012.
Specimens examined: On leaves of *Litsea deccanensis* Gamble (Lauraceae), Chaturbet, 17°50'37.7"N, 73°38'10.8"E, elev. 677 m, 05.02.2014, Bhise M.R., HCIO 51716.

16. *Asterina lobulifera* Sydow in Sydow & Sydow, Philippine J. Sci. 9: 181, 1914; Hosag., C. K. Biju & Abraham, J. Mycophathol. Res. 40: 195, 2002; J. Econ. Taxon. Bot. 28: 175, 2004; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.108, 2011; Hosag., Mycosphere 2(5): 712, 2012
Specimens examined: On leaves of *Glochidion ellipticum* Wight (Euphorbiaceae), Birmani, 17°53'54.8"N, 73°36'41.4"E, elev. 720 m, 14.03.2013, Bhise M.R., HCIO 51717.

17. *Asterina macrosolenae* *sp. nov.*
MycoBank No: MB 811796
Etymology: The specific epithets based on the genus of host plant.
Specimens examined: On leaves of *Macrosolen capitellatus* (Wight & Arn.) Danser (Loranthaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51777; Birmani-Bhairijogeshwari,

17°54'08.2"N, 73°36'45.8"E, elev. 704 m, 10.12.2013, Bhise M.R., HCIO 51778; Dhudhgaon, 17°50'55.7"N, 73°37'36.0"E, elev. 772 m, 14.02.2014, Bhise M.R., MHB 0587.

18. ***Asterina morellae*** Hosag., C. K. Biju & Abraham, Indian Phytopath. 54: 137, 2001; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.123, 2011; Hosag., Mycosphere 2(5): 726, 2012.

Specimens examined: On leaves of *Garcinia indica* (Du Petit-Thou.) Choisy (Clusiaceae), Pratapgad, 17°56'10.5"N, 73°35'04.3"E, elev. 848 m, 13.12.2013, Bhise M.R., HCIO 51779; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0420.

19. ***Asterina myrtacearum*** Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809993

Specimens examined: On living leaves of *Syzygium caryophyllatum* (L.) Alst. (Myrtaceae), Renoshi forest, 17°47'43.10"N, 73°40'29.50"E, elev. 676 m, 13.03.2014, Bhise M.R., HCIO 51664 (holotype); *Syzygium cumini* (L.) Skeels, Old Mahabaleshwar, 17°57'50.44"N, 73°39'12.47"E, elev. 1339m, 18.10.2013, Bhise M.R., MHB 0313(a).

20. ***Asterina nothopegiae*** Ryan, Mem. Dept. Agric. India 15: 104, 1928; Patil & Thite, J. Shivaji Univ. 17: 152, 1977; Hosag., Balakr. & Goos, Mycotaxon 59: 182, 1996; Hosag., C. K. Biju & Abraham, J. Econ. Taxon. Bot. 25: 305, 2001; Hosag., Zoos' Print J. 18: 1280, 2003; Hosag., Zoos' Print J. 21: 2328, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.128, 2011; Hosag., Mycosphere 2(5): 732, 2012.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Par, 17°55'22.4"N, 73°36'06.2"E, elev. 745 m, 17.11.2013, Bhise M.R., HCIO 51718; Par, 17°55'22.5"N, 73°36'05.2"E, elev. 462 m, 17.02.2013, Bhise M.R., MHB0160 (b); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (b).

21. ***Asterina oxyceri*** Bhise, Patil & Salunkhe, Int. J. of Life Sciences 3(1): 73, 2015.

MycoBank No.: MB 817106

Specimens examined: On leaves of *Oxyceros rugulosus* (Thw.) Tirveng. (Rubiaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51719.

22. ***Asterina piperina*** Sydow, Ann. Mycol. 15: 243, 1917; M. S. Patil & Pawar, Indian Phytopath. 42: 251, 1989; Hosag., Mycosphere 2(5): 740, 2012.

=*Asterina piperis* Yates, Philippine J. Sci. 13: 374, 1918.

Specimens examined: On leaves of *Piper trichostachyon* (Miq.) C.B.Cl. (Piperaceae), Ghonaspur, 17°48'16.5"N, 73°39'25.7"E, elev. 696 m, 13.03.2014, Bhise M.R., HCIO 51720; Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 12.03.2013, Bhise M.R., MHB 0203; Kate's Point, Mahabaleshwar, 17°55'78.2"N, 73°36'26.3"E, elev. 930 m, 12.12.2013, Bhise M.R., MHB 0414; Gonoshi, 17°52'46.5"N, 73°37'26.0"E, elev. 674 m, 04.02.2014, Bhise M.R., MHB 0472.

23. ***Asterina prataparajii*** Hosag. Robin & Archana, J. Appl. Nat. Sci. 2: 93, 2010; Hosag., Mycosphere 2(5): 745, 2012.

Specimens examined: On leaves of *Tylophora dalzellii* Hook. *f*. (Asclepiadaceae), Gonoshi, 17°52'46.5"N, 73°37'26.2"E, elev. 674 m, 04.02.2014, Bhise M.R., HCIO 51721; Pratapgad, 17°56'10.3"N, 73°35'17.1"E, elev. 832 m, 10.02.2013, Bhise M.R., MHB0243; Par, 17°54'86.9"N, 73°35'96.7"E, elev. 708 m, 10.12.2013, Bhise M.R., MHB0372; Hatlote 17°5'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., MHB520; Chaturbet 17°50'37.5"N, 73°38'10.1"E, elev. 686 m, 07.02.2014, Bhise M.R., MHB547.

24. ***Asterina radians*** Ellis, Journal of Mycology 7 (3): 276, 1893; Kaul & Nair, Acta Botanica Indica 11: 227-229, 1988.

Specimens examined: On leaves of *Capparis rotundifolia* Rottl. (Capparaceae), Wilson point, Mahabaleshwar, 17°55'25.1"N, 73°40'26.2"E, elev. 1326 m, 03.02.2014, Bhise M.R., HCIO 51780; Cannot pick point, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 04.02.2014, Bhise M.R., HCIO 51781; Tapola Road, Mahabaleshwar, 17°56'52.4"N, 73°40'16.4"E, elev. 1409 m, 22.03.2013, Bhise M.R., MHB 0217.

25. ***Asterina rhamni*** Kar & Ghosh, Indian Phytopath. 39: 206, 1986; Hosag., Mycosphere 2(5): 747, 2012.

Specimens examined: On leaves of *Ventilago maderaspatana* Gaertn. (Rhamnaceae), Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 742 m, 06.02.2014, Bhise M.R., HCIO 51722; Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB 0416.

26. ***Asterina rubiacearum*** Bhise, Patil & Salunkhe, Phytotaxa 511 (3): 283-288, 2021.

MycoBank No: MB 811797

Etymology: the specific epithet refers to the host plant family–Rubiaceae.

Specimens examined: On living leaves of *Canthium dicoccum* (Gaertn.) Teijsm. & Binn. var. *umbellatum* (Wight) Sant.& Merch. (Rubiaceae), Machutar-Tetawali, 17°53'98.5"N, 73°42'29.6"E, elev. 1265m, 11.12.2013, Bhise M.R., HCIO 51666 (holotype); Linghmala, 17°55'15.1"N, 73°36'59.3"E, elev. 1177 m,

22.12.2012, Bhise M.R., HCIO 51665; Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51667.

27. ***Asterina tertia*** Racib. in Theiss., Die Gattung Asterina 7:103, 1913; Sacc., Sylloge Fungorum 24: 443, 1926; Hosag. & Abraham, J. Econ. Taxon. Bot. 4: 558, 2000; Hosag., Biju & Appaiah, J. Mycopathol. Res. 43: 204, 2005; 44: 12, 2006; Hosag., Zoos' Print J. 21: 2329, 2006; Hosag., Chandraprabha & Agarwal, Asterinales of Kerala**,** p.147, 2011; Hosag., Mycosphere 2(5): 755, 2012.

Specimens examined: On leaves of *Rhinacanthus nasuta* (L.) Kurz (Acanthaceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 911 m, 17.10.2013, Bhise M.R., HCIO 51723; *Asystasia dalzelliana* Sant., Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51724.

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Specimens examined: On leaves of *Trichilia connaroides* (Wight & Arn.) Bentv. (Meliaceae), Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., HCIO 51782; Pratapgad, 17°56'10.9"N, 73°35'09.4"E, elev. 821 m, 15.03.2014, Bhise M.R., MHB 0621.

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Specimens examined: On leaves of *Grewia abutilifolia* Vent. ex A. Juss. (Tiliaceae), Gonoshi, 17°55'22.3"N, 73°36'00.2"E, elev. 696 m, 04.02.2014, Bhise M.R., HCIO 51783; Birmani, 17°53'41.4"N, 73°36'41.4"E, elev. 720 m, 14.03.2014, Bhise M.R., MHB 0593; Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.03.2014, Bhise M.R., MHB 0610; *Grewia serrulata* DC., Hatlote, 17°51'43.6"N, 73°35'33.8"E, elev. 687 m, 06.02.2014, Bhise M.R., HCIO 51784.

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Specimens examined: On leaves of *Wrightia tinctoria* R. Br. (Apocynaceae), Kharoshi, 17°50'10.4"N, 73°38'12.8"E, elev. 628 m, 07.02.2014, Bhise M.R., HCIO 51726; Chaturbet, 17°52'01.3"N, 73°38'10.1"E, elev. 652 m, 07.02.2014, Bhise M.R., MHB0550.

Genus- *Asterostomella*

Enumeration of the species

1. ***Asterostomella flacourtiae-montanae*** V.B. Hosagoudar & A. Sabeena, in Hosag., Mycosphere 2(5): 827, 2012.

Specimens examined: On leaves of *Flacourtia indica* (Burm. f.) Merr. (=*Flacourtia montana*, Flacourtiaceae), Machutar-Tetawali, 17°54'32.5"N, 73°41'29.9"E, elev. 1306 m, 12.03.2014, Bhise M.R., HCIO 51785.

2. ***Asterostomella nothopegiae*** *sp. nov.* **MycoBank No:** MB 811798

Etymology: The specific epithets based on the genus of host plant.

Specimens examined: On leaves of *Nothopegia castaneifolia* (Roth) Ding Hou. (Anacardiaceae), Dudhoshi, 17°55'15.6"N, 73°36'59.2"E, elev. 734 m, 15.02.2014, Bhise M.R., HCIO 51727; Par, 17°55'22.3"N, 73°36'00.2"E, elev. 762 m, 17.02.2013, Bhise M.R., MHB0160 (c); Par, 17°55'22.6"N, 73°36'01.2"E, elev. 768 m 17.12.2013, Bhise M.R., MHB0305 (c); Pratapgad, 17°56'10.7"N, 73°35'07.5"E, elev. 829 m, 13.12.2013, Bhise M.R., MHB0418 (c).

Genus- *Asterostomula*

1. ***Asterostomula pavettae*** Hosagoudar & Sabeena in Hosag., Mycosphere 2(5): 837, 2012.

Specimens examined: On leaves of *Pavetta concanica* Bremek. (Rubiaceae), Par-Wada, 17°55'25.1"N, 73°40'26.2"E, elev. 732 m, 23.12.2012, Bhise M.R., HCIO 51786.

Family- Lembosiaceae

Genus- *Lembosia*

1. *Lembosia mahabaleshwarensis* Bhise & Patil, in Bhise *et al*., Phytotaxa 184 (5): 284, 2014. **MycoBank No.:** MB 809994

Specimens examined: On living leaves of *Syzygium rubicundum* Wight & Arn. (Myrtaceae), Par, 17°55'22.30"N, 73°36'00.20"E, elev. 762m, 17.10.2013, Bhise M.R., HCIO 51673 (holotype); Pratapgad, 17°56'10.70"N, 73°35'07.50"E, elev. 829m, 13.12.2013, Bhise M.R., HCIO 51674.

2. *Lembosia memecylicola* Hosag., J. Mycopathol. Res. 43(2): 204, 2005; Hosag., Mycosphere 2(5): 814, 2012.

Specimens examined: On leaves of *Memecylon umbellatum* Burm. f. var. *umbellatum* (Melastomataceae), Ambenalighat, Mahabaleshwar, 17°53'39.9"N, 73°37'02.6"E, elev. 858 m, 06.01.2013, Bhise M.R., HCIO 51790; Old mahabaleshwar, 17°57'50.4"N, 73°39'12.4"E, elev. 1339 m, 18.10.2013, Bhise M.R., MHB 0320; Wilson point, Mahabaleshwar, 17°55'25.3"N, 73°40'26.4"E, elev. 1331 m, 19.10.2013, Bhise M.R., MHB 0348.

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Observations on Floral Nectar and Flower visitors in *Hamelia patens* Jacq. (Rubiaceae)

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Abstract

The present paper deals with the study of flowering phenology, flower dynamics, nectar production, chemical composition and flower visitors of Hamelia patens Jacq.(Rubiaceae)

Hameliapatens is large perennial shrub or small treein the family Rubiaceae that is native to the American subtropics and tropics.The common name of this plant is firebush, hummingbird bush,scarlet bush and redhead.Flowering season of this plant is throughout the year. The flowers are bright reddish-orange or scarlet tubular.And last for 2days.Anther dehisces in the mature bud. Nectary gland present at the base of ovary. The amount of nectar and nectar concentration from flowers was recorded after every two-hour interval from 08.00hrs -17.00hrs. The average volume of nectar was found to be 1µl. The average nectar concentration was found to be 15%. Sugars from floral nectars were detected by one directional thin layer chromatography. Nectar showed the presence of three sugars sucrose glucose and fructose. Flower visitors were observed for their visits and behaviour during the flowering period. Butterflies, sun birdwasps and ants were the main flower visitors.

Key words: Hamelia patens, Nectar, Sugars, Pollinators.

Introduction

*Hamelia patens*is a large perennial shrub or small tree that is native to the American subtropics and tropics.*Hamelia. patens* belonging to family Rubiaceae .The flowers of the *H. patent* are orangish-red tubular which recruit hummingbirds and butterflies for pollination.(Welch and willam C. 2003). Tha family Rubiaceae has 10,700 species consisting treem shrub and hurbs (Robbrecht 1998). Nectary gland presentat the base ovary. Presence of nectaries is a biological character as it is related to a vital function of pollination.Pollination is successful in many plant species as consequences of pollinators seeking nectar.(Southwick*etal*, 1981).Sucrose-rich nectar present. (Faegri and Van der pijl 1980). Floral nectar provides food for insect and birds pollinators.(Baude et al 2016;Carvell et al 2006).Nectar characteristic patterns of nectar secretion and availability, flower production spatial arrangement and morphological aspects of flowers and flower -visiting birds are important in order to understand the foraging behaviour of birds on flowers (Waser, 1982; Kearns and Inouye, 1993). This phonological pattern is associated with long-lived pollinators that set fixed daily foraging routes (Gentry 1974). Bird-pollinated plants are usually characterised by having brightly colour, odourless flowers, tubular and evenly curved corollas,diurnal anthesis(Faegri and Van der Pijl 1980).Flowers produce nectar and are adapted for pollination.In *H.patens* due to bright oranges tubuler colour of flower maximum butterflies, bees and birds are attracted. Ants and house flies are robbers.

Thus, the aim of the present work was to study flowering phenology, the nectar volume (µL), nectar concentration, chemical composition of sugars and flower visitors in *Hamelia patens*.

Material and Methods

Study Area

The present study was carried out in the campus of Shri Shivaji Arts, Commerce and Science College, Akot during February to April 2021.

Flowering phenology

A cultivated population of *Hamelia patent*in college campus was chosen for observations. Flowering phenology, time of anthesis and time of anther dehiscence was recorded during the peak flowering period.

Nectar Analysis

The time of nectar secretion was noted during the peak flowering period. The amount of nectar from flowers was recorded at 2hrs intervals during the flowering period. Nectar was extracted with micro-capillary tubes. Nectar concentration was determined using a hand-held sugar refractometer (Erma Japan) from 8.00hrs to 17.00hrs for 5 days during the peak bloom. For the analysis of sugar and nectar samples preserved in isopropanol as well as fresh nectar samples were used. The sugars present in nectar were studied by using thin layer chromatography. Nectar sample was loaded on the plate along with standard sucrose, fructose and glucose keeping a comfortable distance between the loaded nectar sample and standard sugars. Later the plates were run in a solvent prepared by mixing butanol-4 parts + acetic acid 1 parts + distilled water 5 parts (4:1:5). After solvent run, the silica gel plate was allowed to dry, sprayed with 1% aniline, 1% diphenylamine and 85% Ortho-phosphoric acid prepared in 100 ml acetone.

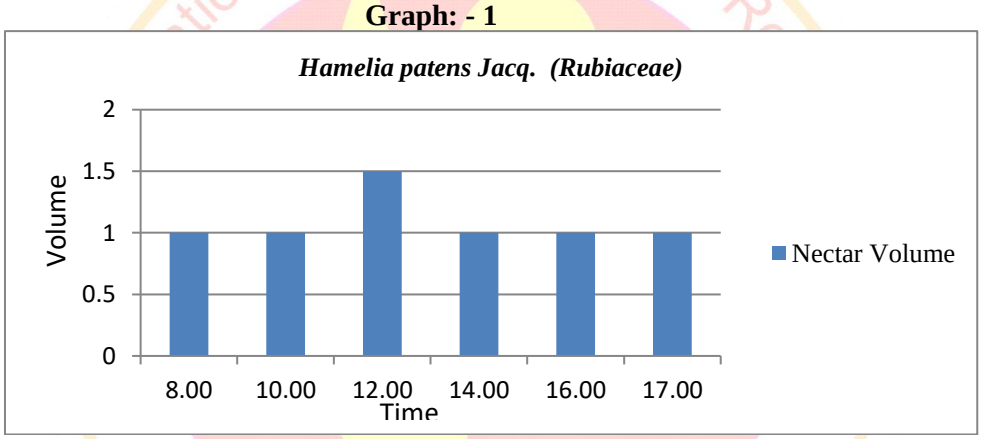
Flower Visitors

Observations were made on the type of flower visitors during the peak flowering period. The duration of visits, number of flowers was recorded at 2hrs interval.

Table 1.Nectar Volume and Nectar Concentration in*H. patens*

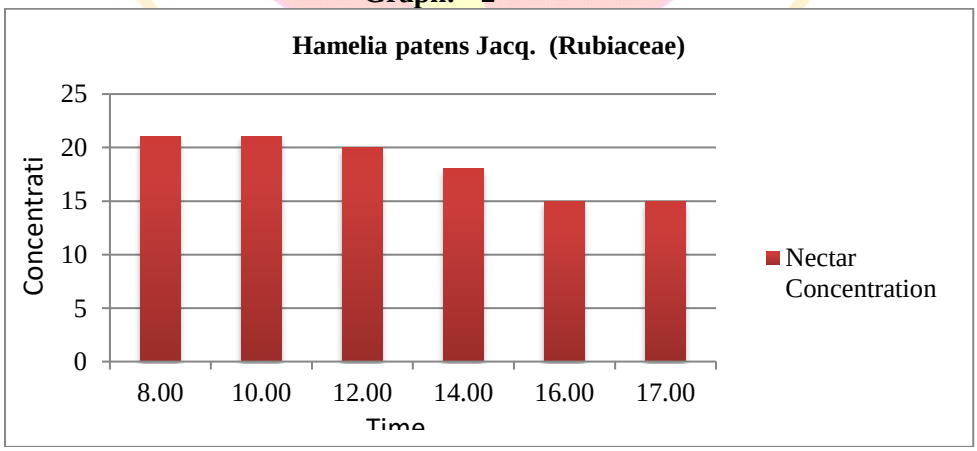
Time	Nectar Volume	Nectar Concentration
8.00	1µl	21%
10.00	1µl	21%
12.00	1.5µl	20%
14.00	1µl	18%
16.00	1µl	15%
17.00	1 µl	15%

Graph: - 1



Nectar Volume in *Hamelia patens Jacq. (Rubiaceae)*

Graph: - 2



Nectar Concentration in*Hamelia patens Jacq. (Rubiaceae)*

Table 2 : Flower visitor's census in *H.patens*

Flower visitors	Forage type	Time of visit	Flower visited
Bees and wasps	Nectar	08.00-1.00hrs	5-6
Butterflies	Nectar	08.00- 11.00hrs	2-3

Ants	Nectar	Throughout day	4-5
Sunbirds	Nectar	14.00- 16.00hrs	4-5
Houseflies	Nectar	11.00-12.00 hrs	2-3

Fig:1.Ant feeding on nectar.

Fig:2.housefly collecting nectar from flower.

Fig:3.Butterfly visiting the flower for nectar

Fig:4.Ant feeding on nectar.

Fig:5.wasp collecting nectar from flower

Result and Discussion

In *Hameliapatens*flowering period throughout years and but the peak flowering period was observed during month of April and september. However, flowering phenology quit variable and under the control of environmental conditions.The inflorescence is polychasial cyme. Flowers open daily 7.00hrs-800hrs. Anther dehiscence takes place between 11.00hrs-1200hrs in the mature bud. During the period of September-february, the flowers start to open around 03.00hrs and are fully open at 03.30hrs.The anther dehisce by longitudinal slits prior to anthesis. And anther dehisce inside the buds.(Chauhan and Galetto L. 2009).Nectar secreation begins before anthesis. The open flower produce 1.2ul nectar and fructose Glucose and sucrose sugars present in the nectar of *H. patent*(Chauhan and Galetto L.).Floral nectar is secreted by plants to attract and reward of pollinators, and it plays a key role in the functional ecology of plants (Baker and Baker, 1983; Gonzalez-Teuber and Heil, 2009). In *Hameliapatens* nectar secretion begins in the buds during morning 7.00hrs-8.00hrs. The quantity of nectar was measure on the day of flower opening at two hours intervals between 8.00hrs-17.00hrs. On an average the total amount of nectar measure during this period in each flower was 1µl (Table 1 & Graph 1). Maximum nectar production occurred during 12.00hrs-15.00hrs.The average nectar concentration was found 18.33% during the peak flowering period (Table 1 & Graph 2).Galetto(1998) made similar observations in H. patentconcentration of nectar 16% and later between 20-25%. The three nectar sugars fructose glucose and sucrose were identified. Sucrose present in abundant amount. Sucrose-rich nectar is present. (Faegri and Van der pijl 1980). The flowers are nectar-rich, orange colour and tubular serve as strong visual cues to attract the butterflies bees and Ants. The present observations showed that in *H. patens* butterflies bees and ants were the main pollinators. Among the peak flowering period observed in the study, in

morning between 07.00hrs -11.00hrs had greater number of pollinator visits per bout.Coloured butterflies and ants visited the flower throughout the day. Most of the bees and wasps visited in between8hrs-1.00hrs.Houseflies visited in between 11.00-12.00hrs. (Table 2).Thomas et,al (1986) studied the interaction between the butterflies and hummingbirds in *Hameliapatens*. While sunbirds are seen in the afternoon between 15.00hrs-17.00hrs. It is interesting observed that the butterflies visit in the morning hours 08.00hrs-11.00hrs. (Chauhan and Galetto L. 2009).

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In vitro evaluation of cytotoxic activity of *Curcuma inodora* Blatt. Rhizomeagainst (Miapaca-2) human pancreatic carcinoma cell line

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Abstract:

To determine the in vitro cytotoxic activity of Curcuma inodoraBlatt.,crude aqueous extract of rhizome against thehuman pancreatic carcinoma cell lines (MiaPaca-2). The cytotoxic activity was evaluated by the tetrazolium salt reduction assay (MTT)at different concentrations(10, 20, 30, 40 and 50µg/ml) of aqueous extract of rhizome for 48 hrs. with standard positive control chemotherapeutic agent viz. 5-Flurouracil.The aqueous extracts showed growth inhibition 26.24 ± 1.81 at highest 50µg/ml. IC_{50} for the 5-FU standard control was 25.9 ±0.68µg/ml. Crude aqueous extract of rhizome Curcuma inodoraproduced IC_{50} value 97.58 ± 2.45 µg/ml.Rhizome aqueous extract of Curcuma inodorashowed a significant reduction in growth of cancerous cells indicate the potential of anti-proliferative growth.

Keywords: *Curcuma inodora, rhizome, Cytotoxicity, Pancreatic cancer cells, MTT assay, 5-Flurouracil.*

Introduction:

Pancreatic cancer (PC) is a highly invasive human malignancy globally with an extreme poor prognosis (Siegel *et al*., 2016). Pancreatic cancer is seventh leading cause of cancer related death all over the world. However, mortality rate of pancreatic cancer are not completely clear. For the majority of concerning PC sufferers, the only therapeutic promise is cytostatic remedy using standard chemotherapeutic drugs such as gemcitabine and 5-FU (5-fluorouracil) or their combination (Michl and Gress, 2013). However, the median progress time of PC sufferers is only about 6 months usually due to an almost complete chemotherapy resistance, and the dismal 5-year survival is currently approximately 2% (Ramfidis*et al*.,2014) Therefore, there may be a great need for each new biomarkers with prognostic and predictive value and newer therapeutic preferences for this disease. MIA PaCa-2 cell line is a prime tumor currently used in vitro models to observe pancreatic carcinogenesis. Wild plants in nature have bioactive phytochemicals that have anti-carcinogenic property.

Curcuma inodora Blatt. belongs to family-Zingiberaceae, commonly known as scentless turmeric. Traditionally, it is used in the treatment of muscular pain, psychosomatic disorders and constipation. Scentless turmeric is used by the tribal as a hair tonic and to cure wound. Tribal uses of *Curcuma inodora* gives an importance to this plant to scientific community and no scientific literature is available to explore the use of anticancer effect of *Curcuma inodora*. Therefore, the aim of this research was to determine the cytotoxic assay in vitro effect of crude aqueous extract of *Curcuma inodora* rhizome.

MATERIALS AND METHODS:

Selection and Collection of Plant: *Curcuma inodora*rhizomes were collected from Melghat region of Amravati District in the month of June to September (Fig.1).

Identification and Authentication of plants: *Curcuma inodora* identification carried out using different

Fig.1. a)*Curcuma inodora* habitat **b)** Rhizome

methods with the help of standard floras (Sharma *et al*., 1996; Dhore, 2002) and authenticated by Taxonomist Dr. S.P. Rothe Professor and Head Department of Botany, Shri. Shivaji Science College, Akola.

Preparation of test solution: Rhizome 1 gm powder crushed in mortar and pestle by adding 10 ml. DW, then centrifuge at 4000 rpm for 10 min. Supernatant concentrations (10-50 µg/ml) prepared by serial dilution method.

In-vitro Cytotoxic Activity Assay: The human pancreatic carcinoma cells (MiaPaCa-2) wereprocure from the National Centre for Cell Sciences (NCCS), Pune, and Maharashtra. Cells were grow in Dulbecco's minimum essential medium (DMEM).MiaPaCa-2 cells were maintain at 37°C, 5% CO_2, in a 90% humidified atmosphere in CO_2 incubator (Galaxy Make). Cells were pass after every 5th days. Experimentation carried out in 96 well Microtiter plates. The cytotoxic activity was measured using MTT (3-(4,5dimethylthiazol- 2-yl)-2,5-diphenyltetrazolium bromide) assay Berridge MV- A new class of cell surface antigens. Quantitative absorption studies defining cell-lineage-specific antigens on hemopoietic cells.Briefly, 2 X 10^4cells/well were seeded in 96-well microliter plates.

Cell Treatment Procedure: Cells were treated with various working concentrations (10-50 µg/ml) of aqueous extract of rhizome and standard anticancer drug i.e. 5-Fluorouracil (5-FU) (10-50 µg/ml) for 48 hours. At the end of incubation period, the medium was replaced by 150µl fresh medium and 50 µl MTT (1mg/mL) was added to each well, followed by an incubation period for a further 4 hours at 37^{0}C. Later, 150 µl of DMSO added to each well for solubilization of the formazan products. Absorbance was taken at 630 nm using a Bio-Tek microplate reader. The percent cell cytotoxicity calculated by using the following formula.

$$\% \text{ Cytotoxity} = \frac{(\text{Absorbance of control sample} - \text{Absorbance of treated sample})}{Absorbance\ of\ control\ sample} X100$$

Statistical Analysis: The results presented as means ± SD of three independent experiments. Statistical differences among means were determined by one way ANOVA. Differences were considered significant at P<0.05. The IC_{50} values were calculated using Graph Pad Prism 5.0 (Graph Pad Software Inc., San Diego, CA). Every experiment included a set of negative controls (untreated cultures) and positive control treated with 5-Flurouracil.

Results And Discussions:

The results for cell growth inhibition by aqueous extracts of the rhizome against MIAPaCa-2 cell lines at 10-50µg/ml concentrations tabulated in Table 1 and graphically represented in Fig. 2. Aqueous extract of rhizome tested *in vitro* for their potential human cancer growth inhibitory effect on MIAPaCa-2 cancer cell lines at various concentrations ranging from 10-50µg/ml. Results obtained that aqueous extract inhibited the growth of cells in concentration dependent manner and showed the positive inhibitory effect on cell growth (Table 1 and Fig. 1). The aqueous extracts showed growth inhibition 26.24±1.81% at highest concentration of 50 µg/ml (Table 1). However, deviation seen when IC_{50} value was calculated. From the figure, it was found that the IC_{50} value with 97.58 ± 2.45 µg/mlrecorded in aqueous extract showed a significant reduction in growth of cancerous cells indicating the potential of anti-proliferative growth (Table 1, Fig.2). IC_{50} for the 5-FU standard. Control showed 25.9 ±0.68µg/ml. inhibition.

Table 1: Effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cell line after the incubation for 48 hrs.

Concentration (µg/ml)	% Inhibition	
	AQ	**5-FU**
Control	0	0
10	4.72 ± 4.16	43.02 ±1.00
20	10.76 ± 1.20	45.78 ± 0.10
30	14.69 ± 2.27	51.02 ± 0.36
40	19.42 ± 1.20	59.37 ± 0.72
50	26.24 ± 1.81	61.07 ± 0.52
IC $_{50}$	**97.58 ± 2.45**	**25.9 ± 0.68**

*Results represented as an average of three± replicates
[**AQ**-Aqueous extract; 5-FU- 5-Flurouracil]

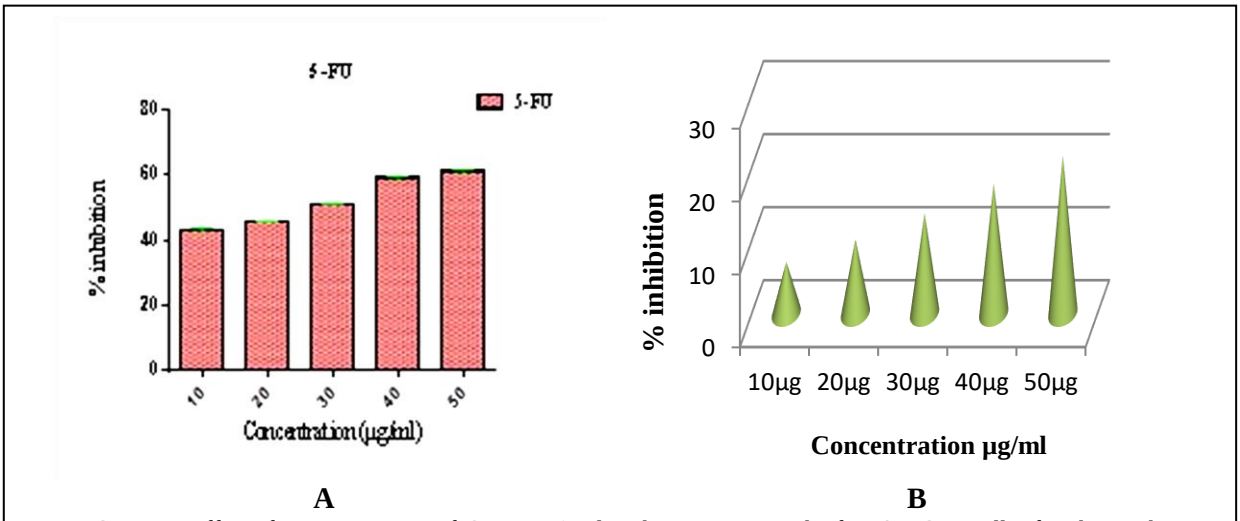

Fig.2: Cytotoxic effect of aqueous extract of *Curcuma inodora*rhizome on growth of MIAPaCa-2 cells after the incubation for 48 hrs using MTT assay. **(A)** 5-FU as standard (positive control) and **(B)** % inhibition of CU-R extract. Data are represented by mean ± SD (n=3). Statistical significance between untreated and treated cells was determined using one-way ANOVA where $p < 0.05$ verses untreated control cells. [AQ –Aqueous extract; 5-FU- 5-Fluorouracil].

The cytotoxicity assay is based on the capacity of mitochondria succinate dehydrogenase enzymes in living cells to reduce the yellow water soluble substrate tetrazolium salt 3-(4,5 dimethyl thiazol-2-yl)-2-5-diphenyl tetrazolium bromide (MTT) into a blue colored i.e. formazan crystals which is measured by spectrophotometer (Masters, 2000; Mosmann, 1983). Since reduction of MTT can only occur in metabolically active cells, the level of activity is a measure of the viability of the cells. The number of cells was found to be proportional to the extent of formazan production by the cells used (Francis and Rita, 1986).

MTT proliferation assay was carried out to determine the growth rate of cells. In the present study, the aqueous extract of *Curcuma inodora*rhizome has indicated significant growth inhibition on Miapaca-2 cell line. The aqueous extract treatment on Miapaca-2 cells lines showed significant decrease in growth rate compared with control. The qualitative phytochemical analysis of aqueous extract of *Curcuma inodora*rhizome detected the presence of carbohydrate and glycosides, protein and amino acids, alkaloids, phenolic compounds & flavonoids, phytosterols, saponins and terpenoids (Ghurde, 2018). Besides this polyphenol, curcumin has anti-inflammatory and anti-cancer properties, modulating the epigenetic alterations typically associated with cancer (Mazidi et al. 2016). Which could be responsible for anti-carcinogenic property. Flavonoids found to possess anti-mutagenic and anti-malignant effects (Masmaan, 1983). Moreover, it has protective effect against cancer by their effect on signal transduction in cell proliferation and angiogenesis.

Conclusions:

The present study revealed that the aqueous extract of *Curcuma inodora* Blatt. rhizome was found to be cytotoxic towards human pancreatic cancer cell line in MTT assay. The 50% cytotoxic effect (IC_{50}) of aqueous rhizome extract of *Curcuma inodora* found to be 97.58 ± 2.45µg/mlmay be due to thebioactive compounds. Hence, present study shows the positive efficacy of rhizome for cytotoxicity towards MIA PaCa-2 cells thus suggesting scientific community to carry out further after animal experimentation to evaluate the potentialtherapeutic agent in pancreatic cancer treatment.

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In vitro anthelmintic activity and phytochemical analysis of Crude Extracts of Aerial Parts of *Tridax procumbens* (L.) against *Pheretima posthuma.*

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Abstract –
The aim of the present study was to evaluate the anthelmintic activity of different extract of Aerial Parts of Tridax procumbens(L.) against Pheretima posthuma. as test worms. The time of paralysis and time of death were studied and the activity was compared with Albendazole as reference standard. The methanolic extract exhibited significant anthelmintic activity as evidenced by decreased paralyzing time and death time. The results thus support the use of Tridax procumbens (L.) as an anthelmintic agent.
Keywords: *Anthelmintic activity,* Pheretima posthuma, *piperazine citrate, Tridax procumbens (L.) Albendazole,*

Introduction-

Traditional knowledge, specific for particular society and community, it become a part of its cultural identity. All these information are unique for every society. in use and majority are still being used by the members of the society. It embraces information on the use of biological and other materials for medical treatment and agriculture, production processes. Use of plant as a source of medicine has been inherited and is an important component of the health care system in India. Herbal medicine claimed for the treatment of parasitic diseases in human and even animals. Helminthes are parasitic worms; which are among the most widespread prevalence in human as well as livestock. Helminthiasis is being endemic**.** It is found that about half (50%) of world population suffer from the Helminthiasis and the numbers are increasing day by day **(Sirama *et al.*, 2015).** According to World Health Organization (WHO) parasitic worm infection are more than (1.5) billion that is (24%) of world population **World Health Organization (2017).**

Few number of Anthelmintics drugs are available in the market, Benzimidazoles (BZD) is the past ones primes anthelmintics commonly called as 'White' dewormers. This class involved ; albendazole, fenbendazole, and oxfendazole, Piperazine citrate, livamizole, morantel and pyrental are chemical dewormers. The common side effects include nausea, vomiting, stomach and abdominal pain, headache, dizziness or temporary hair loss (**Saliha Siddiqui and Kalpana Patni 2018.).** Chemical control of helminthes coupled with improved management has been the important worm control strategy throughout the world. However, increasing problems of development of resistance in helminthes against anthelmintics have lead to the proposal of screening medicinal plants for their anthelmintic activity. Many researchers are screening the traditional herbal system in search of the anthelmintic herbal constituents which overcome all the problems of synthetic drugs. The present study was aim to investigate the "**Anthelmintic Activity**" of plants ***Tridax procumbens* (L.)**. It is a small attempt to find out traditional alternatives to helminthiasis

Materials and methods

Collection of plant materials

The aerial parts of *Tridax procumbens* (L.) were collected from the campus of Govt. Vidarbha Institute of Science and Humanities, Amravati India . Identification was done with the help of standard floras. The plant was identified and authenticated and the voucher specimen was preserved in the Herbarium of Department of Botany.

Preparations of extracts

The crude extract was prepared by crude maceration technique. In the process of maceration, the powdered solid material is placed in a closed vessel (to prevent evaporation) and the chosen solvents were added. When the solvent is water and the period of maceration is long, a small quantity of chloroform added to prevent microbial growth.

Crude aqueous, methanol, acetone and petroleum ether extract of powdered plant were prepared, Briefly, 25gm of grind/ powdered plant material was soaked in sufficient quantity (100 ml.) of aqueous, methanol, acetone and petroleum ether separately for continuous 7 days and the filtered off by a piece of porous cloth and then filter paper. Following extraction, the liquids were concentrated to remove traces of solvents and the process was repeated for two times. The solvent from total extract was distilled off and concentrate was evaporated water bath to syrupy consistency and the evaporated to dryness. This extract was stored at 40 c until use. The crude extract (as much as needed) was dissolved in distilled water on the day of the experiment to prepare stock solution and different dilutions for the purpose of evaluating anthelmintic activity.

Anthelmintic assay: Aqueous, methanolic and acetone extracts from the plants were investigated for their anthelmintic activity against *Pheretima posthuma*. Various concentrations (10, 25 and 50 mg/ml) of each extracts were tested in the bioassay, which involved determination of time of paralysis and time of the death of the worms. The anthelmintic assay was carried as per the method of Ajaiyeoba *et al.*, (2001). with minor modifications.

In the experiment, six groups of six earthworms were released into 25ml of solutions of Albendazole, aqueous, methanolic and acetone extracts of *Tridax procumbens* (L.) (25, 50 and 100mg/ml each) in distilled water. The remaining groups were treated for different concentrations. Albendazole was used as reference standard while distilled water as control. All drug and extract solutions were freshly prepared before starting the experiment. Observations were made for the time taken to paralysis and death of individual worms. Time for paralysis was noted when the movement of any sort could be observed except when the worms were shaken vigorously. Death was concluded when the worms lost their motility followed with fading away of their body colors.

Results and Discussions

Tridax procumbens (L.) is a well known medicinal plant and is widely used in folk ayurvedic system of medicine. In the present study solvents namely methanol, acetone, petroleum ether and aqueous, were used sequentially for crude extraction of *Tridex procumbens* (L.) whole plant. To justify the ethnomedical claims of the plant.

Anthelmintic activity of *Tridax procumbens* (L.)

Table -1: Anthelmintic Activity of *Tridex procumbens* (L.)

Test Sample *(Tridex)*	Conc. (mg/ml)	*P. posthuma* Time taken for Paralysis (in min.)	*P. posthuma* Time taken for Death (in min.)
Methanol	10	114.5 ± 10.6	125 ± 8.48
	30	72.5 ± 9.19	84 ± 12.7
	50	64 ± 14.1	78.5 ± 10.6
Acetone	10	129.5 ± 12.0	145 ± 16.9
	30	100 ± 5.65	124.5 ± 6.36
	50	81 ± 5.6	90 ± 9.89
Petroleum ether	10	164.5 ± 19.0	184.5 ± 14.8
	30	100.5 ± 14.0	120 ± 15.5
	50	87 ± 5.65	109 ± 11.3
Aqueous	10	166 ± 5.65	183.5 ± 9.19
	30	100.5 ± 19.0	130.5 ± 12.0
	50	94.5 ± 13.4	122 ± 12.7
Albendazole	10	401.5 ± 4.94	418 ± 8.48
	30	381.5 ± 4.9	395 ± 5.65
	50	367 ± 8.48	389 ± 2.82

Table-1: showed that Methanolicextract of ***Tridax procumbens(L.)*** significant anthelmintic activity against **'*Pheretima posthuma'*.** Methanolic extract also proved to be efficient than the standard drug.

The **Methanolic** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 114.5 , 72.5 , 64 min. and death time at 125 , 84 , 78min. respectively. Methanolic extract at 50 mg/ml showed efficient paralysis effect (64 min.) than other treated groups whereas methanolic extract 50 mg/ml showed significant anthelmintic activity with death time of (78 min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that methanolic extract of *T. procumbens (L.)* showed significant anthelmintic activity against *Pheretima posthumaand* also proved to be efficient than the standard drug.

The **Acetone** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 129.5, 100, 81min. and death time at 145, 124, 90 min. respectively. Acetone extract at 50 mg/ml showed efficient paralysis effect (81min.) than other treated groups whereas acetone extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367min. and death time was 418, 395, 389 min. respectively. This investigation revealed that acetone extract of *Tridex*

procumbens (L.) showed significant anthelmintic activity against *Pheretima posthuma*. Acetone extract also proved to be efficient than the standard drug.

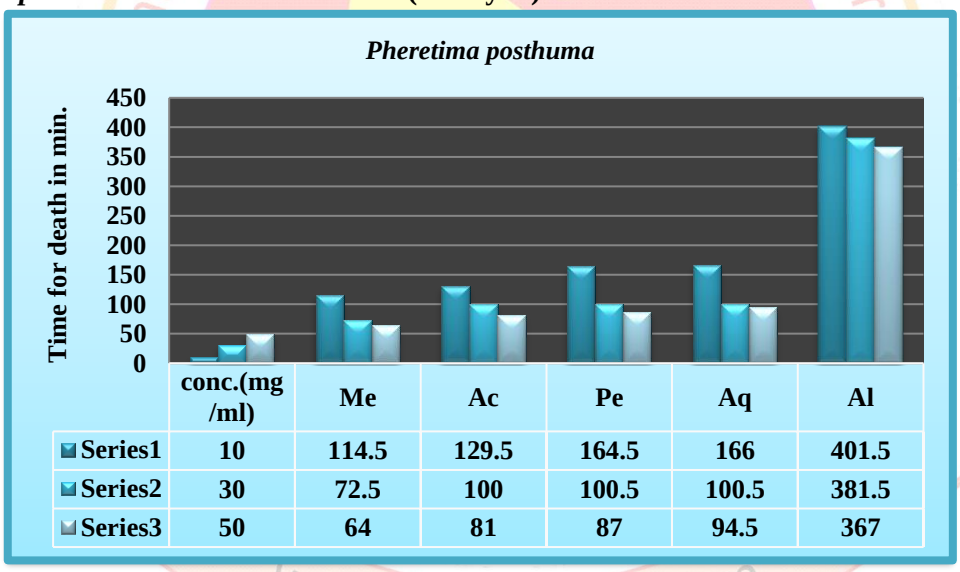
The **Petroleum ether** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time 164.5, 100.5, 87 min. and death time at 184.5, 120, 90 min. respectively. Petroleum ether extract at 50 mg/ml showed efficient paralysis effect (87 min.) than other treated groups whereas petroleum ether extract 50 mg/ml showed significant anthelmintic activity with death time of (90min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that petroleum ether extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma.* Petroleum ether also proved to be efficient than the standard drug.

The **Aqueous** extract of concentration **(10, 30, 50 mg/ml)** showed the paralysis time min. and death time at min. respectively. Aqueous extract at 50 mg/ml showed efficient paralysis effect (166, 100.5, 94.5min.) than other treated groups whereas aqueous extract 50 mg/ml showed significant anthelmintic activity with death time of (94.5min.). Standard drug (10, 30, 50 mg/ml) showed paralysis time 401.5, 381.5, 367 min and death time was 418, 395, 389 min. respectively. This investigation revealed that aqueous extract of *T. procumbens* (L.) showed significant anthelmintic activity against *Pheretima posthuma. Aqueous* extract also proved to be efficient than the standard drug.

When **Albendazole** use as a standard drug extract of ***Tridex procumbens* (L.)** plant of concentration **(10, 30, 50 mg/ml)** showed **paralysis** at **401, 381, 367 min.** and **death** at **418, 395, 389 min.** Respectively.

From the above result, it is clear that the Methanol, Acetone, Petroleum Ether, and Aqueous extracts of plant *Tridex procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the methanolic extracts of ***T. procumbnens*** plant took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole standard drug**. (Methanl<Acetone<Petrolium ether<Aqueous)**

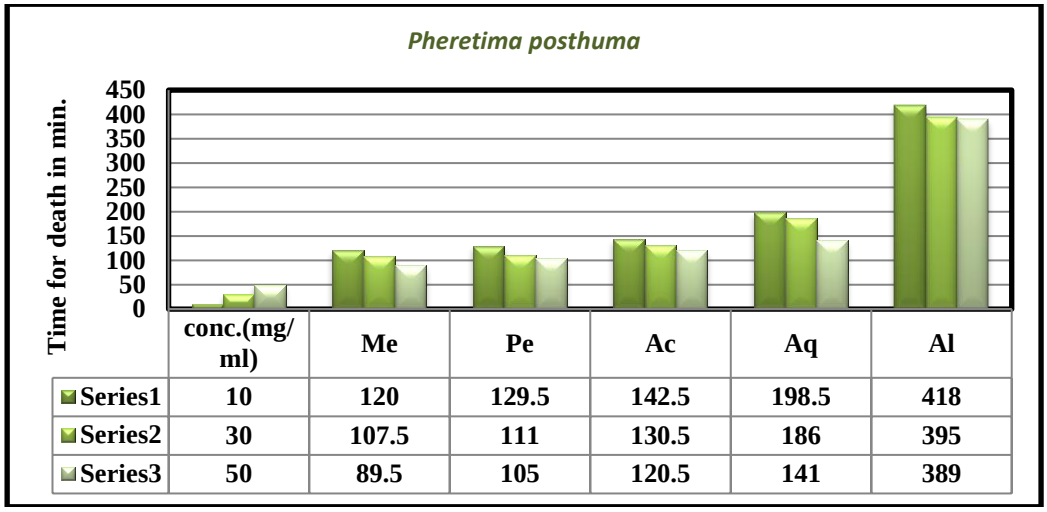
Fig-1. *Pheretima posthuma* showed the time for (Paralysis)



	conc.(mg /ml)	Me	Ac	Pe	Aq	Al
Series1	10	114.5	129.5	164.5	166	401.5
Series2	30	72.5	100	100.5	100.5	381.5
Series3	50	64	81	87	94.5	367

Where, Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

Fig. 2 :*Pheretimaposthuma*showed the time for (Death)



	conc.(mg/ml)	Me	Pe	Ac	Aq	Al
Series1	10	120	129.5	142.5	198.5	418
Series2	30	107.5	111	130.5	186	395
Series3	50	89.5	105	120.5	141	389

Where,Me: Methanol, Ac: Acetone, Pe: Petroleum Ether, Aq: Aqueous, Alb: Albendazole Respectively.

PHYTOCHEMISTRY:

Table -3 Preliminary Phytochemical Screening of *Tridax procumbens* (L.)

Tests	Aq. Extract	Alcoholic Extract
Test for Carbohydrate		
a) Molisch test	+	-
b) Benedict test	+	+
c) Fehlings test	+	+
d) Iodine test	-	-
e) Barfoeds test	+	-
f) Salwinoffs test	-	-
Test for Proteins		
a) Xanthoprotein test	-	-
b) Biuret test	-	-
c) Lead acetate	-	-
d) Millon test	-	-
e) Precipitation test	-	+
Test for Amino acid		
a) Ninhydrin test	-	-
b) Tyrosin test	-	-
c) Cysteine test	-	-
Test for Alkaloids		
a) Dragondroffs test	-	+
b) Modified dragondroffs test	-	+
c) Mayer test		
d) Hagers test	+	+
e) Wagners test	+	+
f) Krauts test	-	+
	-	-
Test for Glycosides(general)		
a) Saponin glycosides	+	+
b) Baljet test	+	-
	+	-
Test for Flavonoids		
a)alkali test	-	-
c) Lead acetate	-	-
d) Shinoda test	+	-
Test for Tannins		
a) Ferric chloride test	-	+
b) Dil. Iodine test	+	-

Test for Fatty oils	-	-

The qualitative phytochemicals analysis aqueous extract of *Tridax procumbens* (L.) showed the presence of carbohydrate, alkaloids, glycosides, flavonoids, tannins and saponins while proteins, amino acids fatty oils are completely absent. In alcoholic extract of carbohydrates, alkaloids, glycosides, and tannins are present and proteins, amino acid, flavonoids and fatty oils are completely absent. **(Table -3).**

From the above result, it is clear that the Methanol, Petroleum Ether, Acetone and Aqueous extracts *Tridax procumbens* (L.) have significant anthelmintic activity in dose dependent manner when compared with standard anthelmintic drug. It reveals that the Methanolic extracts took the less time to cause paralysis and death of the earthworm than that of acetone, petroleum ether, aqueous and albendazole. Standard.Tannis, Glycosides are known to interfere with energy generation in helminth by uncoupling oxidative phosphorylation **(Anthnasiadou *et al.*, 2001). Willam *et al.*, (2014)** reported that plant derived tannin have a definite anthelmintic effect on human intestinal parasite. Thus, these chemicals may responsible for the anthelmintic activity of the plants. Hence, it can be thought about the herbs as alternative source of anthelmintic drugs, further isolation of active constituents responsible for anthelmintic activity is needed, which would be responsible for **'Anthelmintic Activity'** and to possible mechanism of action.

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Plant Diversity of Village Pimpalgaon Chilamkha Tq. Deulgaon Raja Dist. Buldhana (MS)

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Abstract

*We have inherited a rich plant diversity with a high proportion of endemic elements. We are grateful to small, mid-sized or lofty trees who oblige us during their lifetime with oxygen,shade,food,fibre,fruits, timber and medicine. One of the major challenges of our country today is the management of plant specially tree diversity development. In a decades of years a number of very small trees have been planted in our campus. Keeping this in view, we have undertaken documentation of trees of our biodiversity rich village PimpalgaonChilmkha for the first time and we also propose to establish conservation strategies in future for tree(s). The total number of trees recorded in the village PimpalgaonChilmkha, 36 families, 48 genera and 50 species. The family Anonaceae was represented by maximum number of 110 tree genera.The genus Ficushas been represented by maximum number of 06 tree species viz. F. religiosa , F. benghalensis.*F. racemosa*. The medicinally important manyplants like Azadirachtaindica,Eucalyptus citriodora,Aloe vera,Ocimumgratissimumarepresent in village PimpalgaonChilmkha. Polyalthialongifoliais grown as ornamental or avenue tree and is represented by 110 plants followed by Albizzialebbek. As like as many ornamental plants are also present in this village.*

***Key Words**: Systematic Enumeration ,Tree Biodiversity, Village Pimpalgaon Chilmkha Tq.Deulgaon Raja*

Introduction

Ethnobotany deals with the study and evaluation of plant-human relations in all phases and the effect of plant environment on human society. Ethnobotany is considered as a branch of ethnobiology. The term "Ethnobotany" was coined by J. W. Harshberger in 1895 to indicate plants used by the aboriginals: From "ethno"-study of people and "botany" study of the plants. Ethnobotany is the study of how people of a particular culture and region make of use of indigenous plants. Ethnobotanists explore how plants are used for such things as food, shelter, medicine, clothing, hunting, and religious ceremonies. The plants growing in their natural habitat serve as raw material for industries and other local uses. Keeping these facts in view, it was undertaken to prepare an accurate and up to date inventory of trees growing in sprawling Village PimpalgaonChilmkhaTq.Deulgaon Raja is located in Buldhana district and boundryof the Vidarbha, of Maharashtra State. Deulgaon Raja is 80 Km away from district place and 90 Km also from Aurangabad. Deulgaon Raja is located in the northern part of Maharashtra. The 70% of the population is rural. The mainoccupations of these people are dairy, farming and agriculture. The famous salt water Lonar Crater is situated in this district, 90 kms from here. And, The RajmataJijabai's father LakhujiJadhav's native place is located at Sindkhed Raja which is important historical place in district also. The major crop of this district is cotton, jawar and groundnut. Several taxonomists and ethnobotanists continued to survey many areas of Maharashtra, Addition to Maharashtra Flora Vol.I (Singh N.P. &Karthikeyan S. 2000), Flora of Buldhana District (Diwakar P.G. & Sharma B.D. 2000). Saxton and Sedgwick (1918),The ethnobotanical and floristic work, were carried out by Saxton, W. T. and Sedgwick, L. J. (1918). Author also observed plant diversity of nearest college Shri Vyankatesh Arts, Com. & Science College Campus Deulgaon Raja(Mahendra S. Salve &Nilesh P. Kakde, 2017). Earlier the works were carried out ethnobotanical, medicinal and floristic aspects of plants by a good number of workers.The present research report iscarried out in Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana (MS) to explore the diversity of plants.

Objectives of The Study

The main aim of the survey was to collect information about the vegetation of plant species which are used by local people for various purpose and also the species are identified and documented by collecting samples of plant species. Survey were made for collection of plants their identification, followed by Botanical name, Family, Habitat, Uses and Propagation. The campus was visited for the collection of medicinal plants, their digital photographs were also taken. The identification was also done based on literature study (Hooker,1875).

Materials And Methods

The field study was carried out during session 2021-2022 in the Village PimpalgaonChilmkhaTq.Deulgaon Raja Dist. Buldhana(MS). Description of habitat, material and methods as well as the methods of sample collection and identification have been described elsewhere (Bimal et al., 1991).

Table No.1: Plants diversity of Village PimpalgaonChilmkhaTq.Deulgaon Raja

Sr. No.	Tree Name	Family	Marathi Name
1	*Azadirachtaindica*	Meliaceae	Kaduneem
2	*Ficusreligiosa*	Moraceae	Pimpal
3	*Ficusbenghalensis*	Moraceae	Vad
4	*Ficusracemosa*	Moraceae	Umbar
5	*Ricinuscommunis*	Euphorbiaceae	Erand
6	*Emblicaofficinalis*	Euphorbiaceae	Awla
7	*Mangiferaindica*	Anacardiaceae	Aamba
8	*Cassia fistula*	Caesalpiniaceae	Bahawa
9	*Delonixregia*	Caesalpiniaceae	Gul Mohor
10	*Cathranthusroseus*	Caesalpiniaceae	Sadaphuli
11	*Albizzialebbek*	Mimosaceae	Siras
12	*Polyalthialongifolia*	Anonaceae	Ashok
13	*Alstoniascholaris*	Apocynaceae	Saptparni
14	*Neriumindicum*	Apocynaceae	Kanher
15	*Murrayakoenigii*	*Rutaceae*	Kadhipatta
16	*Citrus aurantifolia*	Rutaceae	Limbooni
17	*Hibiscus rosasinensis*	Malvaceae	Jaswand
18	*Bryophyllumpinnatum*	Crassulaceae	Panphuti
19	*Piper betle*	Piperaceae	Nagwel
20	*Ocimumgratissimum*	Lamiaceae	Ran Tulasi
21	*Aloe vera*	Liliaceae	Korphad
22	*Jasminumofficinale*	Oleaceae.	Chameli
23	*Jasminumsambac*	*Oleaceae*	Mogara
24	*Jasminummutiflorum*	Oleaceae	Kunda
25	*Dalbergiasissoo*	Papilionaceae	Shisam
26	*Prunusamygdalus*	Rosaceae	Badam
27	*Terminalia arjuna*	Combretaceae	Arjun
28	*Eucalyptus citriodora*	Myrtaceae	Nilgiri
29	*Zizyphus145ujube*	Rhamnaceae	Bor
30	*Micheliachampaca*	Magnoliaceae	Chafa
31	*American palm*	Arecaceae	Palm tree
32	*Moringaoleifera*	Brassicaceae	Shewaga
33	*Cupressussampervirens*	Cupressaceae	Saru
34	*Opuntiaficus*	Cactaceae	Niwdung
35	*Cereus peruvianus*	Cactaceae	Niwdung
36	*Bamboosa bamboo*	Poaceae	Bamboo
37	*Coccus nucifera*	Palmaceae	Nariyal
38	*Pongamiapinnata*	Fabaceae	Karanj
39	*Clitoriaternatea*	Fabaceae	Gokarn
40	*Abrusprecatorius*	Fabaceae	Gunj
41	*Mimosa pudica*	Fabaceae	Lajalu
42	*Spilanthesacmella*	Asteraceae	Akkalkadha
43	*Embeliaribes*	Primulaceae	Wavding
44	*Bougainvillea glabra*	*Nyctaginaceae*	BoganWel
45	*Dhaturainoxia*	Solanaceae	Dhotara
46	*Solanumtorvum*	Solanaceae	Ranwange
47	*Punicagranatum*	Lythraceae	Dalimb
48	*Musa acuminata*	Musaceae	Keli
49	*Canna indica*	Cannaceae	Kardali
50	*Cissusquadrangularis*	Vitaceae	Kandwel

Results

Floristic studies are important to understand the tree wealth as well as their biology (Panda et al., 2014) and also play an important role in developing the aesthetic values as well as ecosystem services. The present

paper is based on preliminary surveyerand serves as biodiversity data bank for biological and biotechnological applications (Uniyal and Singh, 2014). Further, it provides information related to the plant resources which is necessary for any conservation and management practices. On the basis of field survey of plant diversity in Village PimpalgaonChilmkhaTq.Deulgaon Raja, the preliminary data recorded such as botanical name of tree identified and tree count etc. It is resulted that36 families, 48 genera and 50 species showed their presence in the campus which were collected, identified and listed in Table No. 1. The inventory of tree wealth of the village shall provide the ground work for further studies.

Discussion

The data shows that maximum plant species are family Anonaceae similar result have also reported by Tirkey (2006). From these some are medicinal plant species in Village PimpalgaonChilmkhaTq.Deulgaon Raja. Similarly Ayyanar and Ignacimuthu (2005) also reported medicinal importance of plants. These plant species have Antibacterial, Insecticidal, Antiseptic, Analgestic properties and they are useful in treatment of various skin diseases,allergic reactions and diarrhea treatment. Similarly Thakur et al (1989), Jain, et al (2006), Kala (2009) have also reported antihelmintic, anticancerous, antitumour, antirheumatic, antiasthmatic and antidiarrhoeal activities of various plants .

Acknowledgements

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Phytochemical Screening and Qualitative Analysis of Medicinal Plants *Shorea robusta Gaertn*.

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Abstract

Since ancient time, Medicinal plants have been a major source of therapeutic agents to cure human diseases. Ayurveda, the traditional system of medicine using medicinal plant is highly regarded as the mother of all medical sciences. Herbal medicines are more popular than modern medicine because of their effectiveness, easy availability, low cost and for being comparatively devoid of side effects. Shorea robusta belonging to Dipterocarpaceae family is an important medicinal plant used in various Indian system of medicine. The present study was done for the qualitative analysis for primary metabolites and secondary metabolites of Shorea robusta Gaertn. F.. In this regards the phytochemical analysis of leaves extract of Shorea robusta Gaertn. Fwas done in both extract i.e, alcoholic (both ethanolic and methanolic) as well as aqueous extract. Qualitative phytochemical analysis was performed for the test of primary metabolites include protein and carbohydrate whereas secondary metabolites were phenol and tannins, flavonoids, saponins, glycosides, steroids, phlobatannins, alkaloids and terpenoids with the help of standard protocol. The qualitative phytochemical analysis revealed the presence of maximum numbers of bioactive substances such as protein, carbohydrates, phenol and tannin, saponin, glycosides, steroids, alkaloids and terpenoids in leaves extracts of Shorea robusta Gaertn. F. Therefore, it may be concluded that the medicinal value of these plants was due to the presence of these bioactive substances that has a very significant role to boost immunity and to develop therapeutics which must have a physiological action on human body that has a promising role in the treatment of various diseases. The results suggested that used of this medicinal plant in the present study provide justification for the use of medicinal plants by the local people of Kharsawan in Seraikella-Kharsawan district, Jharkhand (India) to cure many diseases.

Keywords: *Flavonoid, Phytochemical analysis, Primary metabolites, Saponin*

Introduction

Shorea robusta Gaertn.f. is very important non timber forest product. Itcovers approx. 14% of the total forest area of country and is spread across 10 million hac.It plays an important role to in the economicsof Indian states which includes Orissa, Jharkhand and Madhya Pradesh. About 20-30 million people, mostly tribal depend on Sal seeds, leaves and resigns for their livelihood. Sal is a deciduous tree that grows up to 50 m height. Under normal conditions it reaches 18-32 m height, with girth of 1.5–2 m. The bark is dark brown in colour. The average temperature required for the growth of this tree is 22-47^{O}C throughout the year. The tree requires mean annual rainfall around 3000 mm and maximum 6600mm. Sal grows in deep, well-drained, moist, slightly acid, sandy to clayey soils [2].Occurrence of this plant is in tropical Himalaya's region, central India, North-eastern and West Bengal hills upto 1,700m. [3, 4, 5]. Scientific classification of Shorea robusta is

- Kingdom: Plantae
- Division: Tracheophyta
- Class: Magnoliopsida
- Order: Malvales
- Family: Dipterocarpaceae
- Genus: Shorea
- Species: Shorea robust[6, 7]

The ethnomedicinal uses of this plants are for Jwara, Sweta pradara, rakshoghna, atisaara, hiccough, asthma, galaganda, diseases of mouth,diseases of eye, consumption[8, 9, 10, 11, 12 13, 14, 15].

Traditional folk treatment from medicinal plants has always guided researchers to search for novel medications to develop healthy life for humans and animals [16]. In addition, some medicinal plants are still obscured within the plant which need to be scientifically evaluated.Most important phytoconstituent presents in medicinal plants are alkaloids, tannins, flavonoids, terpenoids, saponins and phenolic compounds. These phytoconstituent has therapeutic activity and low toxicity, therefore Pharmacists has been shown their interest [17]. Herbal medicine is on demand due to low toxicity and no side effects in comparison to allopathic medicines [18]. The attention among population increased due to their effectiveness, lesser side effects, increasing cost of modern medicines, cultural acceptability and lack of current medical alternatives [19].

Thus, main purpose of this research work is to analyze the phytochemical screening and quantitative estimation of flavonoid, alkaloids and antioxidant activity of crude Shorea robusta extract.

Materials and Methods

The plant materials were shade dried until all the water molecules evaporated and plants became well dried for grinding. After drying, the plant materials were ground well using mechanical blender into fine powder and transferred into airtight containers with proper labelling for future use.

About 5gm dried powdered plant material was weighed and transferred into each conical flask. 250ml of water methanol and ethanol was added to these conical flasks. After that these conical flasks were heated at 30-40ºC and stirred at 350 rpm for 20 minutes. Aqueous ethanolic and methanolic extract were filtered with Whatman filtered paper. These extracts wereanalysed for the presence of bioactive compounds by using standard protocol [20, 21, 22, 23].

Preparation of plant aqueous extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled water was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of aqueous extract was filtered using Whatman filter paper. This filtered aqueous extract was used for the phytochemical analysis.

Preparation of plant ethanolic extract:

5gm of dried fine powder of plant material was taken in a conical flask and 200ml of distilled ethanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of ethanolic extract was filtered using Whatman filter paper. This filtered ethanol extract was used for the phytochemical analysis.

Preparation of plant methanolic extract:

5gm of dried fine powder plant material was taken in a conical flask and 200ml of methanol was added into it. This mixture was heated on a hot plate at 30º- 40ºC and stirring at 300 rpm for 20 minutes. After that this mixture of methanol extract was filtered using Whatman filter paper. This filtered methanol extract was used for the phytochemical analysis.

Test for proteins

Millon's test

When 2ml of Millon's reagent was added to crude extract, white precipitate appeared which turned red upon gentle heating that confirmed the presence of protein.

Ninhydrin test

When 2ml of 0.2% solution of Ninhydrin was added to crude extract and then boiled, violet colour appeared which indicated the presence of amino acids and proteins.

Test for carbohydrates

Fehling's test

Equal volume of Fehling A and Fehling B reagents were mixed together. 2ml of this reagent was added to 2 ml of crude extract and gently boiled, a brick red precipitate appeared at the bottom of the test tube indicated the presence of reducing sugars.

Benedict's test

When 2ml of Benedict's reagent was added to 2ml of crude extract and boiled, a reddish-brown precipitate formed which indicated the presence of the carbohydrates.

Iodine test

2ml of iodine solution was added to 2 ml of crude extract, a dark blue or purple coloration appeared which indicated the presence of the carbohydrate.

Test for phenols and tannins

2ml of 2% solution of FeCl3 was added to 2 ml of crude extract, a blue-green or black coloration appeared which indicated the presence of phenols and tannins.

Test for flavonoids

Shinoda test

A fragments of magnesium ribbon was added to 2ml crude extracts (aqueous, ethanolic, methanolic) and concentrated HCl was added (drop wise) to the it. After few minutes a pink scarlet colour was appeared which indicated the presence of flavonoids.

Alkaline reagent test

2ml of 2% solution of NaOH was added to 2 ml of crude extract, an intense yellow coloured was formed, on addition of few drops of diluted acid it turned into colourlesswhich indicated the presence of flavonoids.

Test for saponins

5ml of distilled water was added to 2ml of Crude extract was and it was shaken vigorously. The stable foam formed which indicate the presence of saponins.

Test for glycosides

Liebermann's test

2ml of chloroform and 2ml of acetic acid was added to the 2 ml of crude extract. Concentrated H2SO4 was added. A colour change from violet to blue to green indicated the presence of steroidal nucleus, i.e., glycone portion of glycoside.

Salkowski's test

2ml of chloroform was added to 2ml of crude extract. After that 2ml of concentrated H2SO4 was added. A reddish-brown colour was appeared which indicated the presence of steroidal ring, i.e., glycone of the glycoside.

Keller-Kilani test

2ml of glacial acetic acid containing 1-2 drops of 2% solution of FeCl3 was added to 2 ml of crude extract. After that 2ml of concentrated H2SO4 was added to it. A brown ring at the interphase indicated the presence of cardiac glycosides.

Test for steroid

Liebermann's Test

2 ml acetic acid (CH2COOH) was added to 2 ml Crude extract. Then 1 ml of concentrated H2SO4 was added dropwise and then after 1 ml of concentrated H2SO4 was added drop wise. A blue green colour was appeared which indicates the presence of steroids.

Salkowski Test

2 ml of chloroform and concentrated H2SO4 was added to 2ml of Crude extract. A red colour developed at the lower portion of test tube that indicated the presence of steroids.

Liebermann's Bruchard Test

2ml of chloroform was added to 2 ml Crude extract. After that 2ml of concentrated H2SO4 and acetic acid wereadded into this mixture. A greenish colour developedwhich indicated the presence of steroids.

Test for Phlobatannin

2ml of 1% HCl was added to the 2 ml Crude extract (each aqueous, ethanolic, and methanolic) which gave red precipitate on gentle heating that indicate presence of phlobatannin.

Test for alkaloids

2 ml of 1% HCl was added into the 2ml Crude extract (each aqueous, ethanolic, and methanolic) and heated gently. After that Mayer's and Wagner's reagents were added into this mixture. Turbidity of the resulting precipitate was taken as evidence for the presence of alkaloids.

Test for terpenoids

2ml of chloroform was added to 2ml of Crude extract and evaporated to dryness. After that 2ml of concentrated H2SO4 was added and then heated for 2 minutes. A greyish colour was appeared which indicated the presence of terpenoids.

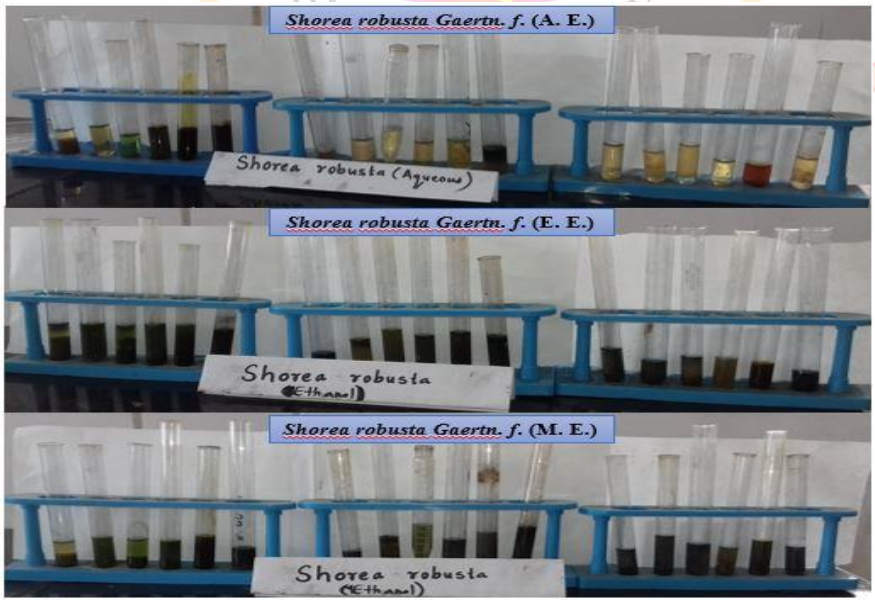

Fig.1: Phytochemical analysis of Shorea robusta Gaertn.f.

Result and Discussion

Table.1: Phytochemical analysis of Shorea robusta Gaertn. in aqueous, ethanolic and methanolic extract

Sl. No.	Phytochemical test	Shorea robusta Gaertn. F.		
		A.E	E.E.	M.E
1	Proteins	+++	+	+++
2	Carbohydrates	++	+	+
3	Phenol & Tannins	++	++	+
4	Flavonoids	++	+	+
5	Saponin	++	_	+
6	Glycosides	++	+	+
7	Steroids	+	+	+
8	Phlobatannins	_	+	+
9	Alkaloids	++	_	+
10	Terpenoids	+	+	+

A.E.=Aqueous extract, E.E.=Ethanolic extract, M.E.= Methanolic extract, (+) = Present,(-) = Absent

Phytochemical analysis of*Shorea robusta Gaertn. F*. (table 1.)revealed that primary metabolites such as proteins and carbohydrates were present in all the extract whereas secondary metabolites i.e. phenol & tannins, flavonoids, saponin glycosides, steroids,phlobatannins, alkaloids and terpenoids were present in all the three extracts except saponin is absent in ethanolic extract, phlobatannin is absent in aqueous and alkaloids is absent in ethanolic extract.

Results obtained by the phytochemical analysis of medicinal plants Shorea robusta Gaertn. F., it could be seen that carbohydrates, phenol & tannins and glycosides were present. Several reports revealed that medicinal plants are rich in phenolic compounds and have antioxidant properties [24, 25]. Phenolic compounds also possess potent antifungal, antiviral and antibacterial activity [26]. It is also mentioned that phytochemical analysis on plants extracts revealed the presence of constituents that are known to exhibit medicinal as well as physiological activities. It was reported that tannins contribute property of astringency i.e., fasten the healing of wounds and inflamed mucous membrane and have received considerable attention in the fields of nutrition.

Conclusions:

Shorea robusta is an important traditionalmedicinal plant used in wide range of medical treatments. Phytochemical analysis revealed that maximum numbers of phytochemicals e.g., flavonoid, tannin, steroid, saponin and many more were found to present in both the plants. Therefore, we can conclude that the medicinal value of these plants due to the presence of these bioactive substances which must have a physiological action on human body. The above findings, traditional uses, pharmacological activities and phytochemistry which provides preliminary information regarding this medicinal plantmight have huge potential for the pharmaceutical industry

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To study the Seasonal Variation of Rhineobothrium Linton from a Marine Fish Trygon Sephen

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Abstract: -

In seasonal variation of the fishes, to collect the different types of fishes in different areasand location. As a medicinal Point of view, fishes ProvidesVit. A, Vit. D and oil, body oil soup from fish, It is use as an Ayurvedic and medicine on color, blindness, Cold and Cough, Asthama &Tuberculasis. In this paper to study the seasonal variation of Rhineobothrium linton from a marine fish Trygon Sephen in Ratnagiri districtat Sangameshwar.
Key words: - Rhineobothrium linton, Marine Fish, TrygonSephen.

Introduction: -

Many fishes are having their high economic value as they provide the highly nutritious & delicious food for human population. These fishes are one of the components of the food cycle in ecology. Parasitology is an evergreen branch for a scientist. Parasitologist have theirpreference of studying helminth. Parasitism is a natural way of life among parasitic diseases are the major public heath Problems leading to mortality in tropical countries, including India. The differed types &several types of parasitism are recognized. Besides these intestinal Parasites there are various types of including Cestodes, Nematodes & Trematodes. Intestinal helminth infections are very common & more than 3500 million cases of helminthiasis exist atpresent either as single as mixed infection all over the world it is observe it.

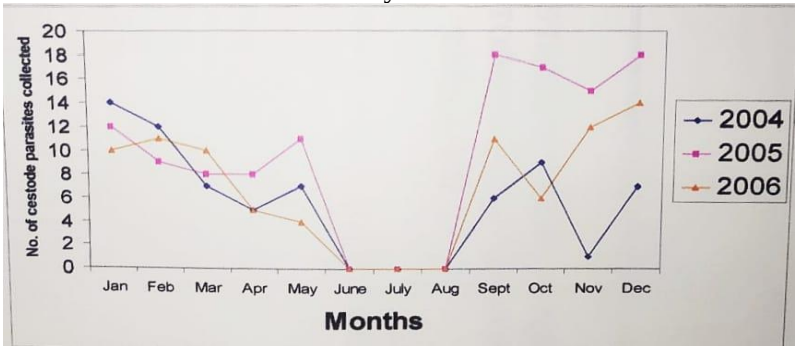
The work on the population dynamics were carried out by many workers on different hosts, Dagiel at (1958), (1964), Susheela (1987) Mittal (1908), Hopkins (1959), Anderson (1976), Pennyuick (1971), Guorder distribution of the Cestodes Parasites. The other workers also studied the effect of climatic factors on the helminthes, include Kennedy (1968-1969), Lawrence (1970), Crofton (1971), Patrick & Esch (1977) have elaborately to studied the effect of seasonal variation. on Parasite of fish.

To study the Seasonal Variation of fishes, it is highly infected to study the different types of cestodes, and the present study include application of statistical method to understand the surveyof seasonal variation is year wise or month wise. Present study includes application ofStatistical method to understand and distribution cestodes parasites both at infra andsupra population levels for each species of Parasites in three annual cycle (January to December)

Material and Methods: -To study the Seasonal Variation in Rhineobothrium linton, thequantitative analysis of helminths and structural grouping was. studied during three annual cycles i.e., January 2004-December 2006 It revealed that the cestode population was potentially dynamic with more or less durability, regularity and cyclic periodicity in the host under investigation. Each annual cycle comprises of three season 1) Rainy seasons (June to September) 2) Winter season (October to January) 3) Summer season (February to May) on the basis of incidence of the infection the influence of annual season. It was observed that the incidence of infection by Helminthes. Parasite increased with host age. The infection level low in young hosts and showed remarkable. infection rises in adults.

To show the above graphical representation in Seasonal Variation of Rhineobothrium linton, 1889. From a marine water fish Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004-2006.

Graph: -Seasonal Variation of Rhineobothrium linton, 1889 From Trygon Sephen (Cuvier, 1871) at Ratnagiri district for the year 2004 – 2006



Conclusion: -

It is concluded that to study the different seasonal variation of the fishes and the. infected host is studying the different types of cestodes.

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A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest

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Abstract:
The Present communication deals with a new species of Diatrypellaarborellasp.nov from Aamdoh forest MelghatDist Amravati. Different varieties of ascomycetes and imperfect fungi were collected by the author. But after detail Morphological and cultural investigation an interesting ascomycetes Diatrypellawasincluded here as new species on new host Careya arborea Roxb.
Keywords:*Diatrypella,Ascomycets,Stroma,Ascus,Ascospores.*

Introduction :

De Notaris established the genus *Diatrypella* with type species *D.vrrucaeformis* (Ehrh.)Nitschke.Clement and Shear,Arx and Muller,included it under spheriales,whereasLutterelle,Martin considered it to be number of the order Xylariales.The first report of this genus was recored in India in 1962.There after Ramchandra Rao,Tilak, and Muthappa have reported a few species.Most of the species of this genus are saprobes in nature(Mehrabi*et al*., 2019). The genus is characterized by conical to truncate, cushion or discoid stromata usually delimited by a black zone in host tissues,umblicate or sulcate ostiolarnecks,cylindrical,polysporales,long stalked,asci and allantoid hyaline yellowish ascospores in their sexual morph and liberatella like coelomycetes asexual morph(Kirket*et al*.,2008,Lakmali*et al*., 2021).The species under study was compared with known species of*Diatrypella*and treated as new species, thedetailed description is given below. The result of molecular study is awaited.

Material and Methods:

The collected specimens were wrapped in butter paper and bagged in envelope. By taking hand sections, semi-permanent microscopic slides were prepared by using cotton blue as stain, sections of the material were studied with the help of relevant keys and literature (Ainsworth *et al*., 1973, Bilgrami*et al*., 1991,Chanen Yang *et al*., 2022, Dennis 1981, Jamaluddin *et al*., 2004, Mehrabi M *etal*., 2019, Pandey 2008, Shang QJ *et al*., 2017). The specimen was deposited in Ajrekar Mycological Herbarium(AMH) Agharkar Research Institute,Pune.AMH No. 9083.(Holotype)

Result and Discussion:

Ditrypellaarborellasp.nov(**Plate1.Fig;1**a,b,c,d,e)(**Fig;**2a,b,c)
(Etym: Host *Careya arborea*Roxb.)

Strom black errunpent, elliptical to cushion shaped,solitory or gregarious,oftencracked,roughened by slightly protruging,ostiolate, measure 413.0-489.6x535.5-1070 µm,perithecia globose to oblong,black,ostiolate measure 214.2-330.6x306-336.6 µm; asci cylindrical to clavate with long,tappering persistent stalk,binucliate,multisporous,measure 66-133x8-11 µm; ascosprealontoid,subhyaline, one celled,irregularlyarranged,nongutullate, measure 1.9-2.2 µm long,paraphysate.

Matrix: On dead stem of *Careya arborea*Roxb. (Fam:Lecythidaceae)) Legit N.S.D atAamdosh,Melghat Dist. Amravati on 31/7/2004 AMH No.9083.(Holotype)

Table-1: Comparison of *Ditrypellaarborella*sp.nov with related species

Species	Perithecia	Asci	Ascospore	References
***D.verrucaeformis* (Ehrh.)Nke (Type species)**	410-530 x 250-400µm	70-100 x 10-15 µm	6-8 x 1.5-2.0 µm	Subhedar(1977)
***D.citricola*El.&EV.**	315-468 µm IN diam.	81.92-126.90 x 9.0-12.83 µm	8.86-14.93 x 1.58-3.49 µm	Chitriv&Wangikar (1980)
***D.leguminacearum* Patil**	250-625 x 250-650 µm	10-20 x 80-150 µm	2.5-3.5 x 6.18 µm	Patil M.S.(1985)
***D. macroasca*M.Niranjan&V.VenkateswaraSarma**	350-520 × 330- 380 µm	115-170 × 18.75-23.75 µm	7.5-15× 2.5 µm	M.Niranjan&V.VenkateswaraSarma(2018)

***D. tectonae*M.Niranjan&V.VenkateswaraSarma**	240-440 x 255-389 ìmdiam	(107-) 120-150 (-173) x (13.5-) 15.5-21.5 (-39.5) ìm (X^{-}= 138 x 19 ìm)	(5-) 7-9 (-12) x (1.5-) 2-2.5 (-3) ìm (X^{-}= 8 x 2.3 ìm)	M.Niranjan&V.VenkateswaraSarma(2018)
***D.lijiangensis*Thiyagaraj&Wanas**	170-460 x 200-300 µm	50-90 x 6-9 µm	6-8 x 1-2 µm	Thiyagaraj&Wanas(2019)
***Diatrypellaarborella*sp.nov**	214.2-330.6x306-336.6 µm	66-133x8-11 µm	1.9-2.2 µm	Understudy

Conclusion:

On comparison with known species vide (Table1) the perithecia are smaller than *D.verrucaeformis, D.citricolaD.leguminacearum, D. tectonae*but larger than *D.lijiangensis.*Asci are larger than*D.verrucaeformis&D.lijiangensis,*the size of ascospores are smaller than the reported species therefore the species understudytreated as new species of *Diatrypellaarborella*sp.Nov

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16. **Illustration:**A New Species of *Diatrypellaarborella*sp.nov. From Melghat Forest :

Plate - 1
Fig - 1

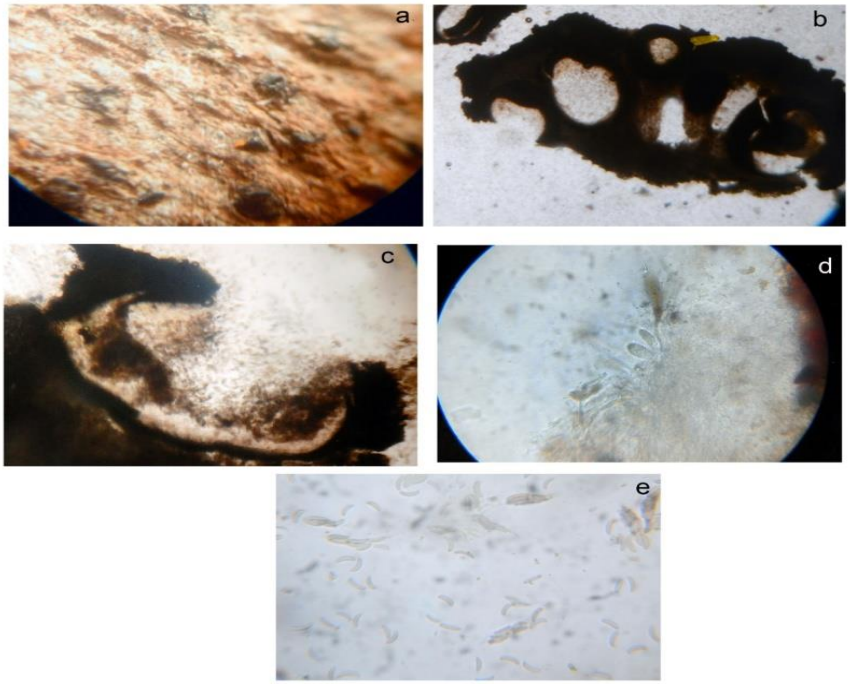

Fig - 2

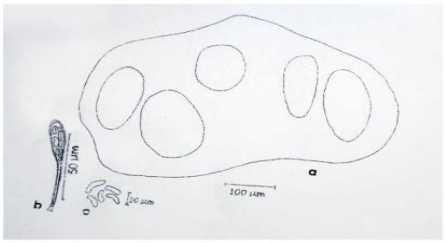

Fig1:(***Ditrypellaarborella*sp.nov)** a) Habit, b) Stroma with perithecium, c) Perithecium, d) Ascus & ascospores, e) Ascospores.

Fig. 2: a) Stroma with perithecium, b) Ascus with ascospore, c) Ascospores

Distribution of Spider Fauna in the Agricultural Fields from Narkhed Region, District Nagpur (Maharashtra State) India

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Abstract:

Narkhed taluka has total area of 64491 Hectors. Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. Wardha river is flowing from western border of taluka. Kar river is flowing from southern border of taluka and Kolar river is flowing from eastern border of taluka. Other river are Jam, Mandakini, Wandali etc.The river Wardha flows in this region and enriches the biodiversity. Spiders are insectivorous predators on earth. They are Feed on insects and consume large number of preys without damaging the crops. Spiders, are the most common ubiquitous animals on land, constitute an essential portion of the predatory arthropods in several ecosystems. Recently in agricultural fields reduced pesticide use and ecological sustainability have lead to increased interest in spiders as potential biological pest control agents. Regularly use of pesticides in agricultural fields which decreases the spider populations. Spiders play an important role in insect pest control without any harm to ecosystem.

This article presents a study on the Diversity, distribution and current status of spider families in Narkhed of Nagpur District. During the present study, The diversity of spiders was studied during July 2021 to January 2022, using insect nets, tapping sticks and pit fall trap etc. During the survey 310 specimens were collected from agricultural field of Narkhed, 108 species were identified belonging to 10 families. Among the specimens collected most of the individuals were adult, the male–female ratio was 1:6. The Family Salticidae and Thomicidae represented 18 species each respectively, Araneidae 30, Oxyopidae and Lycosidae 6, Eracidae 4, Pholcidae 2, Uloboridae 2 species each. The population of spiders was abundant, species richness and diversity was high during the month of October to December. Spiders observed were exclusively carnivorous; mostly feed on insects and other Arthropods, naturally keeping insect population under control.

Keywords: *Spiders, Diversity, Biodiversity, Insects, Agricultural field, Narkhed.*

Intorduction:

Present study was designed to assess the diversity of spiders from Narkhed region, Most of the area of Narkhed taluka are under agricultural land. Some area are hilly and cover with rare forest also. The area extends over 100 sq.km., and lies on Wardha River, Spider species abundance in ecosystem can be high as undisturbed natural ecosystem. Spiders act as pest control creature, which feeds on crop destructive insects. Spiders are beneficial bio-control agent of insect pest in ecosystem **(**Jeyaparvathi S, et al. 2013). Spiders are known to occupying most of the terrestrial habitats. They are generalist predator, which can act against a broader range of insect pests. Spiders are considered to be of economic value to farmers as they play valuable role in pest management by consuming large number of prey in the agriculture fields without any damage to crops. Spiders are among the most abundant insectivorous predators of Terrestrial ecosystem. The current global list of spider fauna is approximately 44,234 belonging to 3928 genera and 110 families (Platnick NI 2019).

Order Araneae is a large group of animals commonly known as spiders, might have been evolved 380 million years ago during Devonian period (Penney and Seldon 2011). The current global list of spider fauna is approximately 42,055 belonging to 3821 genera and 110 families (Platnick, 2011). The spider fauna of India is represented by 1520 spider species belonging to 377 genera and 60 families (Sebastian and Peter 2009). General series on fauna published by Gazetteer of India, Maharashtra state, record a total of 90 species of spiders belonging to 14 families (Tikader and Malhotra 1974). 107 species of spiders belonging to 57 genera under 19 families have been described from Jabalpur district, Madhya Pradesh. (Gajabe, 2004).

Spiders are one of the most diverse groups in the world. Many types of spiders can easily be found even in small area. Salbardi is an untouched area, forest is dry deciduous and having rich bio-diversity. The abundance of spiders in the forest is ecologically important and may be studied for its nature of natural insecticide as well as bioindicator.

Material And Method:

Spider fauna was collected from agricultural field of Narkhed area (every weekend) from vegetation, on crop field, under stones/crevices, near water streams etc. For collection of spiders insects nets, pitfall trap and stroking sticks were used, the specimens were preserved in 70% alcohol, labeled and identified according to Barrrion and Listinger(1995), Davies and Zabka (1989), Gajbe (1987a,b), Tikader (1962,1973, 1982).

Result And Discussion:

The spiders were found abundantly in the agricultural field of Narkhed area. During the study 310 specimens were collected, of which 103 species belonging to 34 genera under 10 families were identified. The

large number of species belong to family Araneidae represented by 30 species in 08 genera, followed by Salticidae 18 species in 06 genera, Erecidae 4 species in 1genus, Gnaphocidae 06 species in 03 genera, Thomosidae 18 species in 06 genera, Tetragnathidae 02 species in 01 genera species, Lycosidae 15 species in 05 genera, Oxyopidae 06 species in 02 genus, and Pholcidae represented 02 species in 01genus and Uloboridae represented 02 species with 01 genera. The population of spiders was abundant, species richness and diversity was high during the month of October to December.

The spiders were found to be living in different types of habitats. The spiders belonging to Families Araneidae, Erecidae, Oxyopidae, Tetragnathidae, and Thomisidae, were mainly found on the vegetation, like shrubs and trees. Spiders living at the bank of rivers and swamp area belong to family Araneidae, Lycocidae, Salticidae, Uloboridae. Most spiders were found living on the ground under the crop field, foliage or in vegetation exhibiting some kind of colorations for camouflage. No exceptionally poisonous spiders were found among the species recorded. The spiders are most abundant and ecologically important, they are exclusively carnivorous and hence help naturally to control insect pest in any ecosystems and can be used as bio-indicator.

There are many environmental factors that affect species diversity (Rosenzweig 1995). Diversity generally increases when a greater variety of habitats types are present (Ried and Miller 1989). Downie et al. (1999) and New (1999) have demonstrated that spiders are extremely sensitive to small changes in the habitat structure; including habitats complexity, litter depth and microclimate characteristics. Documenting spider diversity in this ecosystem can provide important information to justify the conservation of ecosystem.

Sr. No.	Family	Genera	Species
1	ARANEIDAE	08	30
2	ERESIDAE	01	04
3	GNAPHOSIDAE	03	06
4	LYCOSIDAE	05	15
5	OXYOPIDAE	02	06
6	PHOLCIDAE	01	02
7	SALTICIDAE	06	18
8	TETRAGNATHIDAE	01	02
9	THOMISIDAE	06	18
10	ULOBORIDAE	01	02
Total		**34**	**103**

Table No. 1: Checklist of Spider Species from Agro-ecosystems of Narkhed region, District Nagpur. Maharashtra State

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Morpho-Taxonomic Studies of Diversity of Genus *Digitaria* Haller of Family Poaceae of Amravati District, Maharashtra.

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Abstract:-
Amravati is one of the 11 districts of vidarbha. It includes 14 talukas. Flora of Amravati district has been already studied by Dhore (2002) reported 84 species of grasses, during last 16 years no survey was conducted of the area. Survey of grasses conducted during 2014-2018 revealed 117 species belonging to 60 genera. Sporobolus R.Br. is a third largest genus of study area It has 5 species which belong to subfamily panicoideae and tribe paniceae. The aim of our investigation is to study morphotaxonomic revision of family poaceae. It focuses on details of macro and micro morphology of some important grasses.
Key words – Amravati , Flora, Survey, morphology.

Introduction

Grasses are most beautiful group of monocotyledonous plants. They occur on every soil, in all kind of situations and under all climatic conditions. As grasses do not like shade, they are not usually abundant within the forest. But in open places they grow very well and some times whole tracts become grasslands.

Grasses are important for entire ecosystem. Tiger is the king of forest ecosystem. If we want to save tiger, we have to save the grasses because tigers are indirectly dependant on grasses for their food. Robinson writes "Grass is king" it rules and governs the world, without it the earth would be a barren waste.

In the early days when the population was much limited and when limited land was under cultivationmuch of it was covered with plenty of green grasses. So the farmers paid no attention to the grasses. But now population has increased, open land is decreased very much and cattles have increased in number hence farmers have to pay more attentation to grasses. The present destruction of grasses is mainly due to overgrazing, increasing agricultural practices, over use of herbicides, formation of big dams, road widening, clean agricultural practices and trampling by men and cattles. Grazing needs to be inhibited in certain areas and also reduce the use of herbicides. Tender shoots of Bamboo are used as vegetables and also as pickle by locals. The grains of grasses certainly provide a staple food supply for the human beings *Oryza sativa, Triticum aestivum, Zea mays, Avena sativa, Setaria italica, Eleusine coracana, Echinochloa colonum, Sorghum* speciesand rice feeds more human beings than any other plant product. Sugarcane is main source of sugar. A high proportion of the most fertile and productive soil were developed under a vegetative covers of grasses. Root, rhizome and other part of grasses are good soil builders and effective soil stabilizers. Most of the birds and animals depend upon grassland habitat for food, shelter and normal completion of their life cycles Gould (1968).

Despite utmost importance of grasses to human beings, the study on grasses continues to be a neglected subject. This is mainly because of the feeling that it is a difficult group for identification, the leaves and branches of grasses are very much similar, Small floral organs, special terminology and variation in the structure of spikelet and inflorescence. "*Grasses of Burma, Ceylon, India and Pakistan*" studied by Bor (1960) is the main standard reference work on Indian grasses.

Study Area:-

Amravati district is located in the state of Maharashtra-India. It is at $20^0$55' and 20.93 North latitude $77^0$45' and 77.75 East longitudes. It has an average elevation of 343 meters (1125 feet). Total area of the district is 12210 sq. km. Amravati district has tropical wet and dry climate with hot, dry summer from April to June. The annual average rainfall in the district is 852.1 mm and the temperature has recorded between 18^0C to 46^0C (Falling rain Genomics, inc. 2010).

Apart from this, Amravati is one of the largest district of Maharashtra states. It includes fourteen (14) taluka namely Amravati,Achalpur,Warud,Chandurbazar,Dharni, Morshi,Daryapur ,Anjangaon Surji, Chandur Railway, Dhamangaon Railway, Teosa, Nandgaon-Khandeshwar, Bhatkuli, and Chikhaldara . Chikhaldara is the largest talukas of Amravati district and Bhatkuli is the smallest one.

Review of Earlier Work

Though botanical exploration of India has long history, Vidarbha and Marathwada regions remained somewhat neglected. A thorough exploration of Marathwada has been done by Naik and his students for nearly 30 years. Outcome of this work is *"Flora of Marathwada"* by Naik (1998) which a wonderful survey and reference flora.

The monumental work of Bor.(1953) on *"Grasses of Burma,Ceylon, India and Pakistan"*(excluding Bambusiae) published about 50 years ago has changed this scenario and created interest on the study of grasses. This resulted in publication of several books on grasses and the latest addition is *"Flora of Tamil Nadu-Grasses"* by Altaf and Nair (2009) that deals with 447 species (excluding Bamboos).

Patunkar(1980) studied *"Grasses of Marathwada"* region has also published a book "*Grasses of Marathwada*".

Recently, Potdar(2012) has published "*Grasses of Maharashtra*", the book is an outcome of exploration and detailed studies conducted on documents of grass diversity of Maharashtra for last 20 years. During this period 415 species belonging to 125 genera have been described. There are above 10,000-11,000 species belonging to 700 genera in the world (Clayton and Renvoize, 1989 and Watson and Dallwitz, 1992) in India there are more than 1200 species belonging to 268 genera (Karthikeyan *et al*., 1989, and Moulk 1997). Kamble and Pradhan (1988) reported 87 species belonging to 49 genera from Akola district. Acharya (1985) reported 100 species belonging to 57 genera from Wardha district. Deore (2010) reported 65 species of grasses from Washim district. Karthikeyan (1993) reported 81 species from Yavatmal district and Diwakar (2000) reported 60 species from Buldhana district.

Floristic surveys of different area of Maharashtra have been compiled and published by Botanical Survey of India such as *"Flora of Maharashtra state, Monocotyledon"*, Sharma *et al.*, (1996), *"Flora of Maharashtra state, Dicotyledon"*vol. I Singh *et al*., (2000), vol.II Singh *et al*., (2001).

Material and Methods

Plan of Work

1) Study of Habitat

In every season the selected areas were explored systematically. Grass covered sites were targeted for study. Grasses were collected from different habitats like irrigated fields, unirrigated fields, open grasslands, forest, bunds of field, bank of rivers, wastelands, rice fields and rocky places.

2) Sample collection and preservation-

During excursion specimens of grasses were collected and field number is given to each specimen. Field observations were noted down in field diary. After collection the samples are critically studied in laboratory . Then it is dried properly, poisoned by using 2% Mercury Chloride and mounted using conventional methods. For critical cases BSI (Pune) was consulted to match the specimens.

3) Identification-

The identification was confirmed by using floras like flora of British India(Hooker 1872-1897), Flora of Bombay Presidency (Cook 1958), Flora of Marathwada (Naik 1998), Flora of Maharashtra(Almeida,1990), Grasses of Maharashtra (Potdar, Salunkhe and Yadav, 2012) Grasses of Marathawada (Patunkar,1980). Specimens were observed under Sterioscopic binocular microscope.

Artificial keys were provided for genera and species. Population variations are critically studied. Latest nomenclature are given in detail for proper taxonomic level. Each grass specimen description was supported by a note on distribution and herbarium specimen number. Genera and species are arranged alphabetically. Floristic analysis was done to get clear picture of grass biodiversity. Grass species are arranged according to N.L. Bor. All the specimens were deposited in the herbarium of S.S.S.K.R.Innani Mahavidyalaya, Karanja(Lad), Dist-Washim.(M.S.)

4) Observations

Species of *Digitaria* and habitat.

Sr. No.	Specimen No.	Name of Species	Habitat
1	PAM 94	*Digitaria abludens (Roem. & Schult) veldkamp.*	Cultivated fields
2	PAM 25	*Digitaria bicornis (Lam.) Roem & Schult.*	Cultivated fields
3	PAM 97	*Digitaria ciliaris (Retz.) koeler.Descr. Gram.*	Unirrigated fields
4	PAM 84	*Digitaria ischaemum (Schreb.)Muhl.*	Forest
5	PAM 58	*Digitaria stricta Roth.*	Cultivated fields

Key for the species of *DIGITARIA*

1a -	Hairs on the spikelet clavate	2
1b -	Hairs on the spikelet not clavate	4
2a -	Spikelets in triads	*D. ischaemum*
2b -	Spikelets in pairs	3
3a -	Tips of pedicels some what thickened without a rim of hairs	*D. abludens*

3b -	Tips of pedicles cupuliform with a hair of rim	*D. Stricta*
4a -	Spikelets of each pair heteromorphous sessile of spikelets nearly glabrous in front the pedicelled coated with long hairs often. Spreading at maturity	*D. bicornis*
4b -	Spikelets elliptic to elliptic lanceolate spikelets appressed. glabrous when young with spreading white tomentum at maturity	*D. cillaris*

Conclusion:-

Present study is the outcome of exploration tours conducted to document the grass diversity of study area from 2014-2018 and visited different areas of Amravati district in different seasons. During this period over 600 specimens were collected from the study area. During the study 117 species belonging to 60 genera were collected.

Out of 60 genera *Eragrostis* is the largest genus belonging to sub-family pooideae. The 35 species collected from study area were found to be monotypic. In Amravati district pure patches of *Aristada, Ischaemum, Themeda, Andropogon, Heteropogon, Dicanthium, Cynodon and Saccharum* were observed.

Though grasses are herbaceous in nature, but are tough in texture so it is easy to prepare herbarium speciman. Some of the beautiful grasses are *Thelepogon elegans, Mnesithea granularis, Chrysopogon fulvus, Ischaemum rugosum and Dichanthium species.*

Some dominant genera are *Apluda, Aristada, Dicanthium, Cynodon, Dinebra, Eragrostis, Ischaemum, Rottboellia, Heteropogon, Ophiuros, Setaria*.Some grasses have underground rhizomes i.e. *Ischaemum pilosum, Cynodon dactylon, Saccharum spontaneum* whichcan not be eradicated hence the productivity of crops decreases. *Cynodon* is the first class fodder grass present throughout study area. It is palatable and resistant to grazing and trampling because of underground rhizomes. *Dactyloctenium aegyptium* , *Chrysopogon fulvus* are other palatable species of grasses. *Cymbopogon martini*,*Vetiveria zizanioides, Saccharum spontaneum* and *Cynodon dactylon* are the medicinal grasses. Hollow internodes of *Arundo donax* are used formaking pens and musical pipes by locals. The forest areas of Melghat (Chikhaldara and Dharni) are of mixed dry deciduous type with teak as dominant species.

Saccharum spontaneum, Vetiveria zizanioides, Arundo donax present along the sides of rivers and stream which reduce the pressure of flood. The dominant tribes of Melghat are Gond, Korku and Gawali. Gond, and Gawali are the tribal residents of Melghat forest range are the consumers as they feed their livestock mainly by grazing of grasses. Efforts are required to prevent free grazing as once vegetation is lost, it is very difficult to restore.

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Qualitative Phytochemical Screening And Antimicrobial Activity of *Oxalis Corniculata* L.

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Abstract
Medicinal plants have been a valuable source of natural active phytoconstituents that play an important role in treatment of many human ailments. In the present study, Oxalis corniculata L. (stem, leaves, roots and flowers) was evaluated for its phytochemicals and antibacterial potential. The Soxhlet extraction was done by using three different solvents viz. acetone, methanol and water. Qualitative phytochemical analysis showed the presence of various phytoconstituents. The antimicrobial activity was evaluated by disc diffusion method against four bacterial strains (Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli and Staphylococcus aureus) and two fungal strains (Fusarium oxysporum and Fusarium proliferatum). The methanol extracts showed better antimicrobial activity than acetone and aqueous extracts. This may be because of the difference in the presence of various phytoconstituents in them.
Key Words: *Oxalis corniculata, herbal medicine, phytochemical analysis and antimicrobial activity, etc.*

Introduction
Medicinal plants have been useful in the development of new drugs and continue to play a valuable role in the drug discovery process [1]. Herbal medicines have already formed the basis of therapeutic use in developing countries, but recently have also seen an increase in the use of herbal medications in the developed world as well. The biogeographic position of India is unique which makes India rich in all the three levels of biodiversity [2]. Some studies focusing on the investigation of traditional Indian medicinal plants have resulted in the identification of new sources of therapeutic agents [3]. Plants are recognized for their ability to produce a wealth of secondary metabolites and mankind has used many species for centuries to treat a variety of diseases. Many of these natural products have been shown to present interesting biological and pharmacological activities and are used as chemotherapeutic agents or serve as the starting point in the development of modern medicines [4, 5].

In addition, in developing countries, synthetic drugs are not only expensive and inadequate for the treatment of disease, but are also faced with adulteration and side effects. Therefore, there is a need to search new safe infection fighting strategies to control microbial infection. Natural products, either as pure compounds or as standardized plant extracts, provide unlimited opportunities for new drug leads because of the unmatched availability of chemical diversity. There is a continuous and an urgent need to discover new antimicrobial compounds with diverse chemical structures and novel mechanisms of action for new and re-emerging infectious diseases [6]. Therefore, researchers are increasingly turning their attention to folk medicine, looking for new leads to develop better drugs against microbial infections. The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity.

So, the present study deals with the evaluation of phytoconstituents and antimicrobial efficacy of *O. corniculata*.

Materials And Methods
Collection of Plant Materials: Collection will be carried out from garden of Shivramji Moghe College Kelapur (Pandharkawada). Identification will be made with the help of standard floras [5, 6, 9, 12].

Preparation of Powder and Extract: The collected plant materials will be shade dried and mechanically powdered and stored in an airtight container. Various extracts will be prepared according to the methodology [11], will be subjected to our entire studies. The shade dried plants parts will be allowed to pulverization to get coarse powder. The coarse powder material will be subjected to Soxhlet extraction successively with acetone, methanol and aqueous extracts. These extracts will be concentrated to dryness in flash evaporator.

Qualitative Phytochemical Analysis: The study of bioactive component will be made to understand the medicinal values of the plant materials will be screened for bioactive compounds like, proteins, amino acids, carbohydrates, alkaloids, steroids, cardiac glycosides, anthroquinone, glycosides, saponine, flavonoids, terpenoids, quinine and coumarins. The qualitative phytochemicals analysis will be carried out using standard procedure [4, 7, 11].

Antimicrobial Activity: Antimicrobial activity will be carried by using antibiotic sensitivity Agar (Hi-Media) by disc diffusion method [3] against four bacterial (*Enterobacter aerogenes, Pseudomonas aerogenosa, Escherichia coli* and *Staphylococcus aureus*) and two fungal strains (*Fusarium oxysporum* and *Fusarium proliferatum*).

Results And Discussion

Phytochemical study of *Oxalis corniculata* L. showed the presence of carbohydrate, proteins, alkaloid, flavonoids, steroid and saponin. Alkaloid and steroid present in all parts of plant extract except in acetone extract of fruit and methanol extract of leaf respectively. Flavonoid present only in methanol extract of fruit and aqueous extract of leaf. Tannin and Phenolic compound present in all plant extract except acetone extract of fruit (Table-1). For antimicrobial activity, methanol, acetone and aqueous extract of all parts of plant extracts were tested with four bacterial strains - *E. aerogenes, P. aerogenosa, E.coli, S. aureus* and two fungal strains- *F. oxysporum* and *F. proliferatum* (Table-2). Methanol extract shows better antimicrobial activity than acetone and aqueous extract. Methanol extract of stem, leaves, roots and fruits shows a higher zone of inhibition for *S. aureus* than other microbes. This is because of the difference in the presence of phytoconstituents present in them.

Table 1. Qualitative phytochemical analysis of *O. corniculata*

Sr.No.	Phytoconstituents	Test	Plant parts	Acetone extract	Methanol extract	Aqueous extract
1	Carbohydrate	Benedict's Test	St	+	+	-
			Lf	+	+	+
			Rt	+	+	-
			Fl	+	+	-
2	Protein	Million's Test	St	+	+	-
			Lf	-	+	+
			Rt	-	+	+
			Fl	-	+	-
3	Antraquinone glycoside	Borntrager's Test	St	-	+	-
			Lf	+	-	+
			Rt	-	+	-
			Fl	-	-	-
4	Cardiac glycoside	Kellar-Killiani Test	St	+	+	+
			Lf	+	+	+
			Rt	+	+	+
			Fl	+	+	+
5	Coumarins		St	-	-	-
			Lf	+	-	-
			Rt	-	-	-
			Fl	-	-	-
6	Quinone		St	+	+	+
			Lf	+	+	+
			Rt	-	+	+
			Fl	+	+	+
7	Steroids	Salkowski Test	St	-	-	-
			Lf	-	-	+
			Rt	-	-	-
			Fl	+	-	-
8	Alkaloids	Hager's Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	+	+
9	Flavonoids	Lead acetate Test	St	-	+	-
			Lf	-	-	-
			Rt	-	-	-
			Fl	+	+	-
10	Tannins and Phenolic compounds	$FeCl_3$ Solution Test	St	+	+	+
			Lf	+	+	+

			Rt	+	+	+
			Fl	-	+	+
11	Saponin	Foam Test	St	+	+	+
			Lf	+	-	+
			Rt	+	+	+
			Fl	+	-	+

[Note : St - Stem , Lf – Leaf , Rt – Root , Fl – Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Table 2. Antimicrobial activity of *O. corniculata*

Sr.No.	Name of Microorganism	Extract	Diameter of Zone of Inhibition in mm			
			St	Lf	Rt	Fl
1	*Enterobacter aerogenes*	Aq	6	11	12	10
		Ac	12	14	16	15
		Me	14	14	16	15
2	*Pseudomonas aerogenosa*	Aq	6	13	11	17
		Ac	10	17	16	20
		Me	12	18	17	21
3	*Escherichia coli*	Aq	6	6	10	14
		Ac	13	12	15	16
		Me	15	14	16	16
4	*Staphylococcus aureus*	Aq	6	10	13	15
		Ac	15	21	20	20
		Me	16	21	24	22
5	*Fusarium oxysporum*	Aq	11	6	10	11
		Ac	14	14	11	13
		Me	14	15	13	16
6	*Fusarium proliferatum*	Aq	8	6	10	9
		Ac	10	12	14	10
		Me	10	14	15	16

[Note : St - Stem ,Lf – Leaf ,Rt – Root ,Fl– Flower , Aq – Aqueous , Ac – Acetone , Me – Methanol]

Conclusion

The results obtained from the present investigation indicate that, the plant *O. corniculata* rich in alkaloids, flavonoids, steroids and saponin. They are known to show medicinal potential and antimicrobial activity for selected microbes. Thus, the plant under investigation showed their medicinal potential and can be a source of useful drugs. More phytochemical research work is required for isolation, purification and characterization of biologically active compounds. Since the plant *Oxalis corniculata* L. is useful in traditional medicine for the treatment of various ailments; it is need of time to standardize the plant for development of quality control parameters.

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Ethno-Medicinal Uses of Some Selected Medicinal Plants of Pusad Forest Ranges, Maharashtra

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Abstract:
Pusadtalukais enclosed within hilly region with forest vegetation consisting of medicinal and aromatic plants which have traditionally used by local peoples from 100 of years. Traditional indigenous knowledge reveals the immense value of almost all parts of the plant i.e. roots, leaves, fruits, seeds and gum for various medicinal uses. These species has high socioeconomic value providing livelihood to tribal population of the area and has high potential as commercial value.
***Keywords**: Pusad, Ethno-medicnalroperties, Medicinal plants.*

Introduction

Pusadtaluka is situated on the bank of river Pus and in the mountainous hilly region in Yavatmal district of Maharashtra state. Pusad is located at 19°54′N77°35′E19.9°N 77.58°E. It has an average elevation of 315 metres (1033 feet). River Pus flows very near to the town that is why the city was named as Pusad. Climate of Pusad is very high with the temperature going as high as 49 degree Celsius during summers and as low as 5 degree during the time of winters. It receives an average rainfall of about 471mm per year. Pusad is well furnished with hilly region with forest vegetation and separated forest divisionPusad; which is surrounded by hills from almost all the sides and is at little lower elevation than these hills. The name of the city originates from the name of the adjoining river called Pus river.

Plants provide the predominant ingredients of medicines in most medical traditions while the demand for medicinal plants is growing hence, some of them are increasingly being threatened in their natural habitat. Threats can be human-induced such as clearing of habitat, pollution, overharvesting, introduced species, or random natural events such as cyclones, floods, droughts, fire. Traditional methodologies cannot provide the increasing demand of worlds need in medicinal plants and hence there is urgency of development of new technologies to fluffiness of present requirements.

Traditionally from prehistoric times, the use of different parts of medicinal plants was practiced to cure specific ailments evidently due to presence of some bioactive compounds like alkaloids, flavonoids, essential oil, glycosides, tannins, terpenoids, steroids and others. Many of the drugs, currently in use have been isolated from natural sources based on information about curative agent in folklore medicine (Sameera and Mandakini, 2015). About 47000 plant species are found in different parts of India, of them 17,000 flowering plants, 6850 species are endemic to India and 8000 are ethnobotanically important (Wildlife Institute of India, 2007). Singh (1999) reported that out of 250,000 to 300,000 total plants of the world, India harbors' about 45,000 plants. Out of 20,000 medicinal plants of the world, India contributes about 3000-5000 plants. Biodiversity is one of the key components of our basic life support system. The traditional herbal medicines are still practiced in large part of our country in tribal and rural areas. The present attempt is to survey of different regions of Pusad and its surrounding area for medicinal plants and contribution to the knowledge of traditional uses of medicinal plants of this region.

Materials and Methods

For the study of different types of plants author visited different localities of Pusad and adjoining hilly region during all seasons of year. During visits various types of plant were found viz., trees, shrubs, herbs, grasses, ornamentals & medicinal and aromatic plants. For collection of these plants the author was plan to visit different localities at different times. The collected plants at the time of flowering were identified with the help of Botanical flora (Ugemuge, 1986). The medicinal uses of plants and plant parts were recorded from local peoples and the literature.

Observations and Results

S.N.	Botanical Name	Common Name	Family	Category	Locality
1	*Curcuma*aromatica	Ranhalad	Zingiberaceae	Threatened	Isapur
2	*Iphigenia indica*	Ranlasun	Liliaceae	Threatened	Khandala, Dhundi, Isapur,
3	*Gloriosasuperba*	Kal-lawi	Liliaceae	Threatened	Dhundi, Khandala, Belghavhan, Isapur, Katkheda, Harshi
4	*Withaniasomnifera*	Ashwagandha	Solanaceae	Rare	Pusad, Belghavhan, Khandala,

					Katkheda
5	*Vitexnegundo*	Nirgundi	Lamiaceae	Rare	Khandala, Dhundi, Belghavan, Isapur
6	*Amorphophallous* sp.	Dukkarkand	Araceae	Threatened	Khandala
7	*Terminaliaarjuna*	Arjun	Combretaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur, Khandala
8	*Buchananiacochinchinensis*	Charoli	Anacardiaceae	Rare	Belghavhan, Isapur, Khandala, Dhundi,
9	*Asparagus racemosus*	Shatawari	Liliaceae	Rare	Khandala, Dhundi, Belghavhan, Harshi, Isapur,
10	*Buteamonosperma*	Palas	Fabaceae	Rare	Khandala, Dhundi, Harshi,
11	*Bombaxceiba*	Katesawari	Malvaceae	Rare	Khandala, Dhundi, Harshi,Isapur
12	*Madhucaindica*	Moh	Sapotaceae	Rare	Khandala, Dhundi, Harshi,Isapur

Medicinal uses

1) *Curcuma aromatic*: It is used traditionally for eliminating blood stasis, delaying the ageing process, pain relief, liver disease, tonic, skin ailments, antidote for snake bite, wound healing, dysentery, indigestion, cosmetics, skincare, anticancer.
2) *Iphigenia indica*:The plant body is useful in damaged breast cancer, against different tumours, gout, skin infections, scrofula, snake bite, rheumatism, as a laxative; used against different types of cancers namely, thyroid, skin, cervix etc.
3) *Gloriosasuperba*: All the plant parts are useful as an abortifacient, tonic, in the treatment of ulcers, leprosy, piles, abdominal pains, itching, and indigestion.
4) *Withaniasomnifera*: In traditional medicine, the consumption of the roots improves cardiovascular health, reduces swelling and stress, strengthens heart muscles, regulates cholesterol, and reduces hair loss in the human body, bronchitis and malaria.
5) *Vitexnegundo*: The plants root, bark, leaves, fruits are useful as antiseptic, bronchitis, asthma, tonic anti-rheumatic, diuretic, wound , ulcers, muscle relaxant, cardiac disorder,
6) *Amorphophallous*sp.: The plant is useful in gastrointestinal diseases viz. haemorrhoids, vomiting, abdominal pain, liver tonics, digestive, bronchitis, asthma, cough and anaemia.
7) *Terminaliaarjuna*: The bark and fruits are used traditionally as cardio-tonic, tonic in fracture, ulcers, spermatorrhoea, diabetes, cough, tumour, asthma, skin disorder, provide energy to heart muscle.
8) *Buchananiacochinchinensis*: All parts of plant body use in the treatment of various disorders diarrhea, inter costal pains, relive itching, blood disorder, fever, ulcers, dysentery, asthma, snakebite.
9) *Asparagus racemosus*: This plant is recommended in Ayurvedic tests for prevention and treatment of gastric ulcers, inflammation, nervous disorder, liver diseases dyspepsia and as a galactogogue.
10) *Buteamonosperma*: Flowers are astringent to bowel, in cure "Kapha", leprosy, strangury, gout, skin diseases, thirst; flower juice is useful in eye diseases. Flower is bitter, aphrodisiac, expectorant, tonic, diuretic, and good in biliousness, inflammation and gonorrhoea.
11) *Bombaxceiba*: The plant has been used extensively for treatment of some diseases like anti-inflammatory, anti-HIV, hepato-protective, hypotensive, antiangiogenic, antioxidant activities
12. *Madhucaindica*: It is used as Anti diabetic, antiulcer, antiulcers, antipyretic, antifertility, analgesic, antioxidant, swelling, inflammation, piles, wound healing, dermatological, laxative, tonic, antiburn, headache and many more problems.

Conclusion

The plants collected and reported from Pusad, District Yavatmal in the present study are used by the local peoples and tribal in their routine treatment practices. All the traditional drugs obtained from different medicinal plants studied in present attempt are very effective, cheap and available around agricultural fields and in wastelands. So the tribals are using these plants as alternative to allopathic medicines. Further research on these plants on scientific lines may help in developing effective drugs for human health care.

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Ethno- Veterinary Plants Used in Animal Health Care Practices by Livestock Owners From Katepurna Region Dist- Akola (M.S.) India

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Abstract
Livestock economy forms a major part of our agriculture economics. Tribals in far flung rural areas are still depending upon plant and household remedies for curing various veterinary ailments. The folk knowledge of ethno-veterinary significance has been identified by tribals through a process of experience over hundreds of year. The present study throws a light on herbal remedies used in animal health care of Katepurna region district Akola, Maharashtra, India. The paper deals with 15 diseases of domestic animals and their treatments by 50 plant species found in close vicinity of the rural peoples of the study area.
Key Words: Domestic animals, herbal medicines, animal healthcare and Katepurna region.

Introduction
In India enough attention has not been given to the traditional veterinary herbal remedies (Boddings, 1927; Bandyopadhyay *et. al*., 2005 and Prajapati & Kumar, 2005). The use of plant and animal parts for medicines long been in existence and documented in records kept in ancient China, India and Egypt. These ancient indigenous practices were discovered by a series of trial and error which then could not be substantiated by proven scientific theories. However, these practices have produce result of proven efficacies compared to conventional modern medicines (Chopra *et. al*., 1956 and Prajapati *et. al*., 2003).

In recent times, herbal medicines have become indispensable and are forming an integral part of the primary health care system of many nations. There has been rich tradition and indigenous knowledge about animal healthcare in India (Raja Reddy, 1987; Sharma, 1993 and Bhattacharjee, 2001). Modern healthcare in the tribal and rural areas of Katepurna region is characterized by the deficiency of infrastructure, of qualities personal and of medicine. So, the present study was undertaken in rural as well as in forest areas of Katepurna in Akola district.

Methodology
The traditional knowledge of plant base remedies for the treatment of ailments rests with the medicine man, all of which belong to one family of hereditary indigenous practitioners. Skill and experiences are passed on from one generation to the next by word of mouth and guarded like secrets. In view of secretiveness of traditional men and women, it was decided to interview a number of elderly people, who have a great deal of practical knowledge about the plants and animal products used as medicine in the native system. Before actually launching into the field work, rapport was established with tribals of the locality. Experienced people, such as some elders, professional healers, medicine men can provide important information on useful medicinal plants.

To determine the authenticity of information collected during field work, repeated verification of data from different people and at different times was done. The collected plants were identified up to species level with the help of flora (Kamble & Pradhan, 1988; Karthikeyan & Kumar, 1993; Naik, 1998; Singh & Karthikeyan, 2000 and Singh *et. al.*, 2001). The information presented includes the name of ailment, plant parts, animal product or chemical used, their scientific names and mode of usage. The data are presented alphabetically disease and disorder wise.

Observations
In all 50 plant species are used by the natives in the treatment of domestic animals.

1] Anorexia: 50 gm tuber powder of *Corallocarpus epigaeus* Rottl.et Willed. mixed in 250 ml wine is given in anorexia for Loss of appetite.

2] Bloat: Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification. Tuber of *Discorea bulbifera* L. rubbed in cow urine and paste is applied over bloat. Inflorescence of *Mangifera indica* L. crushed in cow urine and the paste applied thrice a day on bloat. Tuber paste of *Corallocarpus epigaeus* Rottl.et. willd. Clarke made in cow urine administered over bloat.

3] Blood purification: Agents believed to remove impurities or deficiencies from blood. Leaves of *Ocimum basilicum* L. crushed with sugar and the decoction in water is given for blood purification.

4] Bone fracture: The stem branches of *Viscum articulatum* Burm. f. given orally or mixed with fodder. Warm leaves of *Soymida febrifuga* (Roxb.) A.Juss applied on fracture part. Poweder of leaves of *Blepharis repens* (Vahl) Roth. mixed with whey or pulses of black gram given for healing bones. Stem bark paste of *Terminalia arjuna* (Roxb.ex DC.) Wight & Arn. applied over bone fracture . Root powder of *Bauhinia racemosa* Lamk. with butter and rice given to animals to join the bones. Leaves of *Capparis zeylanica* L. crushed within castor oil, mixed with bulk of egg and sieve white soil. Paste prepared is plastered around fracture bone bandage with the help of hairs, cloth strips and wooden splints made of lightwood.

5] Cough, Cold and pneumonia: This disease makes the animal to cough continuously due to climate change or by grazing newly raised grasses on the ground. Warm vapour of *Eucalyptus globus* given to the animal in cough and cold.

6] Constipation: Constipation is a condition of bowels when defecation of faeces is irregular or difficult. *Abrus precatorious* L. seeds powder are used orally along with water. Crushed seeds of *Jatropha curcas* L. after removing epicarp are given to animals for same.

7] Dysentery: A disease caused by bacteria or protozoa, causing inflammation of mucus membrane and glands of large intestine, resulting in painful dysentery. The stool often accompanied by mucus or blood. Decoction of leaves of *Eucalyptus globules* Labill mixed with water and by adding by camphor given to animals. Decoction of leaves *Embelia ribes* N. Burm mixed with boiled fruit in water given to animals in dysentery. Dried fruits of *Cucumis melo* L. var. crushed and mixed with wheat for three days in morning given to cattel. Decoction of leaves of *Dolichondrone falcata* (Wall. Ex DC) Seem. after sieving through piece of cloth mixed with butter and given to animals. Decoction of pods of *Cassia fistula* L. mixed with water given to animals. Crushed leaves of *Cardiospermum halicacabum* L. mixed with butter milk given to animals against dysentery. Fruits of *Aegle marmelos* (L.) fed to animals to cure. Fruit powder of *Careva arborea* Roxb., *Sappindus emarginatus* Vahl mixed with *Curcuma longa* L. and decoction is prepared in ghee and 1 lit. decoctions given to cure dysentery.

8] Diarrhoea: A common symptom of gastro- intenstinal diseases resulting infrequent discharge of watery stool. Bark of *Ixora arborea* Roxb. Ex Smith soaked with pulses of *Phaseolus mungo* L. overnight in water then next day mixture is crushed together and mixed with 1 litre whey and given twice a day to cure body diarrhoea. The decoction of leaves of *Barleria prionitis* L. mixed in water is given to animals. Leaves and flowers of *Madhuca indica* J. The decoctionis given to cure body diarrhoea. Crushed leaves of *Cayratia auriculata* (Wall. Ex Wight & Arn.) Gamblle mixed with one liter butter milk and sieving through a piece of cloth is given to animals. The decoction of leaves and young pods of *Acacia nilotica* (L.) Willd. Ex Del. is given to animals against diarrhoea.

9] Eye diseases: Seed paste of *Balanites aegyptiaca* (L.) Del. Applied to eyes to cure corneal opacity. Seed paste mixed with juice of *Citrus limon* L. and *Curcuma aromatic* Salisb. Applied to cure injury of eyes. Fruit paste made in cow urine applied to cure redness of eyes. Latex from leaves of *Ficus benghalensis* L. applied in eyes to cure corneal opacity and watering of eyes. Fruits of *Semecarpus anacardium* L. f. crushed in cotton and soaked cotton is moved in eyes two to four times to cure redness in eyes.

10] External parasites: The leaf juice of *Ailanthus excels* Roxb. is used to kill external parasites like lice and ticks.

11] Fever: Body temperature increases, which can be judge b the touching the animals ear. Decoction of roots or leaves of *Trianthema portulacastrum* L. given to cure fever after worm infection. Decoction of crushed roots of *Marsdenia tenacissima* (Roxb.) Moon. given to cure fever. Bark of *Butea monosperma* (Lamk.) Taub. crushed in cow milk, mixed in cow milk , mixed in water and given to cure fever of bullocks. Leaves and flowers of *Madhuca indica* J.F. Gmel and *Tamarindus indica* L. crushed together and decoction is given to cure fever of Goat.

12] Maggoted wounds: Root powder of *Gloriosa superba* L. is dusted on maggoted wounds to kill worms. Leaf decoction of *Alianthus excels* Roxb. is applied on the wound to remove maggot. Decoction of leaves of *Datura metel* L. used to cure maggot wounds. Decoction of leaves of *Cleome viscosa* L. applied on sores for killing maggots. Decoction of leaves of *Clerodendrum multiflorum* (Burm. f.) O. Ktze. droped on worm infested wounds and crushed leaves are also applied to kill worms.

13] Hebicide poisoning: Roots of *Baliospermum montanum* (Willd.) Muell. – Arg. Are crushed and put under canine tooth in herbicide poisoning. Whole plant of *Cuscuta reflexa* Roxb. Crushed and mixed with 250 gm butter is given orally in herbicide poisoning.

14] Itch: Sense of irritation on skin. Inner bark of *Acacia nilotica* (L.) Willd. Ex. Del. *Emblica officinallis* Gaertn. *Ziziphus nummularia* Burm. f. and leaves of *Feronia elephantum* Corr. Boiled together . The

decoction is sieved through a piece of cloth, one spoon of pepper powder mixed with two spoon hot butter is added into above decoction and one bottle is given twice a day in itching.

15] Repeat breeder: Crushed fruits of *Thespesia populnea* (L.) Soland. Ex Corr. Boiled, mixed with half litter water and given orally for three days in repeat breeder or anestrus.

Discussion

The present study included extensive survey and research work regarding the use of herbal medicine in the Akola district. As observed in most of the cattle owners and common peoples, first choice of treating their animals is traditional herbals remedies. On field tests, it is revealed that the above common ailments were cured fully in all the cases excepting the few negligible. There were no side effects. Further, the costs of all these herbal remedies were negligible in comparison to modern veterinary medicines as prescribe by the veterinarians. As majority of the inhabitant of the Katepurna region solely depends on agriculture and animal husbandry sectors, their poor economic condition does not permit them to meet the cost of allopathic medicines. Hence, they strongly believe and rely upon their traditional herbal medicines.

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Impact of Laser Irradiation on Germination of Seeds

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Abstract

Majority of the population of India has agriculture as the source of their livelihood and it cannot be underestimated. The increasing population and globalization effects demands increase in quality as well as quantity of food along with its variety. Along with that food safety and security is essential factor to be consider. Since decades, novel techniques and technologies are employed to fulfill these demands. Laser technologies have been proved trustworthy in field of agronomy. This article represents the review on impact of laser irradiation on germination of seeds. It includes Laser applications namely impact of coherent laser irradiation on germination of seeds, effect of laser on fresh and dry weight, irradiation effects at different wavelengths on phenology and yield components of pretreated seeds. Herein the review of above mentioned applications of Laser technology in agriculture, its advantages, challenges and possible future work as well as impact of Laser irradiation on germination of seeds is included.

Keywords: *Laser, agriculture, coherent, irradiation.*

Introduction

Agriculture is the means of livelihood of majority of population of India. Even in twenty first century the agriculture field is facing challenges like water shortage, lack of use of technology, energy resources constraints, less availability of land under cultivation. The increasing world population demands increase in availability of foodgrains. Some innovative methods and smart use of available technology should be the wise way to overcome these issue. Along with that food safety and security is the major factor to be consider. Overuse of fertilizers, pesticides, fungicides makes the land infertile. Moreover, many climate changing activities making hazardous effect on environment. Thus there is need of use of novel techniques to fulfill the demands. Sustainable agriculture is a management system for renewable natural resource for food production income and livelihood for present and future generations, maintaining and improving in comic productivity and the ecosystem. (10)

Laser means Light amplification by stimulated emission of radiation. It is an optical device that can generate monochromatic and highly coherent light. (1). The laser discovery in the past century has been of great impact and applied in the society from its conception until today. Among its applications, its use in agriculture as a biostimulator device. The laser light of low intensity produces bio stimulation when used on seeds, seedlings and plants. (9)

Impact of coherent Laser irradiation on germination of seeds

Laser technology is mainly used for pre-sown seed exposure in order to achieve better and faster germination in various, often unfavorable, habitat conditions.Experiments were done on Soybean seeds which includes exposure of seeds to Laser light of different intensities in combination with bacterial vaccine dose. The samples were exposed to two types of laser, a Helium-Neon laser comprised of red light with a wavelength of 632.8 nm and irradiation density of 2 W m^{-2}, and an Argon laser with a blue light, a wavelength of 514 nm and irradiation density of 5W m^{-2}. After performing experiments, the morphological analysis, Isolation and identification of fungi colonized seeds and statistical analysis of the experimental soybean seeds were done. For 21 days the seeds were kept in chamber and effects on germination were observed. It was found that of all the examined cases, seeds germinated best after being photo stimulatedwith a red or blue laser. The highest number of germinating seeds was found in the case of irradiation of the seeds plus vaccine. This is an effective technique in protecting germinating soybeans and the roots of older plants against infestation by soil-borne pathogenic fungi(3)It is observed that the absorbed energy from laser light increased activities of biochemical and physiological process of seeds by the transformation of light energy into chemical energy(9)

Irradiation effects at different wavelengths on phenology and yield components of pretreated seeds

The aim of the study was to determine effects of different dose and different wavelengths on irradiation . The maize was chosen as experimental material. Three types of laser were used: He–Ne (red), Nd:YAG second harmonic generation (green), and diode (blue), generated at 632.8, 532, and 410 nm, respectively. It was found that with different exposure time and power density of the laser the maize plant showed remarkable effects. The irradiation of the sowing material hada positive influence on the seed yield of maize. (4).

Effect of laser on fresh and dry weight, root length, hypocotyl length

In the simple optical experiments of pretreating mug beans with laser of wavelength 632.8 and 488nm shows improvement in root length, hypocotyl length by 28% and 22% respectively (5). Researcher has exposed seeds of pea to helium neon rays for 10 min. gave the highest values of plant dry weight compared to untreated plants and other period (2 and5 min). (6)

Laser treatment for resistance to fungal and bacterial infection

Experiment were performed on wheat. As wheat is the major part of our daily food Development of new alternative therapeutic approach is necessary to curtail fungi infection. This invitro study demonstrated that pre sowing exposure to SHG Nd-YAG laser in wet and dry condition was able to sterilize wheat seeds, improve its growth and development, and may be a good candidate for novel treatment of fungal infected wheat seeds. (8). the irradiation of seeds with 660 nm laser light seems to induce resistance against diseases caused by microorganisms in seedlings (7), which could be an interesting and sustainable area of research. Furthermore, irradiatingseeds with red laser light seems to improve the nutritional value of seedlingsthrough the accumulation of vitamins, minerals, pigments and antioxidants, and isalso capable of boosting both the antioxidant capacity and anti-inflammatory activities(2)

Future Scope and limitations

Herein this review paper presented the impact of irradiation of deed germination of seeds. It is effective for enhancing the agricultural production. The above mentioned study shows the effect of pretreatment to seeds by laser with coherent sources, with sources of different wavelength as well as the use of laser for proper maintenance of water and fertilizers in field. But there are few limitations also. Laser induced changes are positive as well as negative. Bio stimulation by lasers may cause negative effects as well. Thus further study and investigation is needed in this field. This may offer us new horizons to explore and will prove worthy in fulfilling the demand of sustainable growth.

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ORB Weaver Spiders Fauna of Sugarcane Agroecosystems of Mahagaon Taluka Maharashtra, India

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Abstract: -

Spiders play a significant role in ambiguous insect pests in agricultural ecosystem. Modern trends in farming towards condensed pesticide use and natural sustainability lead to enlarged importance in spiders as potential biological control agents.

The association of a powerful involvement among species richness and an exchange the catalog is a serious issue in conservation biology. Such a association could gives the foundation for the association of commercial and easy-to-monitor methods intended for measuring biodiversity, given that an another prioritization of sites for conservation. Together family and genus richness are studied for their capability to calculate the number of spider species self-sufficient of diversity. Genus only is found to be trustworthy sign for ranking sites according to species richness. This study recommends accomplishment of higher taxonomic level as a hopeful loom for calculation of spider species richness or estimation and standing of areas according to conservation significance. This paper is an attempt to understand the diversity and assemblage of spider's fauna from Sugarcane argoecosystem of Mahagaon taluka of Yavatmal district. Out of 154 spider population Total 17 species were observed from 7 genera from Aranidae family.

Keywords:- Agroecosystems, Aranidae Integrated Pest Management ,Spiders, Sugarcane.

I. Introduction:-

ORB Web Spiders is the biggest family amongst spider's world. All species from this family spins web the particular structure of the web is useful for identification of species. Spiders from this family having flat cephalothorax; thoracic region is oval, or almost spherical, divided from head by tilted depression. Eyes are not different in size. Legs are covered with lots of hairy spines, with three tarsal claws. The legs are also varies greatly in length. When spider is in resting stage legs are likely to be drawn up tightly against carapace, which may be completely hidden. In this family male is much smaller and very differ from female and has large, rounded tarsal bulb on the end of each palp. Sternum is triangular or may be heart shaped and coxa IV is being next to it.

The biodiversity of invertebrate species on agricultural land is very important in terms of pest control and conservation. Spiders are principal predator found in Arthropods communities (Gertssch, 1979).

Spiders are significant but in general disappointingly studied arthropods due to unawareness, lack of knowledge, fear and general dislike towards them. The broadly spread concept that spiders are toxic and dangerous, may be the one of reason to stay away from them. All spiders are not venomous only a small number of species such as Black Widow spider, Recluse spider or Red Back spiders bite is harmful for human beings, and sometime they may cause allergic reactions. Venom produced by spiders is poisonous to their common pray like insects, mites and other small Arthropods; venom is inserted to pray through the fangs to immobilize them. Spiders only use their venom to immobilize their prey and hence they act as natural pest controller, so the study of diversity and variety of spiders in agro ecosystem is useful for determination of the benefits of agricultural practices for conservation of spiders, important for pest control (Eyre *et al.*, 1989). Spiders are wide spread in agro ecosystems making up to 20-80% of predatory fauna (Legotay, 1980; Zhang, 1992). To control effects of pests various pesticides are regularly been used by farmers, but these pesticides are having various adverse effects on non target fauna, sometimes these pesticides are harmful to human beings also, therefore more emphasis should be given on bio-pesticides, spiders plays major role in controlling population of insect pests.

II. Material & Method

A. Study Area:-

The area selected for collection of orb weaver's spiders is Sugarcane agroecosystems of Mahagaon Taluka of Yavatmal District (Maharashtra state). Mahagaon and nearby areas habitually depend on agriculture as the main resource of income. The land in the region is very well irrigated because of Pus dam, Veni Dam, Senad Dam, Pimpalgaon Dam And Mudana dam which provide multipurpose benefits of irrigation, drinking water supply, flood control and hydropower generation.. Pus River also provides direct irrigation water to farms. Drinking water is also sourced from this canal. The catchment area is hilly and forested in its upper niches from its source and the lower niches are flat wide valleys. (Rivers, Government of India 2010). Main

crops include Sugarcane, Cotton, Soybean, Bengal gram, Jawar, and Wheat.sugar cane is an irrigated crop, it *can* be *cultivated* on almost all types of soils provided sufficient organic matter is applied under rained conditions.

Mahagaon taluka of Yavatmal district, (Maharashtra) is located at the latitude of 19.7877244, and the longitude is 77.772378**. Mahagaon , Maharashtra, India** is located at *India* country in the *Cities* place category with the GPS coordinates of 20.7277° N and 80.0591° E. **Mahagaon , Maharashtra, India** 398 meters. Above Sea level, that is equal to 1,167 feet. Mahagaon taluka has an extreme variation in temperature with hot summer and cold winter. The rainfall comes from South Western called monsoon mainly in the month of June, July, August and September. The annual average rainfall in the Morshi is 738.40mm and temperature recorded between 17^0C to 45^0C.

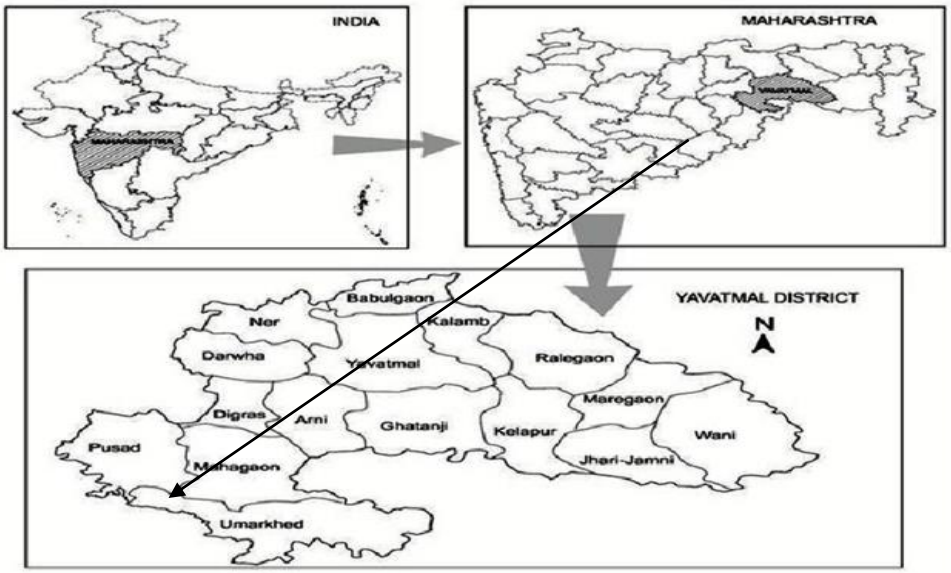

Fig: - Study Area

B. Method

a) Study Period

The investigation was carried out for a period of six months from September 2020 to February 2021. Sampling was conducted in six months at the randomly selected sugarcane field.

b) Sampling

Sampling was done every Saturday - Sunday from quadrates. Spiders were collected only for photographic purpose and released immediately in their natural habitats. Quadrates (1sq. m × 1sq m) placed at four corners and one centre of 10 sq. m × 10 sq. m region by visual search process between 8.00 Am to 12 PM 4 hours in morning and 4 to 6 PM 2 hours in Evening. An adequate interior part was left to avoid boundary possessions. All 1 quadrates were searched. Spiders were collected from the ground stratum and from the terminals of crops. Total 15 Villages were visited consistently for study of spiders.

c) Identification:

Identification of spiders is done with the help of keys available. The specimens were observed for their preserved or photographed. For identification keys of Tikader (1963), Gajabe (2005), Z.S.I. and other literature.

The family wise identification was mainly done with the help of eye position as well as other morphological characters.

III. Result & Discussion:-

Aranidae was the most dominant family in both the study areas as they are very good predators on web. They control the insect and other harmful arthropods which get entangled in the webs. Aranidae shows great predation towards *Leptocorisa acuta* (bugs), and White grubs than the other spider species. Various other observations suggested that spider distribution and re-colonization in fields are important aspects of spider population dynamics in agro ecosystems. (Bishop, L.and S.E. Riechert, 1990). Genus Araneus was dominant during winter followed by Cyclosa these two genera were represents 37% species richness from Aranidae family during 2020-21 but in 2022 the number reduced up to 26% from Sugarcane argoecosystem as the result of pesticide, burning of raw residues of sugarcane and human encroachment in study area.

Family	Species in Sugarcane agroecosystems	Population	Region	Meta- Region
1. ARANEIDAE	*Araneus mitificus* (Female)	9	Site 4	Sawana
	Araneus pahalgaonensis (Female)	11	Site 4	Kalgaon
	Araneus sp.(Female)	10	Site 2	Veni
	Araneus sp.(Male)	12	Site 4	Sawana
	Argiope sp. (Male)	8	Site 1	Pedhi
	Argiope aemula (Male) and (Female)	9	Site 2	Sawna
	Argiope anasuja (Thorell) (Female)	5	Site 3	Mahagaon
	Chorizopes calciope (Female)	6	Site 3	Malkinhi
	Cyclosa hexatuberulata (Female)	7	Site 1	Leva
	Neoscona nautica (Female)	10	Site 2	Tembhi kali
	Neoscona theis (Female)	16	Site 2	Gunj
	Neoscona mukharjee (Female)	11	Site 3	Bhosa
	Neoscona sp. (Male)	14	Site 4	Bori Ijara
	Telacantha brevispina (Female)	12	Site 1	Amni
	Telacantha sp.(Female)	5	Site 2	Amboda
	Zygeilla sp. (Female)	5	Site 4	Kalgaon
	Zygeilla sp.(Male)	4	Site 4	Veni

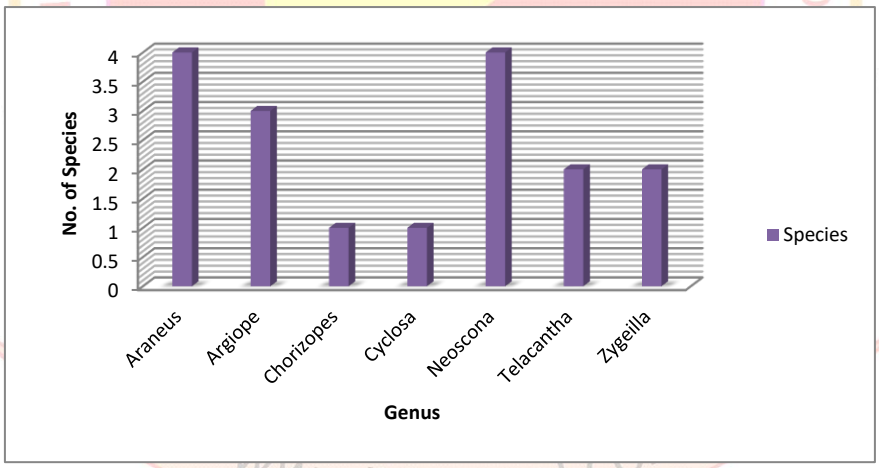

Chart No of Species against Genus of Aranidae Family.

Statistical Analysis:-

Total number of Organisms:-	**154**	Total number of Species	**17**
Average population size: -	**9.059**	Decimal Accuracy: -	4
Number of Regions	**15**	Region sets	6

Alpha Biodiversity [α]

Simpson Index $\frac{\sum_i n_i(n_i-1)}{N(N-1)}$ 0.06069 Simpson Index Approximation $\frac{\sum_i n_i^2}{N^2}$ 0.06679

Beta Biodiversity [β] Comparing two sample areas

Absolute beta Value ($(S_0$-c)-(S_1-c)…): **208** Whittaker's Index (S/alpha): **15**

Sorensen's similarity index: **0** Alternate Whittaker's Index (S/alpha-1):**14**

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Ethnomedicinal Study &Qualitative Analysis of Jatamansi- A Case Study in Lanku valley, Darjeeling, West Bengal.

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Abstract

Medicinal plants have important contribution in the healthcare system of local communities as the main source of medicine for the majority of rural population. The paper is about treatment of various diseases using ethno medicinal practices of Jatamansi. Nardostachysjatamansiis a flowering plant belonging to family Caprifoliaceae. This plant is also known as "Tapaswani" in Ayurveda. It is a perennial, dwarf, hairy, herbaceous and endangered plant species. According to herbal practitioners the plant is used in various herbal formulations to treat epilepsy, hysteria, convulsions, mental weakness, anxiety and insomnia. The study is conducted in Lanku valley, Darjeeing, West Bengal and it is located 60 kms. from the city of Siliguri. The main population of this area is tribal communities and they have their distinct knowledge of language, culture and food habits. In spite of availability of modern medicines, the tribes of Lanku valley region use plant therapy for treatment of various diseases. One of the main reasons of this is rich plant diversity of Lanku valley. Jatamansi is used for various medical purposes by tribes of Lanku valley. The phytochemicals obtained from the plant are widely applied in the traditional herbal medicines. This paper deals with the ethnomedicinal practices of Nardostychysjatamansiand its phytochemical analysis.

Key Word *Nardostychysjatamansi, Ethno Medicine, Traditional Knowledge, Tribal*

Introduction

Human civilisation have used plant for different purposes for centuries. They also found use of plants in treatment of health problems. Systematic study of ethnomedicinal plants are important to find new drugs from indigenous knowledge of medicinal plants. [1] This paper deals with the medicinal importance and preparation, extraction, and qualitative analysis of phytochemicals present in *Nardostachysjatamansi* DC belonging to the familyCaprifoliaceae. It is an endangered, therapeutic herbal plant mostly grows in moist, rocky and steep slopes of undisturbed grass in India, Nepal, Bhutan and China in Himalayan region from 2300 to 6000 m above sea level. The root of this perennial small rhizomatous herb has thick, short dark grey rhizomes which are crowned with fibrous remains of reddish brown petioles of the radical leaves. Different medicinal systems use these rhizomes in traditional medicines as tonic, laxative, antiepileptic, stimulant and antispasmodic. [2]In traditional herbal medicines It is used to treat neurological disorders like hysteria, epilepsy, convulsions and mental weakness. The decoction of its rhizomes also used in treating insomnia and cardiovascular system. [3]*Nardostachysjatamansi* is an endangered aromatic herbal plant is on the verge of extinction due to over-utilization. [4] The study was conducted in Lanku valley it is a village located in Kurseong block of Darjeeling district, West Bengal. The valley is covered with dense forest of both deciduous and evergreen trees, herbs, shrubs and thousands of varieties of flowerless plants like mosses lichens and ferns. [5] In spite of availability of modern medicines People prefer plant therapy for treatment of various diseases. This paper deals with the ethnomedicinal practices of Jatamansi used for the treatment of some selected health problems like insomnia, epilepsy, anxiety and depression. This paper also deals with the preparation, extraction and qualitative analysis of phytochemicals present in this plant.

Objective

To gather information about traditional knowledge aimed at redressing some medicinal value of Jatamansi used by local baidya of Lanku valley, Darjeeling, West Bengal.Authentic documentation of medicinal role of Jatamansi, reefing the existing knowledge and exploring future aspect of this medicinal plant.To provide a new interpretation of Jatamansi with respect to cultural, economic, ecological and conservational point of view.To motivate local people on conservation of JatamansiinLanku region. Phytochemical analysis ofJatamansi has also been performed.

Materials And Methods

For case study and collection of the data semi-structured interviews, questionnaire and direct observation were used. The information was gathered and confirmed by repeated queries raised time to time among the local herbal practitioners and the users as well.Healers have been registered for documentation.

The qualitative analysis has been done to identify the phytochemical constituents present in *Nardostachysjatamansi*DC . The preliminary phytochemical analysis for Proteins, Carbohydrates, Phenol & Tannins, Flavonoids, Saponins, Glycosides, Steroids, Phlobatannins, Alkaloids and Terpenoids has been done. [6]

Collection of plant material

The dried form of roots of Jatamansi is collected from local herbal practitioner of Lanku valley of Drajeeing District. The practitioner collects plant material from different parts of Sikkim that is Nathang, Tamsay and Kisheong.

Extraction of plant material

The extraction of plant material was done by hot water extraction method. The dried plant material was grinded and powder was kept in an appropriately labelled air tight bottle. To get aqueous extract 5gms of powdered material was weighed using an electronic weighing balance. Then it was taken in a beaker and 100 ml of distilled water was added. The mixture was heated on a hot plate with continuous stirring at 30°-40°C for 20 minutes. [7]Then water extract was filtered through filter paper and filtrate was used for the phytochemical analysis. Same process was repeated to get ethanolic and methanolic extract using ethanol and methanol in place of distilled water.

The Plant extract was tested for the presence of bioactive compounds by using standard methods of: *Sofawora,A.1993, *Trease,G.E, *W.C.1989, *Harborne,J.B.1973

Photochemical Analysis of: *Nardostachysjatamansi*
Family-Caprifoliaceae

Phytochemical analysis	**Plant Part used: Roots**
Proteins	**(a) Million's test: 2ml Ext.+2ml Million's reagent Δ→white/ red ppt**
	(b) Ninhydrin test: 2ml Ext.+2ml of 2% Ninhydrin sol. Δ→violet
Carbohydrates	**(a) Fehling's test: 2ml Ext.+(1ml Fehl.A+1ml Fehl.B) Δ→Brick red ppt**
	(b) Benedict's test: 2ml Ext.+2ml Benedict's reagent Δ→Reddish brown
	(c) Iodine test: 2ml Ext.+2ml Iodine solution →Dark blue/ purple
Phenol & Tannins	**2ml Ext.+2% $FeCl_3$ sol. →Blue/ Green or Black**
Flavonoids	**(a) Shinoda test: 2ml Ext.+few fragments magnesium ribbon + conc. HCl→Scarlet pink**
	(b) Alkaline reagent test: 2ml Ext.+2% NaOH Sol. →Intense yellow → few drops dil. H_2SO_4→Colourless
Saponins	**Foam test: 2ml Ext.+ 5 ml distilled water → Foam**
Glycosides	**(a) Liebermann's test: 2ml Ext.+ 2ml chloroform + 2ml acetic acid + conc. H_2SO_4→V/B/G**
	(b) Salkowski's test: 2ml Ext+2ml chloroform+2ml conc. H_2SO_4→Reddish brown
	(c) Keller-kilani test: 2ml Ext+2ml acetic acid+1-2 drops $FeCl_3$→2 ml conc. H_2SO_4→Brown ring
Steroids	**(a) 2ml Ext. + Acetic acid + conc. H_2SO_4→Blue green**
	(b) 2ml Ext. + Chloroform + conc. H_2SO_4→Red
	(c) 2ml Ext. + Chloroform ← Acetic acid + conc. H_2SO_4→Greenish
Phlobatannins	**2ml Ext.+1% HClΔ→Red ppt**
Alkaloids	**2ml Ext.+1% HClΔ + Mayer's reagent + Wagner's reagent →Red ppt**
Terpenoids	**Ext.+Chloroform+ conc. H_2SO_4Δ→Greyish**

(Δ)= Heat Ext=Extract

Case Study

For the case study the semi structured interviews and questionnaire are prepared and the questionnaire was designed to gather information regarding patient's description, case history, their believes and practices, treatment plan, expected outcome of the treatment and actual outcome. This case study was conducted between the month of October (14.10.2020) to April (15.04.2021) and the three patients were under observation.

s. no.	Name of the patient	Age	Disease/ Health problem	Doses	Duration	outcome
1.	Dil Kumar Biswakarma	44	Insomnia	½ tea spoon Jatamansi powder with honey twice a day	Three Months	No symptoms observed
2.	Salim Thapa	58	Epilepsy	1 tea spoon Jatamansi powder with honey or luke warm water twice a day	Four Months7 days	asymptomatic
3.	GhanshyamChhetri	24	Anxiety & Depression	½ tea spoon Jatamansi powder with honey twice a day	Two Months	No symptoms observed

Table.1: Phytochemical analysis of *Nardostachysjatamansi*. in aqueous, ethanolic and methanolic extract

Phytochemical Analysis of: *Nardostachysjatamansi* **Family-Caprifoliaceae**				
Phytochemical analysis	**Plant Part used: Roots**	**Aqueous extract**	**Ethanol extract**	**Methanol extract**
Proteins	**(a) Million's test**	++	++	_
	(b) Ninhydrin test	_	_	_
Carbohydrates	**(a) Fehling's test**	++	_	++
	(b) Benedict's test	_	++	_
	(c) Iodine test	_	_	_
Phenol & Tannins	**Ferric Chloride Test**	++	_	++
Flavonoids	**(a) Shinoda test**	_	++	_
	(b) Alkaline reagent test	++	++	_
Saponins	**Foam test**	++	_	++
Glycosides	**(a) Liebermann's test**	++	_	++
	(b) Salkowski's test	_	++	++
	(c) Keller-kilani test	_	_	++
Steroids	**(a) Liebermann's test**	_	++	++
	(b) Salkowski's test	++	_	++
	(c) Keller-kilani test	++	_	++
Phlobatannins	**1% HCL Test**	_	++	++
Alkaloids	**Mayer's & Wagner's reagents test**	_	_	++
Terpenoids	**Salkowski's test**	++	++	++

(+)= Trace (++)= Present (+++)= Strongly present (--)= Absent (Δ)= Heat Ext=Extract

Result And Discussion

The case study was conducted by selecting three patients randomly who were visiting to local Baidya of Lanku valley and being administered roots of Jatamansi in powdered form. These patients are of different age group who were suffering from different health problems. The method of administration and doses of the plant product was almost same. By certain courses and duration, it was found that the treatment was successful for all the cases.

The qualitative analysis has been done to identify the chemical constituents present in *Nardostachysjatamansi*. Here the + symbol indicates the presence of phytochemical in trace amount, ++

indicates in adequate amount, +++ indicates strong presence of phytochemicals, and -- indicates absence of phytochemicals.

Fig.1: Phytochemical analysis of *Nardostachysjatamansi*, Aqueous Extract

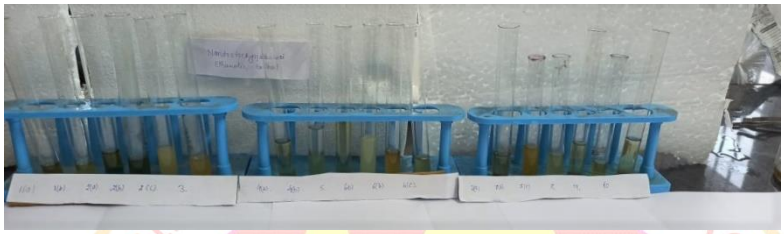

Fig.2: Phytochemical analysis of *Nardostachysjatamansi*, Ethanolic test

Fig.3: Phytochemical analysis of *Nardostachysjatamansi*, Methanolic test

Conclusion

The information gathered from local Baidya and three patients who were suffering from different health problems were consulted and it was found that treatment was successful for all the patients.Despite having modern medical facilities people of Lanku valley used plant therapy to a considerable extent. The phytochemical analysis of *Nardostachysjatamansi*suggested the plantcontains all the primary metabolites and one or other active secondary metabolites like phenol, tannins, Flavonoids, saponin, steroids, phlobatannins, alkaloids and terpenoids. The presence of such secondary metabolites in *Nardostachysjatamansi* shows it has very significant role in the treatment of various diseases in human being.

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Dioscorea bulbifera : A Review of its Phytochemical analysis of some Phenolics & Pigments by spectrophotometric method

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Abstract:

The present study was undertaken to find out phenolic compound content and pigments of leaves of Dioscorea bulbifera L. Collection of plant material were done from Melghat forest region, Dist.- Amravati, Maharashtra. Dioscorea bulbifera L. is tuberous climbing herb,it is commonly known as air potato. its leaves and bulb used in traditional medicine . Dioscorea bulbifera is effective against several therapeutic diseases such as cancer, skin infection,goiter and orchitis.Plants were identified with the help of the standard floras.1gm of were leaves used for determination of Phenolic compounds & some pigments. Phenolic compound act as antioxidant. Antioxidants have been reported to prevent oxidative damage caused by free radical. Estimation of total phenol, quinones, flavonols and tannins were done and estimation of some pigments Anthocyanin, Leuco-anthocyanins and Total carotenoids were done.

Keywords: *Dioscorea bulbifera L, Phenolic compounds, pigments, Spectrophotometer.*

Introduction

Ayurveda, the Indian system of medicine mainly uses plant based drugs or formulations to treat various human ailments because they contain the components of therapeutic value. In addition, plant based drugs remain an important source of therapeutic agents because of the availability, relatively cheaper cost and non-toxic nature when compared to modern medicine.Plant produces these chemicals to protect itself but recent research demonstrates that many phytochemicals can protect humans against diseases.

An ever increasing demand for herbal medicines due to its safety and less side effective has led to usage of medicinal plants worldwide(Kumar et al.,2016). D*ioscorea bulbifera* L. (family: Dioscoreaceae) commonly known as "air potato "is an important edible medicinal plant. Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked asVegetable. It is Considered as a very delicious dish by local as well as Trible People.

A variety of plant secondary metabolites have been reported to act as antioxidants and amongst them phenolic compounds from a major group. There are several reports on the contribution of phenolic compounds to the antioxidant potential of different plant species (Cai *et al.*, 2004). flavonoids are naturally occurring phenolic compound which largely include anthoxanthins (flavones, flavonols, flavanones, flavanols, chalcones and isoflavones), anthocyanins, leucoxanthins and flavonoidal alkaloid (Houghton, 2002).

Yam leaves and tubers used are to treat a variety ofaliments. the leaf of aerial yam is used as a poultice for pimples and tumors and inbath water to soothe skin irritations and stings.(Gao *et al*., 2002).D*ioscorea bulbifera* tubers contain furanoid, norditerpenes, norditerpene, norditerpene glucosides,diosbulbinoside D and F and diosbulbin B and D (Su *et al*., 2003).

Dioscorea bulbifera has gained less attention and an organized synthesis of literature is still missing. therefore ,this study helps to other researchers. According to traditional medicine *D. bulbifera* has used to treat several diseases and detoxify poison and clot blood to stop bleeding.(vasanthi et al.,2010).

Materials and Methods:

Plant material

Dioscorea bulbifera L.

A genus belonging to Discoreaceae family, Large unarmed, tuberous climbing herb, tubershairy stem terete with bulbils in the leaf axils, leaves alternate, broadly ovate to orbicular reniform.flowers small, green, turning purplish with maturity male flowers in short slender, axillary, solitary or fascilated pendulousspikes. perianth

white, stamens 2-2.5 mm long,acute,staminodes 6;styles short;stigmas 3.capsule ablong 1.5-2 0.5-1.2 cm,reflexed 3-winged.seeds winged at one end only.

Flowers and Fruits- August to October

Flowers and fruits : October to January

Uses

Tuber, Bulbils, Leaves, Inflorescence and Flowers are edible, Cooked as Vegetable. It is Considered as a very delicious dish by local as well as Trible People.

Tubers use as Medicinal Properties like dispersing Tonic Intiflamatory, Cough, Bile, Bronchial, Asthma, Rheumatism, Swelling and bone Fracture. (Shkirsagar, 2010).

Preparation of plant material

Fresh leaves were collected and the dried in sunlight. After them powdered with mechanical grinder and stored in airtight container. samples were powdered separately. 1gm each of samples were taken for estimation of Phenolic compounds and pigments grm/ µgm.

Methods:

Estimation of Phenolics such as total phenol, Quinones, Flavonols and Tannins were done according to the methods prescribed by Thimmaiah (1999), which are given below.

Estimation of Total Phenols

1gm of sample was grind with the help of mortar Pestle with 10 ml of 80% ethanol. The homogenate was centrifuged for 20 mininutes at 10,ooo rpm. Supernatant was collected. Supernatant was Evaporate to dryness.

Then after dryness residue was taken and make up the volume with 5ml distilled water. 1 ml aliquate was Pippette out in test tube , and volume make up 3 ml with distilled water . To it 0.5 ml of Folin-Ciocalteu reagent was added. After 3 minutes, 2 ml of 20% Na_2CO_3 solution was added into each tube.

Mixed thoroughly and tubes was kept in boiling water for 1 minute, then allowed to Cool and absorbance at 650 nm was measured against reagent blank.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of catechol. (Thimmaiah S. R. 1999)

Estimation of Quinones

1gm sample was grind with the help of mortar and pestle with using chilled phosphate buffer (5ml for each gm of tissue). The supernatant was collected by

Centrifugation for 30 minutes this was used as enzyme extract. 3ml of buffer, 3ml of standard catechol and 1.5 ml of enzyme extract was pipette in a test tube. It was shaken gently and incubated in water bath. 4ml of TCA (Trichloro acetic acid) reagent (without ascorbic acid) to one and 4ml of TCA reagent (with ascorbic acid) was added. Precipitate was filtered. Absorbance was measured at 400 nm against a reagent bank lacking only extract.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of working standard catechol. (Thimmaiah S. R. 1999)

Estimation of Flavonols :-

1gm sample was grind with the help of mortar and pestle with 10ml of ethanol and the supernatant was collected by centrifugation for 20 minutes.The supernatant was evaporated to dryness; then the residue was dissolved in 5 ml distilled water. 1ml of extract was pipette out into 25ml conical flask and 1 ml of distilled water was added.

Then 4ml of vanillin reagent was added from a burette rapidly within 10-15 sec to flask A and 4ml of 70% H_2SO_4 to flask B.

A blank was prepared in flask C containing 4 ml of vanillin reagent and 2ml of distill water. Shaken the both flasks A and B in a water bath at the temperature below 35^0C. Keeping the flasks at room temperature for exactly 15min. Absorbance was measured flask A, B and C at 500 nm against 47%. H_2SO_4 (flask D).

The absorbance of the flasks B and C from that of A.The flavonol content was calculated using a standard curve prepared from phlorogucinol or kaempferol (100 µg/ml). (Thimmaiah S. R. 1999)

Estimation of Tannins :-

Vanillin hydrochloride method was used. 1 gm of sample was mixed in 10ml methanol after 20-28 hrs. centrifuged and supernatant was collected .pipette out 1ml supernatant into test tube and quickly 5ml of vanillin hydrochloride reagent was added and mixed. After 20 min absorbance was read at 500nm. A reagent blank was prepared with vanillin hydrochloride reagent alone. A catechin standard graph was prepared from working standard (100µg/ml) of catechin and amount of tannins was calculated. (Thimmaiah S. R. 1999)

Estimation of Anthocyanins

1 gm of sample was grind with the help of mortar and pestle by using absolute alcohol. Centrifuge and the extract was collected. 1ml of alcohol extract was pipette in test tube and 3ml of HCL in aqueous methanol was added. 1ml of anthocyanin reagent was add in the samples. The Blank was prepared in the same manner by adding 1 ml of methanol - HCL instead of anthocyanin reagent.

After 15min of incubation in dark, Absorbance was measured at 525 nm After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

Estimation of Leuco-Anthocyanins

1gm of sample was grinded with the help of mortar and pestle by using 10 ml methanol. Centrifuge and supernatant was collected. Pipette out 1ml of extract in test tube and volume was reduce to 0.5 ml on a hot water bath.0.5 ml of distill water and 10ml of anthocyanin reagent was mix thoroughly in reduced extract.

The tubes was heated in water bath for 3 min without covering and with covering total for 40 minute. After heating cool under a running tap. Absorbance was measured at 550 nm against a reagent blank laking only extract. (Thimmaiah, S. R.1999).

Estimation of Total Carotenoids

1 gm of sample was grinded with the help of mortar and pestle by using 10ml of acetone. Extract was filter on Buchner Funnel through whatman no. 42 filter paper. The extraction was repeated until the tissue was free from pigments. Pool the filtrates and partition thrice equal volume of peroxide free ether was using seperatory funnel. For producing two layers during initial ether extraction distilled water was added. Hot water bath was used for evaporation of the combined ether layer which contains carotenoid. The residue was dissolve in 5ml of ethanol. 0.5 ml of 60% aqueous KOH was used for 10 ml of the ethanol extract to saponify.,The mixture was kept in the dark forovernight at room temperature. After overnight equal volume of water and equal volume of diethyl ether was used for partition. Evaporate the combined ether layer as before and the residue was added in minimum volume of ethanol. Absorbance was measured at 450 nm against a reagent blank lacking only extract. Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1ml) of β-carotene. (Thimmaiah,S. R. 1999) After 15min of incubation in dark, Absorbance was measured at 525 nm against the bank laking only extract. (Thimmaiah,S. R. 1999)

A standard curve is the plot obtained by plotting concentration of a given standard along X- axis and the corresponding absorbance values along Y- axis on a graph sheet resulting a straight line which passes through the origin. It is used to quantify the amount of a given compound present in an unknown sample whose absorbance value is matched against that of standard along Y-axis and a corresponding concentration could be read off along X-axis. . (Thimmaiah S. R. 1999)

Result And Discussion

Table 1: Estimation of Phenolics

Sr. No	Name of plant and part used for estimation	Total Phenol		Flavonol		Quinone		Tannin	
1	*Dioscorea bulbifera* (leaves)	Absorbance (650nm)	1900µgm /gm	Absorbance (500nm)	0.65µgm /gm	Absorbance (400nm)	520µgm /gm	Absorbance (500nm)	720µgm /gm

Table 2 : Estimation of Pigments

Sr.No.	Name of plant and part used for estimation	Total Carotenoids Absorbance at (450nm)	Anthocyanins Absorbance at (525nm)	Leuco-Anthocyanins Absorbance at (550nm)
1	*Dioscorea bulbifera* (leaves)	112µgm/gm	33µgm/gm	3.375µgm/gm

Highest amount of total phenol in leaves (1,900µgm/gm) and tanin was observed in leaves of *Dioscorea bulbifera* (720 µgm/gm) and while lowest content of flavonol in leaves (0.65µgm/gm). However there is significant amount of quinone was found (520µgm/gm). In *Dioscorea bulbifera* leaves the rich amount of (112 µgm/gm) total carotenoids was found.

Phenolic compounds and flavonoids have been reported to be associated with antioxidative action in biological systems, acting as scavengers of singlet Oxygen and free radicals. (Rice-Evans *et al.*,1997). The nitric oxide scavenging activity of flavonoids and phenolic compounds are known (Kim H. *et al.*, 2002) . *Dioscorea bulbifera* posses antitumor, anti bacteria, anti-feedant, anti-fungaland hallucinogenic activities.(Urones *et al*., 1995; Biswanath *et al*., 2005).

The significant lowering of blood glucose level shown in the alloxane–induced diabetic rats in good manifestation to show that *D*ioscorea *bulbifera* is an effective antidiabetic regimen. (Okonand Ofeni,2013).
Phenols are present in food, they may have an impact on health and most are known to have an antioxidant activity. (Demitrios 2006) .

Phenols and polyphenolic compounds such as flavonoids are widely found in plant sources and they have been shown to posse's significant antioxidant activities (Van Acker S. *et al.*, 1996). *Dioscorea bulbifera* is widely recongnized for treatment of cancer.(Li et al., 1999).

Carotenoids may also have important anti-ageing and anticancer properties such lutein, which protects the tissues of retina, while canthaxanthin has been demonstrated to inhibit cancer cell proliferation (Palozza *et al*., 1998). Anthocyanins possess a high the rmost ability and contribute towards antioxidative, antiflammatory, cardioprotective and hepatoprotective activities. The mechanisms behind the reduction of blood pressure by anthocyanins were reported due to their antioxidantactivity (Shindo *et al.*, 2007). Extracts of *D. bulbifera* has a strong antibacterial activity(Hu et al.,2005). Pharmacologist studies and ethanobotanical studies and conservation reviews of *Dioscorea bulbifera* given by(Bishwa Bhushan kundu et al.,2020). According to

Conclusion

This study revels that the leaves of *Dioscorea bulbifera* L**.** contain rich total phenol, quinone and tannin, flavonoids and pigments which are known to posses good source of antioxidant ,anticancer activity and anti-inflammatory, antibacterial, anti obesity, antiviral activity. The reported phytochemical studies support its traditional uses and may prove to be useful for clinical evaluation. The use of natural antioxidants has been promoted because of the concerns on the safety against synthetic drugs.

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Behavioral Study of Parrots Around Gram Takarkheda Dharni Region of Western Melghat

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Abstract:

This study make known that the every day flight activity rose ringed parrots at early morning with massive flocking of parrots, and they find the foodstuff around farms located at Dharni region nearer to the small village Takarkheda. Similarly the flight activities at evening time the pattern of flight were in a different way acted, when they back towards the nesting. The intension following the significant learning of flight activity of Adults and younger parrots showed special difference in their behavioral patterns of early morning and evening instance.

This study recommended that the daily observation of flight activity of rose ring neck parrots move early in the morning form their nesting towards the food searches in the forest, farm etc. and vice versa again towards the nesting areas when they get back flight activity of flocking at evening time.

Key words: *Behavior, Flocking, Rose ring Neck Parrots, Nesting, Food, Flight Patterns.*

Introduction:

Behaviour patterns illustrate Most of the time parrots are not easy to catch. Even after being pets, they have a bad mannerism if not maintained properly. Some researchers state that most wild birds can be controlled by banding or wing tagging, but parrots are not birds to be easily trifled with; they chew off such affections. The behaviour of parrots differs from type to type. Some of them are strong and have direct flight whereas most of the species spend their time perching or climbing.

The habitat of African grey parrots is usually moist lowland forests, although they are found up to 2,200 m altitude in the eastern parts of the range. They are commonly observed at forest edges, clearings, gallery forests, mangroves, wooded savannahs, cultivated areas, and gardens Athan and Deter, (2000). African grey parrots often visit open land adjacent to woodlands, they roost in trees over water and may prefer roosting on islands in rivers. These parrots make their nests in tree holes, sometimes choosing locations abandoned by birds like woodpeckers. In West Africa, the species makes seasonal movements out of the driest parts of the range in the dry season **Melo and O'Ryan (2007).**

They are highly social and nest in large groups, although family groups occupy their own nesting tree. They are often observed roosting in large, noisy flocks calling loudly during mornings and evenings and in flight. These flocks are composed parrots, unlike other parrots that are often found in mixed flocks. During the day, they break into smaller flocks and fly long distances to forage**.** They often roost in trees over water and are said to prefer roosting on islands in rivers. Young birds stay with their family groups for a long period of time, up to several years. They socialize with others of their age in nursery trees, but remain in their family group within the larger flock. Young parrots are cared for by older birds until they are educated enough and old enough to become independent flock members. Young exhibit appeasement behaviors towards older members. As they mature, birds become more aggressive with nonspecific, **Athan, (1999)**. Parrots in the wild must learn a complex set of skills. They need to learn how to separate desirable food plants from toxic plants, how to defend territory, how to recognize and avoid predators, how to find safe water, and how to rejoin their families when separated. Also, they must learn how to develop role-appropriate behaviors such as competing and defending nest sites and raising offspring **Galef, (2004)**. Competition for nest holes during mating season makes the species extremely aggressive. Because parrots are partial ground feeders, there is a series of behavioral events that occur before landing and safe consumption takes place **Luescher, (2006)**. Groups of parrots gather at a barren tree until it is completely filled with hundreds of birds that partake in preening, climbing, vocalizing, and socializing. Eventually the birds make their way down to the ground in waves with the entire group never being on the ground at the same time. Once on the ground, they are extremely vigilant, reacting to any movement or sound **Wright, (2002).**

Materials and Methods:

Flocking behavioral and flocking routine of rose- ringed parakeet were studied for a period of 12 weeks (November 2021 to January 2022) in irrigated farm fields of Tehsil Dharni located Village Takarkheda, where adequately bulky crops be present. Incidence of such crops largely remains experimental throughout the year, and therefore, no possibility occurs here for the limitation of food to variety of birds. Various crops *viz.* wheat, maize, rice, fodders besides fruit orchards like citrus, mango, guava, occurs in good proportions. Different trees of variable heights also perform not only as shelter for birds', but also offer appropriate a place where birds regularly settle or congregate to rest at night, and nests (hollows), maintained by them for long durations. For

the present study, surveys were conducted to flight behavioral activity of flocks of the rose-ringed parakeet within the large agricultural area of Dharni region of Melghat. The parakeet settle was quite huge and was located less than distance away from the well grown croplands. Observations were made consecutively in the present studies and were observation on the basis of bulk flocking, forward journey at early morning for the searching of food and return journey towards the nesting at evening.

Results and Discussion:

In this observational study reveal that the flocking behavioral pattern shows modest difference pertaining to the flight towards food availability at early morning at 6 to 7 am for the searching of food and *vice versa* returning journey towards nesting at evening 5 to 6 pm daily observational study through the photographic analysis or flocking size and height of the flight of rose ringed parakeets. It seems to be observed that the early morning flight showed more height approximately 90-100 feet. of flock size containing 400-500 parrots group from the land surface area with creating sound as for call and communicate to each other. But in the return journey of flocking flight behavior seems to different, flocking flight at evening time showed very less distance approximately 10-15 feet contains 200-300 parrots group. Distance from land surface to the flight area, without noising any sound as communication in between the flocks size of parakeets.

Fig. 1. Map view of Dharni region of Amravati District

Fig. 2- Map view where the Observational study were performed

(Note: study area were noted with red colour arrow mark)

Fig. 3. Monthly parrots flights of flocking behavior and size
(November & December-2021 at Morning & Evening flight)

Fig. 4. Monthly parrots flights of flocking behavior and size
(December and January-2022 at Morning & Evening flight)

Table-1 Monthly noted flocking behavior and size of parrots (2021):

Months	Morning Time (Forward Journey from the Nesting) 6:00 to 7:00 am	Evening Time (Back Journey towards Nesting) 5:00 to 6:00 pm
November	400-500*	200-300*
December	400-500*	200-300*
January	400-500*	200-300*

**Note: approximate number of parrots in flight as per photographic collection may vary.*

Present reading circumstances showed that observation on the basis of the flock size of parrots in their natural habitats and behavioral patterns characteristically appears as in morning flight had a dispersed patterns in flight as shown in photo plates which indicates that random flight in parrots, more height than that of evening flight in four month observation. And in the return flight of parrots towards nesting they showed very less distance flight, and made pattern of flight were 'V' shaped noted in photograph captured.

Conclusion:

In this observational study showed that flocking size and their behavioral patterns vary. Parrots are locally common in the area of Dharni Melghat region; it appears seasonally available with the great quantity of nourish in surrounded areas such as, maiz, rice, cajanus, chickpea, and wheat as well as fruits such as guava, berry etc. conventionally yield taken by the Melghat peoples. This observation may show in the futuristic development and identified the issue act as pest for cropping because they feed voraciously on available food in their farm field. This available basic information of theirs seasonal flight and behavioral patterns seems to be identified as their habits and habitat learning in the additional improvements.

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Alteration In Enzyme Of Freshwater Fish,*Channa Orientalis*(Sch.), Exposed To Cyppermethrin And Fenvalerate

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Abstract:
Toxicity study was conducted on Freshwater Fish Channaorientalis to evaluate the enzyme activity of two Pesticides, Cypermethrin and Fenvalerateupto 96 hrs at a duration of 24, 48, 76, and 96 hrs, which shown toxic effect of Cypermethrin and Fenvalerate on Glutamate Oxaloacetate Transaminase. In present study Cypermethrin was found to be more toxic than Fenvalerate to the experimental fish, Channaorientalis.
***KeyWords** : Alterations in Glutamate Oxaloacetate Transaminase, Channaorientalis .*

Introduction:

In Vertebrates and Invertebrates, Cypermethrin acts mainly on nervous systym. Cypermethrin is both stomach and Contact poison(Jin and Webster, 1998).It has been shownto inhibit ATPase enzyme involved in movement of ions against a concentration gradient which are regulated by active transport, this action is especially critical to fish and aquatic insect, where ATPase enzyme provide the energy to active transport, are very important at the sites of oxygen exchange. ATPase inhibition and disruption of active transport, possibly affect ion movement and ability to maintain ion balance and disrupt respiratory surfaces, indicating that Cypermethrn is inherently more toxic to aquatic organism (Siegfried,1993). In pond water that contained apparantly lethal concentration of Cypermehrin(5ppb) because the chemical was absorbed on to suspended solids(Crossland,1982).

The use of synthetic pyrethroids for control various pests is regularly increasing. They are drained into rivers, tanks and pools resulting to pollute aquatic environment. Such chemicals are toxic to non target species and hamper human health too via ecological cycling and biological magnification. Aquatic pollution is greatly affecting the metabolism of fishes and some time heavy mortality has been experienced. A major part of worlds food is being supplied fish source, so it is essential to secure the health of fishes. Among the pyrethroids, Fenvalerate is widely used as synthetic toxicant that causes severe metabolic disorders in fishes(Coats et.al., 1979, Reddy et.al.,1989, Reddy and Philip, 1994,Thakur and Bais 2000).It has been extensively popularised because because of high insecticidal potency, low mammalian toxicity and very short persistance. However, Fenvalerate is extremely toxic to fish. The extreme toxicity of Fenvalerate to fish may be due to efficient gill uptake in efficient detoxification, elimination and sensitivity at the site of action(Bradbury et.al., 1997, Coats et.al.,1989,Tripathi et.al.,2001). Thus low rate of Fenvalerate elimination and metabolism appears to play an important role on the piscidal activity of this insecticide(Bradbury et.al.,1986).So for there are much limited response dealing with the effects Cypermethrin&Fenvalerate on enzyme activity of freshwater fish. Therefore, it is considered of an interest to analyse the effect of CypermethrinandFenvalerate on fish enzyme, Glutamate Oxaloacetate Transaminase.

Materials and Methods:

The freshwater fish, *Channaorientalis* were collected from Amravati local market and Rushi lake of Karanja (lad),(M.S.), and maintained in the laboratory conditions in large aquarium to the maximum number 2 lit/g of fish weight for a period of one month for acclimatization in aerated well water. Fishes were fed daily with ad-libitum and boiled eggs. Fishes weighing about 15 g and 10 cm in length were selected for evaluation or actual toxicity study. Fishes were starved for 48 hrs. Before the start of experiments and kept separately in a group of 10 fishes in each aquarium(test container about 20 lit. capacity). They were kept clean and away from visual and mechanical disturbances. The various physicochemical parameter of test water such as temperature, pH(by pH meter\) Conductivity (byConductometer), Acidity, Alkalinity, Hardness ,dissolved Oxygen and salinity were calculated daily during the toxicity test(following the method described in APHA). The test water was changed every day.Average value of all those environmental parameters were recorded. The pesticides Cypermethrin and Fenvalerate were added to the test water to obtain the described concentration. Then healthy fishes were exposed to various concentration of pesticides for 24, 48, 64, 72, 96 hrs. period respectively. Simultaneously the control aquarium was also maintained without pesticide concentrations. The fishes that survived for the test were sacrificed, by pitching, their different tissues like Liver, Kidney, Brain, Muscle and Gill were taken out for enzyme study. The required tissues from fish were immediately removed and weighed. The extracts were prepared in Mortar&Pestle using ice cold 0.25 m sucrose solution. All extracts were used as

early as possible and stored in the deepfreeze when required too. Substrate buffer (pH 9.0) was prepared by mixing 3ml.of petroleum ether,80 ml. of distilled water, 0.5 g of Sodium glycerophosphate and 0.0424 g. of sodium barbiturate.

The effect of Cypermethrin Glutamate Oxaloacetate Transaminase enzyme in different experimental fish groups (values are significant between $p<0.01$ to $p<0.001$).

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	56.16± 3.32	53.53± 3.40	40.58± 2.86	38.32± 2.56	40.22± 3.78	39.92± 3.10
2	Low pH Alk. 8.5pH	58.28± 2.125	55.38± 2.39	42.21± 1.38	40.32± 1.37	41.35± 1.35	38.72± 2.82
3	Acidic pH 6.5	52.39± 2.38	51.29± 1.28	37.52± 2.35	35.25± 1.29	38.23± 1.72	36.85± 1.25
4	Hardness (100-200ppm)	48.35± 1.35	46.21± 2.73	33.72± 1.42	32.38± 1.25	35.29± 1.38	33.27± 2.38
5	Salinity (1.2%)	45.27± 2.35	42.6± 2.12	30.92± 1.82	28.28± 2.38	31.32± 01.25	28.65± 2.65

The effect of Fenvalerate on Glutamate Oxaloacetate Transaminase enzyme in differentexperimentalgroup (values are significant between $p<0.01$ to $p<0.001$).

Sr. No.	Group	Liver		Kidney		Muscle	
		Control	Expt.	Control	Expt.	Control	Expt.
1	Normal Pesticide	57.28± 40.10	55.38± 9.88	40.66± 2.442.00	40.26±	40.88± 2.36	36.210± 3.32
2	Low pH Alk. 8.5pH	58.28± 21.251.28	56.37±	42.21± 1.38	41.05± 1.28	41.35± 1.35	39.76± 2.21
3	Acidic pH 6.5	52.39± 2.381.35	50.28±	37.9± 2.35	35.23± 2.25	38.73± 1.38	36.72± 1.72±
4	Hardness (100-200ppm)	48.35± 1.95 1.72	45.39±	33.72± 1.41	32.28± 1.27	28.29± 1.38	32.65± 1.25
5	Salinity (1.2%)	45.27± 2.351.32	43.72±	30.92± 1.821.36	29.35±	31.32± 1.25	30.25± 1.72

Result andDiscussion:

The Glutamate Oxaloacetate Transaminase activity was decreased in the tissues of *Channa orientals*treated with Cypermethrin and Fenvalerate. In control fishes the Glutamate Oxaloacetate Transaminase activity was maximum at 24 hrs. thengradually reduced upto 96 hrs. Maximum activity was recorded in liver,then followed by Kidney and Muscle. In experimental group of fishes the Glutamate Oxaloacetate Transaminase activity was significantly reduced in liver, kidney and muscle.

Conclusion:

Over all view concluded that very low quantity of pesticides affects aquatic organism and their metabolic activity.

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Histological changes in the ovary of *Catlacatla*exposed to lethal concentration of *B. aegyptiaca* root.

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Abstract:
20 fresh water fish Catlacatla of both sexes were purchased from local fisherman. They were kept in aquaria and well aerated. The differential acute toxicity of water extracts of B. aegyptiaca root on fish C. catla were carried out under laboratory conditions. The LC_{50} after 96 h of exposure for water extracts of Balanites aegyptiaca root were9.00, 11.00 and 13.00 mg/L, respectively. These values showed that water extracts of Balanites aegyptiaca root was more toxic.Histological alteration in the ovary tissues showed lesion, necrosis, malignancy, cellular degeneration and inflammation, when the fish were exposed to various concentrations (9.00 mg/L, 11.00 mg/L and 13.00 mg/L) of water extracts of B. aegyptiaca root for a period of 96 h revealed that root of B. aegyptiacamay be toxic to fish C. catlaas characterized by severe degeneration ofovary cells.The study concluded that caution must be taken in the disposal of this plant in water bodies as extended exposure time and at higher concentrations could pose adverse effect on the fish Catlacatla.
Key words: Histology, Balanites aegyptiaca, Catlacatla.

Introduction:

Water pollution, has been increasing at an alarming rate due to rapid industrialization, civilization and green revolution. Urban, agricultural and industrial activities release xenobiotic compounds that may pollute the aquatic habitat. Industrialization and growth of human population have led to a progressive deterioration in the quality of the earth's environment. **(Schwarzenbach*et al.*, 2006)** reported that about 300 million tons of synthetic compounds seep annually into water systems (rivers, lakes and sea) leading to water pollution. Pollution of water sources due to chemicals plays a primary role in the destruction of ecosystems. To improve the quality of aquatic ecosystems, it is necessary to know how the rivers and lakes are impaired and what factors caused the environmental deterioration.

Acute toxicities have been measured for many species in variety of ecological systems and most of the commonly used pesticides against Rainbow trout, Blue gills, Sun fish and the gaps are being filled for other species, such as channel fish, some cyprinids and salmons was reported by some authers**(Koprucu*et al.*, 2006)**. Test organisms to be used for acute toxicity test must be ecologically important, occupy trophic position leading to humans or other important species, and have adequate background biology, be widely distributed, be genetically stable, have its early stages (larvae, fry, and juveniles) available throughout the year and be sensitive **(Ernest Hodgson, 2004)**.*Catlacatla*(Hamilton) is one of the major fresh water carps native to India, Bangladesh, Myanmar, Nepal, and Pakistan and introduced in many other countries as exotic species. *C. catla*is a very rich source of proteins and is reported to attain a maximum size of 182 cm and weight of about 50 Kilograms. It is a surface and mid-water feeder, mainly omnivorous with juveniles feeding on aquatic and terrestrial insects, detritus and phytoplankton. It has a characteristically large, upturned mouth with a prominent protruding jaw. Because of its high nutritive value, it is a highly priced food fish and of great demand in the market. The physical and chemical changes in aquatic environment often cause some physiological changes in fish, thus, the water quality of an aquatic body is very crucial because it determines the productivity and other parameters necessary for the fish survival **(Fafioye, 2001)**.

Since prehistoric times, various cultures throughout the world have used piscicidal plants for fishing. Plants are regarded as inexhaustible sources of structurally diverse and biologically active substances **(APHA, 1976)**. Fossil record dates back the use of plants by man for various purposes including medicinal use **(Bhatt, J.P. 1991)**. There are various methods to capture fish from water. These include the use of hooks, net, setting of traps with baits, use of chemical substances and the use of plants and plant products **(Fafioye*et al.*, 2004)**. These methods seem cheap and affordable hence commonly practiced by fisher's folk all over the world. Histology can be used as biomonitoring tools for health in toxicity studies. Histological alterations are biomarkers of effect exposure to environmental stressors, revealing alterations in physiological and biochemical function. Histopathology, the study of lesions or abnormalities on cellular and tissue levels is useful tool for assessing the degree of pollution, particularly for sub lethal and chronic effects. Due to residual effects of pesticides, important organs like the kidney, liver, gill are the first organs to be damaged **(Rahman *et al.*, 2002)**.

In the present study, an attempt has been made to observe possible toxicity and histological changes in vital organ such as overy of the fish *Catlacatla*(Hamilton) exposed to lethal concentrations of plant *Balanites aegyptiaca*root extract for 96h.

Material and Methods:

Roots of *B. aegyptiaca* are collected from local area near to the Daryapur. After shade drying the plant material was grounded into powder using pestle and mortar. One liter of distilled water was mixed with 200 g of powdered plant material. The mixtures were kept for 2 days in tightly sealed vessels at room temperature and stirred several times daily with a sterile glass rod. This mixture was filtered through muslin cloth. Further extraction of the residue was repeated 3-5 times until a clear colorless supernatant extraction liquid was obtained indicating that no more extraction from the plant material was possible. The extracted liquid was subjected to water bath evaporation to remove the solvent. The water bath temperature was adjusted to 400^0 C. The semi-solid extract produced was kept under a ceiling fan to dry. The extract was weighed and portion of it used for phytochemical screening while the rest was use for the susceptibility test.

The adult specimens of *Catlacatla*were collected from the local market and brought to the laboratory. So for this experiment, fish are acclimatized in glass aquarium for 10 days.The survived fish are maintained in aerated condition and are fed regularly with fish food. The water is replaced every week and replaced with declorinated water. Faecal material and debris, if any, is also removed as and when necessary.

Lethal concentration of 09.00 mg/l, 11.00 mg/l and 13.00 mg/l was selected for this experiment. Ten fishes were exposed to each concentration. Along with this, appropriate control was maintained for each test. The mortality did not exceed 5% during the test period in control. Survival and mortality percentage were tabulated after 24, 48, 72 and 96 hrs.

For the lethal toxicity test, the fresh water fishes were divided in two groups as follows.

Group I: - Control group of *Catlacatla*

Group II: - Fishes *Catlacatla*were exposed to lethal concentration of root water extract.

To determine structural changes in internal tissues such as ovaryof both control and exposed fishes of lethal concentration were examined histologically.

Result and Discussion:

For lethal concentration at control there are no lesion, no necrosis, no pigments, no malignancy, no inflammation and cellular degeneration seen for the 24hrs, 48hrs, 72hrs, and 96hrs(Fig-1.1).While at 9.00mg/l inflammation of epithelial layer for 96hrs while no lesion, no inflammation, no necrosis, no pigments, no malignancy, and cellular degradation seen for the 24hrs, 48hrs and 72hrs(Fig-1.2).At 11.00mg/l inflammation on epithelial layer for 48hrs, for 72hrs lesion occurs on epithelial layer, while for 96hrs lesion occurs in epithelial layer and follicle cells and for 24hrs no lesion, no inflammation, no necrosis, no pigments, no malignancy and cellular degradation seen(Fig-1.3).At 13.00mg/l inflammation occurs on epithelial layer for 24hrs, for 48hrs lesion occurs in epithelial layer and follicle cells while, for 72hrs necrosis occurs in epithelial layer and lesion on follicle cells and oocytes and for 96hrs cellular degradation of epithelial layer and necrosis occurs on follicle cells and oocytes(Fig-1.4).

fig-1.1: Ovary (Section) of *Catlacatla* exposed to lethal concentration (control) of root water extract of *B.aegyptiaca*.

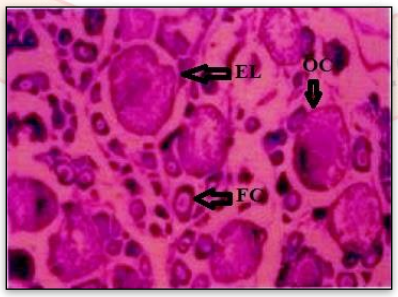


Fig.-Ovary of *Catlacatla* **(Control).**

EL: epithelial layer, **FC**: follicle cellsand**OC**: oocytes. No lesion (L), inflammation (I), pigment (P), necrosis (N), malignancy (M) and cellular degeneration(C).

Fig-1.2: Ovary (Section) of *Catlacatla* exposed to lethal concentration (9.00 mg/l) of root water extract of *B.aegyptiaca*showing lesion (L).

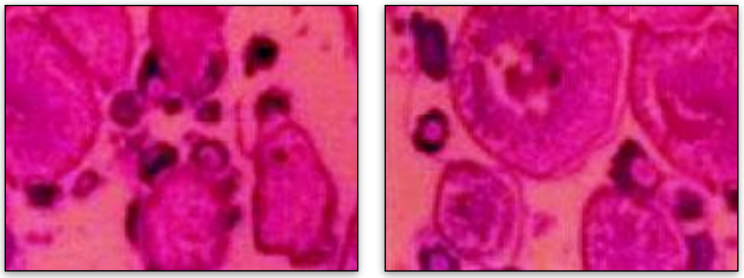


Fig.- 24hrs. **Fig.- 48hrs.**

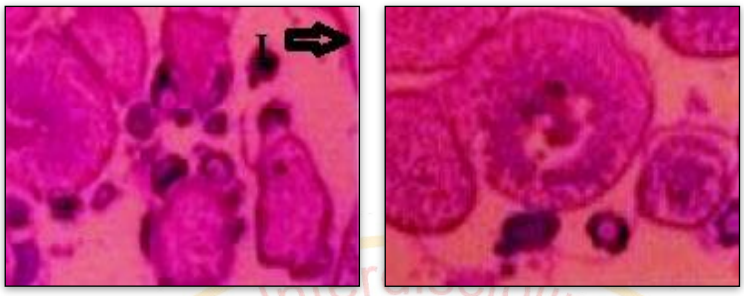


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.3: Ovary (Section) of *Catlacatla* exposed to lethal concentration (11.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L) andinflammation (I).

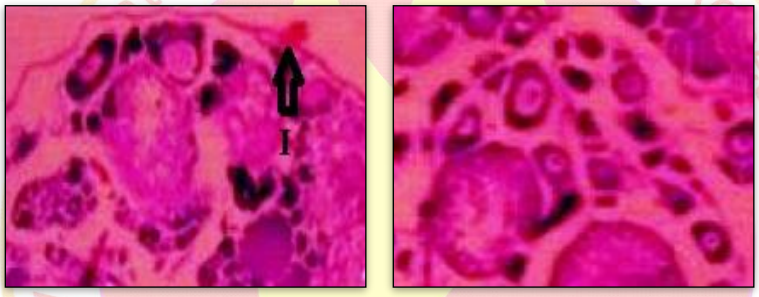


Fig.- 24hrs. **Fig.- 48hrs.**

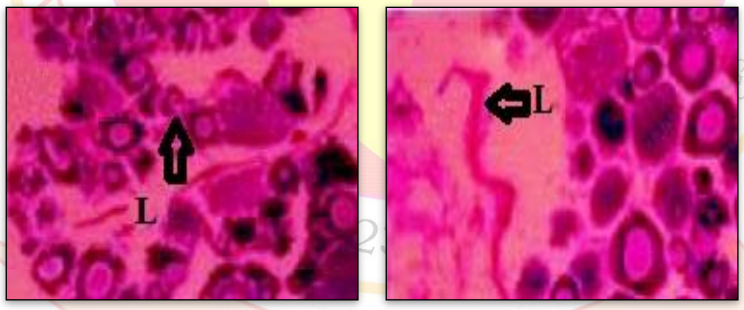


Fig.- 72hrs. **Fig.- 96hrs.**

Fig-1.4: Ovary (Section) of *Catlacatla* exposed to lethal concentration (13.00 mg/l) of root water extract of *B.aegyptiaca*showinglesion (L), inflammation (I),necrosis (N), and cellular degeneration(C).

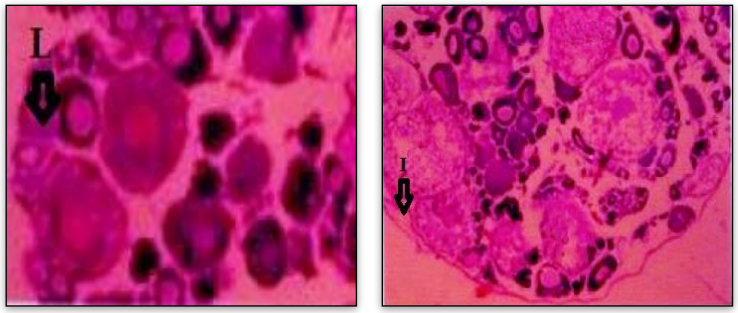
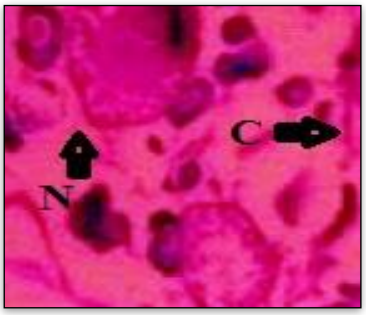


Fig.- 24hrs. **Fig.- 48hrs.**



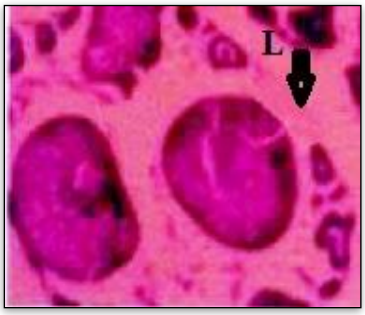


Fig.- 72hrs. **Fig.- 96hrs.**

In the present investigation the ovary of fish exposed to lethal concentration for different time exposure (24hrs. 48hrs. 72hrs. and 96hrs.) showed inflammation and lesion of epithelial layer and follicle cells during low concentration while, increasing concentration for different time exposure showed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes were seen at later time of exposure(Fig-1.2 to 1.4).

In the present investigationshowed inflammation, lesion, necrosis and cellular degeneration of epithelial layer, follicle cells and oocytes in lethal and sub-lethal concentration. Similar observations agree with the finding of**(Khillare, 1992)** observed oocyte maturation and arrest of oocyte development in tertiary yolk stage.**(Lee and Yang, 2002)** observed at the dose of 100 ppm of sumithion, fragmented ova with abnormal shape and arrangement in the experimental fish as compaired to normal.

Conclusion:

The present study proves the toxic potential of the plant root extract and shows moderate to severe alterations inovary tissues which can lead to metabolic changes in the fish. The results of the present study clearly indicated that piscicides have a direct impact on the structural alterations in *Catlacatla*. The plant root extract is known to impair the metabolic and the physiological activities of the organism and through repeated exposure the piscicides tends to accumulate in its tissues even atlethal concentration.

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Effect of Selected Vigna Protease Inhibitors on Growth of Helicoverpa armigera, Hubner

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Abstract

Proteinase inhibitors are the most studied class of defense proteins. The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity against the polyphagous pest, H. armigera. The results showed significant reduction in weight of H. armigera larvae and more larval mortality when fed on proteinase inhibitors of studied Vigna. The LC_{50} values of V. hainiana, V. aconotifolia and V. sublobata were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Introduction:

H. armigera, Hubner (Lepidoptera: Noctuidae), is a major polyphagous pest present widespread in Asia, Africa and Oceania (EPPO, 2006) responsible for significant levels of yield losses in many economically important crops. Helicoverpa pest attack is the big problem as it has covered major part of the world from tropical climates to regions with cooler temperate climate and spread easily to natural migration. Application of huge amount of the pesticides resulted in to high levels of resistance in *H. armigera*. Some of the examples of pesticides to which *Helicoverpa* has acquired resistance are pyrethroids, endosulfan, carbamates and organophosphates (Armes, 1993 and 1995; Armes et al., 1992, 1994 and 1996; Forrester et al., 1993; Kranthi et al., 2001; Martin et al., 2000 and 2003; Torres Villa et al., 2002a). The genus Vigna belongs to Fabaceae, formerly called Leguminosae. It is found that, seeds of the Leguminosae generally contain large quantities of PIs active against insect serine proteases such as trypsin and chymotrypsin (Ryan, 1974). The earlier study indicates that wing bean proteinase inhibitors are good candidates for engineering resistance in to *Helicoverpa armigera* host plants (Harsulkar et al., 1999). Therefore, the study of interactions between such plant proteinase inhibitors and insect proteases can be useful in further insect pest management system.

Material And Methods:

Rearing of *H. armigera:*

Healthy, actively feeding H. armigera larvae were collected from the field & reared on an artificial diet (Nagarkatti and Prakash, 1974 with modification) & maintained under controlled conditions in the laboratory at Dr. Panjabrao Deshmukh Krishi Vidyapith, Akola, India. The laboratory conditions were maintained at 28±2^{0}C temperature, humidity 75±5% and 14:10 h light: dark period. The pupae were collected and disinfected with 0.02 per cent sodium hypochloride solution and transferred to the individual screw capped vials, containing soil bed. The adults emerged from the pupae after 7-10 days were then transferred to the bell jar covered with muslin cloth at its mouth. The sexes were differentiated on the basis of coloration pattern of the wings as female shows chocolate brown wings whereas male are pale brown. The adults were provided sterile cotton swabs imbibed with liquid diet of honey, sucrose and vitamin-E.

Plants for study:

The genus Vigna belongs to Fabaceae, formerly called Leguminosae was used as the source material to screen for protease inhibitory activity. Some of the wild Vigna seeds were collected from Melghat Region of Maharashtra.

Bioassay of PIs against *H. armigera* larvae:

The in vivo effect of Vigna proteinase inhibitors on larval growth of *Helicoverpa* was studied using feeding assay after screening 3 genotypes of Vigna. In spectrophotometric and electrophoretic studies, three accessions of Vigna were found to have potent proteinase inhibitors against *H. armigera*, hence these Vigna relatives were selected for bioassay studies. Early instars larvae were taken from the homogenous culture of *H. armigera* for experimental studies and were allowed to feed on chickpea-based diet having equal quantity of Vigna proteinase inhibitors. This culture was maintained in the laboratory at 27^{o}C with 80% relative humidity. The weight of larvae was taken after every 24 hrs after ingestion of food. Fresh food was given to the larvae on every alternate day to avoid the chances of microbial contamination. Control population was also maintained simultaneously on chickpea bases diet without PIs. The larval mortality and larval weight was recorded.

IC 50 Value of protease inhibition:

It is the amount of PI needed for 50% inhibition of protease activity was determined by conducting the assay. Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V.*

hainiana, V. aconotifolia and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. The 10%, 15% and 20% concentrations of the PIs extracted from seed samples were made and equally added to chickpea-based diet for feeding assay. Ten neonates *Helicoverpa* larvae were released on the chickpea-based diet with PIs. The observations were recorded at 24 hours up to 3 days. The mortality data were recorded with the moribund larvae considered as dead. Water spray as control was maintained to study mortality percentage.

Results And Discussion

Bioassay of *Vigna* PIs against *H. armigera* larvae

Bioassay of PIs against *H. armigera* larvae was conducted using different vigna genotypes such as *V. hainiana, V. aconotifolia* and *V. sublobata*. The chickpea-based diet (PI removed by heat treatment) was used for feeding assay. Equal quantity of PIs extracted from seed samples was added to chickpea diet for feeding assay. The initial weights of the larvae were taken at the time of releasing the larvae on the diet and the final weights were taken on 13th day. The diet was changed on alternate day to avoid the chances of contamination. The results showed significant reduction in weight of *H. armigera* larvae and more larval mortality when fed on proteinase inhibitors of *V. hainiana, and V. aconotifolia* as compared to *V. sublobata* whereas, in control (Chickpea diet without PI) no larval mortality was recorded.

Table 1. Bioassay of PIs against *H. armigera* larvae

PI Source	Initial weight of larvae in (mg)	Final weight of larvae in (mg)	Weight gain in (mg)	Weight reduction as compare to control (%)	Mortality observed at 11th day (%)
V. hainiana	23.7	199.7	176.0	37.61%	45%
V. aconotifolia	23.7	198.3	174.6	38.05%	47%
V. sublobata	23.9	215.2	191.3	32.77%	41%
Control	24.0	320.1	296.1	0% (control)	0%

IC 50 value of protease inhibition

For determining LC_{50} values, the homogenous population of 10 *Helicoverpa armigera* neonates was subjected to chick pea-based diet having different concentrations of *Vigna* protease inhibitors as given in the chapter" Materials and Method". The observed mortality was recorded up to 72 hours at 24 hours interval. The values of median lethal concentrations (LC_{50}) of respective *Vigna* PIs were recorded and presented in the following table.

Table 2: Toxicity of *Vigna* PIs against *Helicoverpa armigera* neonates

Protease inhibitors source	LC_{50} Value in % after 72 hrs.
Vigna hainiana	15%
Vigna aconotifolia	20%
Vigna sublobata	20%
Control	No mortality on 3rd day

The LC_{50} values of *V. hainiana, V. aconotifolia and V. sublobata* were found to be 15%, 20% and 20% respectively after 72 hours of exposure.

Conclusion

Protease inhibitors are important tools for regulating the target proteases. They play a crucial role in controlling many physiological functions. The gut of this insect found to have both trypsin and chymotrypsin proteinases like activity. These proteinases were involved in protein digestion and provided the source of essential amino acids and energy to the insect. Thus, such proteinases become a target for the proteinase inhibitors having tryptic and chymotryptic inhibitory potential.

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The Study of Seed Germination. Seedling and Early Plant Growth by the Effect of Metal Ion and Their Complexes in Plumbago Zeylanica (Chitrak) Plant

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Abstract

This work investigates the usefulness of 3-(2-methoxyphenoxy)-1,2-propanediol as an alternate fertilizer by field experiments on growing Plumbago Zeylanica. Separate field experiments using 3-(2-methoxyphenoxy)-1,2-propanediol and original soil compare the effectiveness of different products for agronomic applications. Attempt has been made with the impact of heavy metals and their complexes of 3-(2-methoxyphenoxy)-1,2-propanediol on to improve the yield of economically important plant Plumbago Zeylanica (Chitrak). The seeds were immersed in Co (II), ligand and its complexes to study the seed germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants, are studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Plumbago Zeylanica(Chitrak). Plant treated with 3-(2-methoxyphenoxy)-1,2-propanediol, complex and metal Co (II). Nitrogen and protein contents are found higher in the treated plants as – Complex >3-(2-methoxyphenoxy)-1,2-propanediol > Co (II).

Key words *- 3-(2-methoxyphenoxy)-1,2-propanediol, Co (II), Plant, Seed Germination of Chitrak, Chlorophyll*

Introduction:

Plant growth regulators are organic compounds, other than nutrients, that produced naturally inhigher plants, controlling growth or other physiological functions at a site remote from its placeof productionand active in minute amounts, modify plant physiological process. The plant physiologists not only to supply basic information regarding how plants growand develop but also to undertake research program undergo designed specifically to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture [1-2].One of the important contributions of the 19th century experimental plant physiology to agriculture was to discovery that soil fertility and adding several nutrients to the soil could increase crop yields. Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing countries throughout the world during the past 50 years and more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and developing.

The complexes of transition metals with bi- allyl thiourea are prepared and their herbicidal and plant growth regulating activities are tested with wheat and cucumbers by Daverski et al [3] Complexes of Piperidene-2-Carboxilic acid with some bivalent metal ions have been reported to be useful in agriculture as plant growth regulators [4]. The Complexes of rare earth with peptides showed the herbicidal and plant growth regularity activity with wheat and barley plant [5].

Since 3-(2-methoxyphenoxy)-1,2-propanediol has intense biological activities, anti-inflammatory, antipyretic and analgesic activities. 3-(2-methoxyphenoxy)-1,2-propanediol inhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Co (II), with 3-(2-methoxyphenoxy)-1,2-propanedioland comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand and control solution on germination, survival seedlings height etc, on Plumbago Zeylanica (Chitrak) plant in order to make suggestion whether complex metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

Seed of Plumbago Zeylanica Species were collected from forest department Akot. Various seed characteristic like seed size, Shape, color and weight of seed/gm. would beobserved. Seed shape - oblong, Seed coat- Hard, Seed color-reddish brown,no. of seeds/gm- 47.9 andSeed size-5-6mm. The solution of Co (II) in the form of nitrate and 3-(2-methoxyphenoxy)-1,2-propanediol of the concentration of 0.01 M was prepared in

double distilled water. The applications of complex, metal, ligand solution are studied by dissolving it in proper solvent at 4, 7.00 and 9.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then grindand filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc, to improve the crop yield. Amongst several economical and medicinally important plants Plumbago Zeylanica (Chitrak) is selected as a plant system.

1. 20 gm healthy seeds of Plumbago Zeylanica (Chitrak) were taken 4.0, 7.00 and 9.5 pH for about three hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, during 14 August 2021 to 30 Sept.2021; the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal Co (II), complex on percentage of nitrogen, protein and chlorophyll in the leaves of Plumbago Zeylanica (Chitrak) plant. Chlorophyll pigments in fresh leaves were determined by spectrophotometric method given by Jahagirdar[21].

Parameters:

Soil pH of soil sample was measured by taking extract of mixture of soil water withpH-meter. Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after $3\frac{1}{2}$ days and survival were noted after 10 days.

After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived plants were measure.

Table 1
Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on Plumbago Zeylanica (Chitrak) Test System.

Test System	Effect of	pH	Parameters						
			%Germination after $3\frac{1}{2}$ days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
Plumbago Zeylanica (Chitrak). Test System	Water (Control)	4.0	73.00	72.00	21.084	7.552	13.478	0.5603	**3.25**
		7.0	78.66	76.66	22.569	7.256	13.698	0.5415	**3.27**
	Ligand	4.0	75.66	75.33	21.964	7.698	13.852	0.5557	**3.87**
		7.0	82.00	81.66	24.214	7.963	15.108	0.5270	**3.63**
	Complex	4.0	76.00	76.00	22.458	8.748	13.563	0.6449	**3.56**
		7.0	79.66	78.00	23.569	8.986	14.231	0.6314	**3.89**
	Metal	4.0	82.00	79.33	21.483	8.698	14.125	0.6157	**3.12**
		7.0	**50.00**	**91.33**	**26.586**	**9.025**	**14.244**	**0.6336**	**3.56**

Table 2
Estimation of Chlorophyll for Plumbago Zeylanica (Chitrak) Plants System

S.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit.x 10^{-3}	Chlorophyll 'b' gm/lit.x10^{-3}
1	Control	Plumbago Zeylanica(Chitrak).	4.986	3.714	**1.754**
2	Ligand		5.725	4.821	**1.018**
3	Complex		5.782	3.560	**1.215**
4	**Metal**		**6.312**	**5.255**	**1.196**

Table 3
Estimation of Total Nitrogen and Proteins in Leaf Powder of Plumbago Zeylanica (Chitrak)

S.No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Nitrogen	
1		Control	6.58	55.28	7.52	**44.562**

2	Plumbago Zeylanica (Chitrak).	Ligand	6.90	56.22	7.34	**42.816**
3		Complex	7.26	54.28	7.12	**46.195**
4		**Metal**	**6.02**	**52.78**	**7.01**	**41.406**

Results And Discussion:

Seed of the target species were taken to study the germination behavior under the influence pre–treatments. Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table clearly indicates that average root length in 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co(II), at all pH increase over is seen that in complex, Co(II), showed decrease in shoot length control. But in case of Plumbago Zeylanica (Chitrak) plant system shoot length increases in 3-(2-methoxyphenoxy)-1,2-propanediol, complex and Co(II), and all pH over control.

Chlorophyll pigment / chlorophyll control were found affected in Plumbago Zeylanica (Chitrak) plant by the treatments. Total chlorophyll was found to be higher in Plumbago Zeylanica (Chitrak). Total chlorophyll content in 3-(2-methoxyphenoxy)-1,2-propanediol and complex is higher than in metal and control treatment in both plant systems.

Percentage of nitrogen and proteins were found affected in leaves of Plumbago Zeylanica (Chitrak) by the treatment of 3-(2-methoxyphenoxy)-1,2-propanediol, complex, Co (II). It is observed that percentage of nitrogen and protein are higher than that of control.

Complex >3-(2-methoxyphenoxy)-1,2-propanediol > H_2O > Co (II).

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Current Study on physico –chemical characteristics and biological factors of Chargaon Lake in Warora Taluka, District-Chandrapur (M.S.). India.

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Abstract

The physico-chemical parameters are water temperature, electric conductivity, total dissolved solids, total hardness, total alkalinity, turbidity, pH, dissolved oxygen, chlorides, COD , BOD, etc. The biological factors considered were macro-zoo benthos and plankton of the lake.Chargaon Lake was constructed as part of irrigation projects by Government of Maharashtra. Nearest city to Lake is Chimur and the Lake is situated in Warora Taluka of Chandrapur District of Maharashtra in India. In the present study an attempt has been made on physico –chemical characteristics and plankton diversity and density of a sub urban perennial water body, located in Chargaon in Warora Taluka District Chandrapur of Maharashtra. The study was conducted during August-2020 to July-2021. The samples were analyzed at monthly intervals for a period of one year. Limnological parameter and plankton diversity are an important criterion for determining the suitability of water for irrigation and drinking purpose. Chargaon Lake has greatest importance for humankind. Lake was highly productive as presence of various class and order of benthos, zooplankton and phytoplankton although there were no sign of problem like eutrophication. Biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton repectively.

Keywords:*Humankind, Irrigation, Benthos, Diversity and Eutrophication.*

Introduction:

Biological production in any aquatic body gives direct correlation with its physico-chemical status which can be used as trophic status and fisheries resources potential (Jhingran*et al.*, 1969). Life in aquatic environment is largely governed by physico-chemical characteristics and their stability. The physico-chemical as well as the biological factor of lake have vital role in aquaculture and productivity of fishes. The quality of water determines the quality of fish to be produce in it. The physical factors are water temperature, water current and turbidity of water, whereas the chemical parameter of lake comprise pH, dissolved oxygen, total alkalinity and total hardness of water. The biological factors considered were macro-zoo benthos and plankton of the lake. The seasonal changes in different physico-chemical parameters are responsible for annual variation and growth of biological factors viz., macro-zoo benthos and plankton etc.

Tepe*et al.*, (2005) found that the water quality attributes such as water temperature, light penetration, dissolved oxygen, total alkalinity and total hardness are the representative of the seasonal fluctuation. Ali *et al.*, (2006) showed that the water quality of fresh water ecosystem undergoes complex changes due to all physico-chemical factors and water quality as a sequence disrupting the aquatic life. Hayat *et al.*, (1996) and Jena *et al.*, (1998) revealed that temperature and ecological conditions are responsible for the fluctuation of salt contents, which in turn influence the production, and growth of fish .

Materials and Methods:

The sampling was carried out in ChargaonLake at five different sites monthly between August-2020 to July-2021 for one year. About 12 water sample were collected in each months.

The physico-chemical factors are water temperature, watercurrent, turbidity of water pH,dissolved oxygen, total alkalinity and total hardness of water, whereas biological factors were macro-zoo benthos and plankton of the lake. Study of physico-chemical factors was carried out by using standard methods(APHA, 1998). For the qualitative estimation safe water quality standards were use(Boyd and Tucker, 1998; Ali*et al.*, 2000). Macro-zoo benthos collected from 1m²area of lake at the depth of 15cm. The plankton was sampled at each spot by filtering 100liters of water. Preservation was made on the spot in 4% formalin. The quantitative analysis of plankton was made with the help of Sedgwick-Rafter counting slide as suggested by Welch (1952).

Result and Discussion:

Water temperature

The average water temperature of lake was found to be varying from 14.12˚c to 21.58˚c during Jan.to July respectively. Thus, water of ChargaonLake is coldest in winter and hottest in monsoon. (Table 1)

Table.1 Average monthly and seasonal variation in water temperature (˚C) of Chargaon Lake (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	12.3	14.7	15.5	17.8	20.4	21.5	21.9	20.4	19.7	17.9	14.5	12.7
Spot B	15.5	17.3	17.3	19.6	20.5	20.4	20.8	19.5	18.6	17.7	16.4	15.6
Spot C	11.2	15.6	17.2	19.7	19.5	20.7	22.4	20.6	18.8	16.9	13.4	11.6
Spot D	16.3	17.8	18.5	20.5	20.8	21.5	21.3	19.6	18.6	17.6	16.8	15.3
Spot E	16.5	17.9	18.3	20.8	20.2	20.3	21.5	19.5	18.8	17.3	16.7	15.4
Average	14.36	16.66	17.36	19.68	20.28	20.28	21.58	19.92	18.9	17.48	15.56	14.12
Season	Summer				Monsoon				Winter			

Water velocity

While calculating the velocity of water, we observed that the rate of water flow is fluctuated from a minimum value of 0.307m/s in Feb.to a maximum value of 0.899m/s in Aug. Thus the water current with a rate of 0.313m/s in winters to 0.849m/s in monsoon is useful for fish survive (Table 2).

Table.2 Average monthly and seasonal variation in water current velocity (m/s) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	0.289	0.364	0.393	0.416	0.576	0.663	0.849	0.615	0.433	0.269	0.281	0.274
Spot B	0.304	0.337	0.393	0.428	0.438	0.864	0.957	0.813	0.522	0.391	0.324	0.314
Spot C	0.271	0.366	0.398	0.421	0.421	0.633	0.765	0.651	0.434	0.354	0.265	0.261
Spot D	0.337	0.351	0.598	0.924	0.924	0.963	0.972	0.811	0.614	0.483	0.388	0.391
Spot E	0.334	0.349	0.598	0.944	0.923	0.877	0.951	0.813	0.619	0.433	0.335	0.325
Average	0.307	0.353	0.476	0.627	0.656	0.656	0.899	0.741	0.524	0.386	0.319	0.313
Season	Summer				Monsoon				Winter			

Turbidity

It has been observed that the water is highly turbid during monsoon period (July-August) with a value of 92.9NTU. Thus is obvious because water becomes turbid due to the rainfall and flash flood. With an unusual variation water was found extremely less turbid during rest of the seasons with the minimum of 7.9NTU in winter. (Table 3).

Table.3 Average monthly and seasonal variation in turbidity (NTU) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	09	11	17	10	12	95	86	51	31	11	08	10
Spot B	06	05	11	09	17	91	96	64	41	18	07	10
Spot C	05	08	09	11	22	88	99	59	39	14	05	07
Spot D	07	09	06	13	21	89	94	61	31	12	11	08
Spot E	09	07	05	09	19	94	97	57	27	10	09	08
Average	7.2	8.0	9.6	10.4	18.2	91.4	94.4	58.4	33.8	13	8.0	8.6
Season	Summer				Monsoon				Winter			

pH

pH fluctuation occur only within a narrow range. The pH of lake was found to be varying from 7.6 to 8.32 during July to December. Therefore, during monsoon the water is least basic and it seems more basic during winter (Table 4).

Table.4 Average monthly and seasonal variation in pH of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	8.2	8.3	8.2	8.1	8.2	7.9	7.9	8.3	8.2	8.6	8.2	8.1
Spot B	7.4	8.3	8.2	8.7	8.6	7.6	7.6	7.3	7.4	7.7	8.1	8.3
Spot C	8.1	8.6	8.2	7.9	7.9	7.2	7.8	8.2	8.3	8.1	8.7	8.4
Spot D	8.2	8.1	8.2	8.3	8.5	8.1	8.1	7.9	7.8	8.3	8.5	8.2
Spot E	8.0	8.1	8.2	8.3	8.3	8.0	8.1	7.6	7.8	8.0	8.1	8.2
Average	7.98	8.28	8.2	8.26	8.3	7.76	7.9	7.86	7.9	8.14	8.32	8.24
Season	Summer				Monsoon				Winter			

Dissolved Oxygen

In December, the oxygen content dissolved in water was found to be highest with the value of 10.72mg/l.The Lake has less D. O. content in Jun. with the value of 7.6mg/l. Thus the fish can endure water having the dissolved oxygen content from7.93mg/l (during monsoon) to 10.57mg/l (during winter). (Table 5).

Table.5 Average monthly and seasonal variation in dissolve oxygen (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	9.8	8.9	8.4	8.6	7.8	7.2	8.1	8.5	9.3	9.8	10.5	10.3
Spot B	11.3	8.9	7.8	7.2	7.4	7.4	7.1	8.6	9.3	10.1	10.4	10.8
Spot C	9.8	8.9	9.5	8.3	7.9	8.2	8.7	8.7	9.4	9.2	10.9	10.1
Spot D	10.4	9.3	8.7	7.4	7.4	8.2	8.3	9.3	9.9	10.5	11.1	10.9
Spot E	10.4	9.3	8.6	7.9	7.5	7.9	8.2	9.5	9.8	10.5	10.7	11.2
Average	10.34	9.06	8.6	7.88	7.6	7.78	8.08	8.92	9.54	10.02	10.72	10.66
Season	Summer				Monsoon				Winter			

Total Alkalinity

In our observation it has been observed that the lake water was alkaline and the magnitude was varying from 59.34mg/l to 100.46mg/l from Augustto February. Thus, the water ofChargaon Lake is most alkaline during winter and then with a regular decrement is least alkaline during monsoon. (Table 6)

Table.6 Average monthly and seasonal variation in total alkalinity (mg/l) of Chargaon Lake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	91.9	80.1	76.2	71.0	64.2	62.4	60.8	64.4	73.5	85.9	89.9	92.4
Spot B	96.2	87.1	80.8	74.1	63	61.7	61.8	62.5	79.8	89.1	99.2	101
Spot C	99.6	83.4	78.5	74.7	62.7	65.4	59.9	67.8	77.6	81.1	101.5	99.2
Spot D	103.3	97.1	79.7	70.2	71.1	60.1	57.6	70.4	91.1	95.3	98.2	99.8
Spot E	111.3	97.1	81.7	73.2	73.1	62.8	56.6	71.1	87.1	91.3	91.9	108.2
Average	100.46	88.96	79.38	72.64	66.82	62.48	59.34	67.24	81.82	88.54	96.14	100.16
Season	Summer				Monsoon				Winter			

Total Hardness

The degree of hardness calculated in the lake water was lowest in July (78.52mg/l) and highest in February (109.26 mg/l). The study summarized that the water in winter in highly hard, while least hard during monsoon. (Table 7).

Table.7 Average monthly and seasonal variation in total hardness (mg/L) of Chargaonlake. (2020-2021)

Month	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Spot A	101.2	93.7	91.2	89.1	75.4	77.5	78.2	77.2	82.5	90.6	92.3	97.5
Spot B	109.3	98.8	85.9	78.2	77.1	75.9	74.9	78.2	82.1	89.2	96.7	101.2
Spot C	104.3	98.5	99.8	92	90	84.4	81.7	84.9	89.6	98.4	99.6	103.1
Spot D	112.4	96.5	94.7	87.5	85.1	74.9	82.4	88.2	91.5	101.4	106.1	109.2
Spot E	119.1	107.4	96.2	86.3	84.6	79.9	84.3	86.9	87.5	98.2	106.3	108.5
Average	109.26	98.98	93.56	86.62	82.44	78.52	80.3	83.08	86.64	95.56	100.2	103.9
Season	Summer				Monsoon				Winter			

Macro-zoo benthic Density

The number ofEphemeroptera (211Units/m²in December while 12 Unit/m² in July), Trichopteran (210 Unit/m² in December while 8Unit/m² in July), Dipteran (13 Units/m ² in July while 145 Units/m² in February), Plecopteran nymphs (51Units/m²in January while 1 Units/m² in August), Coleopteran larvae (99 Units/m²in December while 9 Units/m² in July). Odonata larvae (130 Units/m² in December while 7 Units/m² in June). The average total macro-zoo benthos observed (812Units/m² in December while56 Units/m²in July) and (in winter season 646.33 Units/m² while during monsoon 114 Units/m²). (Table 8).

Table 8. Average monthly and seasonal variations in Macro-zoo benthic density (Units/m^2) (2020-2021)

Macrobenthic groups (Units/m^2)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Ephemeroptera	149	73	52	24	21	12	35	64	110	144	211	155
Trichoptera	140	77	35	21	10	08	35	64	110	144	210	150
Deptera	145	116	63	43	34	13	29	62	88	139	142	110
Plecoptera	48	39	43	40	21	02	01	14	03	14	20	51
Coleoptera	46	61	22	38	11	09	22	22	94	88	99	39
Odonata	42	76	39	29	07	12	50	52	92	110	130	52
Total Macro-zoo benthos (Unit/m^2)	570	442	254	195	104	56	172	278	497	639	812	557
Season	Summer				Monsoon				Winter			

Plankton Diversity

The total phytoplankton were Chlorophyceae, Bacillariophyceae and Cyanophyceae (2925 Units/l in January while 400 Units/l in August). The total zooplankton were Crustaceans and Rotifers (25Units/l in August and 400 Units/l in January). The total plankton density vary (3110 Units/l in January to 425 Units/l in August. (Table9).

Table 9. Average monthly and seasonal variations of Plankton density (Units/L). (2020-2021)

Plankton group (Units/L)	Feb.	Mar.	Apr.	May.	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.	Jan.
Chlorophyceae	375	725	325	510	135	275	Nil	230	475	650	500	600
Cyanophyceae	225	175	Nil	200	125	125	Nil	125	75	150	200	250
Total phytoplankton	2175	1725	1550	1420	950	802	400	1080	2850	2629	2550	2925
Crustaceans	175	100	50	175	25	75	25	75	100	225	155	125
Rotifers	Nil	100	200	220	75	Nil	Nil	25	25	175	100	60
Total Zooplankton	175	200	250	395	100	75	25	100	125	400	215	185
Total Plankton (Units/L)	2350	1925	1800	1815	1050	877	425	1180	2975	3029	2850	3110
Season	Summer				Monsoon				Winter			

In the present study, the water temperature of the lake was observed to be moderate throughout the year. This moderate water temperature is due to its spring-fed nature of origin. It is also supported by Odum (1971) that photoperiod was shorter in winter than summer which is directly related to temperature and hence water temperature is highest in June. The velocity of water current was observed to be fluctuated from a minimum of 0.307 m/s (February) to a maximum of 0.899 m/s (August). It is also obvious from our study that the average rate of water is highest in monsoon whereas lowest in winter.

In present study water was highly turbid during Monsoon (July-August) while very low during rest of the seasons with the minimum of 7.9 NTU in winter. These observations are also supported by Jhingran (1965) who reported that turbidity generally increased to a maximum value in monsoon due to the suspended solids in the flooded water whereas, during the post monsoon months the turbidity values were low but increased again during the summer months with the increase in tidal management and intensity .Upadhyay (1997) calculated the turbidity variation from 2 to 162NTU.

pH is gradually increased from a minimum of 7.83 during monsoon to a maximum of 8.28 during summer. Similar variations in pH of the lake were recorded by Kumar *et al.*,(2006) in Garhwal Himalayas. They concluded that winter maxima for pH might be due to algal growth and minima in monsoon might be due to influx of organic and inorganic ions in to the lake caused by flash flood.

In our study D O highest during winter whereas lowest during, Ali (1999) reported that the dissolved oxygen variation shows inverse relationship with water temperature variation. Bhatt *et al.*, (1984) also reported high D O and low free CO2 concentration in winter.

In present study, the water of ChargaonLake was found to be most alkaline during winter and least during monsoon. Total hardness show minimum during monsoon to a maximum during winter.
Density of total macro-zoo benthos and total plankton populations were plenty in winter while rarely during monsoon. Detritus standing stock is the main reason for high density of benthos in winter and substratum stability too. Moderate temperature low gradient of velocity favors the growth of biotic communities. Similar study was carried out by Rautela*et al.*,(2006) who reported that the macro-zoo benthos had a maximum population during winter(325 Units/m ^{2}) and the minimum (15 Units/m ^{2}) during monsoon season.

Conclusion:

Briefly, present study concluded that physico-chemical parameters levels indicate the moderate quality of water, lake water of the study area was not polluted in respect to physico-chemical assessment. But biological studies indicate that lake water was fit for aquatic organism, such as fishes because of there were plenty of food in the form of benthos, zooplankton and phytoplankton.

Chargaon lake water was habitable for fishes and fit for development of aquaculture. There were no sign of problems like eutrophication. It is also concluded that the higher growth of macro-zoo benthos and planktons in the lake is favored by low water temperature, low current velocity, and moderate turbidity with high D High alkalinity and high hardness during winter's season.

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Isozyme study in *Leucas biflora* (Vahl.) R. Br. of Lamiaceae.

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Abstract:

The present study reveals plant allozymes of family Lamiaceae (Leucas biflora) to establish the phylogenetic relationship. In the present study five allozymes were tested Viz. Superoxide dismutase, Succinate Dehydrogenase, Polyphenol Oxidases, Catalase and Rubisco and data was interpreted by using STATISTICA package. Four enzymes showed reliable polymorphism except Catalase. In Catalase monomorphic allele was elucidated. The bands were stained and allele frequency was calculated. The difference in allele frequency can be helpful to the taxonomist in establishing genetic diversity amongst the taxa of Lamiaceae.

Keywords *- Isozymes, Zymogram, Allele frequency, Polymorphism, Phylogeny.*

Introduction:

The most widespread in its distribution amongst Plant kingdom is Angiosperms. "Tubiflorae" is the largest order of Engler and Diels (1936), revised system of classification with primarily herbaceous plants, gamopetalous corolla, and epipetalous stamens.Taxonomists treated the order Tubiflorae differently. The variation in allele frequency would support as an additional taximetrics in deciding the position of the families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

Allozymes share a common substrate but differ in their electrophoretic mobility that helps in making the comparisons between the populations. In the present investigation, efforts have made to support the new taximetrics on the basis of Isozyme pattern and shared loci.

Allozyme pattern has been studied for calculating the percentage of gene loci and polymorphism per population. For out crossing plants, the numbers and frequencies of alleles detected in any one population are often very similar to another population of the taxa belonging to same family studied. Thus, the findings in the present investigation proved to be helpful to justify the position of the family in the order Tubiflorae on molecular basis.

Review of Literature

Meister (1950), studied the taxa to understand the molecular heterogenesity. Markert (1975a, b, c) published the information about isozymes in 3 volumes namely Isozymes –I, Isozymes –II, &Isozymes –III. Sonnante et al. (1997) obtained better insight into genetic relationship within and between the taxonomic entities of *Vigna luteola* and *V. marina*. Bhat et al. (1998) studied the Isozyme diversity in Indian primitive maize landraces and observed polymorphism for Peroxidase, esterase and acid phosphatase. Apavatjrut et al. (1999) carried out the study on *Curcuma* species. Volis et al. (2003), interpreted that allozyme variation in wild barley is adaptive and directly related to local environment. Soltis & Soltis (2005) gave the detailed study of isozymes in different chapters of plant biology. Isozyme used as a molecular marker to assessed the genetic diversity and structure of wild Tunisian *Thymus capitatus* of Lamiaceae (Ali et. al.2011). Gömöry *et. al.* focussed on potential discordances in spatial patterns of allozyme and quantitative phenotypic variation.

Materials and Methods

The plant material was collected from localities in and around Nagpur District. The seeds of *Leucas biflora* were randomly collected. They were sun-dried and investigation was carried out with fresh material as well as water soaked viable seeds. Band variation was studied as per the method given by Sadashivam and Manickam, 1996; Vellejos, 1983; Wendel & Weeden, 1989.The gel was photographed and interpreted by using the "STATISTICA" package.

Observations

The taxa under investigation showed reliable polymorphism except Catalase due to variation in the banding pattern. Allozyme data was analyzed through cluster analysis by simple matching coefficient method. 27 significant alleles were resolved, of which, number of alleles (bands) found in Rubisco i.e. eight, next to it is seven in Amylase followed by two in Alcohol Dehydrogenase. Catalase is the only monomorphic showing single allele. Zymogram of Rubisco is explained in the given table and scored as follows-
The isozyme pattern of Rubisco is explained below:

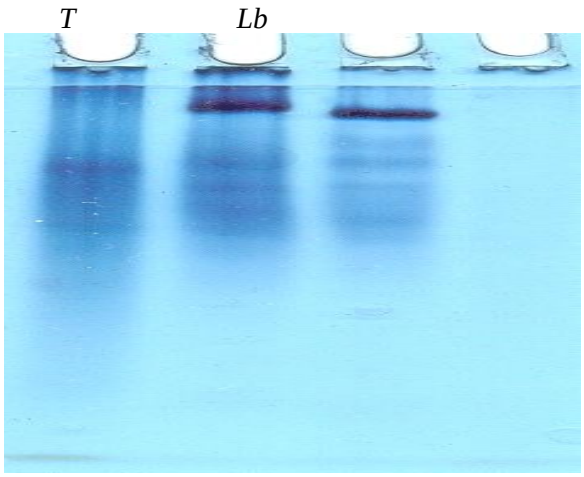

Fig: 1- Zymogram of of Rubisco

Table 1:

Name of Enzyme	**Alleles**	A	***Leucas***	B	C	**% of shared loci(P)**
Rubisco	1	1.000	1.000	1.000	0.000	75.000
Rubisco	2	0.000	1.000	1.000	0.000	50.000
Rubisco	3	0.000	0.000	1.000	0.000	50.000
Rubisco	4	1.000	1.000	1.000	1.000	100.000
Rubisco	5	1.000	1.000	1.000	0.000	75.000
Rubisco	6	1.000	1.000	1.000	0.000	75.000
Rubisco	7	0.000	1.000	1.000	0.000	50.000
Rubisco	8	0.000	0.000	1.000	0.000	25.000
Allele Frequency		**0.500**	**0.750**	**1.000**	**0.125**	

The zymogram represents various isozymes of Rubisco. Figure: 1 show 8 bands of four samples species (A, B, C) along with *Leucas biflora* studied for isozymes. The intensity of band indicates the amount of isozyme present in the sample loaded for electrophoresis. Rubisco 1,4,5,6 present in three samples. Rubisco 2, 7 reported as a single band in two taxa, while 8 in only sample C. 3 bands are shared by Maximum Species. The presence and the absence of band is stated as 1 or 0 respectively and the data is tabulated in Table- I & II. The percentage of population per sample sharing each band /allele/ locus has been calculated below.

The example studied is Rubisco. In Fig. 2 the first locus is present in 4^{th} samples and hence the distribution % among the population is 4/6 x 100 = 66.667. Second in only one sample and hence distribution % is 1/6 x 100 =16.667. Similarly the allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected isozyme loci. Thus, the allele frequency of *Gantelbua*, *Leucas* and *Utricularia* is same i.e. 500, as far as the band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency in the taxa investigated is given in Table II.

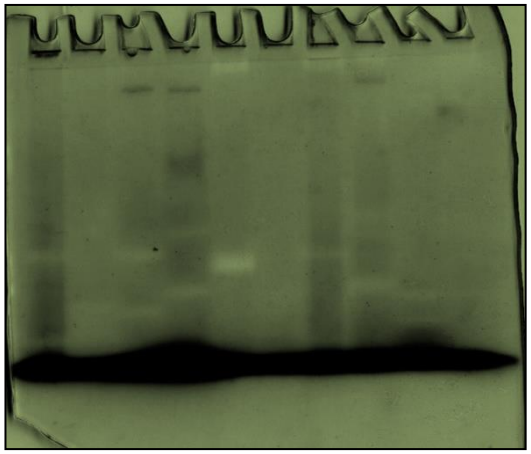

Fig2: Superoxide dismutase

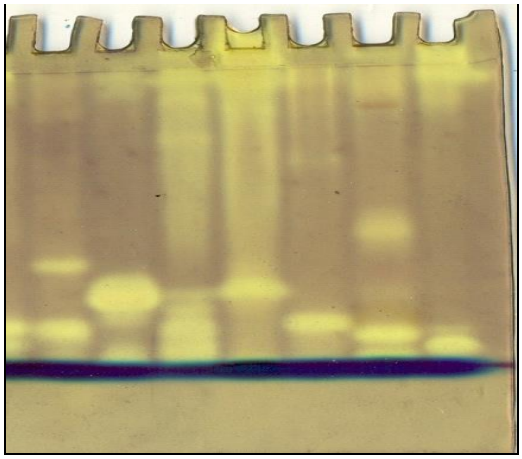

Fig3: Succinate Dehydrogenase

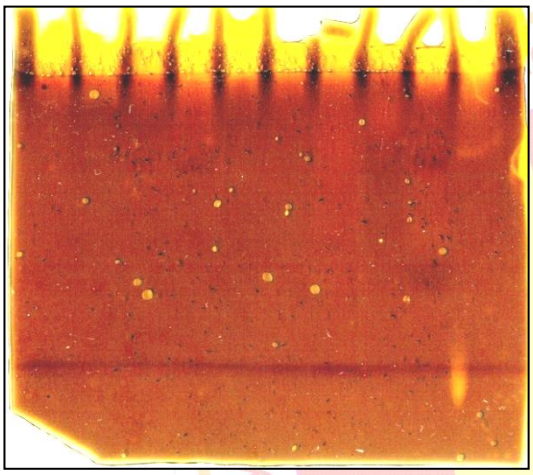

Fig3: Catalase

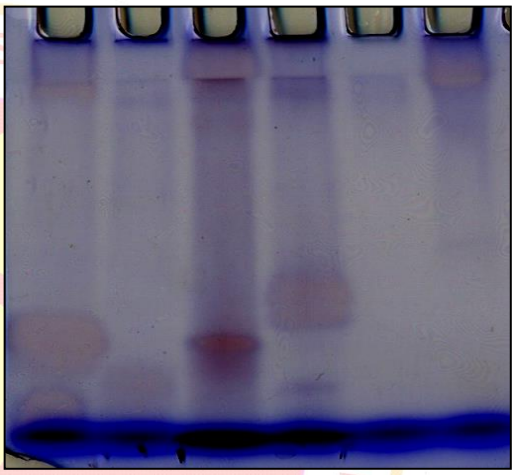

Fig4: Polyphenol Oxidases

The Rubisco shows 8 bands recorded in three taxa and roughly recorded in single taxon. The intensity of band indicates the amount of isozyme present. Rubisco 1 is shared by maximum Species present in all the four samples. Rubisco 1, 4, 5 & 6 reported in maximum taxa while 3 and 7 shared by only 2 taxa whereas 8 shared by only one percent population. In enzyme catalase, the first locus is present in all the four samples and hence the distribution % among the population is 4/4 x 100 = 100%. The allele frequency is calculated for all the samples on the basis of enzyme locus present out of the total detected allozyme loci. Thus, the allele frequency calculated of *Leucas biflora* is helpful when it is compared with the related data collected from the remaining taxa of same family. The band pattern and sharing of loci is concern. The taxon showing more than one band is said to be polymorphic where as only one band is monomorphic by nature. The isozyme scoring and relative frequency of the four other enzymes are given below:

Table: II

Name of Enzyme	A	***Leucas***	B	C	**% of shared loci(P)**
Catalase	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**1.000**	**1.000**	**1.000**	**1.000**	
Polyphenol Oxidases	1.000	1.000	0.000	0.000	50.000
	1.000	1.000	0.000	1.000	75.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	1.000	25.000

	0.000	1.000	0.000	0.000	25.000
	0.000	1.000	0.000	0.000	25.000
	1.000	0.000	0.000	0.000	25.000
	1.000	1.000	1.000	1.000	100.000
Allele Frequency	**0.500**	**0.600**	**0.100**	**0.300**	
Superoxide dismutase	1.000	0.000	0.000	1.000	50.000
	0.000	0.000	1.000	1.000	50.000
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	00.000
	0.000	1.000	1.000	0.000	50.000
	0.000	0.000	1.000	0.000	25.000
Allele Frequency	**0.333**	**0.167**	**0.500**	**0.333**	
Succinic Dehydrogenase	1.000	0.000	0.000	1.000	50.000
	1.000	0.000	0.000	1.000	66.667
	1.000	0.000	0.000	0.000	25.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	0.000	25.000
	1.000	0.000	1.000	0.000	50.000
	0.000	0.000	0.000	0.000	0.000
	0.000	1.000	0.000	0.000	25.000
	0.000	0.000	1.000	1.000	50.000
	0.000	0.000	0.000	1.000	25.000
	1.000	1.000	1.000	0.000	75.000
Allele Frequency	**0.417**	**0.250**	**0.333**	**0.333**	

Table II shows the total allele frequency in all the four taxa studied, depicting the affinity between them. It is calculated on the basis of total allozymes detected.

Discussion and Conclusions:

The investigation carried out could be helpful to find the co-relation among different families which shows affinities and to discuss the link between them. Here one taxon i.e. only Leucas biflora has been studied for five different plant enzymes so as to know about how far this data is reliable to establish the link between close families like Acanthaceae, Lamiaceae, Scrophulariaceae and Lentibulariaceae.

The use of new cladistics in taxonomy for ascertaining taxonomic similarities is recent at infra specific, generic and family level. In this aspect, the present investigation could be helpful for the taxonomists in ascertaining the new data. Earlier, in nineteenth century many taxonomists make use of phytochemical investigations, cellular details and took support of the embryological findings. The isozymes have been used for

the first time as a tool in the identification of some *Curcuma* species (Apavatjrut et al., 1999). Molecular markers proved to be effective in presenting the reliable data in deciding the positions of certain families. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

Lange and SchifinoWittmann (2000), Batista and Sosa (2002), Fu and Dane (2003), Mateu-Andres (2004), Gonzalez Astorga et al. (2004) and Jaaska (2005). Das and Mukherjee (1997), and Kofi et al (2009) combinely analysed the isozyme data to confirm the taxonomic alignment. The isozyme data in the present investigation has been proved to be helpful in making the taxonomic clusters. For eg. One is of Acanthaceae and Scrophulariaceae and second of Lamiaceae and Lentibulariaceae .

Acknowledgements

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Ayurvedic Application of Butea monosperma and its histochemical investigation

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Abstract:
The histochemistry of plant is used to study of anatomical characters as well to find out synthesis and storage of metabolites. Each and every plant have medicinal importance but we does not know which plant parts have much more Synthesis and accumulation of actives Compounds. Plant parts like leaves ,stem ,roots bark are sources of production of one or more metabolites through this technique a correct detection of secretion and accumulation we can find out ,so we can used only that plant parts Systematic screening of them may result in the discovery of novel effective compounds. This studies helps in Histochemical investigation of Butea Monosperma, these plants have many folk medicinal used.
Key Words- Histochemistry, Butea monosperma, folk medicine

Introduction:

Histochemistry is the branch of histology handling the identification of chemical additives of cells and tissues. Starch deposition occurs extensively in the plant body, but the specifically not unusual locations of its accumulation are seeds, the parenchyma of the secondary vascular tissues within the stem and root, tubers, rhizomes and corn (V. B. Kadam, 1999) Starch and proteins are the main ergastic materials of the protoplasm (E. Kuster etal 1996). Fat are extensively distributed inside the plant frame and that they probably occurs in small quantity in every plant cellular (W. Seifriz., 1936). Fats are not unusual reserve fabric in seeds, spores and embryos in meristematic cells. Glucosides are the degradation made from the carbohydrates

Butea monosperma (Lamk.) is a quintessential tree. Tribals use its plants and younger fruits. The plant is used in Ayurveda, Unani and Siddha medicine for diverse ailments. nearly all the elements of the plant namely root, leaves, fruit, stem bark, flora, gum young branches are used as medicine, food, fiber and for other miscellaneous functions including fish poison, dye, fodder, utensils, etc. about forty five medicinal makes use of are related to the plant and out of those claims nearly half of the wide variety of claims have been scientifically studied and said these observations are noteworthy for further studies on present day medical lines. (Burli and Khade, 2007) Flowers are soaked in water in a single day and a cup of this infusion is drunk each morning towards leucorrhoea until remedy (Patil, et.al. 2006).

Histochemistry techniques:-

Fresh plant material are used for sectioning and prepare permanent for studies of histochemistry. Jeffery's fluid (Johansen, 1940) and Johansen (1940) and Gurr (1965). The specific tests achieved are indexed in Table

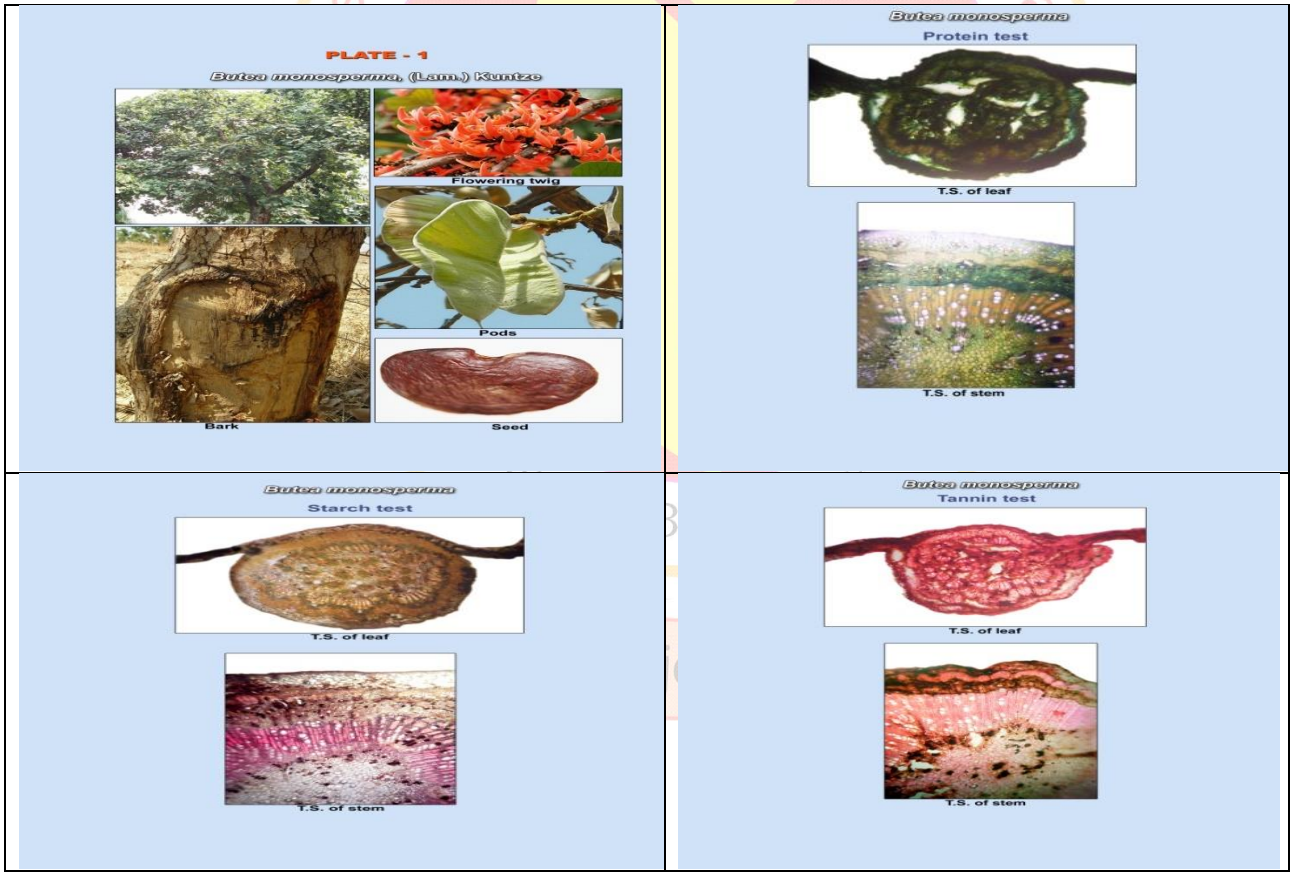
Sr. No	Erastic Content	Chemical Test	Reference:
1	Starch	Iodine, Potassium iodide soln. (IKI Solution.)	**Johansen (1940) and Gurr (1965)**
2	Protein	Potassium Ferro cyanide, Glacial acetic acid	**Johansen (1940)**
3	Tannins	10% ferric chloride solution (aq)	**Johansen (1940) and Gurr (1965)**
4	Saponin	Conc. Sulphuric Acid	**Johansen (1940)**
5	Fats	Sudan III Sudan IV	**Johansen (1940)**
6	Glucosides	Phloroglucinol in 90% alcohol+20% hydrochloric acid	**Johansen (1940) and Gurr (1965)**
7	Alkaloids	a) Idonine solution	**Johansen (1940)**
		b) dil. Nitric a cid	**Johansen (1940)**

Loose hand cutting of plants parts of Stem and leaves are used for histochemical studies with reference to Johansen and Gurr different reagent is used for study of localization of different metabolites Viz starch,

protein, tannin, saponin, fat, glucosides and alkaloids within the tissues (Johansen, 1940). The tests employed was observe:

Studies of histochemistry s of actives compound (metabolites) likes carbohydrates, protein, fats, tannin, saponin, glucoside and alkaloids reacts with specific reagent it offers diverse color stains in section through which accumulation of a few metabolites of the plant is localized in leaf and stem phase describe in table no 2 and picture plate no1

1) Most of starch accumulated in common places like in the parenchyma of the secondary vascular tissue in stem and roots, tuber, rhizome and corms inside the present work, for the taxa under examine, starch become found in leaves and timber of all of the taxa,
2) Protein have been observed within the top and; decrease dermis, scattered cells of mesophyll of leaves, pith parenchyma and cortical parenchyma inside the stem
3) Tannin additionally display distributions, taking place usually in dermis, mesophyll cortical as well as parenchymatous tissue, associated with conductive tissue. Tannins had been discovered inside the leaves
4) Saponin: were discovered within the mid-rib parenchyma of leaves and cortex and pith parenchyma of timber and inside the cells of mesophyll and xylem parenchyma in stem
5) Fats: In taxa underneath take a look at, fat was observed in cells of mesophyll and phloem parenchyma (leaves and stem)
6) Glucoside: Glucosides are the degradation production of carbohydrates glucosides were determined in the dermis ,pith parenchyma of leaves vascular bundles and scattered cells of medullary ray of stem
7) Alkaloids: have been located within the scattered cells of mesophyll of leaves and pith parenchyma of stem .In wanger's reagent, alkaloids were located inside the cells of mesophyll and cells of cortex parenchyma and pith parenchyma of stem



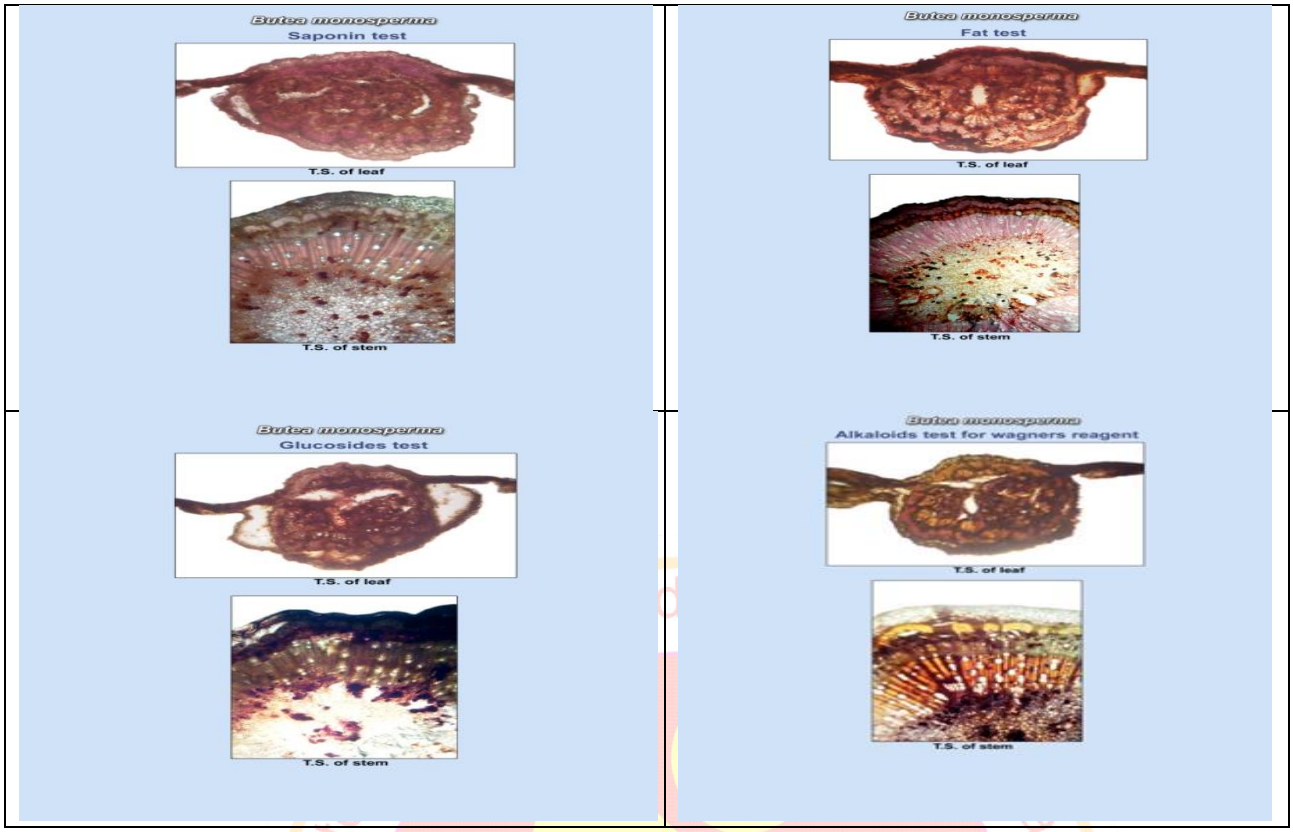


Photo plate shows slides of leaves and stem T.S of histochemistry of Butea monosperma

Sr. No.	Ergastic content	Reaction		Localization	
		Leaves	Stem	Leaves	Stem
1	Starch	$^{+}$ve	$^{+}$ve	Scattered cells of mesophyll, Mid –rib pith parenchyma,	**Cortical parenchyma, Medullary rays, Vascular bundle, and Pith parenchyma**
2	Protein	-do-	-do-	Epidermis, Scattered cells of mesophyll, mid – rib Pith parenchyma	**Epidermis, Scattered cells of Cortex and Pith parenchyma, and Phloem parenchyma.**
3	Tannin	-ve	-do-	-----	**, Scattered cells of Cortex and Pith parenchyma**
4	Saponin	-ve	-do-	----	**Epidermis, Scattered cells of Cortex parenchyma, and Pith**
5	Fat	-do-	-do-	Upper and lower epidermis, Scattered cells of Mesophyll cells and Mid –rib	**Cortical parenchyma, Medullary rays, Scattered cells of Pith parenchyma.**
6	Glucoside	-ve	-ve	-----	**-parenchyma, pith**
7	Alkaloids	-do-	-do-		
	a) Mayer's reagent	-do-	-do-	Cells of Mesophyll, Mid –rib	**Cortex, Xylem parenchyma, and Pith parenchyma.**

	b)Wagner's reagent	**-do-**	**-do-**	**Upper and lower Epidermis, Mid – rib parenchyma.**	**Epidermis, Cortical parenchyma, Medullary rays and Vascular bundle and Pith parenchyma**

Results and Discussion

Histochemical test for fresh section of leaves and stem of *Butea Monosperma*Conclusion

The present helps to save the medicinal plant through histochemical studies through this technique we find out sites of secretion and accumulation of bioactive compounds of the plant. Many plants are used as folk medicine through these techniques people get aware which plant parts are used instead of whole plants the identification of the chemical compounds of the species and its histolocalization contribute to enlarging the pharmacognostic knowledge about this species.

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Preliminary phytochemical screeningof stem bark of *Ficus hispida* L.

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Abstract

Skin infections create physiological and anatomical problems and also affect the social life of an individual. Plant medicines prove to be very effective in simple as well as chronic dermal disease.Traditional medicinal resources,especially plants, have been found to play a major role in managingdermatological ill conditions. The need of the hour is to screen a number ofmedicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken to investigate the phytochemical constituents from the extract of stem barkof Ficus hispida L.by using six solvents i.e., petroleum ether, benzene, acetone, chloroform, ethanol and distilled water.Preliminary phytochemical analysis revealed the presence of Carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, terpenoids and phenols in stem bark extracts.This indicates potential of stem bark of Ficus hispida L. in treatment of skin diseases.

Keywords *- Corticosteroids, Dematological, Leprosy, Phytosterols.*

Introduction

The skin as the largest organ of the body, play a number of vital role such as in protection, thermoregulation, percutaneous absorption, sensory and secretory activity. The acidic sebaceous secretions and surface of skin are aggressive to many pathogens. The rich blood and lymphatic supply of the dermis ensures that both specific and nonspecific immune responses can be quickly recruited against pathogens that invade the skin. The skin defense system may however, be compromised if the surface is penetrated via injury or thinned from the used of corticosteroids, excoriated by inflammatory processes (Barrister *et al.*2000). Disease of the skin may in their turn sharply and deeply affect the whole organism. General indisposition and loss of sleep in certain skin diseases which cause itching may serve as an example of such affections.

Psoriasis, Leprosy, vitiligo etc are among diseases that affect the aesthetics, appearance and social life of the patients. Use of herbal medicine can help the patient with dermatological disease to the quality of his social life which was impaired due to his disease condition. Traditional medicinal resources, especially plants, have been found to play a major role in managing dermatological ill conditions. The demand for herbal medicines is increasing rapidly due to their lack of side effects. Further as the health care costs continue to rise, there is attraction for low-cost remedies. The need of the hour is to screen a number of medicinal plants for promising biological activity against skin diseases. Hence the present study has been undertaken for preliminary phytochemical screening of *Ficus hispida* L.used for treatment of manifestations caused by microorganisms causing skin diseases.

Material and Methods

The material of study i.e., stem bark was collected and washed thoroughly with running tap water and after complete shade drying the plant material was grinded. The grinded plant material of 25 gms was taken in Whatman filter paper No.1. The extraction was done by using Soxhlet's extraction method with analytical grade refluxing solvents like.

a. Petroleum ether
b. Benzene
c. Acetone
d. chloroform
e. Ethanol
f. Distil water

The liquid extract obtained in each solvent was concentrated by distilling of the solvent and then evaporated to dryness at room temperature. At the completion of extraction process, the plant extract was used for the qualitative estimation of carbohydrates, saponins, tannins, flavonoids, alkaloids, glycosides, proteins, steroids, phytosterols, phenols and terpenoids.

Phytochemical analysis

Preliminary qualitative phytochemical screening was carried out for each solvent with the following methods.

1. **Test for Detection of carbohydrates :** Molisch's Test: To a small quantity of extract 10 ml of distil water and two drops of Ethanolic naphthol (20%) and 2ml of concentrated Sulphuric acid were added, formation of reddish violet ring at the junction indicates presence of carbohydrates.

2. **Test for Detection of Saponins :** Foam Test: 2 ml of extract was added to equal amount of distil water and shaken in a graduated cylinder for 15 minutes lengthwise. Formation of 1 cm layer of foam indicates the presence of saponins (Kumar *et al*., 2009).
3. **Test for Detection of Tannins:** Ferric Chloride Test: Small Quantity of extract was taken separately in water, 2-3 drops of 5% ferric chloride was added. Formation of black or green colour indicates the presence of tannins.
4. **Test for Detection of Flavonoids :** Sulphuric Acid Test: A fraction of extract was treated with concentrated sulphuric acid and observed for formation of orange colour.
5. **Test for Detection of Alkaloid**s : Mayer's Test: To 2ml of plant extract, 2ml of concentrated hydrochloric acid was added then few drops of Mayer's reagent were added. Presence of green colour or white precipitate indicates the presence of alkaloids.
6. **Test for Detection of Glycosides :** Sulphuric Acid Test: To 2ml of plant extract, 1ml of glacial acetic acid and 5% ferric chloride was added then few drops of concentrated sulphuric acid were added. Presence of greenish blue colour indicates the presence of glycosides.
7. **Test for Detection of Proteins and Amino acids :** Ninhydrin Test: To 2ml of plant extract, few drops of 0.2% Ninhydrin was added and heated for five minutes. Formation of blue colour indicates presence of proteins.
8. **Test for Detection of Steroids and phytosterols :** Sulphuric Acid Test: To 1 ml of plant extract, equal volume of chloroform and few drops of concentrated sulphuric acid were added. Formation of brown ring indicates the presence of steroids and formation of bluish green colour indicates the presence of phytosterols.
9. **Test for Detection of Phenols :** Ferric Chloride Test: To1 ml of plant extract, 2ml of distilled water followed by few drops of 10% ferric chloride was added. Formation of blue or green colour indicates presence of phenols.
10. **Test for Detection of Terpenoids :** Salkowski test: To 2ml of plant extract 2ml of chloroform and 3ml of concentratedsulphuric acid was carefully added to form a layer. Reddish brown coloration at theinterface is formed indicating the presence of Terpenoids.

Result and Discussion

The detail study of ethno-medicinal plants used in Skin diseases revealed that the most of these diseases remained incurable by the use of modern drugs. The treatment using modern drugs is costly, time consuming and have many side effects. Plant medicines and cosmetics are considered to be more beneficial in treatment of skin disease like psoriasis, eczema dermatitis, vitiligo, candidiasis, athlete's foot, carbuncle, ketosis, acne, pimples, wart, hives and ageing signs etc.

The observations in general revealed that mostly medicinal plants are concerned with traditional medicinal system.In the present investigation preliminary phytochemical investigation in different extracts of *Ficus hispida* L. stem bark showed the presence of phytochemical constituents namely carbohydrates, saponins, flavonoids, alkaloids, glycosoids, proteins, phytosterols, steroids, flavonoids, terpenoids and phenols.

Carbohydrates and proteins which were present in petroleum ether, benzene, chloroform and distilled water extract work together to maintain barrier functions of skin in face of everyday challenges. Saponin was extracted in all extracts except ethanol, shows protection against UV damage. Tannins and flavonoids was found in acetone and ethanol extract accountable for the potent antioxidant capacity of *Ficus hispida* L. Alkaloids showed positive test for petroleum ether, benzene, acetone and ethanol, alkaloids have extensive pharmacological activity such as antioxidant and anti-inflammatory. Glycosides are present in petroleum ether, benzene, chloroform and distilled water extract showed significant antioxidant, antifungal and antibacterial activity.

Phytosterols and steroids showed positive test for petroleum ether, acetone and ethanol. Phytosterols have anti-aging property whereas steroids are very effective in helping in itching and irritation. Phenols are present in acetone, ethanol and distilled water extract; they present antimicrobial, anti-inflammatory or anti-aging actions. Terpenoids showed positive test for petroleum ether, acetone, ethanol and distilled water extract it used to enhance skin penetration and prevent inflammatory disease.

Table 1: Preliminary Phytochemical Screening of various extracts
(Obtained by Successive solvent extraction of plant material)
Ficus hispida L.Present:- **'+ ve'** and Absent:- **'- ve'**

Sr. No	Secondary metabolite	S_1 Petroleum ether	S_2 Benzene	S_3 Acetone	S_4 Chloroform	S_5 Ethanol	S_6 Distil water
1	Carbohydrates	+	+	---	+	---	+
2	Saponins	++	+++	+	+	---	+
3	Tannins	---	---	++	---	+++	+
4	Flavonoids	+	---	+++	---	+++	+
5	Alkaloids (Mayer's test)	++	+++	++	---	++	---
6	Glycosides	+	+	---	+	---	+
7	Proteins	++	++	---	++	---	+
8	Phytosterol & Steroids	+	---	++	---	+	---
9	Phenols	---	---	++	---	+++	+
10	Terpenoids	+	---	+++	---	++	+

Conclusions

The results of phytochemical analysis of stem bark of *Ficus hispida* L. showed presence of many phytochemical constituents which has potential to cure many infectious diseases. The curative potential of ethno-medicinal plants studied during the present investigation will be helpful to evaluate the effectiveness of herbal medicine against skin diseases.

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Study of Diversity of Mollusca and Fish in Borgaon Dam District Yavatmal, Maharashtra, India

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Abstract:-

Molluscan and fish diversity of Borgaon dam Dist Yavatmal Maharashtra have been studies during June 2019 to May 2021 of Borgaon dam of Yavatmal, District Yavatmal and factor which affecting on them. Study reveals that molluscan diversity in Borgaon dam of Yavatmal region, Dist. Yavatmal, Maharashtra, India, reported that total of 18 fish species were recorded and 14 species of molluscs from the dam. The dominant class Gastropoda of Mollusca was dominated by 14 species including Pila globosa, Thiara scabra, Melanoides tuberculata, Bellamya bengalensis, Lymnaea accuminata, Lymnaea lutiola, Indoplanarbis exustus, Zootecus insularis, Tarebia lineate Cerastua maussonianus Filicaulis alte, Laevicaulis alte, Senperula maculata and Rachis punctatus.. Ichthyo fauna of Borgaon dam Dist Yavatmal Maharashtra were dominated by major carps with 10 members belonging to cypriniformes including Labeo rohita, Catla catla, Cyprinus carpeo, Cirrhinus marigala, Labeo calbasu, Labeo bata, Labeo fimbriatus, Puntius sarana followed by 6 members of family siluriformes including Clarius batrachus, Mystus bleekeri, Mystus vittatus, Ompak bimaculatus, Wallago attu, Heteropnoustes fossilis, Amblypharyngodon mola, Puntius sophore and one genera with two species of family channiformes represented by Channa punctatus and Channa striatus. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem as well as sustain a rich molluscan and fish fauna.

Key Words:- Borgaon dam, Mollusca, Ichthyo fauna, cypriniformes.

Introduction:-

The Phylum Mollusca is a second largest phylum in invertebrate. Molluscan are soft bodied animals with or without calcareous shell adapted to almost all habitats with varied ecology. Molluscs are divided into freshwater, marine and terrestrial forms. It includes snails, slugs, clams, oysters, mussels, scallops, cuttlefish, squid and octopus. All the molluscan comprises in three groups, Gastropods, Bivalves and Cephalopods. The freshwater ecosystems in India harbour a rich diversity of molluscs, representing 212 species belonging to 21 families. Of these, 164 species were recorded from rivers and streams (Subba Rao, 1993). Biodiversity is one of the important lives supporting system on the earth. Molluscs are found in various habitat and are divided into freshwater, marine and terrestrial forms. The freshwater Mollusca play an important role in water ecosystem. Gastropoda is extremely diverse group in Mollusca and adapted to all habitats, includes snails and slugs. Bivalves as a group have no head and it characterized by a shell that is divided from front to back into left and right valves. They include clams, oysters, mussels and number of families that live in freshwater (Subba Rao,1989; Patil and Talmale, 2005; Kumar and Vyas 2012; Tripathy and Mukhpadhyay, 2015). Aquatic ecosystem provides a home to many species including phytoplanktons, zooplanktons, aquatic plants, insects, molluscans etc. They are organized at many levels from smallest building blocks of life to complete ecosystems, encompassing communities, populations, species and genetic levels. All aquatic ecosystems around the globe are generally colonized by the representatives of phylum Arthropoda and Mollusca. Benthic invertebrates occupy the bottom of water body. The functional role of benthic communities in the trophic dynamics of river ecosystem is well acknowledged. The composition, distribution of benthic organisms over a period of time provide index of the ecosystem. In recent years, there is a greater emphasis world over for better understanding of benthic environment, For present study the Borgaon dam is selected which was constructed as part of Irrigation Projects by the Government of Maharashtra in the year 1993. It is built on and impounds a local Nallah River. Nearest city to dam is Yavatmal in Yavatmal District of Maharashtra. The dam is an Earth fill Dam .The purpose of the dam is for Irrigation. The Length of dam is 830 m (2723.1 Feet) , while the Height of the dam above lowest foundation is 20 m (65.6168 Feet) . The above lake is used for fishing and bird watching. As per availablity of Literature no authentic data on various species of Mollusca was found Borgaon dam . So present work has carried out to study the diversity of molluscan in Borgaon dam.

Study Area:-

Borgaon dam is 10 km from city Distric Yavatmal located near village Borgaon at 20.3533°N, 78.5879°E which was constructed by the Government of Maharashtra in 1975. It contains rich treasure of flora and fauna. It is fresh water annual lake; water is used for irrigation as well as fishing Purpose by the villagers map.

Material And Method:-

The present work was carried out from studies during June 2019 to May 2020 in Borgaon dam near Borgaon . District. Yavatmal. The sample were hand picked from surface area and by fishing net submerged

surface. The few collected live samples were Preserved in 70% ethanol and dead sample were washed, dried and photographer were taken by Nikon D 5000 camera and species were identified from the handbook an Indian freshwater Mollusca by Ramkrishan and Dey,2007

Result And Discussion:-

Molluscs, a group of most diverse and dominant benthic fauna in water bodies, the Borgaon dam is harbors a number of aquatic weeds in the submerged as well as floating state. Molluscans are of great significance because they form the food of fishes and their productivity play an important link in the food chain. In present study, It was come to notice that molluscan specimens were represented in Borgaondam by only one doinated class Gastropoda. The quantitative analysis of molluscs was not done but it observed that Bellamya species, Pila globosa species and Lymnaea species was the dominant than other because the shell of these species were seen scattered throughout the margin of dam compared to other species.

Observation Table:-

Table 1. Systematic classification of molluscan species observed in Borgaon Dam during June 2019-May 2021 Class Order Family Genus and species of Gastropoda

Sr.No	Class	Order	Family	Genus and Species
1.	Gastropoda	Pectinibranchiata	Pilidae	Pila globosa (Swainson)
2	Gastropoda	Mesogastropoda	Thaiaridae	Thiara scabra (Muller)
3	Gastropoda	Mesogastropoda	Thaiaridae	Melanoides tuberculata (Muller)
4	Gastropoda	Mesogastropoda	Thaiaridae	Tarebia lineate (Benson)
5	Gastropoda	Stylommatophora	Viviparidae	Bellamya bengalensis (Lamark)
6	Gastropoda	Stylommatophora	Cerastuidae	Cerastua maussonianus (Petit)
7	Gastropoda	Stylommatophora	Veronicellidae	Laevicaulis alte (Ferrussac)
8	Gastropoda	Stylommatophora	Veronicellidae	Senperula maculate (Templeton
9	Gastropoda	Stylommatophora	Subulinidae	Zootecus insularis (Pfieffer)
10	Gastropoda	Stylommatophora	Enidae	Rachis punctatus (Anton)
11	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea accuminata (Gray)
12	Gastropoda	Stylommatophora	Lymnaeidae	Lymnaea lutiola (Gray)
13	Gastropoda	Stylommatophora	Planorbidae	Indoplanarbis exustus (Deshayes)
14	Gastropoda	Soleolifera	Veronicellidae	Filicaulis alte (Ferrussaca)

* Not directly found in water but on grass, moist soil and under rocks near Dam

Table 2. Fish species observed in Borgaon Dam during June 2019-May 2021 Family, Genus and species of Fishes .

Sr.No.	Family	Genus and Species
1	Cyprinidae	*Labeo rohita*
2	Cyprinidae	*Catla catla*
3	Cyprinidae	*Cyprinus carpeo*
4	Cyprinidae	*Cirrhinus marigala*
5	Cyprinidae	*Labeo calbasu*
6	Cyprinidae	*Labeo bata*
7.	Cyprinidae	*Labeo fimbriatus*
8	Cyprinidae	*Puntius sarana*
9	Siluriformes	*Clarius batrachus*
10	Siluriformes	*Mystus bleekeri*
11	Siluriformes	*Mystus vittatus*
12	Siluriformes	*Ompak bimaculatus*
13	Siluriformes	*Wallago attu*
14	Siluriformes	*Heteropnoustes fossilis*
15	Siluriformes	*Amblypharyngodon mola*
16	Siluriformes	*Puntius sophore*
17	Channiformes	*Channa punctatus*
18	Channiformes	*Channa striatus*.

* Directly found in Dam water collected by fisherman's.

Number of workers conducted studies on molluscan diversity in different parts of India the freshwater ecosystem in India harbors a rich diversity of molluscs representing 212 belonging to 21 families out of these 164 species recorded from river and streams. Mollusca perform key role in functioning the aquatic ecosystem. The availability of maximum molluscs during summer months could be related to two important ecological phenomenons. Kumar and vyas, reported the eleven species of molluscs from narmada sagar, out of which 8 species comprises of Rachis bengalensis, R. punctatus, Bellamya bengalensis, Melanoides tuberculatus, M. seabra, Lymnaea acuminate, L. lutola and Indoplanorbis exustus. The species of freshwater molluscs as gathered in the present study were quite different and also as reported earlier by some authors. 23 A study on the molluscan diversity of saipung wildlife sanctuary, Meghalaya. Revealed 13 species of molluscs, out of which 12 species were identified as gastropoda and 1 species of Bivalvia bengalensis, F.annadalei, Pila theobaldi, Thiara (lareba) lineata, Brotia (Antimelania) costula, Paludomus (poludomus) Conica, P. (P.) regulaa,, P. (P) Stephanus and Indoplanorbis exustus. Water temperature exhibit a positive correlation with molluscs during 2 years of present study. This shows that increase in temperature within the observed range favors. The growth of molluscs. As per the finding of researcher from above data. The generic as well as species diversity seen in freshwater aquatic ecosystem in different region, Tyagi, 2018 mentioned that there was a variation in molluscan diversity in different freshwater bodies as earlier studied by different researcher which was not due either a single factors is responsible for such variation. Malhotra et.al. 1996 reported the maximum molluscas during summer month could be related to some ecological important phenomenon's such as maximum abundance of decomposers, settled organic matter and macrophytes on bottom of water body and also increase water temperature activating the process of decomposition of organic sediments. Bath et.al. observed that the important for breeding and feeding of the molluscs. Borgaon dam is due to moderate amount of water, temperature and available micro vegetation and decomposers. The abundance of molluscan fauna from present study area indicates the rich productivity. The species inhibiting bottom of lake plays an important role in converting organic matter together with the microbenthos into a biomass, which in turn consumed by the fishes thus help in the secondary productivity and form an important component in the food web of ecosystem.

Conclusion:-

It can be conclude from the present study that among the selected site. The freshwater mollusks and fishes aid in assessment of ecological status of water bodies. The study relevant to the diversity distribution and ecology become imperative during the study. Present study observed the present status of mollusks and fish shows richness of Borgaon dam. Some anthrogenic activities may be consider as a threat to the mollusks and fishes as well as other living organisms of this dam. Hence the mollusks and fishes have a tremendous impact on Indian tradition and economy and it is also considered as bioindicatores of pollution and ecosystem health. The identification, taxonomic account and distribution of mollusks and fishes found in Borgaon dam is useful for better management and Borgaon dam region.

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Review on Effect of EMS as a Chemical mutagen for improvement of Legume Cropsvarieties

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Abstract

Mutation is defined as any heritable changes in an individual's genome and phenotype. In the hands of plant breeders, mutation breeding is the most potent and effective weapon available. It has been used to improve morphological and physiological characters, disease resistance, draught resistance and quantitative characters including yielding ability.

It is a cheap and fast method of developing new improved varieties.Plant breeding aims to generate novel, high-yielding, and improved cultivars by examining genetic variability in important qualities. The chemical ethyl methane sulfonate (EMS) is routinely used to cause mutations at loci that control economically important features.

Keywords: *Mutation, Phenotype, breeding, cultivar, EMS.*

Introductions:

Hugo de Vries first time used the term "mutation" in 1901. Mutation is described as a change in the number or sequence of nucleotides that is permanent and relatively uncommon. The genetic improvement of crop plants for various economic characters through the use of induced mutations is referred to as mutation breeding.

Mutations have been induced using physical mutagens such as X-rays, Gamma rays, fast and thermal neutrons, heavy ion beams, and chemicals such as EMS, DES, and SA. As of now, 408 mutant varieties of food legume crops from 24 distinct crop species have been released for cultivation utilising mutation procedures around the world (Kharkwal et al., 2005).

There is immense scope to enhance mineral nutrient (biofortification) and essential amino acid contents of human food as well as animal feed along with altered protein and fatty acid profiles, physicochemical properties of starch, enhance phytonutrients in fruits and reduced antinutritional factors in staple food grains. Induced mutations could play a key role in inducing mutations in crop plants to improve nutritional quality. 776 mutant varieties have been recognised for their improved nutritional qualities among the globally developed 3,000 mutant types. (Jain et. al., 2011).

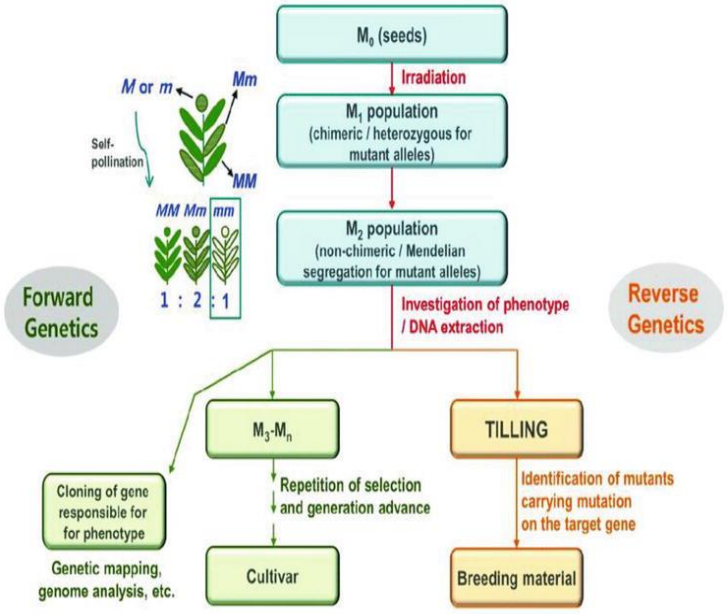

Fig.1. Mutation breeding integrated use with modern techniques.
Source: Directly taken from Jo and Kim, 2019.

Development of legume mutant varieties:

Physical or chemical mutagens can cause mutations. This is an excellent method for increasing genetic diversity for use in functional genomics and plant breeding. There have been 3,218 mutant varieties released around the world so far. Free exchange of mutant material and deployment in locations where farmers' needs are vital can maximise the use of mutant lines around the world.

Mutagenesis can be made more beneficial in the improvement of crop plants with the help of well-defined objectives in national research programmes, the availability of effective mutagenesis techniques, and efficient phenotype screening tools. Mutant identification/selection at the genotypic level, using new, high-throughput technologies, has changed the way mutations are now used in genetics and breeding.

Chemical mutagens are popular in in-vitro mutation induction, although irradiation can also be applied at low doses, EMS has become the mutagen of choice for developing mutant populations for high throughput screening such as in developing TILLING populations (Pathirana et. al. 2016)

As a result of sustained efforts through the use of physical and chemical mutagens, the IARI institute has made important contributions in understanding of induced mutagenesis(Kharkwal et al., 2004, 2005) and also achieved major success in developing eleven high yielding, disease resistant and agronomically suitable mutant varieties in several crops like chickpea,cow pea, field pea, pigeonpea and soybean(Kharkwal et al, 2004, Kharkwal et al., 2008).

Sagade (2008) used gamma rays, EMS, and MMS to achieve dramatic results in quantitative features in urdbean.

In Chickpea (Cicer arietinum L.) Var. Virat, the effect of Ethyl Methane Sulphonate (EMS) on seed germination and seeding injury was investigated. With rising EMS concentrations, the percentage of seeds germination reduced and seedling damage rose. Chickpea yield has not increased significantly in the last ten years. (Barshile et. al., 2006).

One of the reasons for chickpea's failure to achieve breakthrough productivity has been suggested to be a lack of genetic variety.Long pod mutants with greater diameter are a beneficial variant that can be used to boost seed yield by increasing the number of seeds per pod and seed size.

Long pod mutants with gamma rays, EMS, HZ, and SA in mungbean were identified by Sharma and Singh (1992) and Wani et al. (2011). while long pod mutants with EMS, gamma rays, and their combination in cluster bean were reported by Singh and Agarwal (1986) to have higher genetic variation and yield potential.

Four gigas mutant plant types were obtained from the M2 population of Chickpea cultivar Vijay; three from 300 Grey dosage and one from 0.2 percent EMS.All gigas exhibit a dominating phenotypic appearance, with 1.5 times the height of the control, an elongated, strong stem, and wider and broader leaflets than the control. The EMS gigas has fewer primary branches and larger, smooth leaves. One of the 300 Grey dose was sterile, while the other three contained flowers and pods. In comparison to the control, one gigas (EMS 0.2%) demonstrated 10 days of early flowering (Bogawar et. al. 2017).

Physical mutagen (gamma rays at 300 and 400 Gy doses) and chemical mutagen (ethyl-methane sulphonate 0.5 percent) treatments were used to mutagenize the seeds of three desi varieties of Chickpea released from Pantnagar. M1 generation showed gradual decrease in germination with increase in mutagen strength in addition to this, combination treatments caused more biological damage than individual mutagen treatment. Except for two agronomic traits, number of primary branches per plant and pod length, variation for variety demonstrated considerable differences in M2 generation..For eight traits, including yield per plant, all types of mutagenic treatments and variety treatment variance were significant (Dinkar et. al.,2020). Chickpea secondary branch number grew significantly in both the 300 Gy alone and the combination treatment with 0.5 EMS treatments. For several traits, the genotypic response was variable at different mutagenic levels.Although none of the genotypes outperformed the control for yield per plant at all of the treatment levels, one genotype, PG114, showed a substantial improvement in yield component trait pods per plant at 300 Gy + 0.5 percent EMS (Dinkar et. al.,2020).

M2 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean, with lower and moderate doses of the mutagens increasing the mean number of seeds per pod and 100-seed weight, whereas M3 generation showed a complete positive trend of shift as a result of EMS treatment to mungbean. By increasing the quantity of seeds per pod and seed size, long pod and bold seeded mutants can be employed to increase yield potential The genotypic coefficient of variation, heritability, and genetic advancement in the treated population increased considerably for all of these variables, showing that mutagen-induced variability has a significant potential to improve the mungbean crop (Wani et. al. 2017).

When compared to gamma rays and combo therapies, EMS was found to be more successful at causing mutations. In this way, gamma rays were the least effective. The reaction to mutagenic efficacy was higher in the var. pusa-372 than in the var. Pusa-212 among the two Chickpea varieties (Wani 2009).

Conclusion:

From the above discussion regarding mutagens EMS (Ethyl Methane Sulphonate) is a effective chemical mutagen for the improvement of pulse crops like Chickpea, mungbean, urdbean etc. these improvement may be in the quantity or the quality of the crop.

The effect of EMS in the specified amount of dose is may be useful for the improvement of legume crops varieties and can be use as a best tool for mutational breeding to fulfil the food demand of country and having an economical value.

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Case Studies in Kidney Stone Herbal Treatment

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Abstract

The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences, over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research. A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Finally it results into renal colic. Herbal treatment was given for twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Keywords: *Case Studies, Kidney Stone, Herbal Treatment.*

Introduction:

During the past two decades, the cost for the development of novel drugs has tremendously increased. In parallel, the number of novel drug candidates with acceptable toxicity is decreasing. Therefore, pharmaceutical companies focused their attention on novel technologies such as genomic, bioinformatic methods and the development of macromolecular drugs (Simon, 2008; Deverka et al, 2010; Allerheiligen, 2010). The availability of sophisticated therapies developed by high-tech medical and pharmaceutical research in industrialized countries will be more and more restricted to rich elites. On the other hand, traditional medicines have been developed in almost all cultures worldwide. As a consequence, two-thirds of the world population with insufficient access to modern drugs still relies on natural medicines (Efferth, 2011).

Routine of drug development involves a synthesis of bioactive compounds (taking clues either from alternative systems or ethnobotany) and their preclinical (animal experimentation) and clinical trials before bringing the medicine in market. This is a time consuming as well as tremendously costly method. However, in the eyes of traditional healers and also researchers working in the field of ethnobotany, traditional medicines have been applied for hundreds or thousands of years in patients. Therefore, it is not obvious why the activity of natural medicines should be first tested in cell lines in-vitro or in mouse experiments in-vivo.

Uses of crude drug in treatment are almost unacceptable to the modern society. Modern society thinks that to give an 'Herbal Tea' to a patient is unethical, only because they culturally do not recognize the value of popular tradition. Best example of this mentality is the failure of herbal drug programme in Brazil. In 1970s a programme was started in Brazil to introduce the herbal preparation into primary health service. In-spite of wonderful results the programme was stopped for unknown reasons (Elisabetsky and Posey, 1994).

There has been a gradual increase in use of alternative therapy worldwide. A survey released in May 2004 by the National Center for Complementary and Alternative Medicine focused on who used complementary and alternative medicines (CAM), what was used, and why it was used. The survey was limited to adults living in the United States. According to this survey, herbal therapy, or use of natural products other than vitamins and minerals, was the most commonly used CAM therapy (18.9%) when everything else proved to be ineffective (Mwangi and Gitonga, 2014). In the United Kingdom, it is estimated that in 1996 alone, at least 72 million pounds was spent on alternative therapies (licensed herbal medicine, homeopathic remedies and essential oils for aromatherapy). Herbal remedies are very common in Europe. In Germany, herbal medications are dispensed by apothecaries (e.g., Apotheke). Prescription drugs are sold alongside essential oils, herbal extracts, or herbal teas. Herbal remedies are seen by some as a treatment to be preferred to pure medical compounds regulated as supplements, same case with the US (Goldman, 2001). In USA approximately 40% of the annual expenditure on medicine can be attributed to sales of herbal remedies directly to the public and other naturopathic treatments (Barnes, 2002). However, in India selling the traditional drugs or practicing the local traditional health system has no legal acceptance.

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

A kidney stone, also known as renal calculus, is a solid concretion or crystal aggregation formed in the kidneys from minerals in the urine. Kidney stones typically leave the body by passage in the urine stream, and

many stones are formed and passed without causing symptoms. If stones grow to sufficient size (usually at least 3 mm or 0.12 in) they can cause blockage of the ureter. Blockage of the ureter causes decreased kidney function and dilation of the kidney. This leads to pain in the flank or lower back and often radiating to the groin or genitals. This pain is often known as renal colic. It is commonly accompanied by urinary urgency, restlessness, hematuria, sweating, nausea, and vomiting. Other associated symptoms include: fever, blood in the urine, pus in the urine, and painful urination. Urinary stones are typically classified by their location in the kidney (nephrolithiasis), ureter (ureterolithiasis), bladder (cystolithiasis), or by their chemical composition (calcium-containing, struvite, uric acid or other compounds). Calcium (calcium oxalate) is one of the most common types of component in human kidney stones. Vegetarians tend to have higher levels of citrate excretion and low risk of stone formation (Johri et al., 2010). About 80% of those with kidney stones are men. For stones pain control is usually the first measure. More severe cases may require procedures, e.g. extracorporeal shock wave lithotripsy and percutaneous nephrolithotomy.

Methodology:

In case of Ayurveda people are now actively conducting clinical trials to establish the authenticity of Ayurvedic medicines. In fact, Ayurveda has been practiced in India since ages and has stood the test of time. The efficacy and safety of Ayurvedic drugs is a proved one, through clinical experiences over not only hundreds but thousands of years. However, for global acceptance there is need to assess the efficacy of these drugs through scientific clinical research.

For case studies selection of disease was based on two important criteria-

1) The disease should be non-infectious or is the result of changed life style (life style diseases).
2) It was strictly avoided to select the critical diseases like cancer or those which need surgery.

Consent form was prepared with the help of registered medical practitioner.

Only those patients were considered who were willing to give the consent without any condition or hesitation. Before taking consent the proper counseling of concerned person was done regarding the disease for which he/she was taking the treatment and need to keep record at particular time intervals.

Consent form was also prepared for medicinemen. The most important fact mentioned in the consent form was that his formulations will not be disclosed to any other person who can take the disadvantage of his knowledge and secondly he will not face any medicolegal situation.

Case studies were undertaken to examine and establish the credibility of ethnic health practices. Collaboration was made with registered medical practitioner Dr. S. G. Kadu (M. B. B. S., Ex Medical Officer, Regi. No. 1080) and local vaidus. To make it very clear I would like to state that these are not clinical trials but is simply scientific case follow-up with the consent of patient and vaidu.

In case studies the diagnosis made by medicineman was either confirmed by registered medical practitioner or the patient started traditional/herbal treatment after the ailment was diagnosed by the doctor. All are non-comparative studies (no comparison parallel to allopathic medicine). Original papers of case studies signed by registered medical practitioner and local herbal healer as well as consent forms signed by patients are retained with author.

Study Treatment:

Fully expanded leaf of *Bryophyllum calycinum* Salisb. and fruits of *Piper nigrum* L. was given to eat on empty stomach. After half an hour, 50 ml of decoction, prepared from roots of *Hemidesmus indicus* (L.) Schult. and fruits of *Tribulus terrestris* L., was given. Treatment was repeated twice/day till relief upto twelve days. Clinical follow-up was taken after 3 days, 6 days and 12 days. In all 15 studies were made to understand the efficacy of the treatment.

Result and Discussion:

It is mainly confirmed by acute stomach-pain over the kidney angle in abdomen, difficulty in passing urine and painful urination. In all 15 case studies have been recorded. The age of the test group varies from 20 Yrs. to 78 Yrs. Period of suffering varies from 1- 4 Yrs. In all cases 6-7 days of treatment resulted in 90% relief irrespective of the period of suffering and age. In one case even sonography reports were procured. In Ayurveda, *Bryophyllum pinnatum* (Lam.) Oken (Syn. *B. calycinum* Salisb.) known as 'Pashanbhed' is used to treat the kidney stone. In Warud tahsil also traditional healers use the same plant. This shows intimate relationship between ethnomedicine and the ancient life science i. e. Ayurveda in India (Sharma, 1982).

In traditional practices whole plant or its extract or polyherbal extract are used. It is the synergistic effect of phytoconstituents in a plant which exhibit their action. It is frequently observed that single medicinal

herb or complex herbal mixture show the expected bioactivity, but during fractionation with bioactively-guided isolation of natural products the activity gets weaker and finally can even be lost. An interesting aspect in this context is that one compound of an herbal mixture may activate some proteins of a signal transduction pathway of interest, while another constituent of the mixture may activate the other proteins of the same signaling cascade. Hence the reciprocal supplementation leads to full stimulation of a signaling route and thereby therapeutic effects (Efferth, 2011). Hence there is a need to adapt traditional treatments after more scientific validation.

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An Investigation of Plant Growth and Nutrient Content by the Effect of Metal Ion and Their Complexes in Cassia Tora (Tarota) Plant

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Abstract

*In the present study Cassia Torawere taken as experimental plant in order to study effect of heavy metals and their complexes of (1S- cis)- 4- (3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine on to improve the yield of economically important plant.*Cassia tora *Linn. (Family: Leguminosae) is well known plant widely distributed in India. Different parts of the plant (Leaves, seed, and root) are reputed for their medicinal value.The seeds were immersed in Mg (II), ions, ligand and its complexes to study the germination and growth pattern and certain physiological processes. Effect of ligand, metal ion and complex solution on growth, determination of % of nitrogen, proteins and chlorophyll in the leaves of plants were studied. The data harvested indicates increased germinations in all seed treatments. The changes in growth pattern of roots length and shoots length are observed in the experimental plants. However, chlorophyll content was found to be higher in plant species. The percentage of nitrogen and proteins were found affected in the leaves of Tarota plant treated with Sartraline, complex and metal Mg(II). Nitrogen and protein contents are found higher in the treated plants as compared to control.*

Key words –Sartraline, Mg (II), Plant, Chlorophyll, Nitrogen, Protein.

Introduction:

India is virtually a herbarium of the world. In India, we are using plants and herbs as the basic source of medicine because we are rich in them. The plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research program to increase yield of plant products. Seed germination behavior is important for horticulture and agriculture.[1,2]

Metals are acting a beneficial role for plant growth, development, and productivity at an optimum concentration in the form of the essential micronutrient[3]. To grow and complete the life cycle plants use the essential micronutrients[4]. The plant takes these essential heavy metals like iron, zinc, copper, and manganese from the soil due to concentration gradients and selective uptake of these metals[5]. These ions enthusiastically affected the function of many enzymes and cellular metabolism. These metals also play a prominent role in the synthesis of protein, nucleic acids, photosynthetic pigment, and it also take part in the structural and functional integrity of cell membranes[6].Agricultural scientists realize that crop plants grow in production to the amounts of various nutrients present in soils. Today the application of various salts to soils is a basic future of agricultural practice. With the application of these and other fertilizer to soils, the large crop yields obtained in developing. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed on the crop plants with in the object of accelerating and modifying the plant growth and their development.Manganese (Mn) is an essential plant mineral nutrient, playing a key role in several physiological processes, particularly photosynthesis.

Some of heavy metals (Fe, Cu and Zn) are essential for plants[7].Oxines and Gibberlines are the growth promoting harmones.[8-10] Very dilute solution of these growths promoting hormone solutions, if sprayed over the plant, chlorophyll synthesis is accelerated and consequently vegetative growth has been observed. Experimental results indicate that, if the hormonal solution sprayed over crop plants, the crop yield increases to a considerable extent.

Since *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*has intense biological activities,antidepressant, selective competitive inhibitor. Sertralineinhibits the activity of the enzymes and since no work is reported on the biological application of binary complexes of Mg (II), with *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine* and comparing with pure ligand, metal and control solution (double distilled water) to study the effect of complex, metal, ligand over control solution on germination, survival seedlings height etc, on *Tarota* plant in order to make suggestion whether complex, metal and ligands can be used as a plant growth regulator.

Also, biological analysis of chlorophyll contents and percentage of nitrogen and proteins in the leaves of leafy vegetables are carried out at room temperature.

Material And Experimental Methods:

The solution of Mg (II)in the form of nitrate and *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*of the concentration of 0.01 M was prepared in double distilled water. The applications of complex, metal, ligand solution is studied by dissolving it in proper solvent at 3.60, 7.00 and

10.5 pH and at constant ionic strength of 0.01 M potassium nitrate solution. Fertilized soil was collected from agricultural land. It was then ground and filtered. This soil was filled in two wooden trays and tray was moistened with water. Sowing of seeds was done in the soil after one hour.Passioura J.B.[11] has studied on soil structure and plant growth. Many soils contain continuous macrospores that provided niches for the roots to grow in. The presence of such macrospores increases the extent of the root system, Soil structure not only affect the ability of root to grow and to supply the leaves with water and nutrients it also induces them to send hormonal signals that slow the growth of shoot.

Experiments Performed:

In general practice various chemicals are used in agriculture as an ingredient of various pesticides, insecticides, fertilizers etc., to improve the crop yield. Amongst several economical important plants *Tarota* is selected as a plant system.

1. 100 healthy seeds of *Tarota* were taken 3.5 and 7.00 pH for about two hours. These seeds soaked were taken out of each solution and sowed in the wooden tray in a row, the wooden tray was kept under atmospheric pressure at room temperature.
2. Effect of ligand, metal ion, complex solution on growth of Tarota (*Cassia tora) species*plants was studied at different pH (3.5 and 7.00).
3. Effect of ligand, metal Mg (II), complex on percentage of Nitrogen, Proteins and Chlorophyll in the leave of *Cassia tora* plants were studied.
4. Chlorophyll content in fresh leaves were determined by spectrophotometric method given by Jahagirdar[12].

Parameters:

Plant growth is decided on the basis of parameter such as percentage of germination, survival, seedling height, shoot length; root length and thickness of young leaf having high values compare to control systems. Germination was noted after 3 days and survival was noted after 10 days. After noting the survival of plant, they were taken out of soil. The seedling height and thickness of leaves of survived *Tarota*plants were measured.

Table 1.1-Effect of Ligand, Metal ion and Complex on Germination, Survival, Seedling height etc. on *Cassia tora*Test System.

Test System	Effect of	pH	Parameters						
			%Germination after 2&1/2 days	% Survival after 10 days	Seedling height (cm)	Root length (cm)	Shoot length (cm)	Root / Shoot	**Width of young leaf (cm)**
***Tarota*Test System**	Water (Control)	3.5	60.00	60.00	23.072	8.621	14.450	0.590	**1.65**
		7.0	66.66	66.66	23.62	8.84	14.78	0.5981	**1.620**
	Ligand	3.5	73.33	73.33	22.984	8.718	14.603	0.5970	**1.761**
		7.0	80.00	86.66	25.24	9.14	16.08	0.5440	**1.841**
	Complex	3.5	60.00	60.00	23.614	8.712	14.702	0.5925	**1.421**
		7.0	73.33	80.00	24.49	9.07	15.41	0.5885	**1.490**
	Metal	3.5	80.00	73.33	23.881	8.804	15.077	0.584	**1.850**
		7.0	**30.00**	**93.33**	**27.71**	**8.22**	**14.44**	**0.5692**	**1.843**

Table 1.2- Estimation of Chlorophyll for ***Cassia tora***Plants System

Sr.No.	Treatment	Leaves of plant	Total Chlorophyll gm/Lit.x10^{-3}	Chlorophyll 'a' gm/lit. x 10^{-3}	Chlorophyll 'b' gm/lit. x 10^{-3}
1	Control	*Tarota*	5.125	3.714	**1.754**
2	Ligand		6.725	5.921	**2.028**
3	Complex		6.873	4.659	**2.316**
4	**Metal**		**7.413**	**6.354**	**2.292**

Table 1.3 - Estimate of Total Nitrogen and Proteins in Leaf Powder of***Cassia tora***

Sr. No	Plant	Treatment	% Element			% Protein
			Nitrogen	Carbon	Hydrogen	
1		Control	7.35	38.18	6.85	**38.657**

2	*Tarota*	Ligand	7.87	37.23	6.78	**39.213**
3		Complex	8.11	35.54	6.67	**39.443**
4		**Metal**	**8.32**	**33.76**	**6.39**	**39.574**

Results And Discussion:

Germination starts when the seed shows emergence phase of growth, which begins, with penetration of embryo from the seed coat and end with the development of root and shoot system. Elongation of shoot axis follows emergence of radical.

The rate and extent of elongation is subjected to the variety of controls, including nutrition, hormones and environmental factors. Though the root and shoot development start within a fraction of time but the further developments may vary according to the nutrients required for the development of root length and length shoot independently. Therefore, root length and shoot length differs. The observation table 1.1 clearly indicates that average root length in *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II), at all pH increases over control.

Chlorophyll control / chlorophyll pigment were found affected in *Tarota*plant by the treatments. Total chlorophyll was found to be higher in *Tarota*.

Percentage of nitrogen and proteins were found affected in leaves of *Tarota* by the treatment of *(1S-cis)- 4-(3,4- di chloro phenyl)- 1,2,3,4- tetra hydro-N-methyl-1-naphthalenamine*, complex, Mg (II). It is observed that percentage of nitrogen and protein are higher than that of control.

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Extraction of Natural Dyes From *Nerium Oleander* L.Flowers For Cotton And Silk Colouration

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Abstract:
Alarming environmental issues posed by largescale use of synthetic dyes in textile industries made researchers to focus on the development of safer alternatives i.e. natural dyes. In present investigation, aqueous, ethanoland alcohol extracts of flowers of Nerium oleanderused for dyeing cotton and silk.Protocol adopted were – without mordanting and with two different chemical mordant i.e. Ferrous ammonium sulphate and Copper sulphate. Aqueous extract shows lighter color shade than the ethanolic and alcoholic extracts. All extracts with mordant ferrous ammonium sulphate shows darker color than Copper sulphate. In dyeing without mordant procedure, dark and lightest colors obtained were Grey beige and Thunder respectively. It was found that mordant ferrrous ammonium sulphate exhibit darker coloration on cotton than the Copper sulphate. Dark olive and uniform were the darkest shades obtained by dyeing with mordant ferrous ammonium sulphate. While silk exhibitthree lighter coloration i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.
Keywords: *Natural dyes, Nerium oleander, Ferrous ammonium sulphate, Copper sulphate, mordants.*

Introduction:

Nature is full of wonderful colours, which enriched our life. These colors are utilize for dyeing purposes. Colour variability and promising shades can be obtained by using synthetic dyes, they posed devastating effects in the form of pollution, health hazards, toxicity and high saturation rate in environment. As hazards of synthetic dyes are no longer unknown, evaluation of natural resources available for their possible dye yielding potential is gaining more attention in recent years.

The word "Natural dyes" comprises all those colorants that can be obtained from plant, animal or mineral resources without any chemical processing. As the food, pharmaceutical, cosmetic as well as the textile coloration industry increased demand for these dyes during the last decade, use of natural dyes has gained more importance. Certain natural dyes are known to have mutagenic effects e.g., safflower yellow and elderberry color; while some like carmine, can cause serious respiratory consequences like asthma. But yet most of them are safe, mostly eco-friendly, biodegradable,less toxic, and less allergenic as compared to synthetic dyes. In the beginning, there were dyes derived only from natural sources which were used in the coloration of textiles, food, drugs, cosmetics and also for coloration of paper leather, shoe polish, wood, cane, candles in smaller quantities (Han and Yang, 2005; Hill, 1997; Ali *et al.*, 2006; Gulrajani, 2001).

Even though natural dyes have so many advantages over synthetic dyes, non-availability in their color shades and non-efficient applicationprocedure limiting their use as a most promising dye resources. *Nerium oleander* (Syn. *Neriumindicum*) is a large, spreading, evergreen shrub with whorled branches and leaves. Flowers are red, pink or rosy colored born in terminal cymes (Dhore,2002). Present investigation is an attempt to evaluate dye yielding potential of flowers of *Nerium oleander* (red variant) for cotton and silk coloration.

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Materials and Methods:

Flowers of *Nerium oleander* L. were collected from local area of Pawan Nagar, Amravati and were identifiedby using standard flora(Dhore, 2002). Fresh flower petals of *Nerium oleander* (Red variant) were used for dye extraction and dyeing process (Figure 1).Two different fabric materials -Tasar silk and cotton fabric were bought from Amravatimarket.2% Ferrous Ammonium sulphate and 5% Copper sulphate were used as chemical mordents.Three different solvents - water, ethanol and alcohol were used for dye extraction.50 gm of fresh flowers petals of *Nerium oleander* were crushed in mortar and pestle with 100 ml. of solvent. The solution was filtered through muslin cloth to obtain dye.

For dyeing without mordanting procedure,cotton and silk fabrics were immersed directly in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For dyeing with mordanting procedure,Cotton and silk were first immersed in beaker containing either 2% Ferrous Ammonium Sulpahte or 5% Copper Sulphate for 3 hours and then they were further immersed in a dye bath solution containing dye. After dyeing, the dyed material was dried at room temperature.For washing and shade analysis, dyed fabrics were washed with tap water and finally dried in air at room temperature. Pantone shade color charts system was used for matching the naturalcolorants shade.

Results and Discussions

Different shades of colors obtained from Aqueous, alcoholic and ethanolic extract of *Nerium oleander* with and without use of chemical mordantshas been tabulated in Table I and Table II (Figure 2) with their Panton shade number.

About six different color shades obtained by direct treatment of cotton and silk fabrics in dye solution. Among those darkest shade exhibited by alcoholic extract on cotton (Grey beige, Panton paint shade no. 5773) while most lighter color exhibited by alcoholic extract on silk(Thunder, Panton paint shade no. 5645). All other extracts exhibited different intermediate colors on cotton and silk fibers.

Table I: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander*on cotton and silk without mordant.

Sr. No.	Materials	Extract	Color shade (Panton paints color chart)	Color
1	Cotton	Aqueous	5845	Dark beige
2	Silk	Aqueous	5527	Edge comb grey
3	Cotton	Alcoholic	5773	Grey beige
4	Silk	Alcoholic	5645	Thunder
5	Cotton	Ethanolic	451	Himalaya
6	Silk	Ethanolic	452	Paper bark

About twelve different color shades were obtained from aqueous, alcoholic and ethanolic extracts of *Nerium oleander* with mordantsFerrous ammonium sulphate (FAS)and Copper sulphate were tabulated in Table II (Figure 3).

Ethanolic and alcoholic extract with mordant Ferrous ammonium sulphate found to exhibit Dark olive (Panton paint shade no.418) and Uniform (Panton paint shade no. 5615) respectively on cotton which are the darkest shades while most lighter shades exhibited by silk fiber dyed by ethanolic extract with Copper sulphate (Surfmist, Panton paint shade no. 4535), alcoholic extract with Copper sulphate (Squirrel grey, Panton paint shade no. 442) and aqueous extract with Copper sulphate (Light pewter, Panton paint shade no. 5517).

Table II: Effect of aqueous, alcoholic and ethanolic extract of *Nerium oleander* on cotton and silk with mordant.

Sr. No.	Materials	Mordant	Extract	Color shade (Panton Paints color chart)	Color
1	Cotton	FAS	Aqueous	448	Best bronze
2	Silk	FAS	Aqueous	416	Gulf
3	Cotton	Copper sulphate	Aqueous	5797	Dark ivory
4	Silk	Copper sulphate	Aqueous	5517	Light pewter
5	Cotton	FAS	Alcoholic	5615	Uniform
6	Silk	FAS	Alcoholic	443	Shale grey
7	Cotton	Copper sulphate	Alcoholic	5783	Moss
8	Silk	Copper sulphate	Alcoholic	442	Squirrel grey
9	Cotton	FAS	Ethanolic	418	Dark olive
10	Silk	FAS	Ethanolic	429	Harbor grey
11	Cotton	Copper sulphate	Ethanolic	15-1218	Flaxen
12	Silk	Copper sulphate	Ethanolic	4535	Surfmist

Bhuyan and Saikia (2005) evaluated dye yielding potential of different parts of five plant species *Rubiacordifolia, Morindaangustifolia, Tectonagrandis, Mimusopselengi* and *Terminalia arjuna*and concluded that dyes obtained from native plants might be alternative sources to synthetic dyes for dyeing of natural silk and cotton. Parthsarthi and Lokesh (2015) tested efficiency of dye extracted fromdried and semidried sample (without calyx) of*Spathodeacampanulata* and found that cotton fabricdyed with water extract was found to have bestresults and can be used for textile application.

The color variability from camel brown to dark chocolate brown was obtain by Vankar*et al.* (2009) when cotton, silk and wool yarn fabrics were dyed with *Garcinia mangostana*pericarp after premordantaing with metal salts of Al, Sn, Fe, Cr and Cu. Again Vankar*et al.* (2009) proposed that huge amounts of

Tagetuserecta(marigold) flowers offered in Indian temples generate very large waste. They suggested use of this floral waste as a source of natural dye for cotton, silk and wool coloration on industrial scale.

Figure 1 : Plant Material

Nerium oleander

Figure 2 : Notable color variation obtained by using dye extracted from *Nerium oleander*

Grey beige P. S. No. 5773 | **Thunder P. S. No. 5645** | **Dark olive P. S. No. 418**

Surfmist P. S. No. 4535 | **Uniform P. S. No. 5615** | **Squirrel grey P. S. No. 442** | **Light pewter P. S. No. 5517**

P. S. No. – Panton Paint Shade Number

Singh *et al.* (2004) even reported antimicrobial properties of natural dyes obtained from five plants *Acacia catechu, Kerrialacca, Quercusinfectoria, Rubiacordifolia*and *Rumexmaritimus*against common pathogens *Escherichia coli, Bacillus subtilis, Klebsiellapneumoniae, Proteusvulgaris* and *Pseudomonas aeruginosa.*They found that*Quercusinfectoria*dye was most effective and showed maximum zone of inhibition.

Many workers worked on applications of plant based dyes for fabric and textile coloration. Ali *et al.* (2006) Eucalyptus bark, Sachan and Kapoor (2007) from turmeric rhizome (*Curcuma longa*), Nilani*et al.* (2008) from marigold (*Tageteserecta*), Kulkarni *et al.* (2011) from Pomegranate (*Punicagranatum*) Peel,Kamel*et al.*(2009) from *Crocus sativus*, Mongkholrattanasit*et al.*(2010) from Eucalyptus leaves, Shingane in *Bombaxceiba* (2015).

Conclusions

In aqueous extract of *Neriumoleander* there is lighter color shade than the ethanolic and alcoholic extracts on cotton and silk fiber. On cotton dark color obtained than silk fiber. Six color shades obtained when cotton and silk fabrics in dye solution out of which Grey beige was the darkest one while Thunderwas the lighter shade. There are twelve different color shades obtained in dyeing with mordant treatment. All extracts with mordantFerrous ammonium sulphate showed darker color than Copper sulphate. Dark olive and affix uniform to fabrics the dark shades obtained by dyeing with mordant Ferrous ammonium sulphate. While silk exhibit three lighter colorations i.e. Surfmist, Squirrel grey and Light pewter by dyeing with mordant Copper sulphate.

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Inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

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Abstract:

The present paper deals with the inventory of the scorpion fauna of Akot tehsil of Akola district, Maharashtra, India. Two species of scorpions were recorded from different microhabitats. Present information provides a baseline biological data for further demographic and ecological studies and stresses the need for impact assessment prior to undertaking developmental projects in region, since Arachnids exhibit restricted movements and are vulnerable to habitat modification.

Key words:*Akola, Akot, India, Inventory, Maharashtra, Scorpion.*

Introduction

Scorpions are predatory arachnids of the order Scorpiones. They have eight legs, and are easily recognized by a pair of grasping pincers and a narrow, segmented tail, often carried in a characteristic forward curve over the back and always ending with a stinger. The evolutionary history of scorpions goes back 435 million years. They mainly live in deserts but have adapted to a wide range of environmental conditions, and can be found on all continents except Antarctica. There are over 2,500 described species, with 22 extant (living) families recognized to date. Their taxonomy is being revised to account for 21st-century genomic studies (Ahmadi*et al.,* 2020; Anderson *et al.,* 2021).

Scorpions primarily prey on insects and other invertebrates, but some species hunt vertebrates. They use their pincers to restrain and kill prey, or to prevent their own predation. The venomous sting is used for offense and defense. During courtship, the male and female grasp each other's pincers and dance while he tries to move her onto his sperm packet. All known species give live birth and the female cares for the young as their exoskeletons harden, transporting them on her back. The exoskeleton contains fluorescent chemicals and glows under ultraviolet light (Feola. *et al.,* 2020).

The vast majority of species do not seriously threaten humans, and healthy adults usually do not need medical treatment after a sting. About 25 species have venom capable of killing a human, which happens frequently in the parts of the world where they live, primarily where access to medical treatment is unlikely.Scorpions appear in art, folklore, mythology, and commercial brands. Scorpion motifs are woven into kilim carpets for protection from their sting. Scorpius is the name of a constellation; the corresponding astrological sign is Scorpio. A classical myth about Scorpius tells how the giant scorpion and its enemy Orion became constellations on opposite sides of the sky (Howard. *et al.,* 2019).

In this concern, a present study is an approach to understand the diversity of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India

Materials and Methods

The Akot tehsil of Akola district is one of the most diversified regions in Maharashtra State of India, with respect to biodiversity. Its healthy climate, mountainous terrain, rugged configuration, and sudden fall in elevation are phenomenal. Akot is a city in the Vidarbha Region and a municipal council in Akola district in the Indian state of Maharashtra. It is located between 21.1°N 77.06°E. The climatic condition of this district is characterized by a hot summer, well-distributed rainfall during the south-west monsoon season, and generally dry weather during the rest of the year (Akola Gazetteer,2022). The survey was conducted to prepare an inventory of Scorpion Fauna from Akot Tehsil of Akola District, Maharashtra, India. The observed scorpion species were identified on the spot using published keys (Tikader and Bastawade 1983);

Results and Discussion

The study was conducted during 2021 in Akot tehsil of Akola district, Maharashtra, India. Study reveals the presence of two scorpion species. *Heterometrusphipsoni* (Pocock, 1893), the forest scorpions, is a species of scorpions belonging to the family Scorpionidae. *Hottentottapachyurus* (Fabricius, 1798), the Indian scorpion is a species of scorpion of the family Buthidae.Heterometrusphipsoni (Pocock, 1893) are lapidicolous scorpions found under stones. Hottentottapachyurus (Pocock, 1897) are non-burrowing species and mostly found only under tree bark.

Warburg (1997) studied biogeographic and demographic changes in the distribution and abundance of scorpions inhabiting the Mediterranean region in northern Israel. Warburg (2000) studied intra- and inter-specific cohabitation of scorpions in the field and the effect of density, food, and shelter on their interactions. Raz*et al.* (2009) have studied biodiversity, species abundance, inter-slope divergence and other aspects of scorpion fauna of Mt. Carmel, Israel. Pande*et al.*, (2012) studied the diversity of scorpion fauna of Saswad-Jejuri, Pune District, Maharashtra, India. Thus, scorpion diversity, distribution, abundance as well as other related aspects of scorpion ecology are well studied elsewhere. As the study area is earmarked for development projects such as plantation, beautification, dam construction, urbanization and industrialization that will lead to habitat loss through land use modification.

Detailed studies on scorpion fauna of India including various ecological aspects such as population estimates, diversity, distribution, abundance, biogeographic and demographic changes, microhabitat preferences, etc. are necessary to understand the potential threats to the scorpion fauna and to direct conservation efforts.

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The Effect of Feed Cycling And Ration Level on Compensatory Growth Response in Fresh Water Fish Ctarias Batrchus

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Abstrat:
To investigate the nature of compensatory growth in fish, a 6 week study was performed on fresh water fish claras batsaushus Fishes were starved for 0 (control-lA), 1 (IB), 2 (1C) and 3 (ID, IE & IF) weeks and then re-fed to satiation for 1,2 and 3 weeks. Weekly changes in weight gain, percentage weight gain and specific growth rate were monitored during re-feeding. Although «1 and I/ feeding cycle group (IB) with 5% ration level performed better than '3 and 3* and '2 and 2' feeding cycle groups since all the parameters viz. mean weight gain, percentage weight gain, SGR and FCR values showed an improving trend after re-feeding in this group but it is much less than control group. Final results suggested that growth parameters were significantly different (P<0.05) in case of control group as compared to experimental groups suggesting that starvation followed by subsequent re-feeding did not play a role in more growth of Cyprinus carpio.*
Keywords: *Compensatory growth, Starvation, Specific growth rate Food conversion ratio. Feed cycle.*

Introduction

catch-up growth refers to the unusually fast growth that follows a period of reduced growth resulting from restricted food availability. Compensatory growth is a phase of unusually rapid growth following a period of undcr-nutrition. Compensatory growth is usually accompanied by hyperphagia (an increase in appetite) and sometimes improved growth efficiency. This phenomenon has been reported in a range offish species covering different taxa (Dobson & Holmes, 1984; Russell & Wootton, 1992; Jobling *et al.*, 1994; Kirn & Lovell, 1995; Hayward *et al.*, 1997; Sacther & Jobling.1999; Qian *et at.* ,2000; Wang *et al.* ,2000 and AH *et al.* ,2003).

Present study was designed to investigate the effect of feed cycling/starvation on *C.carpio.* Particular emphasis was laid to understand whether compensatory growth is present or not since it is a way to ameliorate fish growth performance, as in some of the species, compensatory growth is so intense that fish exhibit a higher growth rate than those continuously fed. Moreover, this information can also be utilized in designing the feeding schedules of particular fish in culture operations.

Material And Methods

Fishes were divided into 6 groups having 6 fishes in each group. Feed cycling period and ration level were changed in all the treatments.

Group 1A - (Control group) Fed @ 5% body weight during the whole experimental period.

Group IB - Starved for one week and then re-fed for next week. This feed cycling (alternate starvation periods and feeding periods) continued throughout the period of experiment i.e. 6 weeks. Again the feed was given @ 5% of the body weight.

Group 1C - Initially starved for 2 weeks and then re-fed for next 2 weeks. The feed was provided @ 5% of the body weight.

Group ID- Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided® 3% of the body weight.

Group IE - Fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @ 5% of the body weight.

Croup IF - fasted for first 3 weeks and then re-fed for next 3 weeks. The feed was provided @7% of the body weigh! per day ration level, adjusted weekly.

In all the treatments, diet was given once a day. Groups were .sampled weekly. Three fishes were netted from each group and measured and then were returned to their appropriate groups. The experiment was conducted in duplicate and it continued for six weeks. The left over feed and excreta were removed once a week. The left over feed was collected in already weighed beakers and oven-dried at 105°C aad weighed. The data was statistically analysed to calculate ANOVA with the help of MS, Excel 2003 and SPSS (12.0 version Inc. Chicago, USA) and mean compared by using Duncan's Multiple Range Test (Duncan, 1955).

Results And Discussion

1. Weight gain : Analysis of Table. 1 reveals that at the end of sixth week:
1. The weight gain was observed to be best in group-IA with weight gain of about 0.33±0.02 gm which was signi ficantly different (P<0.05) from all other groups;

2. The weight gain was found to be less in group ID having -0.04±0.01 grn weight gain which was not found to be significantly different (p<0.05) from the value recorded for group 1C, having weight gain of-0.08±0.01 gm.
3.The value of the weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF, and IF.

Table. 1 Observed values for weight grain, % weight grain, specific growth rate ; and food conversion ratio for groups IA-IF.

Parameters	Weight gain		Percentage weight gain		Specific growth rate	
Weeks/Groups	Week 3	Week 6	Week 3	Week 6	Week 3	Week 6
IA	0.12i0.05"	0.33i0.02"	11.53±0.02'	31.73iO.03"	0.52^.01"	0.64iO.()l"
IB	0.10±0.02[a]	0.26±0.03[b]	10.OOiO.05"	26.00i2.00"	0.42i0.01[b]	0.54*0.01"
1C	-0.05iO.01"	-0.08±0.01[d]	-4.76i0.01[c]	-2.85i0.01[c]	-0.19iO.01"	-0.16iO.01"
ID	-0.24iO.01"	-0.04±0.01[d]	-35.41±0.01[r]	-4.16i0.04°	-1.14±0.01[f]	-0.38i0.01[c]
IB	-0.I8iO.OP	0.05i0.01[c]	-17.82±0.02[C]	4.95i0.05<	-0.81i0.01[c]	-0.07i0.01[d]
IF	-0,!6±0,01[C]	0.05±0.01'	-10.73i0.03[c]	3.35i0.05[d]	-0.52±0.0!°	-0.0710.01"

2. Percentage weight gain (% WG): Analysis of Table. 1 reveals that at the end of sixth week
   1. The percentage weight gain was observed to be best in group IA with percentage weight of about 3! .73 ; 0 03% which was significantly different (P<0.05) from all other groups;
   2. The percentage weight gain was found to be less in group ID having -4.16±0.04% which was not found to be significantly different (P<0.05) from the values recorded for group 1C, having % weight gain of-2.85±0.01 %.
   3. The values of the % weight gain showed a decreasing trend from groups IA to ID and again a little increase in group IF and IF.
3. Specific Growth Rate (SGR): Analysis of Table. 1 reveals that at the end of sixth week:
   1. The specific growth rate was observed to be best in sub-group IA with SGR of about 0.64±0.01% which was significantly different (P<0.05) from all other groups;
   2. The SGR was found to be less in group ID having -0.38i0.01% which was not found to be significantly different (PO.05) from the values recorded for group 1C, having SGR of QO. 16±0.01%.
   3. The value of the SGR showed a decreasing trend from group IA to ID and again a little increase in the group IE and IF.

The results suggested that the growth parameters were found to be significantly different (P<0.05) in case of group IA and was best among all treatments suggesting that starvation followed by subsequent re-feeding did not play a role in the more growth of the fishes. Our observations are in accordance with Schwarz et al. (1985) who have also observed that the controlled groups with constant and regular ration level showed better growth than other groups. The experiment performed showed that compensatory growth does not occur Almost every group undergoing starvation showed the largest weight loss during the first week of starvation as found by Dobson and Holmes (1984) due to gut emptying (Elliott,1972). The rate of weight loss declined in subsequent weeks upon re-feeding there was a moderate increase in the weight due to gut refilling in all the groups, same has been recorded by Quinton and Blake (1990) while studying the effect of feed cycling and ration level on compensatory growth response in rainbow trout, Oncorhynchus mykiss.

A perusal of the Table. 1 reveals that as the experiment progressed, a decline in specific growth rate (SGR) was observed in groups (IB-IF) as compared to control group IA with starvation producing a negative specific growth rate in all the groups. The present observation thus indicates that the length of starvation had a marked effect on SGR. Similar results have been put forth by Furhan et al. (2006) in Cirrhinus mrigala and Muhammcd et al. (2006) in Labeo rohita. Further, The results indicate that common carp was unable to maintain its SGR during re-feeding periods like that of control (lA).Contrary to this however, Van Dijk et al (2005) observed that juvenile roach, Rutilus rutilus was able to fully compensate SGR when transferred to rc-fccding after 21 days of starvation. Similar results have been recorded by AH (1999) for three-spined sticklebacks, Gastrosteus aculeatus.

Data reveals that occurrence of compensatory growth is species specific and depends upon the duration of fasting period in warm water fish species (Xie et al. ,2001). A comparative analysis of all the treatments reveals that' 1 and 1' feeding cycle group with 5% ration level (IB) performed better than rest of the experimental groups and weight gain, % weight gain, SGR and FCR values also showed an improving trend after re-feeding in restricted fish (Table. 1). Such an improving trend cannot be designated as compensatory

gain rather it appears more to be a case of the stunted/restricted fish performing at the level expected for smaller/restricted fish. Thus, it can be safely concluded that compensatory growth does not exist in Cyprinus carpio as data of our present study is also quite convincing for this conclusion.

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Some Wood-Rotting Fungi from Khultabad Tehsil, District Aurangabad (M.S.) India.

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Abstract
Wood rotting fungi are the parasite as well as saprophytic which grow on the living trees, dead trees, wood logs and decay the external and internal structural components which are cellulose, hemicellulose, and lignin. In the present investigation, thirty-seven specimens of macro-fungi were collected from different areas of Khultabad Tehsil, District Aurangabad (M.S.) India, from that twelve specimens were studied. Based on morphological and microscopic characteristics which belong to nine genera and twelve species. It was observed that Auricularia nigricans, Flavodon flavus, Phellinus badius, Pseudofavolus tenuis, Scytinostroma duriusculum, Trametes cingulata, and Truncospora tephropora were most abundantly found while Ganoderma mediosinense, Phellinus allardii, Phellinus gilvus, Pleurotus djamor, and Trametes ellipsospora are rarely observed macro-fungi.
Keywords: *Khultabad, Macro-fungi, Microscopic, Morphological, Saprophytic.*

Introduction
Wood rotting fungi have the ability to decompose wood causing rot, fruiting bodies of macro-fungi grow on living trees, dead trees, and wood logs which comprise 10% of total fungal diversity from which 16–41% have been described to date (Rossman 1994, Mueller et al, 2007). Wood decaying fungi are classified into three groups i.e. brown rot, white rot, and soft rot, wood decay by brown rot fungi is brown and crumbly which degrade via the enzymatic and non-enzymatic system. Cellulase enzymes are secreted by brown rot fungi for degradation, but no lignin-degrading enzyme is involved. White rot fungi associated with hardwood decay show different decaying patterns by secretion of cellulase and lignin-degrading enzyme. According to (Jasalavinch et al. 2000) white rot fungi can utilize all major components of the cell wall including carbohydrates and lignin. Soft rot fungi secrete cellulase enzyme from hyphae which break down cellulose and lower lignin content in wood and create the cavity in the wood cell wall. The injuries to branches, roots and the main trunk of trees allow wood-decaying agents to gain entry through wounds and make the serious loss of wood's mechanical strength. Wood decaying fungi are an important component of the forest ecosystem (Wang et al, 2011).

Studies on Indian wood-rotting fungi were initiated with Europeans' launch of studies in Indian fungi. The first Indian record of its kind could be traced back to the work of (Klotzsch 1832) in his paper on Indian Polyporaceae. (Ranadive et al., 2013) studied eight families, fourteen genera, and twenty species of Aphyllophorales from Pune district. (Chouse and Mali 2020) on the diversity of Aphyllophorales from Latur district, Maharashtra reported thirty-four genera and forty-seven species of wood-rotting fungi. (Gore and Mali 2021) reported seventeen genera and eighteen species of wood-decaying fungi from Paithan Tehsil, Aurangabad district (M.S.) India.

Materials And Methods
In the present investigation, the thirty-seven specimens of wood-rotting macro-fungi were collected 20 to 25 days after heavy rainfall during the year 2014 – 2019 after several intervals from various regions of Khultabad Tehsil, District Aurangabad (M.S.) India. The specimen of Basidiome were collected in brown paper bags, noting the hostname, locality, date of collection, color of the specimen, and type of attachment suggested by Gilbertson and Ryvarden (1986). The morphological and microscopic character was recorded, fresh material from the field and dried material in the laboratory. Macroscopic observations were carried out by using Cosmo Compound Light Microscope under a 10X objective. The freehand thin section cutting of fruiting bodies was done by chopping method with the help of sharp razor blades, stained and studied in 10% KOH, Lactophenol, Cotton Blue, and Melzer's reagent and microscopic observations were made under 40X and 100X Magnification (Olympus CX 41) in the laboratory.

Result And Discussion
Details of the wood rotting fungi collected during present investigation has been described with photo plate 1 as fallows.

***Auricularia nigricans* (Sw.) Birkebak, Looney& Sancher–Garcia.**
Basidiome 5–31 × 4–26 mm, annual, pileate, lossely attached with small tapered stalk, moist dependent, jelly like when fresh and brittle on drying. Upper surface velvety hairy. Margin acute, decurved. Lower fertile surface smooth. Context jelly like when fresh, waxy hard when dry. Basidia cylindrical, hyaline, 3-septate, 39 –

58 × 3.5 –5 µm with 1–3 lateral sterigmata, sterigmata 9–14 × 1.5–11 µm. Spores 13–15 × 4–5µm, cylindrical to allantois, slightly kidney shaped, thin walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′39″N 75˚14′10″E; alt 677m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–360).

***Flavodon flavus* (Klotzsch) Ryvarden**

Basidiome 5–73 × 4–59 mm annual, resupinate to pileate, widely effused reflex. Upper sterile surface concentric zonation, tomentose. Lower fertile surface poroid, lamellate, iripicoid to hynoid, pores 1–2 per mm. Tube up to 3 mm deep. Context up to 2 mm thick. Hyphal system dimitic. Generative hyphae hyaline, thin to slightly thick-walled, septate, branched, 1.4–3 µm wide. Skeletal hyphae thick-walled, branched, 2–6 µm wide. Cystidia occur as skeletal hyphal projection, thick-walled, encrusted at the tip, 11–32 × 6–11µm. Basidia 23 – 28 × 6 – 8 µm, clavate, hyaline, thin-walled, with 4-sterigmata. Spores 5.3–7 × 3–4.5 µm, ellipsoid, smooth, thin–walled, hyaline.

Specimens examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′33″E; alt 702m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–397).

***Ganoderma mediosinense* J.D. Zhao**

Basidiome 87–132 × 52–108 × 3–29 mm annual, pileate, laterally to centrally stipitate, leathery when fresh, corky to woody on drying. Upper sterile surface mostly sulcate, weakly zonate, glabrous. Margin distinct, acute to obtuse. Lower fertile surface poroid round, regular, pores 3–4 per mm. Context up to 19 mm wide, homogenous. Tubes up to 10 mm deep. Stipe 59–79 × 14–26 mm, cylindrical to inflated near pileus, homogenous. Hyphal system trimitic, generative hyphae 1.4–3 µm wide, clamped, septate, thin-walled, hyaline. Skeletal hyphae 2–5 µm wide, thick-walled. Binding hyphae 1.4–3 µm wide, thin, hyaline. Basidia clavate, 4-sterigmate, clamped at base. Spores 8–10 × 5–6 µm, ovoid to ellipsoid, exospore smooth and hyaline, endospore distinctly echinulate. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′48″E; alt 718m; on the wood logs of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 08/09/2016; Vijay Gore (VUG/VPM–358).

***Phellinus allardii* (Bres.) S. Ahmad**

Basidiome 72 × 106 × 2–18 mm, perennial, resupinate to pileate. heavy when fresh, corky hard on drying, broadly attached and elongated, frequently sub-resupinate. Upper sterile surface narrowly sulcate. Margin fertile, sharp, undulating, velvety. Lower fertile surface poroid, round, pores 5–8 per mm. Context very thin, sometimes almost absent. Tubes up to 3 mm deep. Hyphal system dimitic, generative hyphae 2–3 µm wide, simple septate, smooth, hyaline. Skeletal hyphae 3–3.5 µm wide, thick-walled, smooth, hyaline. Basidia 11–15 × 5–6 µm, clavate, 4-sterigmate, septate at base. Spores 4.5–6 × 3–4 µm, broadly ellipsoid to subglobose, thick-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′48″E; alt 719m; on the living tree but on dried main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–771).

***Phellinus badius* (Cooke) G. Cunn.**

Basidiome 34–109 × 22–71 × 2–28 mm, perennial, sessile, semicircular, easily detachable from the host. Upper sterile surface velvety. Margin obtuse, sterile. Lower surface poroid, pores 4– 7 per mm, thick-walled. Context up to 22 mm thick, corky when fresh, hard on drying. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae hyaline, septate, branched, 3.5–4 µm wide. Skeletal hyphae thick-walled, 3.5–5 µm wide. hymenial setae absent. Basidia broadly clavate 10.5–14 × 5.5–7 µm, 4–sterigmate. Spores 6–7.5 × 5–6.5 µm, ellipsoid to sub-globose. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′19″N 75˚13′47″E; alt 722m; on the living tree on main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–769).

***Phellinus gilvus* (Schwein.) Pat.**

Basidiome 22–54 × 18–37 × 4–11 mm, annual to perennial, imbricate, sessile to effuse reflexed, corky to brittle on drying. Upper sterile surface weakly zonate, finely velutinate, glabrous, strigose to radiate-striate. Margin acute, lobed. Lower surface poroid, round and regular, smooth, shiny, pores 6–9 per mm. Context homogenous, up to 7 mm thick. Tube up to 4 mm deep. Hyphal system dimitic, generative hyphae septate, branched, 2.4–4 µ m wide. Skeletal hyphae thick-walled 3.5–5 µm. Hymenial setae thick-walled, 25–35 × 6–10 µm. Basidia 5.8–11 × 4.4–6 µm, clavate, hyaline with 4-sterigmata. Spores sub-globose to ellipsoid, 4.5–6 × 2.4–3.5 µm, thin-walled, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Varegoan; 20˚05′01″N 75˚21′40″E; alt 655m; on the dried standing stump at main trunk *Azadirachta indica* A.Juss.; 21/08/2016; Vijay Gore (VUG/VPM–272).

***Pleurotus djamor* (Rumph. ex Fr.) Boedijn**

Basidiome 15– 39 × 12–31 mm, annual, spathulate to flabelliform, convex or depressed towards the base. Upper sterile surface finely tomentose towards the base, finely striate. Margin at first involute, often incised. Lamellae are deeply decurrent, sometimes with yellowish cream or pale red tints, narrow, moderately crowded. Stipe absent or reduced and then lateral or eccentric, 1–5 × 3–4 mm, cylindrical, solid. Context thin, 1–4 mm thick, soft, fleshy. Hyphal system dimitic generative hyphae 3–8 µm, with prominent clamp-connections, skeletal hyphae, 2.5–8 µm. Basidia 23–30 × 3–6 µm, narrowly clavate bearing 4-sterigmata. Cheilocystidia 22.5–30 × 6–7 µm, inflated clavate. Spores 7.5–9×4–5 µm, cylindric, hyaline, thin-walled, Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚14′48″E; alt 679m; on the wood logs of *Mangifera indica* L.; 08/09/2016; Vijay Gore (VUG/VPM–753).

***Pseudofavolus tenuis* (Fr.) G. Cunn.**

Basidiome 25–53 × 19–38 mm, annual to perennial, dimidiate, flabelliform to semicircular, effused-reflexed to pileate, leathery when fresh, corky to tough on drying. Upper sterile surface smooth concentrically zonate, sulcate, glabrous, radially wrinkled. Lower fertile surface poroid 1–2 per mm wide, angular to hexagonal. Context up to 1 mm wide, homogenous; Tubes 1–2 mm long, homogenous. Hyphal system trimitic, generative hyphae hyaline, thin-walled, clamp, branched, 1.5–3 µm wide. Skeletal hyphae thick-walled, 3.5–6 µm wide. Binding hyphae hyaline, thick-walled, 3–5.5 µm wide. Spores 14–17.5 × 4–6 µm, cylindrical, hyaline, thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′23″N 75˚15′32″E; alt 702m; on the fallen dried twing of *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–394).

***Scytinostroma duriusculum* (Berk. & Broome) Donk.**

Basidiome 19–104 × 17–72 mm, annual, membranous, resupinate to widely effused papery thin, and brittle on drying. Fertile surface smooth, when touched gives velvety sensation. Context finely layered, smooth, dense, subhyaline in section, faintly stratose, homogeneous. Hyphal system dimitic, generative hyphae thin-walled, clamp absent, branched, nondextrinoid, 1.5–2.4 µm wide. Skeletal hyphae branched, branches mostly lateral, 1.2–2 µm wide. Spores 5.5–7.5 × 4–7.5 µm in diameter, globose, amyloid, smooth. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Gadhana; 20˚02′20″N 75˚15′32″E; alt 711m; on the living tree at main trunk *Senna siamea* (Lam.) H.S.Irwin & Barneby; 22/09/2016; Vijay Gore (VUG/VPM–390).

***Trametes cingulata* Berk.**

Basidiome 20–39 × 12–16 × 3–6 mm, annual, dimidiate, semicircular, hard, corky, sessile. Upper sterile surface glabrous, weakly zonate, concentrically ridged to radially wrinkle. Margin thin, acute to obtuse, wavy. Lower fertile surface poroid, round to regular, 5–7 per mm. Context homogenous, up to 4 mm thick. Tubes up to 2 mm deep. Hyphal system trimitic, generative hyphae hyaline, thin-walled, septate with clamp, 2–3.5 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 3–5.5 µm wide. Binding hyphae 1.5–3 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 4- sterigmate, 16–22 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 3–3.5 ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Khultabad; 20˚00′51″N 75˚12′08″E; alt 706m; on wood log *Acacia nilotica* (L.) Delile; 10/08/2014; Vijay Gore (VUG/VPM–12).

***Trametes ellipsospora* Ryvarden**

Basidiome 16–34 × 10–19 × 2–4 mm, annual, resupinate to effused reflex to pileate, sessile with a broad base, leathery when fresh, brittle on drying.. Upper sterile surface covered with stiff persistent strigose hairs, shiny, sulcate, weakly zonate. Margin thin, acute, wavy. Lower fertile surface poroid 4–6 per mm pores, pores surface flat or decurrent, angular, irregular, toothed. Context duplex, up to 2 mm thick. Tubes up to 2 mm deep. Hyphal system dimitic, generative hyphae hyaline, thin-walled, septate with clamp, 1.5–3 µm wide, skeletal hyphae hyaline, thick-walled, unbranched, narrow lumen, 2–5 µm wide. Binding hyphae 2–3.5 µm wide, thick-walled, smooth, hyaline. Basdia clavate, thin-walled, 11–14 × 4–6 µm. Basidiole clavate, thin-walled, 19–26 × 9–12 µm. Spores 3.5–5.5 × 2–3.5 µm, ellipsoid, thin-walled, smooth, hyaline. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Bhadji; 20˚01′20″N 75˚13′47″E; alt 725m; on the living tree on dried branch *Senna siamea* (Lam.) H.S.Irwin & Barneby; 07/11/2019; Vijay Gore (VUG/VPM–772).

***Truncospora tephropora* (Mont.) Zmitr.**

Basidiome, 72 × 34 cm, up to 1.4 cm thick at the center, resupinate to widely effused, tough to hard when fresh, woody hard on drying, broadly elongated. Margin sterile, obtuse. Fertile surface poroid, 4–6 per mm pores, round, regular, cracked when mature. Context papery thin to almost absent, hard, homogenous. Tubes up to 14

mm wide, duplex or in the layer, each layer or strata up to 3 mm wide. Hyphal system trimitic, Generative hyphae 2.1–3 µm wide, clamped, thin-walled, smooth, hyaline. Skeletal hyphae 3.2–4 µm wide, thick-walled, smooth. Binding hyphae1.4–3 µm wide, thin to thick-walled, branched, smooth, hyaline. Basidia 13–16 × 4–5 µm, narrowly clavate, 4-sterigmata, clamped at the base. Spores 4.7–6 × 3.5–4.5 µm, broadly ellipsoid, truncate, collapsed partly, moderately thick-walled. Specimen examined: INDIA; Maharashtra, Marathwada, Aurangabad district, Taluka Khultabad, Yesgaon; 20˚04′56″N 75˚20′24″E; alt 660m; on the dried standing stump on main trunk *Eucalyptus oblique* L'Hér.; 21/08/2016; Vijay Gore (VUG/VPM–273).

Conclusion

Wood-rotting fungi were collected during July (2014) to November (2019) after the regular interval from different sites of Khultabad Tehsil, Aurangabad district (M.S.) India. Thirty-seven specimens of macrofungi were examined, and from that nine different types of genera and twelve species, were studied (Photo Plate 1) which belong to six families Auriculariaceae, Hymenochaetaceae, Irpicaceae, Peniophoraceae, Pleurotaceae, and Polyporaceae. Polyporaceae is dominating family consists of four genera. From the above discussion, it is concluded that *Auricularia nigricans*, *Flavodon flavus*, *Phellinus badius*, *Pseudofavolus tenuis*, *Scytinostroma duriusculum*, *Trametes cingulata*, and *Truncospora tephropora* were most abundantly found while *Ganoderma mediosinense*, *Phellinus allardii*, *Phellinus gilvus*, *Pleurotus djamor*, and *Trametes ellipsospora* are rarely observed macro-fungi, belongs to four hosts *Acacia nilotica*, *Azadirachta indica*, *Mangifera indica*, and *Senna siamea*.

Photo Plate-1


Auricularia nigricans (Sw.) Birkebak, Looney& Sancher–Garcia.


Flavodon flavus (Klotzsch) Ryvarden

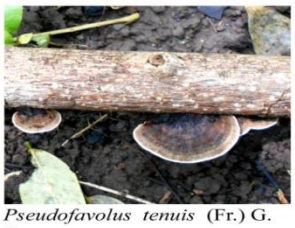

Ganoderma mediosinense J.D. Zhao


Phellinus allardii (Bres.) S. Ahmad


Phellinus badius (Cooke) G. Cunn.


Phellinus gilvus (Schwein.) Pat.


Pleurotus djamor (Rumph. ex Fr.) Boedijn


Pseudofavolus tenuis (Fr.) G. Cunn.


Scytinostroma duriusculum (Berk. & Broome) Donk.


Trametes cingulata Berk.


Trametes ellipsospora Ryvarden


Truncospora tephropora (Mont.) Zmitr

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Ethnoveterinary Plants to Treat Bone Fractures of Animals in Buldana district, Maharashtra.

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Abstract:

The people of rural areas still depend to a large extent upon plants and household remedies for curing Veterinary ailments. The folk knowledge of Ethnoveterinary medicine and its significance has been identified by the traditional communities through a process of experience over thousands of years. This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements. Out of the Total population, majority of the people was found dependent on traditional (herbal) system of treatments practiced by local herbal healers. In this study observed that old aged people have more knowledge and experience particularly in remote areas for curing Veterinary ailments. The traditional system of Treatment is one of the most important Prevailing systems in the area where modern Veterinary health care facilities are rare or in very poor conditions.

The purpose of the present Study was to unravel the mode of application of the medicine prepared from Plants and quantify the dependence of the local people on herbal and allopathic systems of veterinary health care.

Key words: *Ethnoveterinary plants, livestock.*

Introduction:

Ancient human beings were closely associated with animals ,especially the domesticated ones and with the plants those were found in and around their close vicinity as well as with other plants which were used for their daily necessities like food ,shelter, clothing and medicines .Ethnoveterinary medicine consists of local peoples knowledge dealing with folk beliefs ,skiills,methods, and practices pertaining to animal health care and production .This knowledge is based on close observation of animals and or the oral transmission of experience from one generation to the Next .The Buldana district has a predominately livestock based economy and social welfare .However ,economic dependence on livestock ,lack of effective veterinary infrastructure have forced the local farmers even today to apply their indigenous knowledge to look after and maintain their livestock population. This paper includes social practices and the ways in which livestock are incorporated into farming system. Over centuries people have developed their own system of keeping animals healthy and productive using age old remedies, surgical and manipulative techniques and religious practice. The use of ethnoveterinary medicine uses differ not only from region to region but also among and within communities. Ethnoveterinary medicinal practice and skills have developed through time mainly by tribal and error and sometimes through experimentation and innovation.This paper deals with commonly found in different categories of livestock (i.e. Cow., oxen, buffalo etc) and their treatment with10 medicinal plants 10 species belonging to 10genera and 9 families that occur in forests as well as close vicinity of the rural settlements.

Material and Method: -

During investigation, repeated field visits were made to the remote villages. After establishing good rapport with local herbal healers, elderly persons and a person athorough knowledge of veterinary practices. Some of the commonly occurring veterinarydiseases were listed. The morpho taxonomical description of each plant taxon was done and identified with the help of different floras.

Observation-

Local people of various regions used 10 different types of plants for Bone fracture in animals. The plants arranged alphabetically with family name and Mode of Administration.

Sr. no.	Name of Plant	Family	Mode of Administration
1.	*Bauhinia racemosa*	Fabaceae	Root powder with butter and boiled rice is given to animals for three days in bone fracture to join the bones.
2.	*Blepharis repens*	Acanthaceae	Powder of leaves mixed with pulses of Black gram given to bone facture in animals.
3.	*Buchanania latifolia*	Anacardiaceae	Gum resin is used in case of Bone fracture where plaster cannot be tied
4	*Capparis zeylanica* L.	Capparaceae	Leaves crushed with water mixed with 250ml edible oil and

			applied on bone of cattle on Bone of cattle in Bone fracture.
5.	*Cassia fistula*	Fabaceae	One Pinch seed powder is mixed with melted Jaggery and applied on thigh swelling in lamness.
6.	*Cissus quadrangularis*	Vitaceae	1.Stems are crushed, and the paste is applied on bone fracture in cattle. 2. Stems crushed and mixed with jawar floor and the bolus is fed to animals for healing the bone fracture.
7.	*Clematis triloba*	Ranunculaceae	The vegetable oil or butter is applied over the fractured part and then the decoction of leaves is applied for joining bone of Animals. This treatment used in case where plaster can not be tied.
8.	*Soyamida febrifuga*	Meliaceae	Warmed leaves are tied on the fractured bone.
9.	*Terminalia arjuna*	Combrataceae	Stem bark crushed in water and the paste applied over bone fracture.
10.	*Viscum articulatum*	Santalaceae	Stem branches are given orally or mixed with fodder.

Conclusion-

The ethnoveterinary medicinal plants species are collected by local people from the surrounding areas, forests and are being used as remedies for various animal ailments. Documentation of ethnoveterinary medicinal plant survey of vital importance in finding some miraculous medicines for curing various veterinary diseases .10 plants from 9 families used in bone fracture of animals. Taking into consideration all these facts and the importance of plats Uses it is very necessary to save plant and to undertake such studies before the knowledge is lost forever.

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Status and distribution of Barn owl *Tyto alba* from Melghat Tiger Reserve, Amravati, Maharashtra, India

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Abstract
Distribution and population status of Barn owl Tyto alba was assessed by survey methods. This study implies thatowl species distribution is not common and also the species is less observed in dense forests.
Keywords – MTR, Owls, Owlets, Population status, Birds of prey, Barn owl

Introduction
Owls are found in diverse habitats such as from deserts to forests, including human habitations. However, despite their wide presence they are confined and difficult to be seen (Kumar *et al*. 2017).Owls are of great economic, scientific and aesthetic values hence the species has been given much importance (Santhankrishnan, 2011).

All owls have a large, rounded head with eyes directed forward. The basic morphological features of the members of this group include a curved bill with a pointed tip similar to diurnal birds of prey, and talons having curved and sharp claws which are very powerful which may be considered as an adaptation for carnivory. These birds have mostly coloured plumage which is soft and fluffy. Ecologically Owls may be considered as nocturnal counterparts to diurnal birds of prey, without being related to them.

Barn owls are Normally nocturnal, sometimes hunting diurnally in dim weather; flies slowly low over fields. This species roosts and nests mainly in cavities in old buildings, ancient forts and ruins or caves. Breeds throughout year, Nest is a collection of straw, twigs, rags and rubbish padded into tree-hollow and holes. The same site is used year after year.

The Indian subcontinent is home to 32 species of owls, according to Grimmet et al. (1999) 30 of them recorded from India. Also recently updated checklist of India by Praveen *et al.* (2016) recorded presence of all 32 owl species.

Amravati district harbours dense forest cover. It includes the famous widely spread Melghat Tiger Reserve and many other forests adjoining the Amravati city. Diversity studies have been done many years ago (MTR official checklist) thus requiring re- assessment of current status of owl diversity with location data, hence an effort was made in the present work to study the diversity of owls and owlets in this region.

Materials and Methods -

The work was conducted in the Melghat Tiger Reserve of Amravati district, Melghat is the hotspot of biodiversity of the state. It is located in Central India, as a southern part of Satpuda hill range. The Melghat Tiger Reserve and adjoining forest lies at the Northern extreme of Amravati district of Maharashtra State on the Madhya Pradesh border. Melghat Tiger Reserve is a representative of the Biogeographic Zone ‘6 E Deccan peninsula’ Central Highlands in the central India.

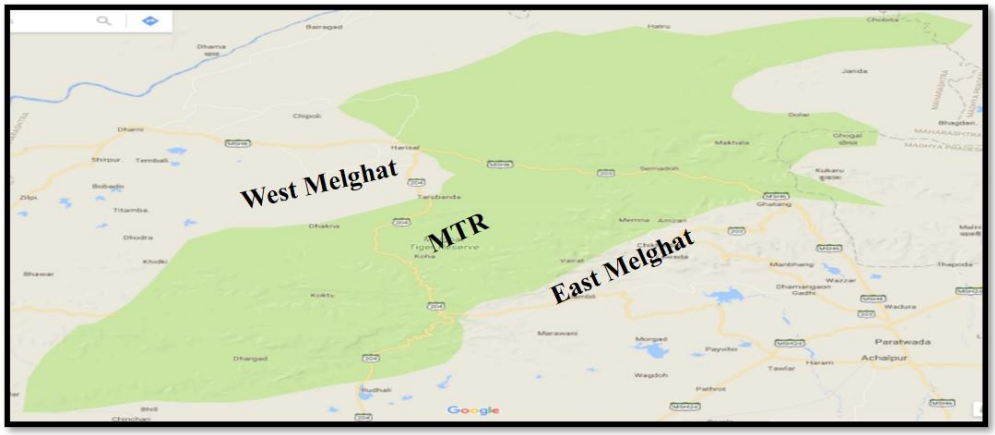

Fig – 1 – Map of Melghat Tiger Reserve.

Extensive Survey of Melghat Tigre reserve was done during the July 2013 to December 2017 to enlist number of owl and owlet species. Interviews with local indigenous people were conducted for collecting

information about sightings of the owls. Various other inputs from the local people were also taken into accord. Following survey techniques were used in the present study,

1) Surveys were done systematically in the study area by making use of existing forest roads, local trails, animal trails along rivers and streams and around water holes. Surveys were conducted either by foot or by motorized vehicle. Information provided by the local people was considered during each visit
2) Point survey (around villages and Rest Houses, ancient trees and riverine ecosystem) were done. At larger spatial scales, counts or detections at points have been used to document raptor presence (Kennedy and Stahlecker 1993), community diversity (Manosa and Pedrocchi 1997), and to estimate occupancy (McLeod and Andersen 1998).
3) Sighted owls were photographed and identified with the help of different field guides, some owls were identified with self recorded calls, using Sony ICD voice recorder and parabolic disc. The latitude and longitude data (GPS) of the sites of sightings of the owls were recorded by a GPS device.

Result and Discussion–

Species was not commonly recorded in Melghat Tiger Reserve. The species was reported from both East and west Melghat but not in dense forest. Total 21 individuals were reported, of which 10 were sighted. All of which were in association with human habitation such as Rest house premises, and agricultural farms. Surprisingly all nests were found in old or dry Banayan tree holes. It is observed that it is present in its nest in tree cavity for whole day and is not seen generally in day time. Pellets from the owl species were collected and studied.

According to Taylor (1992), Bam Owl selected isolated trees around farm sheds and villages and along hedgerows and woodland edges, rather than in the centres of woodland, which is in corroboration with the present study. Following map depicts an idea about distribution of Barn owls from MTR.

Fig. 2 – Map Showing Barn owl sighting locations recorded during Study.

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Phylogeny of Vertebrates from striated muscle proteins

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Abstract

Every living cell requires specific enzymes for the thousands of chemical reactions that maintain life. Like enzymes muscle proteins such as actin and myosin are specified by genes with unique DNA sequences. Both actin and myosin and the unique structures into which they are organized are conserved among all animals, no matter how diverse. This conservation implies that the encoding DNA sequences have changed little through evolutionary time. Just as similarities of structures indicate a common descent, variations and differences indicate divergence on the evolutionary tree. A complete understanding of DNA and inheritance, however, requires a greater appreciation of the importance of proteins. DNA dictates the production of specific proteins, but the proteins themselves directly determine an organism's traits. Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Key words : skeletal muscle, muscle protein, amino acid sequences , molecular phylogeny

Introduction :

Recently DNA has been a primary focus of research, but the ultimate function of DNA is to specify what proteins are made. In fact, recent studies of the genome sequences of humans and other organisms have revealed that the number of proteins expressed by a species contributes more to its complexity than does the number of genes (Jasny and Kennedy, 2001, International Human Genome Consortium, 2001).

The genes for actin and myosin are members of gene families that encode proteins that enable movement while actin and myosin are highly conserved across all animal species, other muscle proteins show more variability . The variations in an organism's proteins are the results of random DNA mutations within the encoding genes, which have occurred over thousands to millions of years. Each mutation may results in some kind of change in a protein. These changes can lead to novel traits and generate diversity individual differences among members of a population. Occasionally, a genetic mutation will alter a protein's structure to confer a functional advantage, enhancing an organism's survival in a particular niche, environment, or predator-prey relationship. Thus, genetic diversity makes evolution possible, The Evolutionary biologists are interested in how individual species arose from earlier forms. A classic way of addressing this question is to compare the morphology of different living organisms to one another and to fossilized species. With the onset and advancement of molecular biology, it is now possible for evolutionary biologists to compare not only the physical form and structure of different organisms, but their DNA and proteins as well.

Therefore, a close study and comparison of particular proteins from different species may indicate how closely related the species are. Species that diverged from a common ancestor a long time ago are less similar biochemically than those that diverged more recently. The biochemical composition of organisms includes their protein molecules. Thus, the degree of relatedness of two species can be estimated from the amount of similarity between their protein make ups. Molecular phylogeny , is the use of the structure of molecules to gain information on an organism's evolutionary relationship. The origin of species over a century later, evolutionary biologists still use tree diagrams to depict evolution because the floral analogy effectively convey the concept that speciation occurs. Recent advances in molecular technique as well as more powerful phylogenetic algorithms and faster computers have made it possible to infer phylogenetic relationships using sequences data, (Zardoya, and Meyer,). Different branches of related organisms separated at evolutionary times. The further apart species are on the tree, the less related they are, Molluscs and arthropods diverged from one another before the emergence of chordate animals with backbones, very early in evolutionary time. These animals are only distantly related to fish, birds, reptiles, mammals and amphibian, which are more closely related to each other. Just as similarities of structures indicate a common descent, variations and differences indicates divergence on the evolutionary tree. Proteins have important in phylogeny and the classification and hence the present study designed to know evolutionary correlation between different vertebrate animals with respect to striated muscle proteins which are involved in movements in the selected animals.

Materials and Methods :

Analysis of Proteins by using Block Maker and Peptool online software

The analysis of molecular information of muscle proteins in the different Vertebrates. Their amino acid sequences were obtained in the FASTA format from the NCBI Home Page by using NCBI sequence viewer v 2.0 windows internet explorer cited by www google com and conducted a comprehensive search for muscle protein sequences such as Actin, Myosin, Troponin, Tropomyosin. From selected species and their fasta formats were aligned together by Block Maker by accessing the website WWW. Block Server. Finally build the Phylogenetic tree for each protein. A set of blocks can also be used to construct and display a neighbour joining tree for examination of possible subfamily relationships. Because blocks represents the most highly conserved regions of proteins, misaligned regions were avoided to get a high quality tree. Further studies was carried out by using pep tool a protein analysis software.

Observations and Results :

I) Phylogeny of Actin :

The results obtained are shown in Fig.1.1 All the 14 sequences selected for phylogeny resulted into one block, with a width 14. The tree (Fig.1.1) showed 3 clades . First clade comprises of 4 lineages, B.gargarizans, C.batrachus, R.tigrina and C.punctatus. Second clade comprises of 6 lineages , C.coturnix, G.gallus, H.japonica, M.musculus, N.naja, and R.norvegicus as these lineages split originated from a common ancestor. The third clade includes 4 species with a common ancestor which splits into 2 subclades. C.livia showed the separate lineage and other three L.rohita, O.cuniculus and C.versicolor mutuated at various time from one common ancestor. The most recent lineages are C.versicolor and L.rohita with more mutational changes. C.versicolor and O.cuniculus developed from a common ancestor.

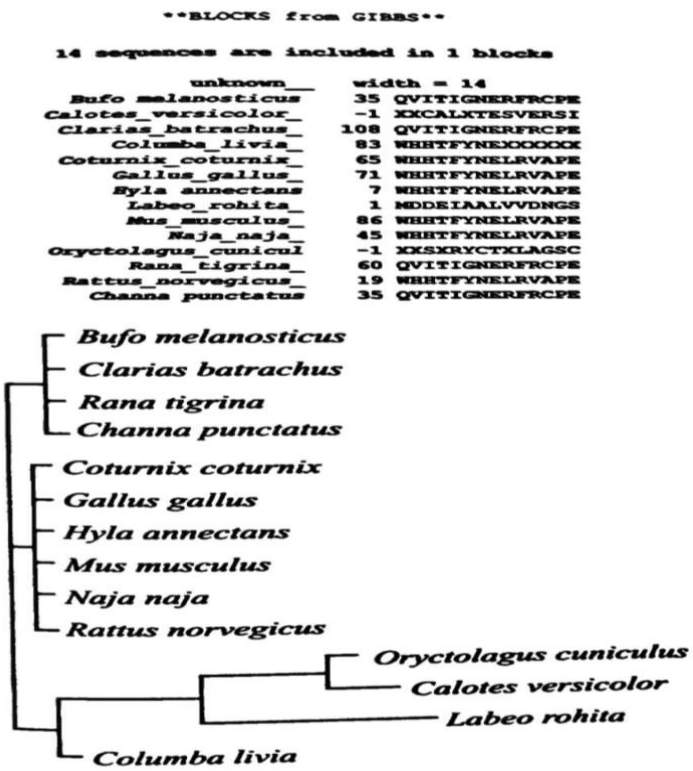

Fig.1.1 Phylogeny of Actin

ii) Phylogeny of Myosin:

The results obtained are shown in Fig. 1.2 All the nine myosin sequences used for phylogeny studies resulted into one block, with a width 17.The phylogram of myosin (Fig.1.2) showed four clades, among the 4 clades first and fourth clades comprises 2 lineages, the *R. tigrina* and *H. chrysoscelis* which split from common ancestor. The second clade comprises of 2 lineages, *O.cuniculus* and *N.naja* as a sister taxa. The lineage *O.cuniculus* has undergone less changes in myosin development during evolution than lineage *N.naja* The third clade represents 5 species with a common ancestor which further evolved in 4 different directions (4 subclades). *G.gallus* showed the separate lineage and other four *C.coturnix*, *M.musculus*,

L.rohita and *R.norvegicus* mutuated at various time from one common ancestor, the most recent lineages are *R.norvegicus* and *C.coturnix* with more mutuational changes, *R.norvegicus* and *L.rohita* developed from a common ancestor. *C.coturnix, M.musculus, L.rohita* and *R.norvegicus* are the cousins with respect to development of myosin.

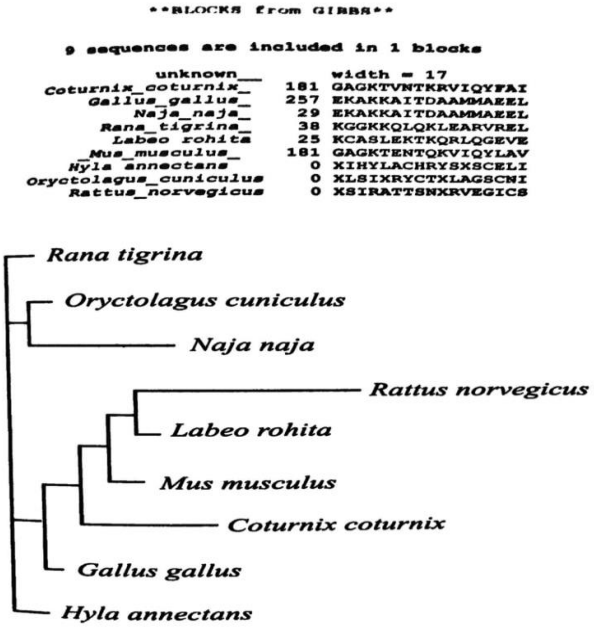

Fig.1.2 Phylogeny of Myosin

iii) Phylogeny of Troponin :

The results obtained are shown in (Fig.1.3). All the nine sequences selected for phylogeny of troponin resulted into one block with a width, 23. The phylogram (Fig.1.3) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus, R.norvegicus, R.tigrina.* These lineages originate from a common ancestor.The fourth clade includes 6 species with a common ancestor which splits into 2 subclades. *C.coturnix* showed separate lineage and other five *L.rohita, G.gallus, B.marinus, N.naja* and *O.cuniculus* mutuated at various times from a common ancestor. *N.naja* and *B.marinus* are sister taxa developed from a common ancestor. The most recent lineage is *O.cuniculus. O.cuniculus* and *N.naja* are cousin lineages in the development of troponin.

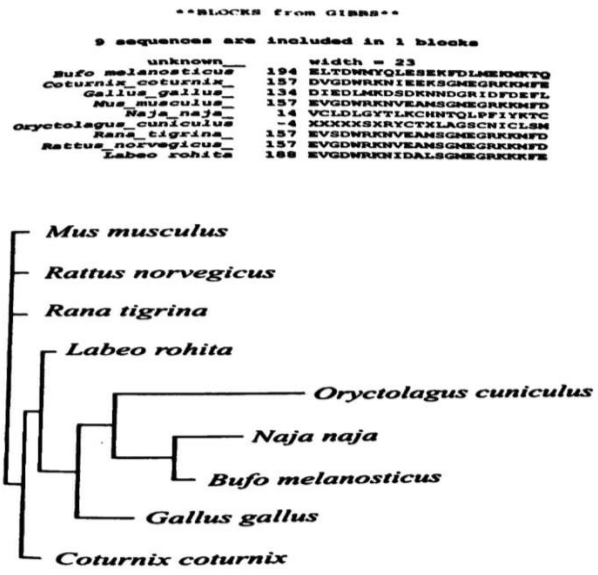

Fig.1.3 Phylogeny of Troponin

iv) Phylogeny of Tropomyosin :

The results obtained are shown in (Fig.1.4). All the ten sequences selected for phylogeny of tropomyosin resulted into one block with a width,32. The tree (Fig.1.4) showed four clades. First, second and third clades comprises 3 separate lineages leading to *M.musculus*, *R.norvegicus* and *G.gallus.* The fourth clade is separated into 4 lineages *B.viridis*, *H.chrysoscelis* , *R.tigrina* and a fourth complex lineage. The fourth clade includes two main lineages which split from a common ancestor. *C.coturnix* is quite separate lineage and the remaining three *O.cuniculus*, *L.rohita* and *N.naja* develop separately. *L.rohita* and *O.cuniculus* are the sister taxa developed from a common ancestor. The most recent lineages are *N.naja and O.cuniculus* with a more mutational changes and they are cousins with respect to tropomyosin development.

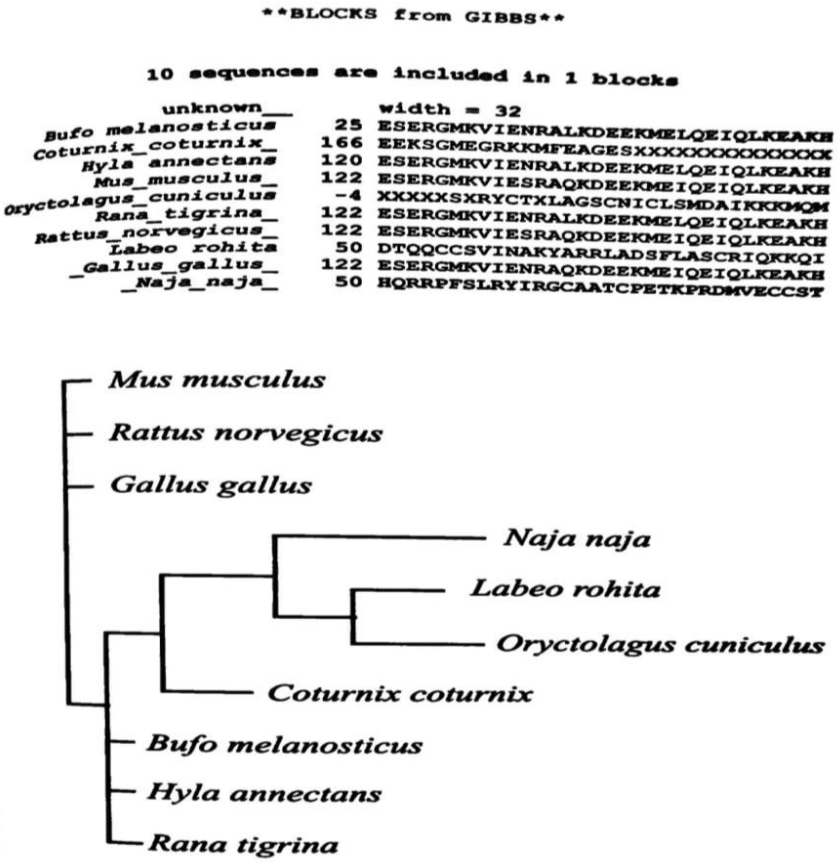

Fig.1.4 Phylogeny of Tropomyosin

Discussion and Conclusion:

The muscle protein phylogeny studies indicated divergent evolution with respect to Actin, Myosin, Tropomyosin and Troponin on different lines (Fig.1.1 to1.4) . Actin exhibited conserved amino acid sequences in C.coturnix, G.gallus, H.japonica, M.musculus, N.naja and R.norvegicus with a width of 14 amino acids . Thereafter actin exhibited divergent evolution with similar conserved amino sequences in Bufo, Clarias, Rana and Channa and diversified sequences in Columba, Labeo, Oryctolagus and Calotes. Actin in Columba livia striated muscles evolved simultaneously with Bufo. The phylogeny tree drawn for Actin amino acid sequences indicate the latest mutation in Labeo rohita which could be because of the genetic modification and or its introduction as an invasive species.

Similar observations are recorded by Volff (2005) who stated that the striated muscle development in all the culturable fish species are recent in the evolution. Myosin phylogeny was found to be more divergent than that of actin. Astonishingly, a conserved sequences of 17 amino acid width is found in Gallus gallus and Naja naja , though both of them evolved on separate lines.With respect to myosin evolution myosin in R.norvegicus, Labeo rohita and Coturnix coturnix, the mutations appear to be recent and this could be because all of them are culturable species. However, in R.tigrina and H.chrysoscelis myosin is evolved separately showing their divergent evolution and thus they are distantly related. Zardoya and Meyer (2001) studied the origin and phylogenetic relationships among living amphibians and supported the Batrachus hypothesis from both molecule and morphology based studies provides a robust phylogenetic framework that will be helpful to

comparative studies among the living amphibians and will permit better understanding of the considerably divergent digit developmental patterns found in frogs and tree frogs. Troponin in all the culturable species like Rattus norvegicus, Labeo rohita and Coturnix coturnix show primitive nature , however all the molecules in all these culturable species show divergent evolution from a common ancestor. Mus musculus, Rana tigrina and Rattus norvegicus exhibit a conserved block of 23 amino acids. Troponin from Labeo rohita also shows the similarity in this 23 amino acid block with 5 replacements as shown below.

Rattus norvegicus EVGDWRKNVEAMSGMEGRKKMFD
Labeo rohita EVGDWRKNIDALSGMEGRKKFE

The troponin evolution which is much more divergent proves the functional modifications. Performance is an intermediate step between morphology and biochemical evolution (Harris and Steudel, 2002). The bones to which the striated muscles are attached change the functional efficiency of the animal variability in the myosin ,tropomyosin and other muscle proteins are studied by Harris and Sterdel (2002) and concluded that the existence of most of the vertebrates are because of survival of fittest and the muscle proteins play a major role in it. Thus during evolution of striated muscle, biochemical changes took placed in Actin, Myosin, Troponin and Tropomyosin elimination some amino acids and by addition of some amino acids. Secondly, these alterations in amino acids sequences might have taken place as a change in the bones to which these muscles are attached with respect to increase the functional efficiency for survival. The present results also indicated that the amino acids proline, alnine, glutamic acid and glycine are lost gradually from actin and myosin during evolution. Protein analysis is quite cheaper, time saving and more reliable for phylogenetic relationship of animals.

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X-ray Diffraction Analysis of Mn-Ti doped Co-ferrite Nanoparticles

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Abstract

In the present investigation, Mn-Ti doped $CoFe_2O_4$ with the formula $CoFe_{2-2x}Mn_xTi_xO_4$ ($x = 0.05$) using well known standard sol-gel auto combustion synthesis method with a view to understand the influence of Mn-Ti doping on the structural properties. X-ray diffraction technique was used to investigate the crystal structure, nano-crystalline nature and for the determination of structural parameters. Absence of impurity peaks in the XRD pattern revealed the single-phase formation. Powder X-ray diffraction analysis of the XRD pattern proves that prepared nanoparticles belong to cubic spinel structure. The crystallite size estimated from Debye Scherrer formula was found to be 21 nm. The lattice constant obtained from XRD data found to increase as compared to pure cobalt ferrite.

Key words: *Sol-gel method, X-ray diffraction, lattice constant.*

1. Introduction

Magnetic materials are key aspects of today world. Nanotechnology and nana science are the two side of coins leads to develop magnetic materials. The magnetic materials in particular ferrite plays a key role in many technological applications on the basis of their very good electrical and magnetic properties. Iron oxide and metal oxide are the basic composition of ferrite materials.

Ferrite materials are metal oxides have high electrical resistivity, low eddy current losses and convincingly low costs coupled with their potential microwave applications such as circulators, isolators and phase shifters. Now a day nanosized ferrite materials have been widely used to prepare many electromagnetic devices such as inductors, converters, phase shifters and electromagnetic wave absorbers. The crystal structure of ferrite leads to different types namely spinel ferrites, cubic garnet and hexagonal ferrite. Spinel ferrite are the most common magnetic material represented by AB_2O_4 formula (where A= divalent metal ions and B = trivalent Fe^{3+} ions)[1]. These materials are widely studied because of their interesting electrical and magnetic properties. .

Various electrical and magnetic properties of ferrite such as DC electrical resistivity, activation energy, drift mobility, saturation magnetization, coercivity, permeability, Curie temperature are of current interest to many researchers. The combined electrical and magnetic properties along with low eddy current and dielectric loss associated with the ferrite have placed them at the top of the magnetic materials. Many researchers have carried out synthesis and investigations of electrical and magnetic properties of ferrite for different applications[2].The crystal structure of the ferrite is such that any cations of different valance and size can accommodate in the interstitial sites bringing wide variation in the properties of ferrite. The synthesis of ferrite is simple and can affect the properties of ferrite. Apart from method of synthesis chemical composition, choice of dopant cation distribution, etc also influences the properties of ferrite. Spinel ferrite, garnet and hexagonal ferrites are of great interest to many scientists and technologist. However, considering the processing, cost and applicability spinel ferrite are found to be more versatile and useful in many technological applications. Interest in the production of nonmetric metal oxides has enormously risen in the last years because of the novel and/or exalted properties they display. Among the many synthetic methods proposed, good results have been obtained by standard sol-gel auto combustion synthesis method.

Spinel ferrite possesses cubic spinel structure with FCC type and has two interstitial sites[3]. In the family of spinel ferrite, cobalt ferrite is one of the best and promising candidates for many applications. Cobalt ferrite possesses inverse spinel structure in which cobalt ions occupy octahedral [B]site and F^{3+} occupy both tetrahedral (A) and octahedral [B] site. The coercivity of the cobalt ferrite is much more than another spinel ferrite. The high saturation magnetization, high magneto crystalline anisotropy and high permeability are the features of cobalt ferrite[4]. In the literature there are many reports on the various properties of cobalt ferrite and substituted cobalt

ferrite. In last two to three decades cobalt ferrite in nanocrystalline form has attracted the attention of many researchers. The properties of nanoparticles are very much different than that of their bulk counterpart. Greater reactivity, larger surface area to volume ratio, greater stability, chemical homogeneity etc are the important characteristics of the spinel ferrite nanoparticles[5]. Researchers have investigated various electrical and magnetic properties of the cobalt ferrite nanoparticles for various applications such as drug delivery, magnetic hyperthermia, sensors, catalyst, water purification, photo degradation etc. There is ample scope to prepare the cobalt ferrite using different technique with improved properties which can lead to novel applications. Therefore, it is of great interest to prepare cobalt ferrite in nanosized form by wet chemical method. Doping of Zn, Al, Cd, Mg etc ions in Cobalt ferrite have been reported in literature, however, co-doping of magnetic Mn^{2+} ions and non-magnetic Ti^{4+} ions in cobalt ferrite is not reported in the literature. Therefore, attempt is made to synthesize Mn-Ti doped cobalt ferrite and study the X-ray diffraction analysis.

2. Experimental details

2.1. Chemicals

For the preparation of $CoFe_{2-2x}Mn_xTi_xO_4$ (x = 0.05) nanoparticles, the chemical such as Co $(NO_3)_2 \cdot 6H_2O$, Fe $(NO_3)_2 \cdot 9H_2O$, Ti $(OC_4H_9)_4$, Mn $(NO_3)_3 \bullet 4H_2O$, $C_6H_8O_7$, NH_3 samples having 99.99 % pure AR grade chemicals are used. The following (Fig.1) flow chart shows the stages involved in the complete process for preparation of spinel ferrite by sol-gel auto combustion method

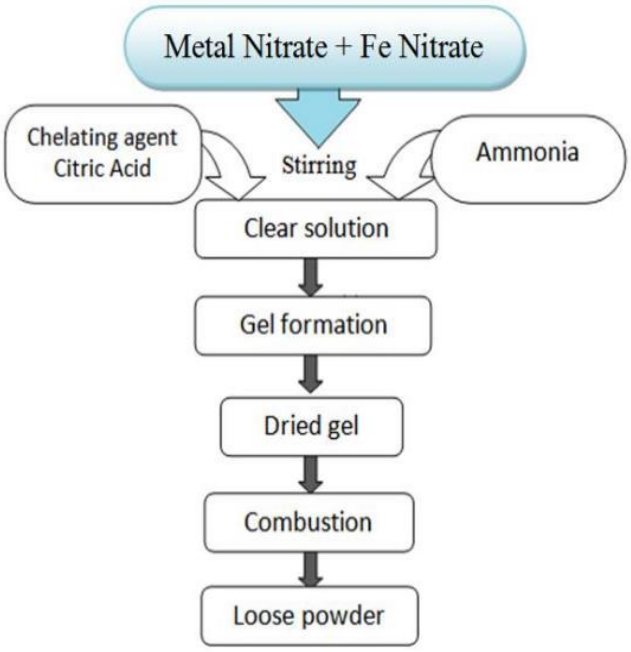

Fig. 1: Flow chart shows the stages involved in preparation of spinel ferrite by sol-gel auto combustion method

2.2. Characterization tools

To study the X-ray diffraction (XRD) analysis, $CoFe_{2-2x}Mn_xTi_xO_4$ (x=0.05) nanoparticles were carried out at room temperature by using standard characterization tools. The details of characterization tools along with their make and specification applied are given in Table 1.

Table 1: Details of the characterization techniques

Name of the Technique	Make and Model	Specifications
X-ray diffraction (XRD)	Rigaku X-ray diffractometer	Source: Cu-Kα radiation Range: 10^0 - 70^0
UV-Visible spectrophotometer (UV-Vis)	Agilent Technologies Carry 100 UV-Vis	Range: 100-1000nm

3. Results and discussion

3.1. X-ray diffraction analysis

Crystallographic structures were examined by powder X-ray diffraction (XRD) using Rigaku X-ray diffractometer. The prepared Mn-Ti doped cobalt ferrite ($CoFe_{2-2x}Mn_xTi_xO_4$, where x = 0.05) nanoparticles were characterized by X-ray diffraction technique. The X-ray diffractogram were recorded at room temperature is shown in **Fig. 2.**

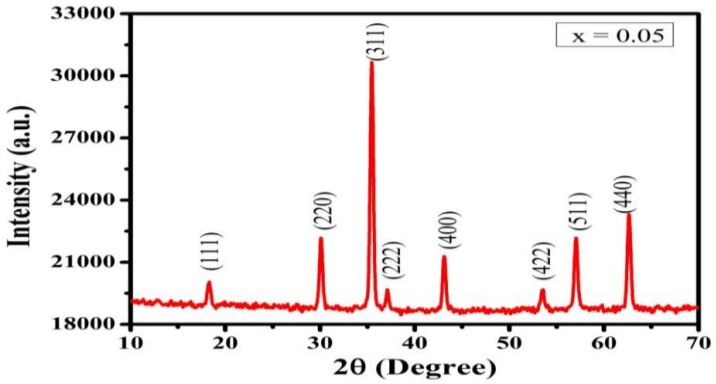

Fig.2: XRD pattern of $CoFe_{2-2x}Ti_xMn_xO_4$ (x= 0.05) nanoparticles

A close examination of XRD pattern shows that the presence of well-defined intense and sharp Bragg's peaks which are indexed using Bragg's law. The diffraction peaks are designated as (220), (311) (222), (400), (440), (511) oriented at various Bragg's angle[6]. All these diffraction peaks are the part of cubic structure with FCC type. No extra peaks other than the cubic phase was observed in the XRD pattern. Thus, it proves that the prepared nanoparticles possess single phase cubic spinel structure. The structural parameters like lattice constant (a), unit cell volume (V) and X-ray density (d_X) were determined using the XRD data and their values are put in Table 2. On comparison with the lattice constant of the pure cobalt ferrite (a = 8.382, [7]), it is noticed that that the lattice constant of the presents Mn-Ti doped cobalt ferrite has been increased. These results can be supported by the ionic radii of Mn-Ti is greater than that of Fe^{3+} ions. The replacement of Fe^{3+} ions by Mn-Ti composition x results in increase of lattice constant. The unit cell volume and X-ray density was also determined using the value of lattice constant. The X-ray density (d_x) of all the samples was calculated using the molecular weight and volume of the unit cell using the following relation.

$d_x = 8M / Na^3$

where, M is molecular weight and N is Avogadro's number.

Table 2 shows the values of unit cell volume and X-ray density, which show increased and decrease respectively in comparison with pure cobalt ferrite. These results can be attributed to the fact that both unit cell volume and X-ray density depends directly and inversely respectively to the lattice constant.

Table 2: Variation of lattice constant 'a' (Å), Crystallite size 't' (nm), X-ray density 'dx' (g/cm^3), lattice volume (Å^3)

Composition (x)	a (Å)	t (nm)	d_X(g/cm^3)	V (Å^3)
0.05	8.385	21	5.324	589.6

4. Conclusions

The successful incorporation of Mn-Ti dopants in cobalt ferrite has been achieved through sol-gel auto combustion synthesis technique. The X-ray diffraction pattern and its analysis revealed the formation of single-phase cubic spinel structure of prepared samples. Lattice constant and unit cell volume increased, whereas X-ray density is decreased as compared to lattice constant of pristine cobalt ferrite nanoparticles.

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Characterization and Thermal Stability measurement of Chemically Synthesized polyaniline-SnO_2 nanocomposites

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1. Introduction

In earlier days, use of conventional sources of energy is increased due to increase in necessity and also this result in increase in pollution for environment. [1] Hence there arises a need of some alternate and renewable source that exists last long and should not pollute the environment and soil as well. For this purpose some conducting polymers like polyaniline (PANI) has gained much interest as having some interesting applications such as sensors, microactuators, polymeric batteries, electronic devices and electrolytic capacitors. [2] The commercial exploitation of most of the applications based on polyaniline is closely linked to the lack of its processability and mechanical properties [3]

The properties of electronically conductive polymers depend strongly on their microstructure and morphology. [4] It is well known that polymer composites can be produced exhibiting enhanced properties that the constituent materials may not exhibit. Conducting polymer nanocomposites formed by immobilization of metal nanoparticles into the conjugated conducting polymer matrices [5]. Conducting polymers synthesized with doping any metal oxide such as SnO_2 given much increased conductivity and stability of the composite formed in nanosize.

In the present work, chemical oxidative polymerization method used to synthesize polyaniline doped with SnO_2 at a particular weight percent. The SEM images shows, polyaniline nanoparticles of different diameters were obtained, Thermal stability of the polymers plays important role to modify the polymer properties to be used for advanced applications. Also it indicates that, the morphology and particle size of product are depend on the temperature during synthesis Hence thermal stability of conducting PANI and its composites has great importance.[6,7] It is measured using TG-DTA analysis.

2. Methods and Materials:

2.1 Materials used:

The Aniline Hydrochloride (AR grade), Ammonium Persulphate (AR grade), Hydrochloric Acid, Acetone (AR grade) obtained from Loba Chem. Mumbai, (India). All the chemicals were used as received. Double distilled (DD) water was used for synthesis.

2.2 Synthesis of Polyaniline (PANI) nanoparticles:

In this process polyaniline nanocomposite was synthesized by chemical oxidative polymerization method [8]. 2.59 gm of aniline hydrochloride was dissolved in 50 ml distilled water in a volumetric flask. Similarly 5.71 g of ammonium persulfate (APS) was dissolved in 50 ml distilled water kept for 1 h. at room temperature (303 K), During additions, the mixture is stirred for 2 h. and allowed to polymerize for next 1 h. Then the resulting dark green precipitate of PANI was filtered. Then washed with three 100 ml portions of 0.2 M HCl and acetone. Obtained precipitate was kept in oven to dry for about 8 hrs. at 50-60 ^{0}C.

2.3 Synthesis of PANI- SnO_2 Nanocomposite:

In this process polymer composite was synthesized by in-situ chemical oxidative polymerization method [9] for 15 wt. % of SnO2. SnO2 nanoparticles were dispersed into the APS solution of 50 ml DD water and stirred for 1 h before added to aniline monomer. Aqueous solutions of 2.59 g of aniline hydrochloride prepared in 50 ml DD water. It is then added slowly in APS under vigorous stirring for 2 h. and allowed to polymerize for next 1 hr. The resulting dark green PANI-SnO2 precipitate was filtered and washed with three 100 ml portions of 0.2 M HCl, and acetone. Obtained precipitate was kept in oven to dry for about 8 h. at 50-60 0C. In this way PANI-SnO2 nanoparticles were formed.

3. Characterization Techniques:

3.1 Scanning Electron Microscopy (SEM):

In the present work Field Emission Gun-Scanning Electron Microscope with model number JSM-7600F was used. Magnification was about 25 times to 1,000,000 times. This technique gives the morphology of synthesized composite.

3.2 X-Ray Diffraction Technique (XRD):

XRD is a method for structural materials characterization and quality measurement. To determine particle size Debye-Scherrer method is used. Sixth generation MiniFlex 600 X-ray diffractometer (XRD) is used for the determination of crystallite size, strain and molecular structure of material.

4. Result and discussion:

4.1 Scanning Electron Microscopy:

The surface morphology of PANI and PANI-SnO_2 (15 wt %) nanocomposite was observed under scanning electron microscope (SEM) and obtained images are as shown in figure. The surface morphology of nanocomposite was completely different compared to without dopant. The surface morphology changes from rough to smooth. PANI - SnO_2 shows fine microsphroidal surface observed with poor matrix.

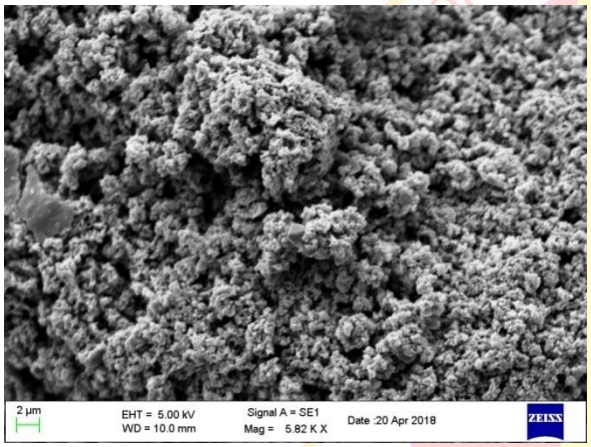
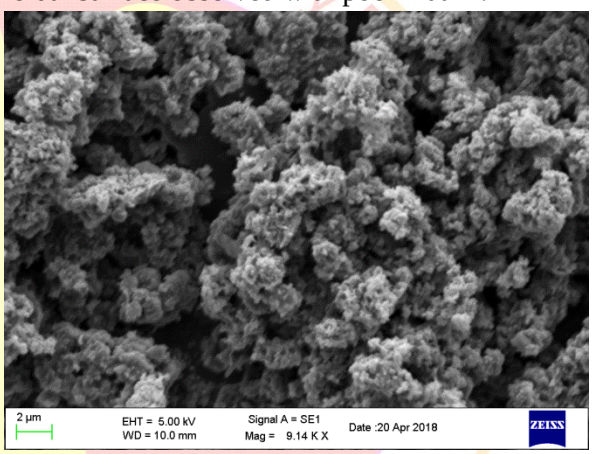


Fig. Pure PANI



PANI-SnO_2 nanocomposite

The average size of the particles is 15-268 nm. PANI is completely amorphous in nature whereas PANI-SnO_2 nanocomposite shows partly crystalline as well as amorphous phase. The micrograph shows porous microstructure in which SnO_2 nanoparticles are dispersed in fibrous PANI forming a nanocomposite. It is highly microporous and thus capable of increasing the liquid–solid interfacial area providing more locations for the insertion.

4.2 X-Ray Ddiffraction:

From the following figures it can be stated that the more crystalline regions in the zinc oxide sample are observed with major reflections between 20° and 30° (2θ values). Also less intense peaks at 17°, 20°, 25° (2θ values) indicate the high crystallinity of SnO_2 samples.

Absence of peak in the intensity versus 2θ curve represents complete amorphous state of sample. Indication of peak or peaks in the curve suggests formation of phase or phases in the composite during polymerization process.[10] The degree of crystallinity increased in PANI-SnO_2 nanocomposite than pure conventional PANI, clearly indicated the homogeneous distribution of nanoparticles in the polymer matrix.

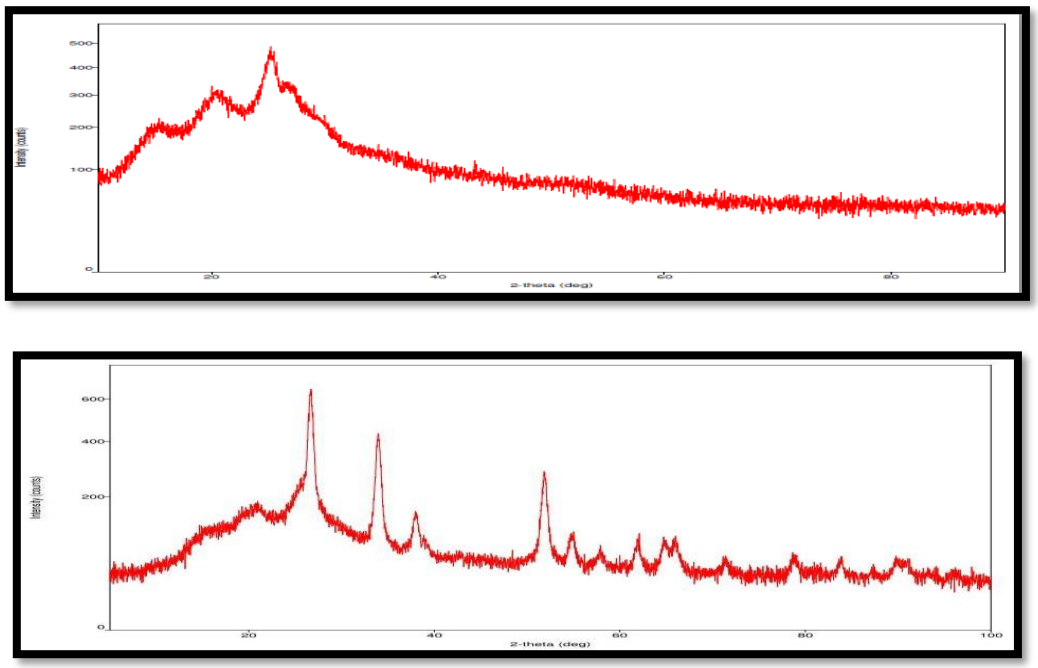


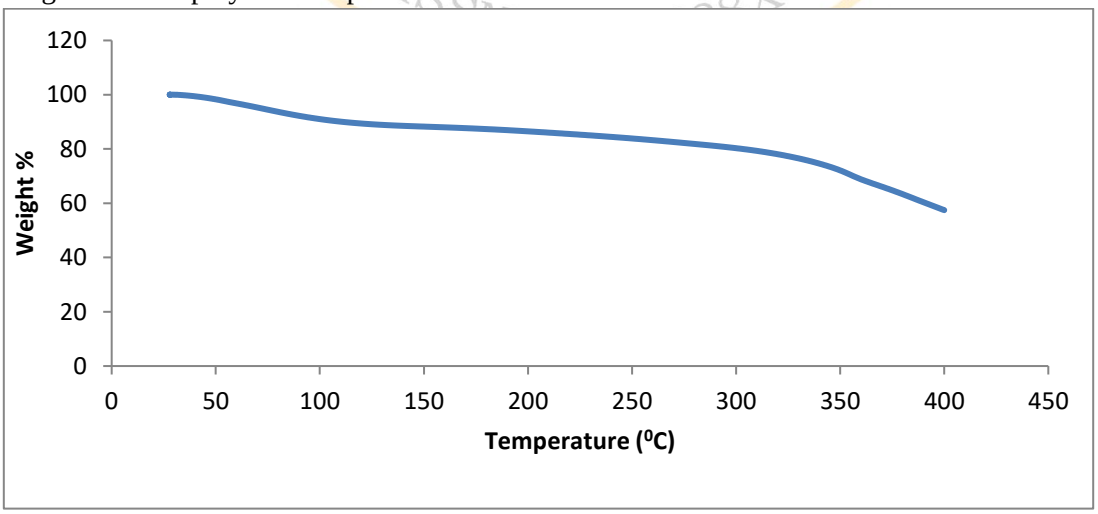
Fig. XRD pattern of Pure PANI and PANI-SnO_2 nanocomposite

The crystallite size can be determined using Debye Scherrer formula and found as 40 nm. The XRD-pattern of PANI-SnO_2 shows sharp diffraction peaks at 26°, 34°, 51° which confirms the presence of SnO_2 nanoparticles are highly crystalline and can be indexed as (110), (101) and (211) planes of SnO_2. Also these peaks were slightly shifted from their respective standard positions which may be due to metal oxide. [11] The XRD pattern of PANI shows the three broad peaks at 2θ= 15.13°, 20.34°, 25.20°.PANI showed two broad hallows at 2θ =20.34° and 25.20°. A nanocomposite show the greater crystallinity due to the addition of SnO_2.

4.3 Thermogravimetric Analysis and Differential Thermal Analysis:

Thermal properties of pure Polyaniline and PANI doped with Tin Oxide (SnO_2) nanocomposite were evaluated by TGA/DTA in the temperature range 0ºC to 700 ºC at a heating rate of 15 ºC/min as shows Figure.

TGA thermograph of PANI-SnO_2 nanocomposites shows two step degradation. In first step the initial weight loss was observed between 35 to 200^0 C and was attributed to the loss of moisture and low molecular weight compounds in polymer composite. It can be clearly seen that both samples exhibit minimal weight loss until the samples reached 200^0 C. In second step, a major weight loss was observed form 200 to 700^0 C and was due to the degradation of polymer composite.



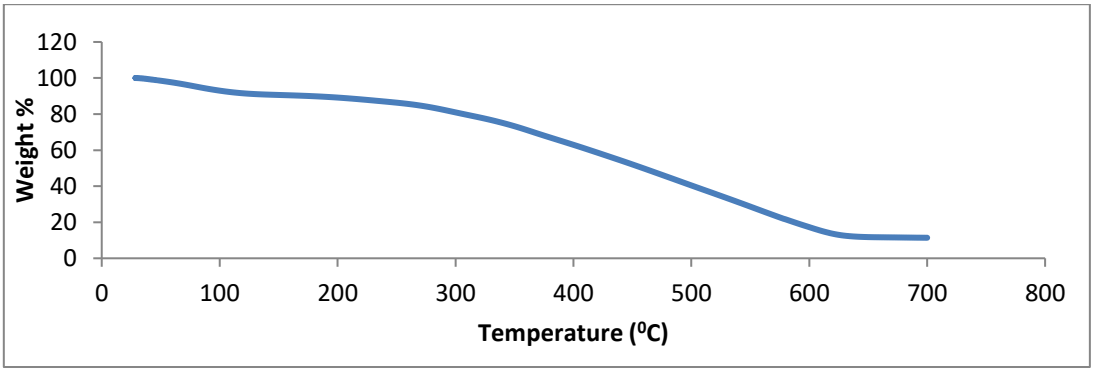


Fig. Thermogravimetric Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows that in two step degradation of PANI-SnO_2 nanocomposite, loss of ~ 93 % of its weight when it was heated to 670^0 C. It indicates that ~ 83 to 93 % of the sample consists of polymers and softeners. The residual about ~ 6 to 16 % was considered to account for metallic compounds, added as Tin Oxide and dopant.

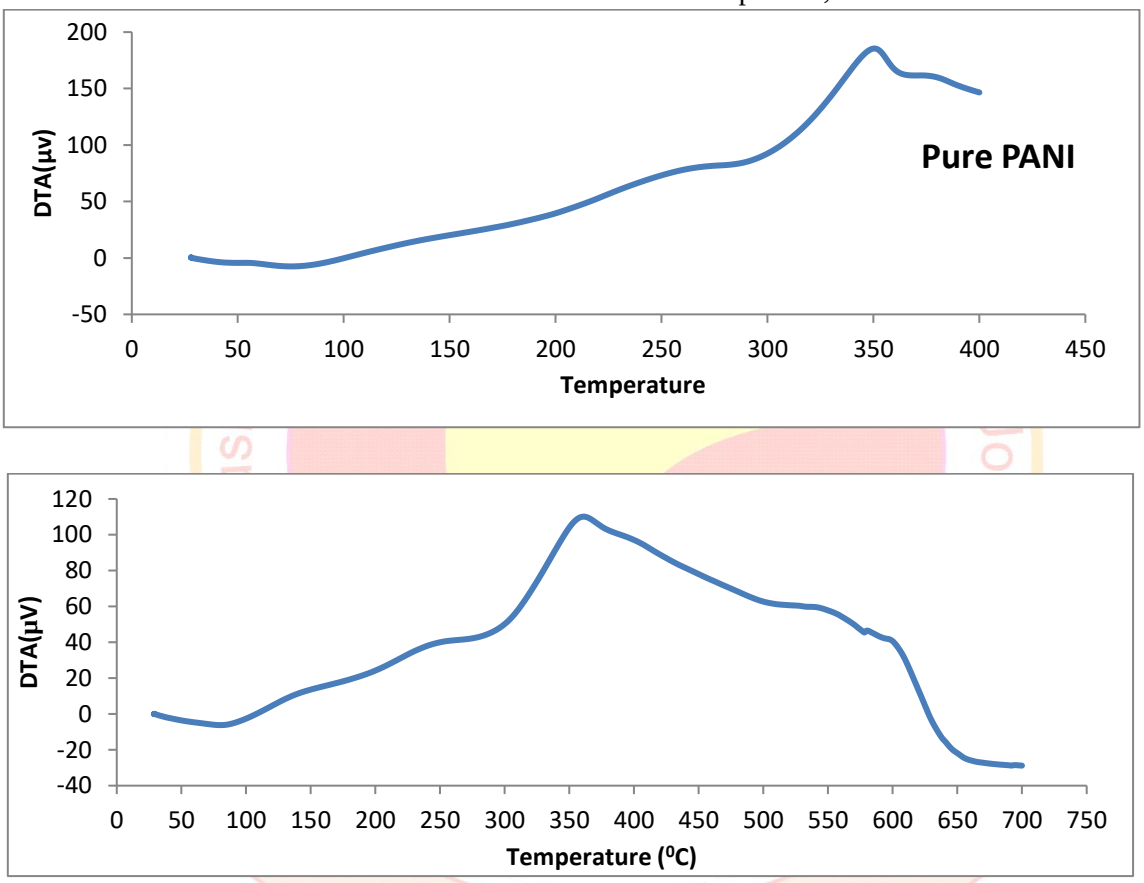


Fig. Differential Thermal Analysis Curve of Pure PANI and PANI-SnO_2 nanocomposite

Figure shows DTA curves of pure Polyaniline and PANI doped with SnO_2. In DTA curve, the endothermic peak appearing at ~ 75-100^0 C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. Another endothermic peak appearing at 273 – 285^0C in the in situ synthesised hybrids is assigned to the decomposition and elimination of dopant. The sample PANI-SnO_2 nanocomposite shows the strong and broad exothermic peak in the range 350 to 400 ^{0}C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-SnO_2 nanocomposite. This study indicated that the sample is thermally stable up to 343^0C.

PANI doped with Tin Oxide (SnO_2) shows the strong and narrow exothermic peak as compared with pure Polyaniline. It shows that with the addition of Tin Oxide the thermal stability of PANI-SnO_2 nanocomposite was increased. Thus it indicates that PANI-SnO_2 nanocomposite is more thermally stable than pure Polyaniline.

5. Conclusion

In this work, Pure polyaniline (PANI) and PANI-SnO_2 nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. The particle size of PANI-SnO_2 was found to be 15 to 268 nm. SEM image shows the formation of nanoparticles of composite with agglomeration of the particles. XRD shows a size of about 40 nm for the nanoparticles of PANI-ZnO with 15% of weight. Also thermal stability of the nanocomposite is observed as more than the pure PANI. At about 400 and 500 deg. celcius the powder is degraded. It is more stable and less degradation of the nanocomposite is observed due to addition of metal oxide SnO_2. Such type of material could be used for various applications such as photovoltaic cell, rechargeable batteries, etc.

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Synthesis And Characterization of Zinc Oxide Nanoparticles from *Alishewanella Sp*. And Its Antimicrobial Activity Against Escherichia Coli

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Abstract

Metal nanoparticles have been intensively studied within the past decade. Nanosized materials have been an important subject in basic and applied sciences. Zinc oxide nanoparticles have received considerable attention due to their unique antibacterial, antifungal, and UV filtering properties, high catalytic and photochemical activity. The objective of this work is to synthesize Zinc oxide nanoparticles using green synthesisl method and characterize zinc oxide nanoparticles using scanning electron microscope and X-ray diffractometer. Further its antimicrobial activity against Escherichia coli is studied.
Key words: *Nanoparticles, Zinc oxide, Alishewanella sp., Escherichia coli.*

Introduction

New technologies often create new challenges to science in addition to their benefits, raise concerns about health and various environmental problems. Recent nanotechnology holds a promise and a broad aspect towards wide applications of nanoparticles in a multiple way of emerging fields of science and technology. Over last decades, nanotechnology has established as the great innovation of science and technology. Nanotechnology is a science and engineering branch of recent well established technology refering at the nanoscale, i.e. 1 to 100 nm Generally, metal oxide nanoparticles are inorganic. Various nanoparticles like Fe, Ni, Co, Mn, Zn, etc. are known as the enormously accepted magnetic materials for a wide range of applications like various electronic ignition systems, generators, vending machines, medical implants, wrist watches, inductor core, transformer circuits, magnetic sensors and recording equipment, telecommunications, magnetic fluids, microwave absorbers, etc. They are also applicable in other high-frequency applications. Green synthesis method is proved as beneficial over other methods which are implemented for the synthesis of nanoparticles. Green synthesis methods are eco-friendly approach and compatible for pharmaceutical and other biomedical applications, as the toxic chemicals are not used in these methods.

Besides, this method does not require high pressure, temperature. Synthesis of various nanoparticles by microorganisms is used more than the other techniques due to its ecofriendly nature. The use of environmentally beneficial materials like plant leaf extract, bacteria, fungi and enzymes for the synthesis of zinc nanoparticles proposes abundant benefits of eco-friendliness and compatibility for pharmaceutical and many other biomedical applications

These compounds act as chemo-therapeutic agents for the treatment or prevention of bacterial infections (Saunders Comprehensive Veterinary Dictionary 2007). An antibacterial agent is considered as bactericidal if it kills bacteria or as bacteriostatic if it inhibits their growth. Different methods have been adopted for the assessment and investigation of antibacterial activity in vitro. These methods include disk diffusion, broth dilution, agar dilution, and the microtiter plate-based method.

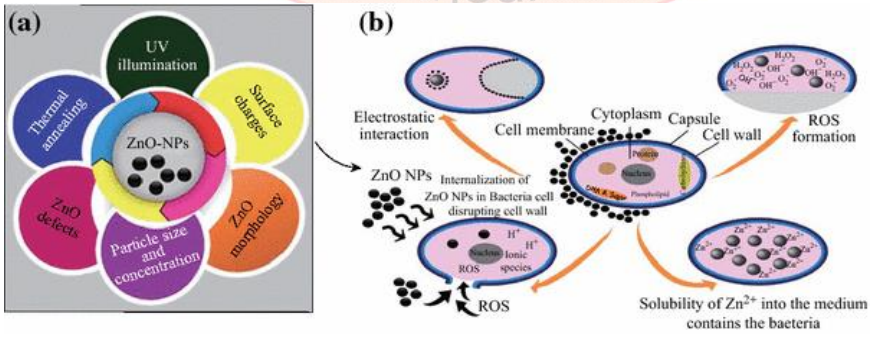


Fig:2 Correlation between the a influence of essential ZnO-NPs parameters on the antibacterial response and the different possible mechanisms of ZnO-NPs antibacterial activity.

Correlation between the influence of essential ZnO-NPs parameters on the antibacterial response and the **b** different possible mechanisms of ZnO-NPs antibacterial activity, including: ROS formation, Zn^{2+} release, internalization of ZnO-NPs into bacteria, and electrostatic interactions.

The antimicrobial property of nanoparticles is determined by their size, shape, morphology, composition and crystallinity. Researchers are going on to synthesize nanoparticles, designing of nanodevices and application of these in different fields like medical science, environment, energy, information, and communication, industries and also in food technology etc. Generally there are two parts of nanoparticles, the core material and a surface converter. The surface converter is responsible for alteration in the physicochemical properties of core materials. The core material consists of a variety of biological materials like phospholipids, lipids, lactic acid, chitosan, and dextran or may be formed of carbon, chemical polymers, silica or meta

Experimental:

Materials And Methods

- Culture of *Alishewanella species*
- Distilled water
- Zinc Sulphate
- Mueller Hinton Agar
- Nutrient agar
- Nutrient broth

Nutrient agar:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Nutrient broth:

Composition

Ingredients	Gms/lit
Peptic digest of animal tissue	5.000
Sodium chloride	5.000
Beef extract	1.500
Yeast extract	1.500
Agar	15.000
Final Ph (at 25^0)	7.4 to 0.2

Muller Hinton Agar

The major used of Mueller hinton agar is for antimicrobial susceptibility testing

Composition

Ingredients	Gms/lit
Beef extract	2.00 gm
Acid hydrolysate of casein	17.50 gm
Starch	1.50 gm
Agar	17.00 gm
Distilled water	1000 ml
Final pH (at 25^0)	7.3 to 0.1

Reagent

- Crystal violet
- Iodine
- Safranin (0.25%)
- Alcohol (95%)
- Hydrogen peroxide (3%)
- Oxidase reagent (1% tetramethylene paraphenylene diamine dihydrochloride).
- N HCl.

Following reagent was used for identification and characterization of isolated.

1. Crystal violet stain

Solution A:

Crystal violet - 2.0 g
Ethyl alcohol - 20ml

Solution B:

Ammonium oxalate - 0.8 gm
Distilled water - 80 ml
Mixture of solution A and B

2. Grams Iodine solution

Iodine - 1gm
Potassium Iodine - 2.0 gm
Distilled water - 100 ml

3. 95% alcohol

4. Safranin solution (1%)

Safranin - 1.0 gm
Distilled water - 100ml

Preparation of 2mM ZnO solution

100ml $ZnSO_4$ solution was prepared which has the molecular weight of 161.47g/mol. 2.86 gm of $ZnSO_4$ was dissolved in 100ml distilled water.

Method

Enrichment of culture

Enrichment culture is a medium having specific and known qualities that favour the growth of particular microorganism. Enrichment culture's support the growth of particular microorganisms while inhibiting the growth of others. These cultures are used to increase the small number of desired organism to detectable work in the present work. Enrichment of culture was done in nutrient broth containing zinc sulphate solution as a source for synthesis of ZnO nanoparticle.

Centrifugation

Centrifugation is used to separate the two miscible substances. The culture was centrifuged at 3000rpm for 20 minutes. After centrifugation cell pellets were seperated by removing supernant. Separated cell pellets were inoculated in 100ml of 2mM zinc sulphate solution.

Synthesis of ZnO NPs

For synthesis of ZnO nanoparticle flask containing 2mM solution of zinc sulphate with cell pellets was incubated on rotary shaker for 3 days at 100 rpm. Zinc oxide nanoparticle synthesis was seen by means of change in colour from white to pale yellow.

For confirmation of zinc oxide nanoparticle synthesis UV-visible spectophotometric studies was done, from which the graph was obtained showing spectra at 430nm.

Results And Discussion

Nutritional responses, optimization of pH and temperatures of *Alishwanella sp.*			
Colour	Creamy	Trehalose	-
Size	Large	Arabinose	+
Shape	Circular	Galactose	-
Texture	Moist	Rhamnose	-
Elevation	Flat	Salicin	-
Opacity	Opaque	Xylose	-
Margine	Serrete	Esculin	-
Gram staining	-	Malic acid	-
Shape	Rod	pH 6	-
Catalase	+	pH 7	+
Oxidase	+	pH 8	+
Indole	-	pH 9	++
Methyl red	-	pH 10	++
Voges Proskauer	-	pH 11	++
Citrate utilization	-	pH 12	+
Nitrate reduction	+	Temp 30ºC	+
Dextrose	+	Temp 40ºC	++
Lactose	-	Temp 60ºC	-
SR- Short Rod; (+) = Positive; (-) = Negative; + = Normal growth; ++ = Moderate growth; +++ = Luxuriant growth			

Biosynthesis of ZnO NP's

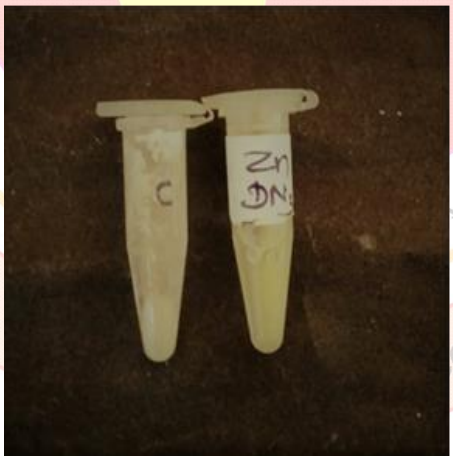


Fig 1. Biosynthesis of Zno NPs

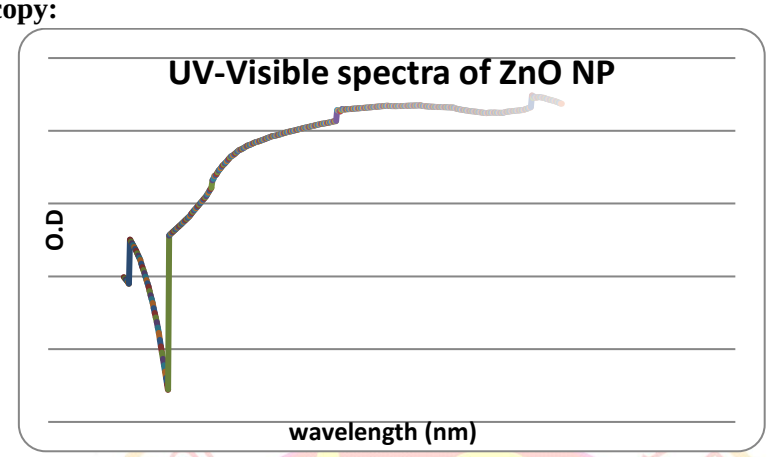
1. Control eppendrop without cell pellets
2. Experimental eppendrop with cell pellets showing colour change from white to pale yellow.

Culture was maintained by serial sub-culturing on nutrient agar slants. Two experimental flask was used for the zinc oxide nanoparticles synthesis of nanoparticle shown in the figure. Confirmation of synthesized nanoparticle in the medium was characterized by the change in color of the reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM $ZnSO_4$ without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM $ZnSO_4$ with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized (Fig 1).

reaction mixture from white to pale yellow after 24h of incubation. First flask was used as a control containing 2mM ZnSO4 without inoculation of cell pellet kept on rotary shaker, which did not show color change after 24 hours. The second flask containing 2mM ZnSO4 with cell pellet kept on rotary shaker, pale yellow color formed after 24 hours which shows positive result. That means it confirmed that the zinc oxide nanoparticle was synthesized.

Characterization of zinc oxide nanoparticles:

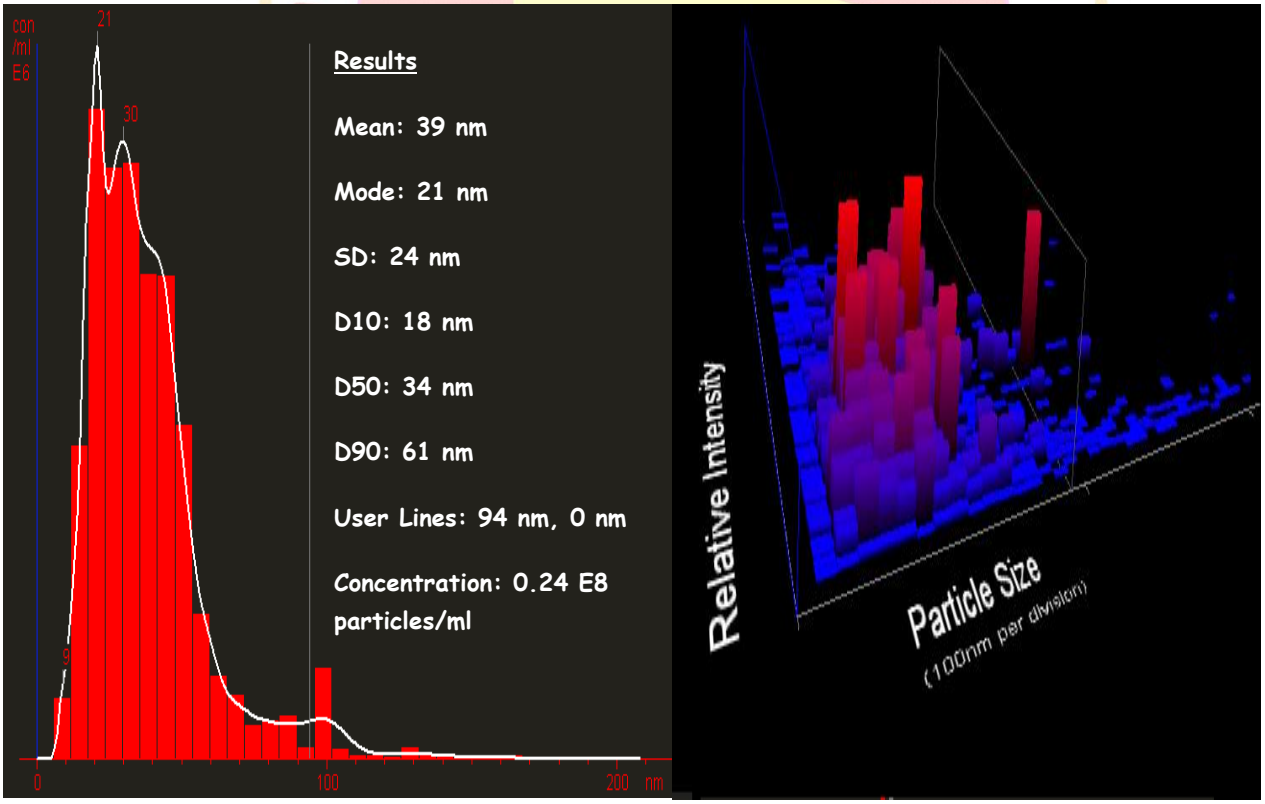
UV- Visible spectroscopy:



Graph1. UV-Visible spectra of ZnO NPs

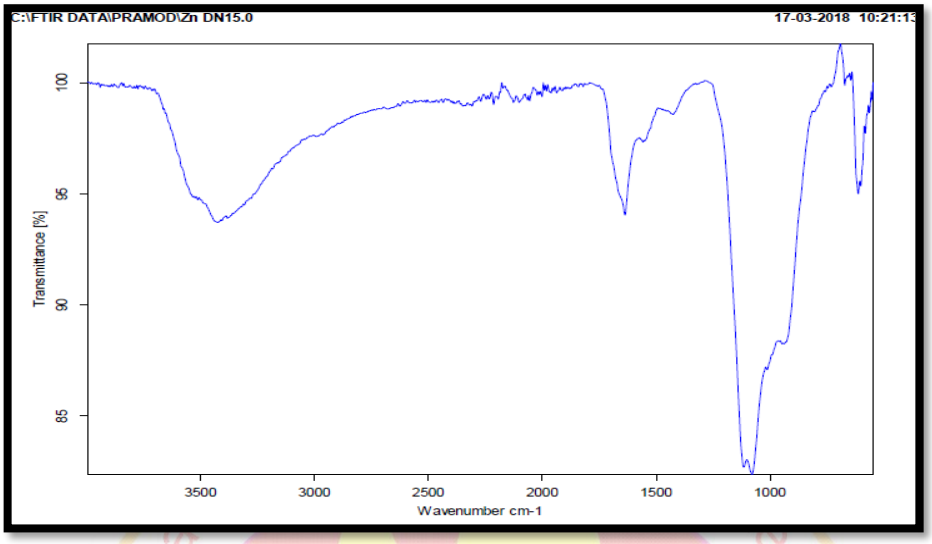
The synthesized zinc oxide nanoparticle solution was observed in UV–visible spectra, the change in color of this solution was recorded in Spectrophotometer in the range of 350–500nm. The absorption Maxima was seen at 440 nm, which confirms the synthesis of zinc oxide nanoparticles for studied bacterium. The absorption maxima was at 440 (Graph1).

Nanoparticles tracking and analysis (Nanosight LM 20)



Nanoparticle tracking analysis NTA (NanoSight-LM 20) histogram showing particle size distribution and the average size of zinc oxide nanoparticles (39 nm). The particle analyzer results revealed the presence of nanoparticle in the range of 21 to 39 nm. The mode displayed by the analyzer was 21 and the mean was 39nm.

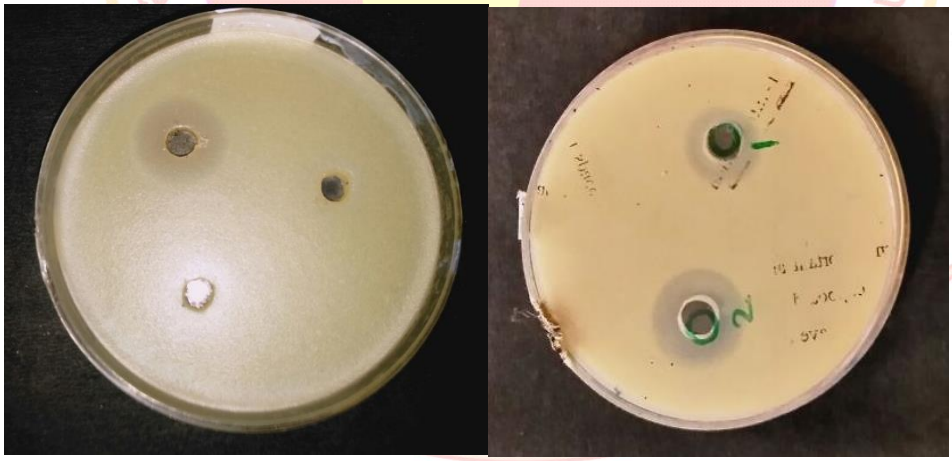
Fourier transform Infra-red spectroscopy



Graph 2: FT-IR of zinc oxide nanoparticle

Graph 2.Shows the of FTIR spectrum of the ZnO nanoparticles synthesized by biological, which was acquired in the range of 500-4000cm-1. The band between the 500-550cm^{-1} corelated to metal oxide bond (ZnO). FTIR method measurements was carried out to identify the possible biomolecules responsible for capping and efficient stabilization of the metal nanoparticles synthesized by the microbes. It also confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-1} corresponds to the C=O bonds.

Antimicrobial activity of ZnO NPs:



A. Experimental **B. Control Positive**

Fig 2: Antimicribial action of ZnO NPs

Fig 2 A: Action of zinc oxide nanoparticle against *E.coli*.

Fig 2 B: Action of standard antibiotic tetracycline

Table 2: Antibacterial action of zinc oxide nanoparticle.

Test organism	Zone of inhibition (mm)
E.coli	**19**

Table 3: Antibacterial action of standard antibiotic

Antibiotic	Zone of inhibition (mm)
Tetracycline	22

The antibacterial activity of zinc oxide nanoparticle against pathogens was performed by well diffusion method. For testing the antibacterial activity of zinc oxide nanoparticle the well diffusion method was used, the pure bacterial culture was subculture on muller hinton agar respectively. Wells of 8 mm diameter made on muller hinton agar using cork borer. The strain was swabbed uniformly into the individual plates using spreader. After that Using a micropipette, sample of nanoparticles solution poured into the well and incubated plates for 24 hours. And the zone of inhibition was observed.

This work demonstrates that zinc oxide nanoparticle showed the property to synthesized by bacteria. The isolated strain of *Alishwanella sp.* was found to have the potential to form zinc nanoparticles at room temperature within 24 h. The synthesized zinc oxide nanoparticles was characterized by UV– Vis spectroscopy and confirmed by particle analyze, FT-IR spectroscopy and Zeta potential. Zinc oxide nanoparticle was again tested for its antimicrobial activity against pathogenic *E.coli*. These zinc oxide nanoparticles shows very good effectivity on some pathogens.

Conclusion

Alishwanella sp. was able to synthesized zinc oxide nanoparticle efficiently. The source used for synthesizing zinc oxide nanoparticle was zinc sulphate. The nanoparticle was characterized by visual observation, UV-VIS spectrophotometer, FT-IR spectroscopy and zeta potential. The size of zinc oxide nanoparticle ranged from 21 to 39 nm.

The UV-Vis spectroscopic study shows the Plasmon resonance property, confirmed the reduction of metal ion and formation of nanoparticle with plasma resonance peak at 440 nm. The change in color of ZnO solution was recorded in Spectrophotometer in the range of 350–500nm. The sharp bands of zinc colloids were observed at 426 nm proves the zinc metal reduces the bacterial cell extract more efficiently.

Nanoparticle tracking analysis NTA (NanoSight-LM 20) showed particle size distribution and the average size of zinc oxide nanoparticles (39 nm). FTIR confirms the reduction of metal ions by the used bacteria. The peaks in the range of 1100-1600cm^{-1}.The nanoparticles was found to be the potent inhibitors of pathogenic bacteria and have shown significant zone of inhibition against pathogenic *E. coli*.
particle size.

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Water vapour sensing mechanism of pristine SnO_2 nanoparticle based thick film sensor

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Abstract

The SnO_2 was synthesized by co-precipitation method. The gross structure and phase purity of the pure SnO_2 nano powder were examined by powder X-ray diffraction technique. It reveals that the sample crystallize in tetragonal structure. The surface morphology investigated through field emission scanning electron microscope(FE-SEM) results that pure SnO_2 possesses uniform grains and is almost homogeneously distributed, which indicates the high packing density of the materials and nano spheres like structures. Further, Water vapour or humidity sensing investigations of pristine SnO_2 nano powder were study. Our result indicates that pristine SnO_2 in form of thick film was most sensitive for humidity under same conditions. The hysteresis plot between increasing and decreasing the RH range of 30–90% Rh and vice versa. The samples resistance decreases from 10^{11} Ω to 10^{8} Ω. The similar change was also observed in sensitivity. The response and recovery time were also studies. The results were re- producible up to ± 79% after 2 months of observations.

Key words: *SnO_2 nanoparticle, Humidity sensor.*

1. Introduction

Humidity plays a significant role in every part of the Earth in biology factors and varrious industrial processes. To have a desirable surrounding atmosphere, it is essential to monitor, detect and control the ambient humidity under different conditions ranging from low temperature to high or in combinations with other gases by precise and provident sensors [1,2]. Due to the different operating conditions of moisture sensors in different areas of application ranging from indoor to open air uses, various types of humidity sensing instruments have been developed based on different work principles and diverse hygroscopic sensing materials [3-5]. The operating principle of metal oxide semiconductor sensors is based on the change in conductivity of the sensitive layer by the chemical adsorption of molecules. Typically, the metal oxides semiconductors (SnO_2, In_2O_3, WO_3, ZnO, etc.) are used to create sensitive layers [6-8]. Tin oxide is an n- type wide band gap semiconductor (Eg = 3.6 ~3.97eV) and its electrical properties critically depend on its stoichiometry with respect to oxygen, on the nature and amount of impurities or dopants present and on its size as well as shape of nanostructures [9-11]. Stannic oxide is formed in the structure of rutile, the spatial group being P4/mnm. The unit cell is tetragonal, it consists of six atoms – two stannum and four oxygen atoms – and is characterized by the lattice parameters a and c and intrinsic parameter u. The optimized cell parameters obtained in the calculation are as follows: a=b= 4.738Å, c= 3.188Å and u = 0.30756. In the bulk all Sn atoms are six-fold coordinated to threefold coordinate oxygen atoms. The SnO_2 is an anisotropic polar crystal, which crystallizes in tetragonal rutile structure [12-16]

In this work, SnO_2 nanoparticles is synthesized by using co-precipitation method. The humidity sensing properties of the synthesized material such as hysteresis cycle, sensitivity and response time of pure synthesized material were studied.

2. Experimental

2.1 Synthesis of SnO_2 nanoparticle

All the chemicals used in this study were of GR grade purchase from Sd-fine, India (purity 99.99%). In preparation of SnO_2, 2 g (0.1 M) of stannous chloride dehydrate ($SnCl_2.2H_2O$) is dissolved in 100 ml distilled water. After complete dissolution, about 4 ml ammonia solution is added to above prepared aqueous solution with magnetic stirring. The solution was stirred for 20 minutes to make homogeneous solution. White gel precipitate is immediately formed and it is allowed to settle for 12 hrs. Then it is filtered and washed with deionised water 2-3 times. The obtain precipitate were mixed with 0.27 g carbon black powder (charcoal activated). The obtained mixer is kept in vacuum oven at 70 ºC for 24 hours so that the mixer gets completely in to dried powder. Then this dry product was crushed into a find powder by grinder. Now obtained product of fine nano powder of SnO_2

was calcinated at 800°C up to 8 hours in the auto-controlled muffle furnace (*Gayatri Scientific, Mumbai, India*.) so that the impurities from product will be completely removed.

Preparation of thick films

The thick film was prepared by screen printing technique on a glass substrate. Initially, for the screen printing the thixotropic paste was formulated by mixing the sintered fine powder of pure nano SnO_2 powder a with a solution of ethyl cellulose (as 10% temporary binder) in a mixture of organic solvent such as butyl cellulose, butyl carbitol acetate and turpineol. The ratio of inorganic to organic part was kept as 75:25 in formulating the paste. The paste of pure SnO_2 and it was screen printed on a glass substrate in the form of thick films. The prepared films were dried at 80-110°C in oven for 1hrs then the dried films are kept for fired at 500°C for 25 min in muffle furnace (Kumar make Mumbai), so that all the organic materials (in the form of binders) and organic impurities can be evaporated form the sensor material. For the surface conductance measurement, the electrodes of silver paint were formed on adjacent sides of the films and again, the films were subjected to heating at 80°C for 15 min for drying the silver paint.

2.2 Characterization

X-ray diffraction (XRD)

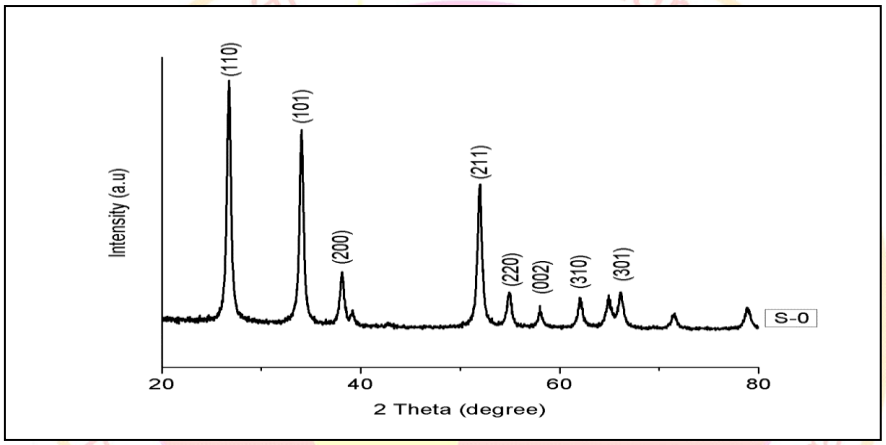

Figure 1 XRD pattern of pristine stannic oxide (SnO_2)

Figure 1. shows the XRD pattern of pristine stannic oxide (SnO_2) nanostructure synthesized by liquid phase via co-precipitation method calcinated at 400°C it is clearly observed that the highest intensity peak is obtained at (110) crystal planes and other peaks lying at (101), (200), (211), (220) and (002) of SnO_2. All the peaks match well with the standard tetragonal structure of SnO_2 with lattice constant a = 4.723 nm and c = 3.238 nm and its unit cell volume (V=72.24A^{o3}) with JCPDS card no. 71-0652. All the peaks are perfectly match with pure SnO_2 nanostructure, which indicates the high purity of obtained SnO_2 nanoparticles. The average crystalline size was found to be 23.19 nm calculated by using Debye-Scherer formula [17].

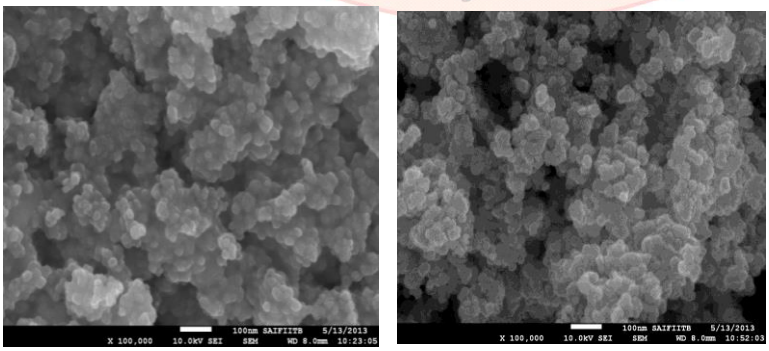

Figure 2. FE-SEM of pure SnO_2

Figure 2. shows the micrograph of sample pure SnO_2 thick films in this the particles are found to in the tetragonal shape within the particle size in the range of about 15 nm to 31.2 nm.

3. Result and Discussion

Hysteresis Plot

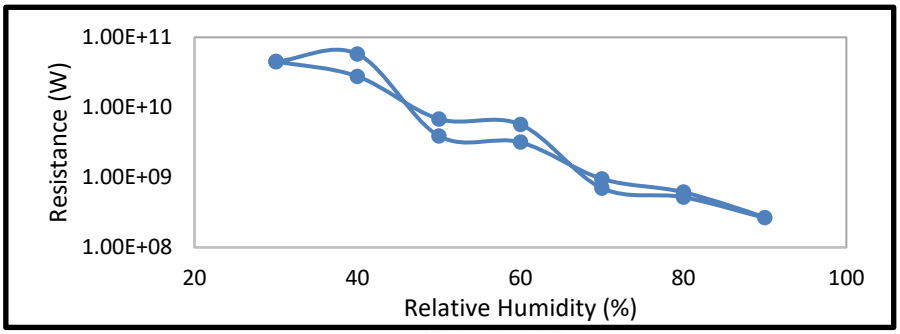

Figure 3. Hysteresis Plot

Hysteresis plot of pristine SnO_2 shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure 3. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance from 10^{11} Ω to 10^{8} Ω, these is a very remarkable change in the observed in the value of resistance in pristine SnO_2 material. In all the prepared sample the hysteresis is present which shows processes of regeneration is quite slower. Apart from these a sample shows comparable decrease in resistance with an increase in % RH which indicates that the conduction occurred at the grain surface by release of electron from the water molecule and possessed a high sensitivity factor due to large surface area and porosity in the form of thick films.

Sensitivity

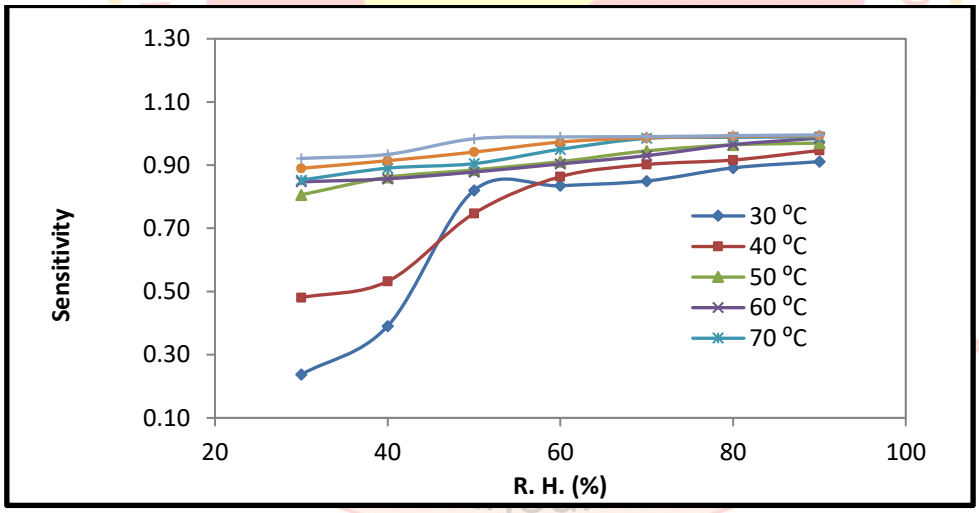

Figure 4. Sensitivity curve

The sensitivity is found to be increasing with the RH for the thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 4. For higher RH the sensitivity curve is found to be higher for the thick film of pristine SnO_2. It also state that the change in conductivity is more in SnO_2 nano materials the similar change is observed in sensitivity also. The Pure SnO_2 nanoparticle-based sensors exhibits significantly higher sensitivity it is due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapuors. The fall in resistance is mainly due to the increased amount of conduction electron or charge carrier upon adsorption of water vapours by the surface layer of the thick films.

Response Time

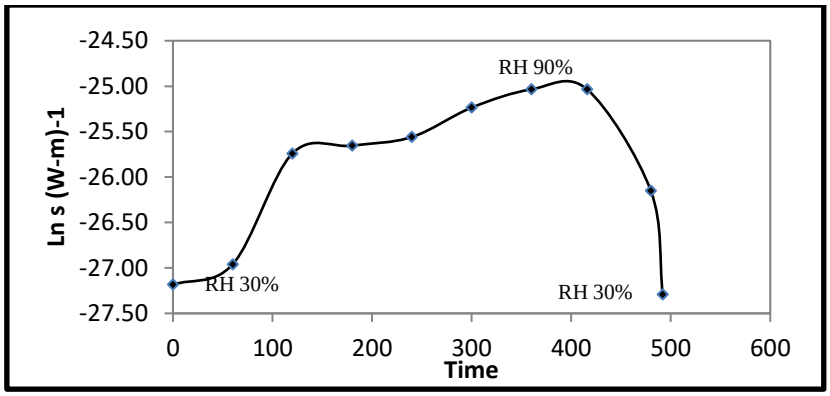

Figure 5. Response Curve

The responses curve pristine SnO_2 at constant temperature is as shown in figure 5. From the response curve, on time and recovery times are measured. Under the condition of constant temperature, the relative humidity is increases from 30 % RH to 90% RH in some appropriate time and then at the 90 % RH it is stopped, (ON response time) 360 sec which is after, it was allowed to fall up to 30 % RH (OFF recovery time) which is 127 sec. It is observed that response and recovery time is nearly fast in the pristine SnO_2.

4. Conclusion

SnO_2 nanoparticle was successfully synthesise co-precipitation method. Minimum crystallite size was found to be 23.19 nm for SnO_2 nanoparticle. The Surface morphology of pure SnO_2 shows that most particles are spherical in shape leaving more space as pores and hence it was most sensitive for humidity sensing. The Hysteresis plot shows very significant average change in the value of the resistance from 10^{11} Ω to 10^{8} Ω during forward and reversed cycles. Sensitivity is found to be increasing with the RH in pure SnO_2 thick film and it is increasing up to some particular RH and then afterward it remains constant. This shows that it has good scope for the development of moisture sensor in the range of relative humidity 30% to 90% RH. The response and recovery time of pristine SnO_2 based thick film sensors were satisfactory i.e. the sensors were found to be fast in operation. The recovery time found to 127 s at constant temperature respectively.

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Green And Facile Synthesis Of Silver Nanoparticles Using *Azadirachta Indica* (NEEM) Extract

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Abstract:
Nanoparticles are gaining interest in biomedical applications due to its importance such as anti-bacterial, anti-fungal and anti-cancer agents. Eco-friendly green methods using plant extracts are gaining popularity due to the abundance of raw materials and the production of non-toxic by-products threatening to the environment. For the synthesis of silver nanoparticles (SNPs) using the leaf extract of Azadirachta indica as a reducing agent from 1 mM silver nitrate ($AgNO_3$) has been investigated. The synthesis silver nanoparticles were characterized by UV/VIS spectroscopy, XRD, EDAX, IR and Scanning Electron Microscopy. Thus from this study it can be concluded that Azadirachta Indica can be effectively used for synthesizing silver oxide nanoparticles.
Keywords: *Silver oxide Nanoparticles, Green Synthesis, Azadirachta indica*

Introduction

Biological synthesis process provides a wide range of environmentally acceptable methodology, low cost production and minimum time required. At the same time the biologically synthesized silver nanoparticles has many applications includes catalysts in chemical reactions [1]. In this context, the concepts of green chemistry have gained immense popularity; these are mainly concerned with replacing chemical products and improving or developing processes and technologies to reduce or even eliminate substances that are harmful to health and the environment [2]. Generally, metal nanoparticles can be prepared and stabilized by chemical, physical, and biological methods; the chemical approach, such as chemical reduction, electrochemical techniques, photochemical reduction and pyrolysis and physical methods, such as Arcdischarge and physical vapor condensation are used. To synthesis stable metal nanoparticles with controlled size and shape, there has been search for inexpensive, safe, and reliable and "green" approach. The novel methods so called green/biosynthesis have been recently developed by a variety of plant extract such as Ocimum Sanctum, Petroselinum crispum, Murraya koenigii, Coriandrum Sativum for the synthesis of metal nanoparticles[3-5]. Among the various metal nanoparticles synthesized (such as silver, gold, iron, zinc and platinum), silver nanoparticles have gained more importance in the nanotechnology field. As, silver in the nano size is safe inorganic and non-toxic agents and encompasses a wide range of applications such as antibacterial and antifungal effects. It promotes reactions without hazardous solvents, reducing agents, and stabilizers [6]. Several green methods have been applied so far for the preparation of AgNPs including electrochemical reduction, microwave and sonochemical preparation, or synthesis from supercritical liquids [7].

Here we have developed a rapid, eco-friendly and convenient green method for the synthesis of silver nanoparticles from silver nitrate using leaf extracts of Azadirachta indica.

Material And Methods

Materials: Materials used in this research consist of Silver nitrate, *A. indica* (Neem) used in this work were collected from the garden of Shri. Shivaji science college Akot.

Preparation of Water Leaf Extract of A. indica (Neem): To 10 gram of powered leaf sample 100 ml of water as a solvent was added (10g/100ml). Plugged with cotton wool and then kept on a rotary shaker at 200 for 10 hours. After 10 hours the extract was filtered and the filtrate was concentrated using flash evaporator and stored in air tight containers at 4°C and used for further experiments.

Synthesis of Silver Nanoparticles (AgNPs) from water Leaf Extract of A. indica (Neem): Silver nanoparticles were prepared from water leaf extract of *A. indica (Neem)*. To 10 ml of the water leaf extract 90 ml of 1mM silver

nitrate solution was added. The extent of nanoparticles synthesis was monitored by measuring the absorbance at 400-600nm

Characterization of Silver nanoparticles

UV-Vis spectrophotometer:

Formation of silver nanoparticles is easily detected by spectroscopy because the colored nanoparticle solution shows a peak ~400 nm. The band in silver nanoparticles solution was found to be close to 400 nm. In this study, spectrophotometer was used to measure the optical density of solutions.

EDAX Spectroscopy:

The EDAX is a reliable tool to determine the elemental composition of the synthesized AgNPs from *A. indica (Neem)* extract. The EDX profile of the AgNPs from *A. indica (Neem)* extract showed the presence of typical peaks for silver. Additional peaks also observed which indicated the presence of nitrogen and oxygen, representing the existence of other elemental compounds in the AgNPs.

FTIR Spectroscopy:

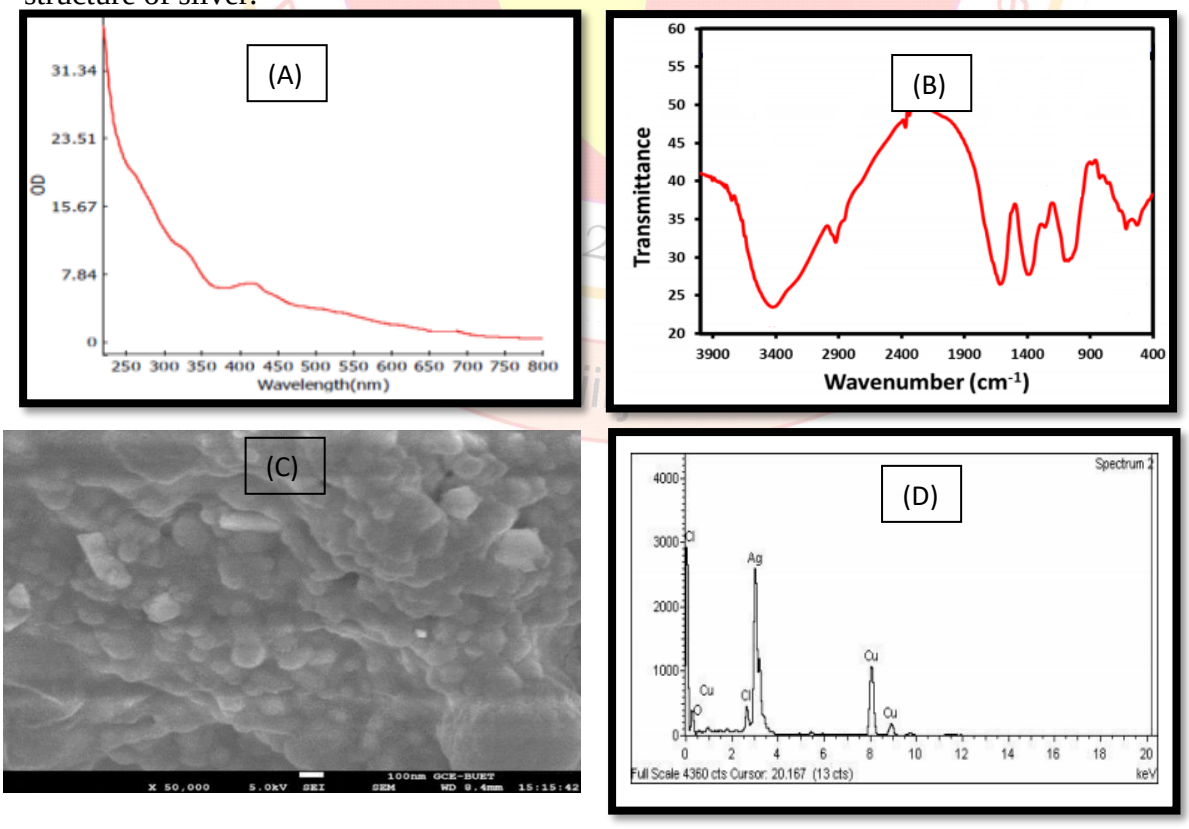
The FTIR spectra of *A. indica (Neem)* extract leaf extract showed the characteristic peaks of OH, alkene, aldehyde groups which may be involved in the reduction and stabilization of silver nanoparticles. The presence of OH, aldehyde and alkene in the extract acted as the capping and stabilizing agent for the synthesis of silver nanoparticles. The silver nanoparticles synthesized from *A. indica (Neem)* extract leaf extract showed the presence of phytoconstituents namely amides, alkenes, aliphatic amines, alkanes and alkyls, responsible for the reduction of silver nitrate.

Scanning electron microscopy:

SEM images showed that most of the silver nanoparticles are predominately spherical in shape having smooth surface and well dispersed with close compact arrangement shown in fig. (C).

X-Ray Diffraction:

The XRD pattern of synthesized AgNPs using *A. indica (Neem)* leaf extract was shown in Fig. (E). The XRD was done to determine the crystalline nature of AgNPs and the resulted peaks were found at 37.90°, 44.05°, 64.25° and 77.20° representing (111), (200), (220) and (311) face centered cubic structure of silver.



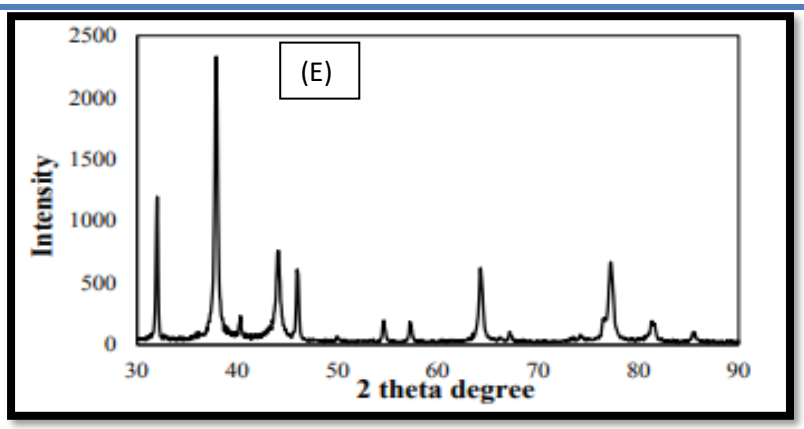


Fig. (A) UV-Vis spectrum (B) FTIR spectrum (C) SEM spectrum (D) EDAX spectrum (E) XRD spectrum of silver nanoparticles.

Conclusions

The green synthesis of AgNPs using *A. indica (Neem)* leaf extract was shown to be rapid, eco-friendly and produced nanoparticles are fairly uniform in size and shape. The functional groups present on their surface confirm the bioactive potential. The AgNPs showed a good stability profile. The ideally suited structure for AgNPs was successfully characterized. This work indicates that neem leaf extract had a good valuable potential in the future for production of silver nanoparticles

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Application of Nanotechnology in Food Packaging: A Review

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Abstract

Nanotechnology has validated its competence in almost all feasible fields. But still, Food Nano packaging is an incompletely explored discipline of observe both in Nano technology and food science. The motive of this paper is to expose the applications of nanotechnology in food packaging. Bio primarily based packaging is a one of the terrific techniques to reduce the environmental pollution. It replaces the non-degradable polymers with biodegradable materials which reduces waste and may be altered to increase the shelf life, and beautify food nice. Next is advanced packaging, which objectives in producing packaging cloth with excellent barrier homes, mechanical energy, flexibility and stability. Smart packaging is set use of Nano sensors and Nano devices inside the detection of freshness of food, contaminants in meals, screen changes and integrity of packaging fabric.

Keywords: Nanoparticels, Nano biosensors, Nanopacking

I. Introduction

Nanotechnology is the engineering of practical systems at less than a hundred nm scale degree. Nanotechnology applications are multiplied in the numerous sectors within the industrial world so as in food industry. Nanotechnology acts a distinguished function in food enterprise via supporting to enhance its range of sub sectors together with meals packaging. At present studies are being carried out to extend the shelf lifestyles and enhance meals first-rate even as decreasing packaging waste.

Thus, Nanotechnology applications in food packaging have brought about big amount of improvements which can be used inside the packaging industry commercially. This evaluate covers the position of novel nanotechnology primarily based meals packaging strategies in order to get higher enhancement in Food Quality and Safety.

Application of nanotechnology in improvement of bio based totally packaging which includes starch and polylactic acid, progressed packaging consisting of Nano laminates, Nano coatings and Nano clay, and clever/shrewd zone such as spoilage indicators, Nano-primarily based sensors and lively tags have been reviewed

II. Bio Based Packaging

The developing problem related to disposable of plastic in-turn has caused the development of bio degradable packaging. Bio based totally packaging are biodegradable packaging movie which can be able to controlling moisture switch and/or fuel trade with the intention to enhance protection and keep the dietary and sensory satisfactory. Bio polymers are used to produce these sorts of packaging movies. Bio polymers have poor mechanical, thermal and barrier houses [1].

Particularly, high brittleness, low warmth distortion temperature, excessive permeability of gasoline and vapored bad resistance to processing operations has confined their programs in meals enterprise [2,3]. Thus nanotechnology has been applied to improve the properties of these biopolymers. Nano-composites are advanced to conquer these boundaries of the biopolymers via nanotechnology. At nano scale degree, the size of the filler is immensely decreased, leading to the full-size increment in the floor area of the fillers. This is desired due to the fact bio Nano composites depend upon the high floor location of the Nano sized fillers which ends up in a massive boundary or interfacial place among the matrix or biopolymer and Nano filler. These kinds of alteration to biopolymers have advanced the homes of it as food packaging materials.

Biopolymers consist of plant-derived substances along with, starch, cellulose, other polysaccharides, and proteins; microbial products like polyhydroxylbutyrate and polymers synthesized chemically from naturally derived monomers including, polylacticacid. Most reviews centered on software biopolymer movies as fit for human consumption films

III.**Starch**

Starch and derivate are the most commonly used form of biopolymers that has been studied to supply bio-Nano composite materials for food packaging programs. Studies display that starch is absolutely degradable and will induce biodegradability of non-biodegrable substances while mixed Unfortunately, the starch has some limitations, including poorer mechanical residences and robust hydrophilic behavior (bad moisture barrier) [4, 5]. To conquer this problem, incorporating inorganic materials and artificial polymers has been proposed to improve water barrier belongings of starch. If starch is processed in an extruder via both mechanical and thermal power, it may be transformed to a thermoplastic fabric.

Here, plasticizers are used to reduce intra-molecular hydrogen bonds and to offer balance to product residences. But still thermoplastic starch (TPS) cannot meet some of these necessities along with green mechanical, oxygen and moisture protection. To overcome this problem, clay turned into used as follows. Clay has been used as a potential filler to improve the residences of TPS. Starch or clay Nano composite films have been obtained through dispersing montmorillonite (MMT) nanoparticles via polymer melt processing techniques [6].

IV.**Polylactic Acid (PLA)**

Polylactic acid (PLA) is the maximum common artificial biopolymer that has been studied until nowadays. PLA has received attention as a biocompatible, sustainable, biodegradable cloth with better mechanical properties. Therefore, PLA presents greater disposal alternatives and its production is much less environmentally burdensome than traditional petroleum-primarily based plastics [7, 8].The most essential barriers for the packages of PLA in meals packaging are its negative hardness, sluggish degradation, terrible gasoline barrier properties, and hydrophobicity [8]. Nanotechnology may be carried out to enhance this assets through the usage of Nano composites. Solvent casting of combinations of PLA and organophilic clay in chloroform led to substances with an improved crystallization tendency and extended Young's modulus.

The PLA layered silicate Nano composites, evolved by means of simple soften extrusion, exhibited considerable development of material residences in each solid and soften states as compared to the matrix without clay [2]. The oxygen barrier residences of Nano composite of amorphous PLA blended with chemically changed kaolinite had progressed by using 50%. The mixture of PLA and MMT layered silicate may additionally bring about a Nano composite with barrier homes appropriate for food packaging applications [4].

V. **Improved Packaging**

In the improved packaging improvement, nanomaterials are mixed into the polymer matrix to get better barrier properties and to enhance temperature and humidity resistance of the packaging [4]. Such new packaging materials have top notch barrier houses to save you the migration/diffusion of O2, CO2, water vapor, and taste compounds. This could have a high effect at the shelf existence of clean and processed meals. In many events, it has been stated that the barrier residences of this new packaging film can be improved through about 50% as compared to the properties of the neat polymer. This is due to the creation of a maze shape results in a tortuous route for gases and different molecules and by way of that decreasing their permeation fee [9]

VI. **Nano Coatings**

Coating in meals may be defined as skinny film of edible fabric placed among meals additives to provide a barrier to mass switch. Edible coatings are currently broadly used on a spread of ingredients, consisting of veggies, end result, chocolate, meats, cheese, bakery products, candies and French fries [6].Up to now range of researches has been done in order to improve the bodily homes of these suitable for eating movies by way of the combination of Nano-debris.

In order to decrease the migration of oxygen, clay MMT has been integrated into pectin. Anoticeableraise in stability of chitosan layered Nano composites become received [6]. The inclusion of inorganic Nano fillers which include, TiO2, ZnO and ZnS, and carbon nanotubes has more desirable the retention of taste, acids, sugars, shade and texture, elevated balance at some point of delivery and garage, stepped forward look and decreased spoilage [8].

VII. **Nano Laminates**

A Nano laminate is made of two or more layers of fabric with nanometer dimensions which can be bodily or chemically bonded to each different. Nano laminates provide some blessings over traditional technologies for the practise of fit to be eaten coatings and films and therefore have some of crucial applications in the food enterprise [10]. A range of various adsorbing substances could be used to increase the distinctive layers, which includes; natural poly electrolytes (proteins, polysaccharides), charged lipids (phospholipids, surfactants), and colloidal debris (micelles, vesicles, droplets) [11,12]. It could be useful to incorporate active functional agents such as antioxidants, antimicrobials, enzymes, anti-browning dealers, flavors, and colors into the movies. These purposeful agents might increase the shelf lifestyles and high-quality of coated ingredients [6]. These Nano laminates may be created completely from food-grade ingredients (proteins, polysaccharides, lipids) by way of the usage of easy processing operations which includes dipping and washing [11].

VIII. **Nano Clays**

Nano clays are bi-dimensional platelets with a completely minute thickness (1 nm) and several micrometer lengths. Those are high performance, enormously to be had and occasional price substances. Thus vast range of clinical researches has been carried out approximately nanoclays. Interaction among the Nano clays and polymers are considered as the number one principle for Nano primarily based packaging. According to the prevailing clinical researches; two varieties of Nano scale composites are created by means of the interactions among Nano clays and polymers, named as intercalated Nanocomposites and exfoliated Nano composites.Beer packaging gives particular examples on Nano clay packages in packaging zone.

In the past, plastic was no longer used as a packaging material in beer industry because of the oxidation and unwanted flavour improvement.

Nanotechnology has given a practical answer using Nano composites to conquer the hassle. This caused employment of plastic substances in beer bottling and this cloth offers 6 month shelf existence for beer. This era may be additionally carried out in packaging of gentle liquids (ETC institution 2004). In addition to liquids, positive meals gadgets such as processed meat, cheese, confectionary, and boil-in-bag ingredients can also be packaged according to this era. Other than the shelf life extension, there are numerous different blessings in Nano clays and Nano-crystals primarily based packaging. As an example, the weight of the Nano-based packaging is appreciably less and as a result it results in cut-off the transportation value. Significant boom in film electricity is also may be performed in these types of substances and this ends in make certain the protection of the meals stuff that is within the packaging. The maximum full-size limitation of this generation is that the Nano clays on polymers reduce the transparency of the packaging.

IX. **Nano-Based Sensors**

Environmental modifications leads to the deterioration of food product and also leads to boom the microbial hobby on meals stuffs and toxicant generation. Nano particles and Nano composites may be used to meals packages which can be act as reactive particles and pick out unwanted changes. These kinds of substances are considered as nanosensors.Nanosensors can discover precise chemical substances, pathogens and toxicants, with reaction to their level of incidence in food stuff.

Time temperature integrators, gasoline detectors for food spoilage and O2 sensors are the not unusual kinds of Nano sensors applied in food packaging. As an instance, Scientists at Kraft, Rutgers University and the University of Connecticut, have designed the “digital tongue” to come across pathogenic microorganisms and other substances in elements in step with trillion with the assist of embedded Nano sensors within the packaging substances using nanotechnology. The sensors can detect coloration modifications in the bundle when the food merchandise start to destroy

X.**Conclusion**

Researches screen that nanotechnology is a promising generation that facilitates in innovative tendencies inside the meals packaging. Application of nanotechnology in meals packaging shows sizeable enhancements in

the processing, shelflife, fitness and packaging functionalities, transportability, and decreased expenses. Nanotechnology can be applied in food packaging in many approaches. Most of this applications are nonetheless in the experimental or fundamental level and some are handiest restrained to excessive-cost merchandise.

Bio based packaging is one among such utility. Increased interest in environmental pollutants made bio based packaging an indeed generation. Bio based totally programs have changed the non-degradable polymers. The problems associated with these biopolymers are overall performance, processing and value. The Nano composite is evolved to triumph over those barriers of the biopolymers via nanotechnology. In starch to improve its first-class Nano composite is produced the use of MMT clay as Nano filler. The mixture of PLA and MMT layered silicate results in a Nano composite with better barrier houses appropriate for meals packaging.

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Particle Size Confinement of Hybrid Nanostructured Zinc Oxide / Polyaniline Matrix

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Abstract

Hybrid matrix of Zinc oxide/Polyaniline (ZnO/PANI) nanocomposite material was synthesized by typical oxidative polymerization which followed by Ultra-sonication treatment. Due to this post treatment of ultra-sonication radiation bombardment; particle size was reduce which causes confinement in particle size. This confinement of particle size reveled by XRD patterns, also it is found that at polymerization stage nanotube were formed. These reduce small sized hybrid nanostructured Zinc oxide/Polyaniline materialmay enhanceextensive properties like electrical and gas sensing properties.

Keywords: Hybrid ZnO/PANI, Ultra-sonication, X-ray diffraction, Particle Size, Confinement.

1. Introduction

The use of nano-sized materials, nano-composite materials and hybrid structurematrix nano-compositematerial are rapidly arousing interest in scientific community due its intensive properties like the surface-to-bulk ratio for the nano-sized materials is much greater than that for coarse materials [1]. In nano-sized materials, a large fraction of the atoms are present at the surface and hence the surface properties become paramount.

Since then, broad research has been carried out on nano-sized conducting polymers because of their excellent electrical, optical and sensing properties. These materials have broad application in areas ranging from anticorrosion coatings to chemical sensors and biosensors, light-emitting devices, and solar cells, as well as many others [2]. Among the variety of conducting polymers due to unique electrical properties, stability and easy fabrication process polyaniline is one of the most attractive materials. Because of these interesting properties, polyaniline has been a potential candidate in many applications [3, 4].

Semiconductor Metal oxide (SMOx) material like Zinc Oxide (ZnO), Titanium dioxide (TiO2), Magnesium Oxide (MgO) etc has many applications in electrical, thermal, optical and sensing devices. These materials are easily synthesized by using large variety of synthesis methods. These SMOx materials particle sized varies from bulk to nano- size; depending upon synthesis techniques and conditions during synthesis [5-7].

Now days, there are emergent interests to combine both organic and inorganic materials for applications in electro-optic [8-10]. Combination of nanosized metal oxides and conducting polymer has the potential to enhance the property of the hybrid complex matrix of metal oxide and conducting polymer. Such composites material enhances properties due to its optimized volume to surface ratio of nanosized metal oxides. The properties of nanocomposite materials depend not only on the properties of their constituents but also on their combined morphology and interfacial characteristics [9-12].

Among the various semiconductor oxides materials, Zinc Oxide (ZnO) has been chosen as the key sensing material. Zinc Oxide is among the extensively studied metal oxide outstanding because of their unique properties and important characteristics for example low cost, easy availability and wide range of applications

Polyaniline which can be synthesized either by chemical oxidization polymerization [13-15] or electro polymerization [16]. Conventional chemical polymerization is conducted by polymerizing aniline monomers in the presence of a free radical activator.In past two decades, a variety of methods have been used to synthesize polyaniline nanofibers, including electrospinning, interfacial polymerization, rapid- mixing,nanofibers seeding, templates and surfactants or oligomer-assisted polymerization [12].

In present work composite material of Zinc Oxide (ZnO) and Polyaniline (PANI) synthesized and structural properties were studied also on the basis of X-ray diffraction (XRD) patterns the property of particle size confinement was studied.

2. Experimental

I. Synthesis of Nanomaterial Metal Oxide: Zinc Oxide (ZnO)

All the chemicals used in this study were of GR grade purchase from Sd-Fine, India (purity 99%). The chemicals are used without any further purification. Synthesis method adopted from S.D. Charpe *etal*[17] liquid –phase method. Finally we get product of ZnO nanoparticles.

II. Synthesis of Conducting Polymer: Polyaniline

In present work, use International Union of Pure Applied Chemistry (IUPAC) method is used prepare polyaniline in which aniline hydrochloride (5.18gm) is dissolved in 100 ml distilled water to make up volume. Ammonium peroxydisulphate (11.42gm) is dissolved in 100 ml distilled H_2O in a volumetric flask. The solutions are kept for 1 hour at room temperature. The above solutions are mixed together in equally proportion with constant stirring [18].

The precipitated is collected by filtration and washed with 0.2 M HCl, to remove all residual monomers, oxidant and its decomposing products. Finally it is washed with acetone to removes low –molecular-weight organic intermediates and oligomers. It also prevents the aggregation of PANI precipitated during drying. The precipitated is dried at 60^0C for 12 hours. The resultant material is a polyemeraldine salt.

2.1.Synthesis of Nanocomposite (PANI/ZnO)

In the experimental work, there were syntheses of hybrid matrix of ZnO/PANI done. For this synthesis process *in –situ polymerization* method was adopted [17-20] to prepare nanocomposite of PANI/ZnO hybrid matrix. First we prepare 1 M HCl solution in distilled water. Here we used Zinc Oxide which prepared in steps I.

In preparation we add Zinc Oxide (ZnO) in 1M HCl solution to achieved 0.1 M gel solution of Zinc Oxide then this solution under treatment of sonication for 1 hour. Now prepared 100 ml 0.1 M Aniline hydrochloride Solution then add 10 ml sonicated ZnO solution. Again go for sonication for 10 minutes then add 100 ml Ammonium peroxydisulphate (APS) solution slowly with continues stirring, after 3 hours we achieved polymerization. This type polymerization is called as *in-situ Polymerization*[21-22].

After 3 hours filter, washed above solution with 1 M HCl solution and dried under vacuum for 12 hours. Hence, nanocomposite hybrid matrix structures of PANI/ ZnO were synthesized [21].The yield of synthesized ZnO/PANI nanostructure was found to be well proportion. To study particle size conferment effect, bombardment of Ultra-sonication radiation of specified voltage and for specific time intervals.Synthesized ZnO/ PANI nanostructure which were sonicated for 0 min(without sonication),10 min and 20 min time period named as 0 min ZnO (S_1), 10 min ZnO (S_2) and 20 min ZnO (S_3) respectively.

3. Results and discussion

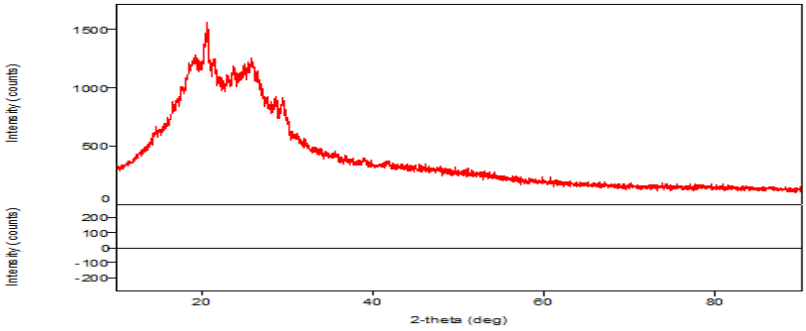
3.1. X-Ray Diffraction Studies

3.1.1 ZnO/PANI Composite

The main objective of the present investigation is synthesis of nanocomposite of ZnO/PANI. In present work three samples were studied and they are labelled 10% Zinc Oxide – Polyaniline (10%-ZP) [S_1], 15% Zinc Oxide – Polyaniline (15%-ZP) [S_2], 20% Zinc Oxide – Polyaniline (20%-ZP) [S_3].

The semi-crystalline structure of nanocomposite (ZnO/PANI) were characterized by powder X-ray diffraction (RigakuX-ray diffractometer) with Cu-α source and 2θ range of 10° - 90°.

Figure 01 (a, b and c) shows X-ray diffraction patterns of synthesized nanocomposite samples of ZnO/PANI (S_1 to S_3).



(a)

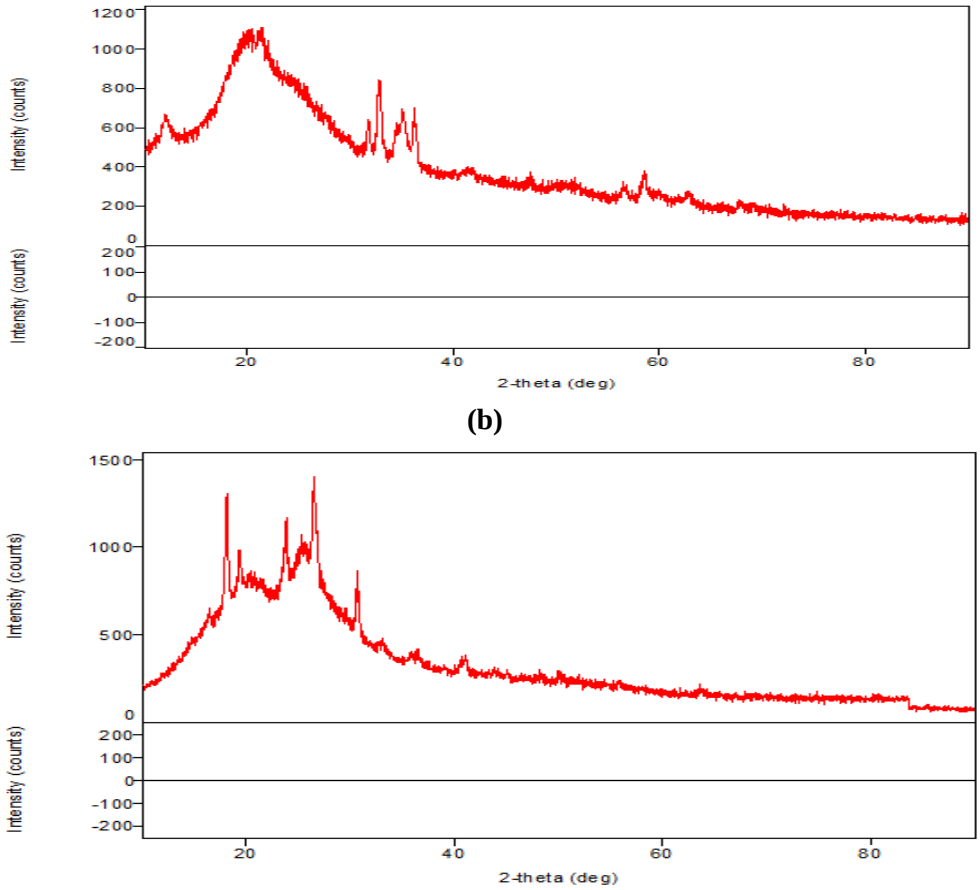


Fig. 1: XRD Pattern (a) 10%-ZP, (b) 15%--ZP, (c) 20%-ZP

Left part of all figures 1(a) to 1(b) showscrystalline nature. The corresponding X-ray diffraction peak for (100), (002), (101), (102) (110), (103), (200), (112), (201), (004), (202) and (104) planes confirm the formation of hexagonal wurtzite structure of ZnO (DB card no.-2300013).Hence XRD pattern confirmed that synthesized ZnO are highly crystalline in nature [23].

The recorded XRD pattern figure 1 (a to c) confirmed that synthesized composite of ZnO/PANI Zinc Oxide/ Polyaniline are polycrystalline nature that is semi amorphous in nature [24, 25].One can see the presence of peaks corresponding to zinc oxide nanocrystallites. However, these peaks are slightly shifted, from their respective standard positions, may due presence of PANI matrix. This superficial property of the nanocomposites as has also been suggested by Tang *et al* [26] in the study of x-rays patterns of Polymethylmethacrylate (PMMA) and zinc oxide composites.

With increasing concentration of ZnO, a slight broadening in all the peaks corresponding to PANI is observed. The broadening is however more pronounced as the concentration of the zinc oxide increases in composites and as concentration of zinc oxides in polyaniline (PANI) increases crystallinity increases. The probable reason for this is influence induced on nanoparticles due to the surface effects arising from the surrounding PANI [27]. However, the presence of such polymer matrix seems to cause the decrease in the size of zinc oxide nanoparticles due to the formation of polymer-Zn complex on the surface of zinc oxide nanoparticles present within/on the surface of the nanocomposites. Various nanocomposites combinations showed similar peak patterns, therefore, it may be assumed that presence of polyaniline did not cause any change in crystal structure of zinc oxide or negligible change which may be ignored.

3.2. Effect of Ultra-Sonication on ZnO/PANI Matrix:

To compare the broadening of peaks obtained in case of different samples, XRD patterns are merged together. Further, the calculated average crystallite size of prepared samples is shown in Table 1.It was found that

average crystallite size decreases due to increase in sonication time interval [28-29]. The influence of thesonication time on the crystallite size was the main subject of interest here.

Furthermore, from XRD patterns can be seen that there little shift in diffraction peaks due to ultrasonic radiation treatment

Table1: Comparison of crystallite size among S_1, S_2 and S_3

Sr. No	Sample	2 Theta (degree)	FWHM Value (degree)	Crystallite Size (nm)
1	S_1	36.25	0.1022	85.46
2	S_2	36.41	0.1235	70.76
3	S_3	36.45	0.1485	58.85

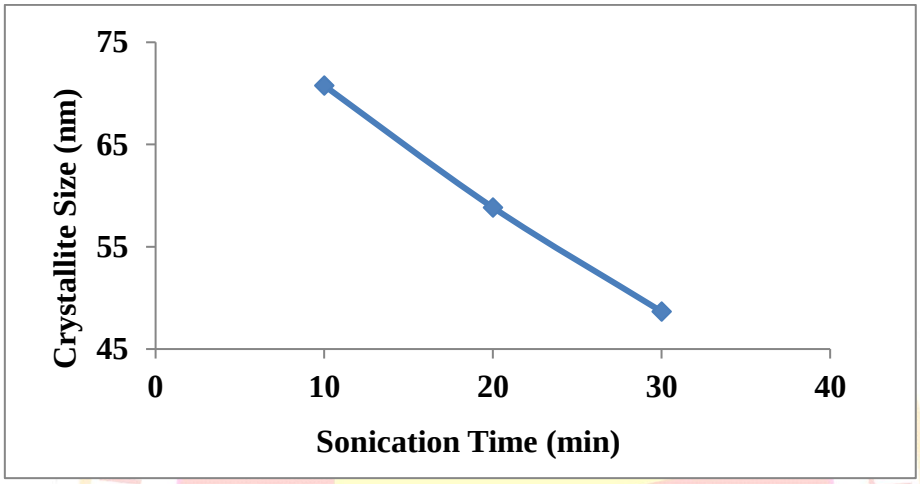
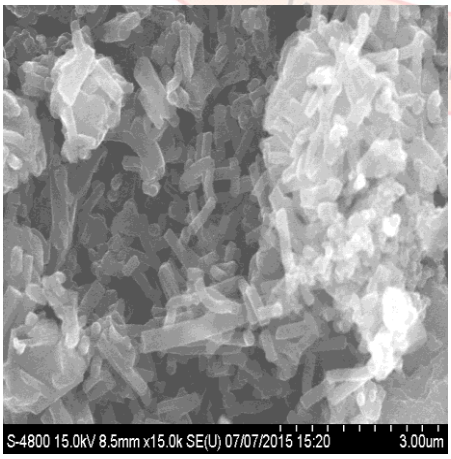


Fig. 2: Variation of crystallite size with sonication time.

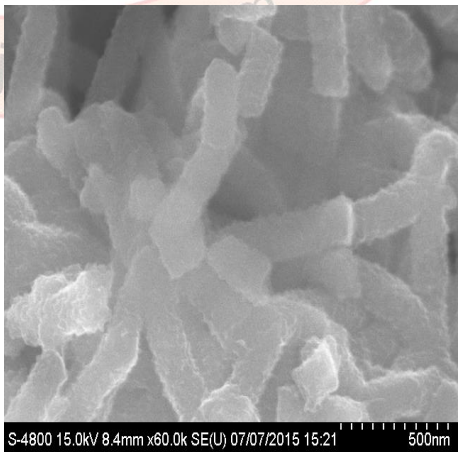
Figure 2 shows the variation of crystallite size of synthesized ZnO/PANI with its sonication time. It is seen that poly-crystallite size decreases with sonication time. So it observed that the mechanical influence produced by ultrasonic waves such as emulsification, stir, and others, could prevent the crystal growth and aggregation [30].

3.3. SEM of Nanocomposite PANI/ZnO

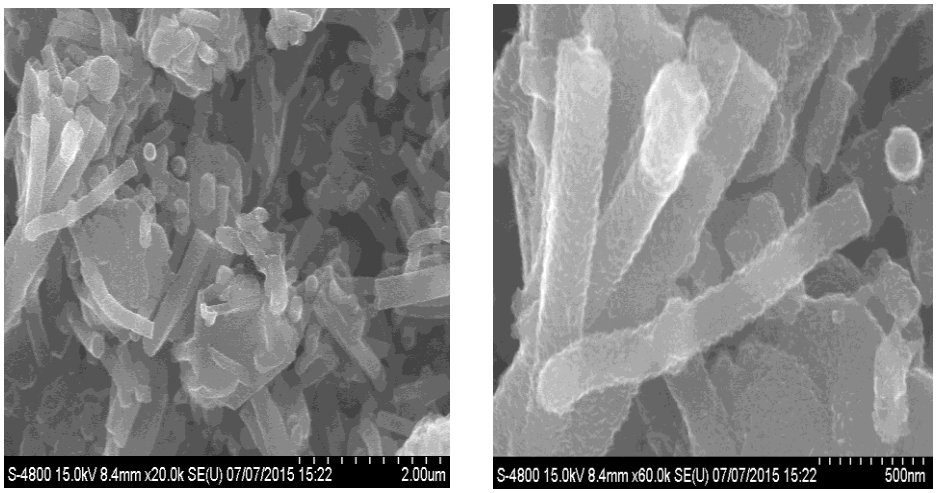
Figure 3(a, b, c & d) shows SEM micrograph of nanocomposite of zinc oxide and polyaniline at different resolution scale. From micrographs it is cleared that there were formation of nanotubes of nanocomposite material ZnO/PANI. It is observed that from SEMimage 3 (a and d) on head of polyaniline nanotube there is decomposition of nanosized Zinc Oxide. This is evidence for *in –situ polymerization* method of PANI and ZnO to synthesis nanocomposite of ZnO/PANI.



(a)



(b)



(c) **(d)**

Fig. 3 (a to d) SEM micrograph of ZnO/PANI at different resolution scale

4. Conclusions

The Pure Zinc Oxide, Pure Polyaniline and ZnO/PANI nanocomposites have been successfully synthesized. ZnO nanotubes were successfully covered with PANI by process of '*in situ'* chemical oxidative polymerization of aniline. Due to interfacial interactions between nanocomposite ZnO and PANI, there is formation of PANI and ZnO matrix. This type of hybrid material will use in many applications.

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Humidity Sensing Propertiesof PANI Doped Zinc Oxide Nanocomposites Thick Film Sensor

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Abstract

Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors. In the present work Polyaniline is prepared by polymerizationof aniline under acidic condition. Zinc Oxide (ZnO) nanopartical prepaired by wet chemical method at room temperature using zinc nitrate and sodium hydroxide as starting material . ZnO nanoparticles were combined with conducting (PANI) polymer via polymerization in acidic aqueous solution to obtain a new type of inorganic – organic composites nanostructured . It is observed that PANI doped ZnO nanocomposites sensor shows a high response and sensitivity with good repeatability as compared to that of purePANI and ZnO nanoparticle.Theeffect of hysteresis is of the sensors, theeffects of pure and composite oxide on sensitivity of the sensors were studied. The crystallinity and the crystallite size were examined byX-Ray Diffraction technique.

Keywords: Polyaniline ,Zinc Oxide Nanocomposites,Humidity sensor.

1. Introduction

There is a growing demand for a sensing system that has high sensitivity, wide dynamic range, good stability, quick response, good reproducibility, simple structure and minimal cost. Metal oxide films sensitive to humidity have been reported earlier where sensing has been done using optical means. However, metal oxide humidity sensors depending upon measurements of electrical parameters require high temperature operation and consume significant amount of power.Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [1, 2]. Humidity sensors that are available in the market include dew point, infrared, catalytic and tin oxide-basedsensors, which may be expensive, or require high temperature operation and consume significant amount of power and high cost ofmaintenance [3].Much research has been focused on the development of humidity sensitive material [4–6]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [7–9]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [10]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [11–16].

2. Synthesis of Material:

A) Synthesis of Polyaniline (PANI): In general is synthesized using two major polymerization approaches: electronic and chemical polymerization. In the present work polyaniline is synthesized by chemical polymerization method in which 0.2 M aniline hydrochloride is used as monomer unit. The synthesis is done by oxidative polymerization with 0.25 M ammonia peroxysulphate in aqueous medium. Bothsolutions kept 1 hour at room temperature then mixed in beaker, briefly stirred. And left at rest to polymerized , next day, the pani precipitate was collected on a filter , washed with three 100 ml portion of 0.2 M HCL and similarly with acetone . polyaniline hydrochloride powder was dried in air and then in vaccum at 60°c. Polyaniline prepared under these reactions and processing condition are further referred to as standard sample.

B) Synthesis of Zinc oxide (ZnO): It is prepared by the aqueous solution of zinc nitrate. And ispreparedbydissolving 0. 2M of zinc nitrate hexahydrate in 100 ml of distilled water .To this aqueous zinc nitrate solution 0.2 M sodium hydroxide is added and the reaction mixture was heated at 80°c along with stirring and the

process is carried out for four hour after which the white precipitate was obtained. The formed oxide wet precipitate is centrifuged Then the wet precipitate is washed with de-ionized water to remove impurity ions present in it and further heated in the oven at 150°c to dry the precipitate formed.

Characterization :The above synthesized PANI-ZnO composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD),the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ᵬ in the range 40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

Result And Disscusions:

XRD Pattern of ZnO

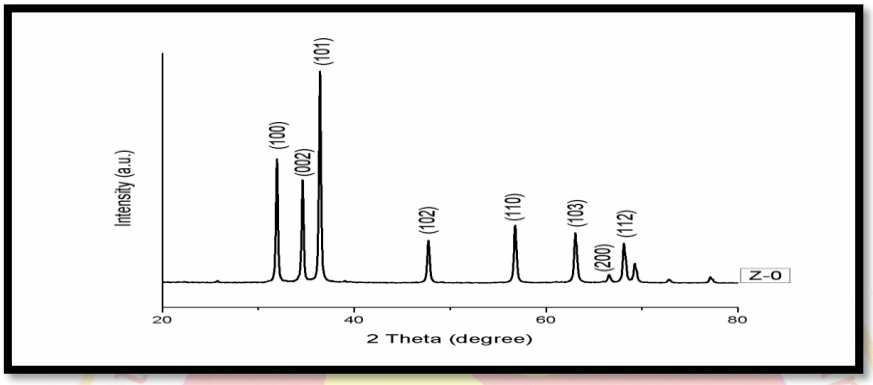

Fig. 1 XRD of Pure ZnO

XRD pattern of pristine zinc oxide (ZnO) nanostructure synthesized by liquid phase method via chemical wet reaction method were calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (002), (101), (102), (110) and (103) planes. All the peaks match well the standard hexagonal wurtize structure of zinc oxide (ZnO) with lattice constants a = b = 0.3249 nm and c = 0.5206 nm [JCPDS card no. 36-1451]. All the peaks are perfectly match with pure ZnO structure, which indicates the high purity of the obtained ZnO nanoparticle. The average crystalline size was found to be 37.38 nm calculated by Deye-Scherrer formula.

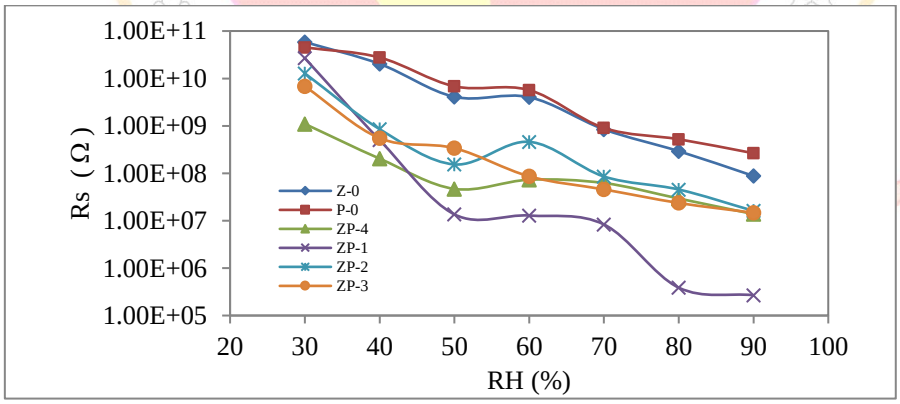

Figure: 2 Hysteresis plot

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the fig. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample ZP-1 (10ZnO – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{5}\Omega$, these is a remarkable change in the value of resistance.

Sensitivity

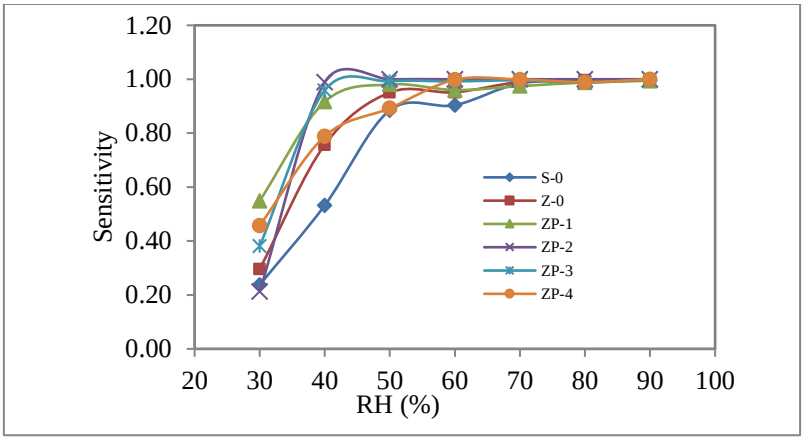

Figure: 3 Variation of sensitivity with Relative Humidity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in fig. 3 For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of ZP-1 (10ZnO-90PANI) is more than ZP-2, ZP-3, and ZP-4 samples and also from the pristine samples P-0 and Z-0. The (ZnO-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from ZnO nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

5. Conclusions:

Nanostructured ZnO was successfully prepared via chemical precipitation method and PANI with IUPACpolymerization technique. Minimum crystallite size was found to be for ZnO is 37.38 nm. The Hysteresis plot shows very significant average change in the value of the resistance from$10^{11}\Omega$ to $10^{5}\Omega$during forward and reversed cycles of sampleZP-1(10ZnO-90PANI). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant.Amongst all the prepared samples ZP-1 is more sensitivity than other prepared composite samples.

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Ba TiO_3 doped Polyaniline based Nanocomposites thick film senor for humidity sensing Application

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Abstract

Polyaniline (PANI) and $BaTiO_3$-Pani composites were synthesized by chemical polymerization method using ammonium per sulphate (APS) as an oxidizing agent. This is a single step polymerization process to synthesize the conducting polymer. Thick films of PANI and BaTiO3-Pani were fabricated by Screen – Printing followed by firing at 70º c for 30 min. BaTiO3-Pani thick films resulted in humidity sensor. An exceptional sensitivity was found to the relative sensor at 80º c and no cross sensitivity was observed to other hazardous and polluting gases ever at higher concentration. . The effect of microstructure and dopant concentrations on the gas response,Hysteresis , sensitivity, of the sensor in the presence of humidity were studied and discussed.

Keywords: *Polyaniline , Barium Titanate,BaTiO3-Pani composites , Humidity sensor.*

1. Introduction

The use of sensors by human being has been day by day increasing at an astounding rate in the last few years and modern society depends heavily on the use of the sensors for variety of purposes. Over the last decades a variety of chemical sensors have been developed based upon semiconductors, which monitor different characteristic sensor properties such as conductivities for electronic conductivity sensors, impedance for capacitance sensors, potentials for field effect sensors or temperatures for calorimetric sensors. For the determination of gas components, many of these devices make use of the same molecular detection principle. Depending on the operation temperature, their signals are caused by changes in the concentration of free electrons, dielectric constants, electrical fields and heats of adsorption or reaction. These changes result from physisorption, chemisorption, catalytic reactions, and surface or bulk defect reaction with particles from the gas phase.

There is a continuing need for accurate, reliable, inexpensive sensing systems for measuring relative humidity (RH), not only for human comfort but also for a broad spectrum of applications in chemical industry, process control, atmospheric sciences, agriculture etc. Humidity is one of the most common constituents present in the environment and its measurement is indispensable when it comes to monitoring of various environmental parameters. For instance, detecting organic pollutants in indoor atmosphere, organic vapour monitoring, maintenance of Green houses, performance of air/ smoke filters, hydrocarbon sensing are all affected by relative humidity conditions. Therefore, sensing and controlling relative humidity is of great importance [1].

In the recent years there has been significant progress in the field of polymer based humidity sensors. According to their sensing mechanisms these can be either resistive type or capacitive type. In addition to the traditional quaternary ammonium and sulfonate compounds, polymers containing phosphonium have also been studied for humidity sensing. Copolymers, mutually reactive copolymers and conjugated polymers have also been reported for humidity sensing. Conjugated polymers especially conducting polymers like polypyrrole, polyethylene, polypropylene etc. have shown humidity sensing properties [2]. Besides these metal-polymer nanocomposites for instance iron oxide-polypyrrole have also been reported for relative humidity sensing sensor. The present study deals with the humidity sensing application such as relative humidity, stability humidity, selectivity etc. of selected inorganic materials.

Humidity control and monitoring are of great interest to a wide area; these include moisture sensitive products, fresh and pack-age food, drug storage and environmental control for valuable Antiques or paintings etc. [3,4]. Humidity sensors that are avail-able in the market include dew point, infrared, catalytic and tin oxide sensors, which may be expensive, or require high temperature operation and consume significant amount of power

and high cost ofmaintenance [5].Much research has been focused on the development of humidity sensitive material [6–8]. Among these are the investigation of using conducting polymers such as polyaniline, polypyrrole, and polythiophene for humidity and gas sensing [9–11]. Advantages with polymers as sensing materials are light weight, flexible, low cost and simple fabrication process [12]. Pure polymer, polymer blends and polymer–inorganic composites have also been studied for the purposes, resulting in different degree of advancements in this area [13–19].

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B)Synthesis of Barium titanate ($BaTiO_3$): In preparation of barium titanate ($BaTiO_3$) 0.25 M $Ba(NO_3)_2$ solution and 0.25 M $TiO(NO_3)_2$ solution were dissolved in 2 N nitric acid solution in a beaker. About 0.6 M tartaric acid solution was then added to under constant magnetic string. The solution heated under continuous string to its boiling point until all the liquid evaporated. About 7 gm of ammonium nitrate was added towards the ends to avoid slurry formation. Brown fumes evolution takes places and fluffy mass were settled at the base of the beaker. The product is then dried in vacuum oven at 96^oC for 2 hrs. So that moisture will removed from the final product and we will get dry product. Then this dry product was crushed into fine powder and finally this fine nanopowder of $BaTiO_3$ was calcinated at temperature 800^oC for 5 hrs. in the auto controlled muffle furnace to remove the impurity form the product will be completely removed and get a final product of $BaTiO_3$ nanoparticle.

3. Experimental methodology for humidity: -

The humidity chamber/ stability chamber has stainless steel body purchased from Gayatri Scientific, Mumbai . The working size of humidity chamber is 50×43×430cm (H×D×W). The chamber having two open side door window namely inner side door and outside door, inner side is full length inner plexi glass door which is transparent and outer side door was metal door with magnetic gasket and lock . inside the chamber it has two trays, which are made of stainless steel. it has PID digital display temperature indicators which is outside at the top of the chamber , indicating the current temperature of the chamber .indicating the current temperature of chamber. The power sources of 230 V having frequency of 50Hz required. the temp[rapture range is ambient to 80 C. The chamber has temperature accuracy of ± 1.0 C .

The range of humidity varying from 40% RH to 80% RH having the accuracy of ± 3% RH. To operate the chamber a program feed for the varying RH as well as different temperature. Which will sets the controlled the humidity of set temperature for given time. To measure the humidity characteristics , the sensor element was placed inside the humidity chamber by operating the program at different RH and temperature the humidity was varied . The sensor element was placed inside the humidity was measured by standard hygrometer which is already placed inside chamber . The electrical resistance of the file was measured by using Keithley source meter (2400). The humidity and temperature of the chamber camn be controlled by using Bull's Eye control UK-100, it is a program controller for humidity and temperature verses time even controller .The UK-100 can be program by varing RH, temperature , time parameters. The total number of programs are 99out of this are set program for set temperature 40 C by varying RH 1 steps NO. Of program 8, event 0001, are tabulated

4.Characterization :

The above synthesized PANI-$BaTiO_3$ composites are structurally and surface morphologically characterized by using different technique like X- ray diffraction (XRD), and scanning electron microscopy (SEM).the x-ray diffraction patterns of the prepared samples are obtained by Siemens D 5000 X-ray diffractometer using CuKα radition (λ =1.717 A°). The diffractograms are recorded in terms of 2ꝏ in the range

40°-50° at ambient temperature with scanning rate of 2° per minute .The surface morphology of polyaniline and its composites are studied by using Leica's SEM (modal S 440) at 10kv.

X-Ray Diffaration

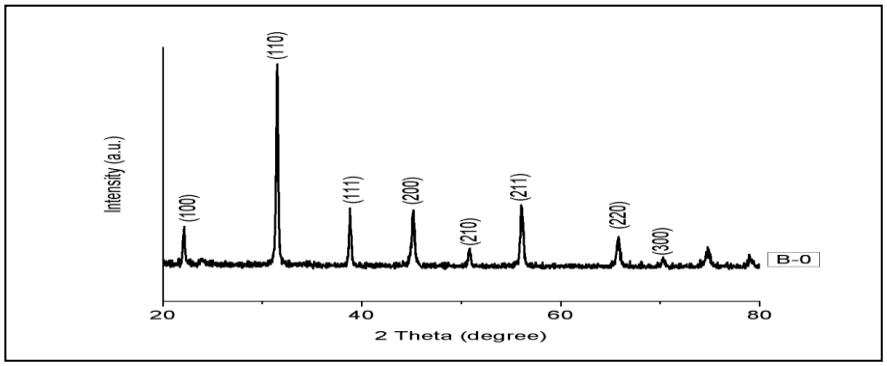

Figure: 1 XRD of ($BaTiO_3$) (B-0)

The XRD pattern of pristine Barium Titanate ($BaTiO_3$) nanostructure synthesized by liquid phase method via solid state method calcinated at 800ºC as shown in figure 1.The crystalline nature with 2θ peak lying at (100), (110), (111), (200), (210) and (220) planes. All the peaks match well the standard provskite type structure of Barium Titanate ($BaTiO_3$) with lattice constants a = 3.992 nm and c = 4.036 nm . All the peaks are perfectly match with pure $BaTiO_3$structure, which indicates the high purity of the obtained $BaTiO_3$nanoparticle. The average crystalline size was found to be 46.90 nm calculated by Deye-Scherrer formula.

Hysteresis plot :

Hysteresis plot shows the variation between resistances of sample with respect to the relative humidity in increasing and decreasing order from 30 to 90 % RH as shown in the figure. 2. A very small hysteresis present during forward and reverse cycle of relative humidity, where as a very significant average change observed in the value of resistance of sample, in the sample BP-1 (10$BaTiO_3$ – 90PANI) the change in value of resistance is from $10^{11}\Omega$ to $10^{3}\Omega$, these is a remarkable change in the value of resistance.

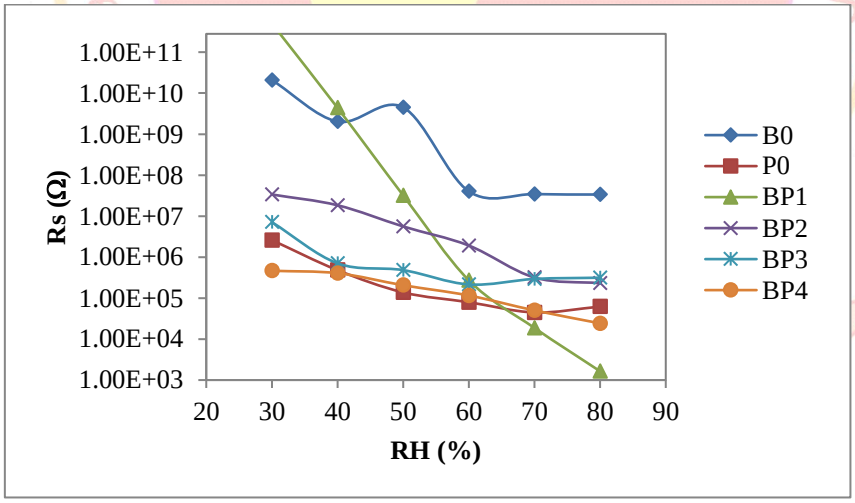

Figure: 2 Hysteresis plot

Sensitivity

In the above samples the sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant as shown in figure 3. For higher RH the sensitivity is found to be higher in case of all samples of thick films. The sensitivity of BP-1 (10 $BaTiO_3$ -90PANI) is more than BP-2, BP-3, and BP-4 samples and also from the pristine samples P-0 and B-0. The ($BaTiO_3$-PANI) composite sensors exhibits significantly higher sensitivity than sensor constructed specially from Barium Titanate nanoparticles and PANI itself due to the formation of heterogeneous interface between them and more adsorption site was created to absorbed more water vapours.

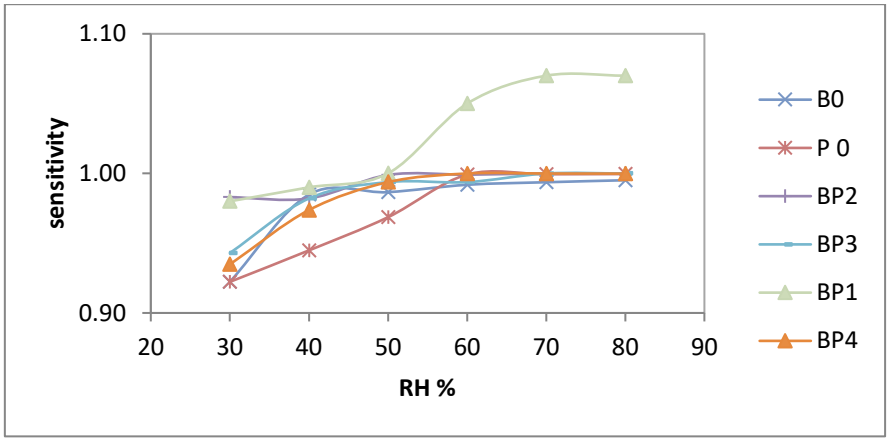

Figure: 3 Sensitivity curve

5. Conclusions

Nanostructured $BaTiO_3$ was successfully prepared via chemical precipitation method and PANI with IUPAC polymerization technique. Minimum crystallite size was found to be $BaTiO_3$ is 46..90 nm. The Hysteresis plot shows very significant average change in the value of the resistance from $10^{11}\Omega$ to $10^{3}\Omega$ during forward and reversed cycles of sample BP-1 (10 $BaTiO_3$-90PANI)). The sensitivity is found to be increasing with the RH for all the samples of thick films and it is increasing up to some particular RH and then afterward it remains constant. Amongst all the prepared samples BP-1 is more sensitivity than other prepared composite samples.

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Sol-gel Auto Combustion Synthesis and Characterizations of Cobalt Ferrite Nanoparticles

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Abstract
Cobalt ferrite ($CoFe_2O_4$) nanoparticles were successfully synthesized by sol-gel auto combustion method. Pure phase formation of cobalt ferrite with cubic spinel structure was observed in X-ray diffraction pattern. The average crystallite size, lattice parameter and other structural parameters were calculated from XRD data and they were in reported range. The magnetic parameters were measured by M-H hysteresis loop technique at room temperature and saturation magnetization, remenant magnetization and coercivity was estimated.
Keywords: *Cobalt ferrite, Sol-gel auto combustion,XRD, Magnetization.*

1. Introduction:
In order to meet today's technologies requirement, the development of new synthes is technique to develop new materials is essential which produces nanosized materials with superiormagnetic performance compared to that of bulk materials is desired. Different wet chemical methods areavailableforthesynthesis of spinel ferrite nanoparticles, suchas, chemical co-precipitation,sol–gel, hydrothermal, solvothermal, thermaldecomposition and microwavecombustion methods[1, 2]. These wet chemical methods are economic, easy, requires less time and low temperature, produces particles of nanometer dimensions and therefore now a days commonly used in the synthesis of magnetic nanoparticles of spinel ferrite.

Amongst these wet chemical methods, thesol–gel auto-combustion technique is one of the most convenient and effective method, involving a low reaction temperature(80°C–100 °C) and a rapid turn-around time for powder synthesis[3]. In the variety of spinel ferrite materials, cobalt ferrite is the unique spinel ferrite with inverse spinel structure, in which Co^{2+}ions occupy an octahedral [B] site. The high saturation magnetization,high permeability,high electrical resistivity,high Curie temperature, high magneto-crystalline anisotropy etc are the notable properties of nanocrystalline cobaltferrite[4].These properties are useful in many applications including magnetic recording media, magnetic sensors, magnetic memories, magnetic fluids, magnetic composites and catalysis, antennarods, permanentmagnets etc[5].

Thus, the present work reports on synthesis of nano-crystalline spinel structured cobalt ferrite sample by sol-gel auto combustion method using citric acid as a fuel. The results on structural, morphological and magnetic properties are reported in this work.

2. Experimental
The nano-crystalline cubic spinel structured cobalt ferrite ($CoFe_2O_4$) sample was prepared by sol-gel auto combustion method using citric acid as a fuel. AR grade chemicals such as cobalt nitrate ($Co(NO_3)_26H_2O$), ferric nitrate ($Fe(NO_3)_39H_2O$) and citric acid ($C_6H_8O_7$) were used for the synthesis. The metal nitrates to fuel ratio calculated using propellant chemistry was taken as 1:3. Ammonia solution was added to maintain the pH of the solution at 7. The as-synthesized powder is sintered at 550°C for 4 h and then used for further investigations. The detailed procedure is reported in the literature[6].

The prepared sample was characterized by X-ray diffraction (XRD) technique by Regaku model. The XRD patterns were recorded at room temperature in the 2θ range of 20° to 80° using Cu-Kα radiation (λ = 1.54056 Å). The magnetic properties of the cobalt ferrite sample were measured using pulse field hysteresis loop technique at room temperature.

3. Results and Discussions
3.1 Structural characterizations
The room temperature X-ray diffractions patterns of un-irradiatedand irradiated $CoFe_2O_4$ ferrite nano-particles are shown in Fig. 1. All the reflection peaks in the XRD pattern were indexed by using Bragg's law. The presence of planes (220), (311), (222), (400), (422), (511) and (440) in the XRD pattern reveals the cubic spinel structure of all the samples.It is also evident that all the reflection peaks are intense and sharp. No impurity peaks were observed thus the samples are single phase in nature[7].

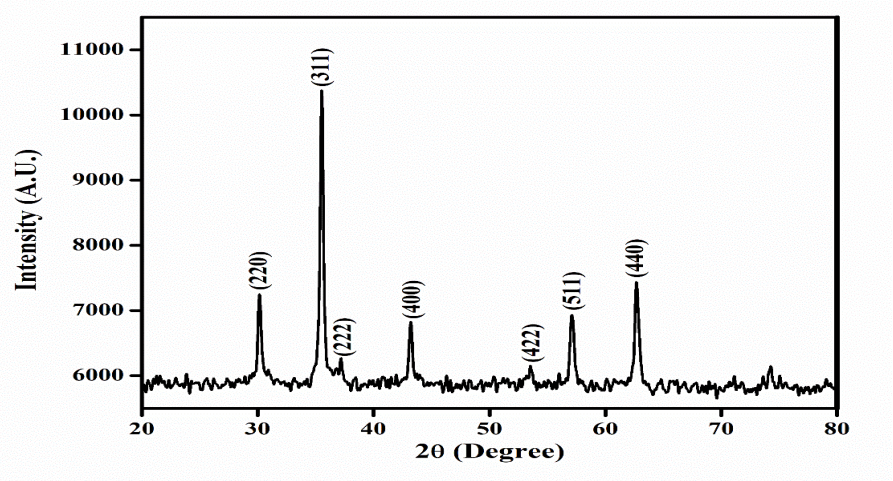

Fig.1. X-ray diffraction pattern of $CoFe_2O_4$

The Lattice constant (a) values of the cobalt ferrite samples was calculated using standard relation,

$$a = d\sqrt{(h^2+k^2+l^2)} \quad Å$$

where, (d) is interplanar spacing;(h k l) is Miller Indices.
The obtained values of the lattice constant (a) are tabulated in Table 1.
The unit cell volume (V) was calculated by using the following equation

$$V = a^3 \quad Å$$

where, V is the unit cell volume, a is the lattice constant.
The X-ray density (d_X) was calculated by using the relation and values are summarized in Table 1;

$$d_x = \frac{Z \times M}{V \times N_A} \text{ gm/cm}^3$$

where, Z is the number of molecules per formula unit (Z = 8 for spinel system),M is molecular mass of the sample,V= $a^3$is the unit cell volume,$N_A$is the Avogadro's number.

Table 1. Lattice parameter (a), Average particle size (t), Unit cell volume (V) and X-ray density (d_x) of $CoFe_2O_4$

a (Å)	**8.28**
t (nm)	26
V (Å^3)	588
d_x (gm/cm^3)	5.19

The crystallite size of cobalt ferrite powder was calculated using the Debye-Scherer's relation for small and uniform sized cubic crystals mentioned below;

$$t = \frac{0.9\lambda}{\beta \cos\theta}$$

where, λ is wavelength of the Cu-Kα radiation, β is the full width of the half maximum, θ is Bragg's angle. The obtained values of the particle size are presented in Table 1 and are having good agreement with the literature [8].

Magnetic characterizations

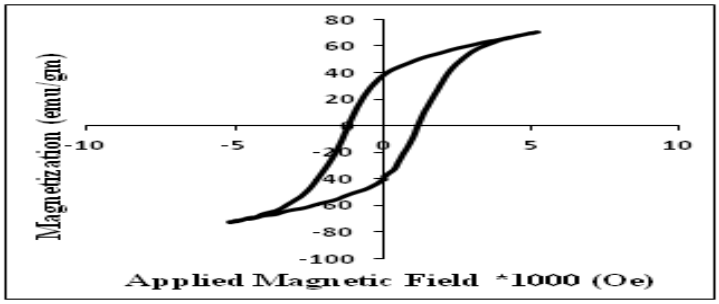

Fig. 2 The M-H plot of the $CoFe_2O_4$nanoparticles

The magnetic properties of present cobalt ferrite sample were recorded using pulsed field hysteresis loop technique at room temperature with the applied field ranging upto 1000 kOe is shown in Fig. 2.Saturation magnetization(M_s), remenance magnetization(M_r) and coercivity(H_c) values are reported in Table2. The magnetic hysteresis(M–H) loop confirms that the sample possessferro magnetic performance with soft magnetic nature[8, 9].

Table 2: Saturation magnetization (M_s), coercivity (H_c), remenance magnetization (M_r) of cobalt ferrite nanoparticle

M_s (emu/gm)	M_r (emu/gm)	M_r/M_s	H_c (Oe)
68.70	40.50	1.69	1096

4. Conclusion

The spinel structured cobalt ferrite nanoparticles were successfully synthesized by sol-gel auto combustion method usingcitric acid as a fuel. Pure phase formation of spinel type cobalt ferrite with no impurities was observed from X-ray diffraction pattern. The average crystallite size of the prepared sample was found to be 26 nm. The values of saturation magnetization (M_s) and coercivity (H_c) were found to be 68.70 emu/gm, and 1096 Oe respectively.

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Study of thermal properties of Polyaniline-Poly vinyl acetate blend

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Abstract

An attempt was made to study the thermal properties of Pani-PVAc blend. Pani-PVAc blends were prepared by chemical synthesis method. Thermo gravimetric analysis was carried out for various polymers to determine the wt. loss at different temperatures. The themal analysis of pure conducting polymer was recorded for comparison as original standard. TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

Keywords: Pani-PVAc blend, Chemical synthesis, TGA/DTA.

1. Introduction

In last few decades, there has been a great deal of increasing interest in the synthesis and characterization of conducting polymers because of their applications in organic batteries, sensors, microelectronic devices, electro catalysis and also their electrical, electrochemical and optical properties [1].

Earlier the blends of PVC and PPy were prepared by oxidative chemical polymerization of pyrrole with an oxidizing agent $FeCl_3$. Ionic conductivity study of such material was carried out and studied the effect of oxidizing agent on conductivity of the films [2]. Polyvinyl acetate (PVAc) is used extensively in coatings, adhesives [3] and films. The carbonyl group (C=O) in the structure of PVAc forms hydrogen bonding (like polyamide) with amine and hydroxyl groups and this may also enhance miscibility with polyaniline. Hence, PVAc has been chosen for blending with Pani.

There are many methods of blending polymers but only limited techniques can be applicable for conducting polymers. PVAc is soluble in high dielectric constant solvent such as methanol. However, Pani is not soluble in this solvent even after modification with suitable dopants. Hence, a new method has been adopted for blending these two components [4].

2. Experimental

Poly vinyl acetate obtained (M.W. 40000), 2 gram dissolved in 100 ml methanol was taken in a beaker. To that, 0.51 gram of monomer aniline (0.005M) and 5 ml of 1 N HCL solution were added. About 25 ml of 0.1 M initiator ammonium per sulphate was added slowly to the above reaction mixture under constant stirring. Similar reactions were carried out with aniline concentration of 0.01M, 0.02M and 0.05M and 10 ml of 1N HCL, 20 ml of 1N HCL, 50 ml of 1N HCL solution. The aniline to ammonium per sulphate molar ratio in all the above reactions was 1:1, so as to reproduce same conditions in all cases.

The polymerization of aniline was carried out simultaneously in each vessel. The reaction was carried out at ambient temperature for 10 Hr. The blend was precipitated in distilled water, filtered, washed with distilled water several times and dried in a vacuum till moisture was removed. The green mass of each composition of the blend was crushed in mortar and pestle to a fine powder.

Thermo gravimetric analysis was carried out for various samples to determine the weight loss at different temperatures. All the measurements were carried out using TG/DTA (Seiko II SSC 5100 Japan model). The samples used were in the form of powder and tested under nitrogen atmosphere at the rate 10^0/min from room temperature to 500^0 C.

3. Results

The interaction between the polymers can also be noted from the degradation curves through TGA studies. Given figure shows the wt. loss and thermal stability in the blend. Thermogram was scanned under the nitrogen atmosphere at the rate of 10^0/min (heating) and the temperature range were 25^0C to 500^0C. Thermal data is given in the table. The TGA curve of Pani and PVAc shows three steps wt. loss. The first wt. loss in both the prestine polymers at 150^0C to 300^0C was owing to the loss of absorbed moisture and solvent from room temperature to around 300^0C. The second stage occurring at 350^0C, decreased from 68.75^0C to 52^0C and the broad DTA peak of PVAc shows that the melting owing to the loss of acid dopant in Pani salt, as there is very less interaction between N atom and Cl atom and degradation of PVAc chain. The final degradation of the polymers occurs from 350^0Cto 500^0C. S. H. Goh, etal [5] has studied the TGA of the same blend film. It was observed that the nature of the degradation pattern matches very closely to our data.

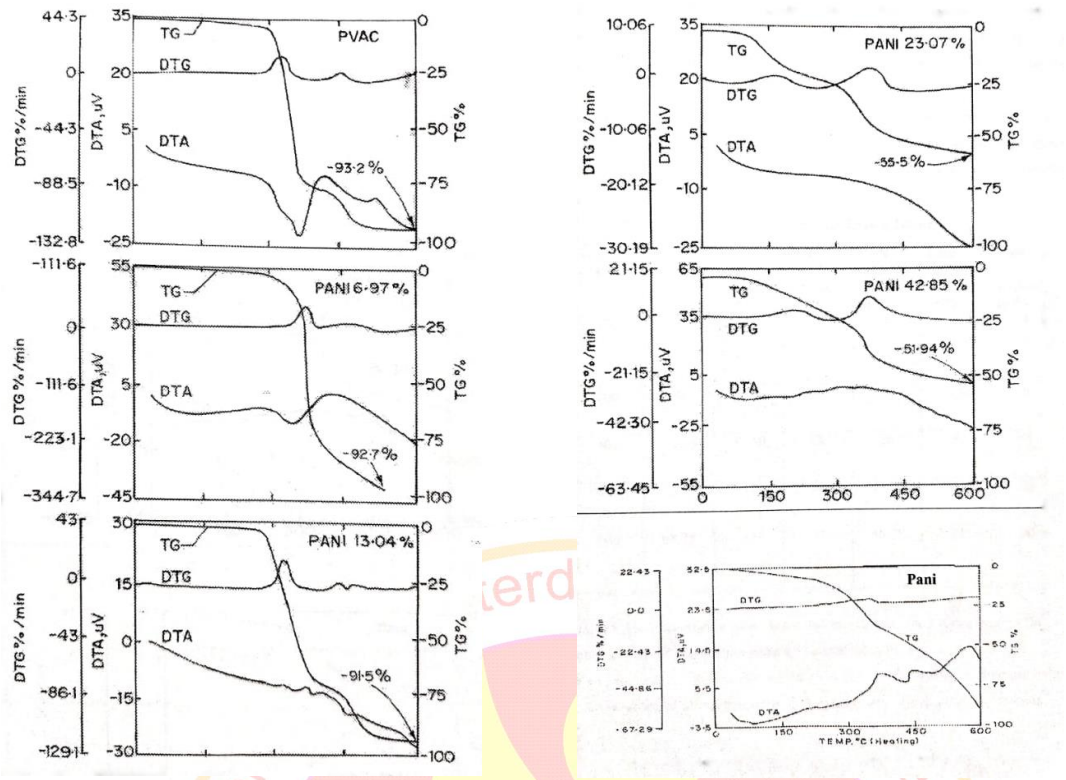

Figure: Thermogram of Pani-PVAc blends

It was noticed that as the percolation of Pani in the blend is increased, the wt. loss decreased from 68.75^{0}C to 52^{0}C and the broad DTA peak of PVAc shows that the melting temperature was reduced on modification. From the thermogram it was observed that the blend shows the improvement in thermal stability.

Table: Thermal data of Pani-PVAc blend

S.N.	Temp (^{0}C)	PVAc wt. loss in %	Pani (3%) wt. loss in %	Pani (7%) wt. loss in %	Pani (13%) wt. loss in %	Pani (68%) wt. loss in %	Pani wt. loss in %
1	100	1	1	1	3	2	3
2	200	4	2	6.25	14	13.50	6
3	300	10.50	36.50	29	26	30	18
4	400	37	44	48	43.75	43.50	40
5	500	68.75	63	72	56.25	52	60

As the PVAc concentration increases in the blend, and blend concentration follows the same trend of degradation pattern as observed in PVAc. The wt. loss found in the blend concentration is not observed in prestine polymers, suggesting the presence of interaction between the polymers, which alters the degradation pattern.

4. Conclusion

TGA/DTA data shows that, interaction between the polymers, altered the rate of degradation and wt. loss decreases as the PVAc concentration increases in the blend i.e. thermal stability increases. The decrease in wt. loss was observed from 68.75% to 52%.

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Recent Advancement of Electrochemical Biosensors Based On Conducting Polymers: A Mini Review

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Abstract :

Day by day humans life style become fast due to this fast life style people forgot to take care of their health. From the health care point of view the development of biosensors is necessary. The various conducting polymers showed prominent response in the field of biosensing due to their great electrochemical, physical, optical and thermal properties. The many researchers try to enhance the sensitivity by adding the dopant or taking their composition such as TiO2, SiO2 andMnO2 etc. These mini-reviews give the information about recent development in the field of electrochemical biosensors based conducting polymer. Also tell us about the process of biological sensing and their different electrochemical technique for detection.

Keywords : electrochemical biosensors, paper based biosensor, urea biosensor, glucose biosensor, cancer biosensor.

1.Introduction

The health care point of view biosensing is necessity in our everyday life. Now a day's world suffering from most silent health related issues one of them is diabetes can damaged the heart, blood vessels, eyes, kidneys and nerves, leading to disability and premature death [1]. Generally most of the patient insulin which is utilized by the cell to get glucose inside cell decreases so that cell cannot utilize glucose. Hence the sugar level in the blood increases. The patient health is depends on glucose concentration that related to the symptoms of diabetes mellitus [2]. The classification of various types of biosensors which are shown below.

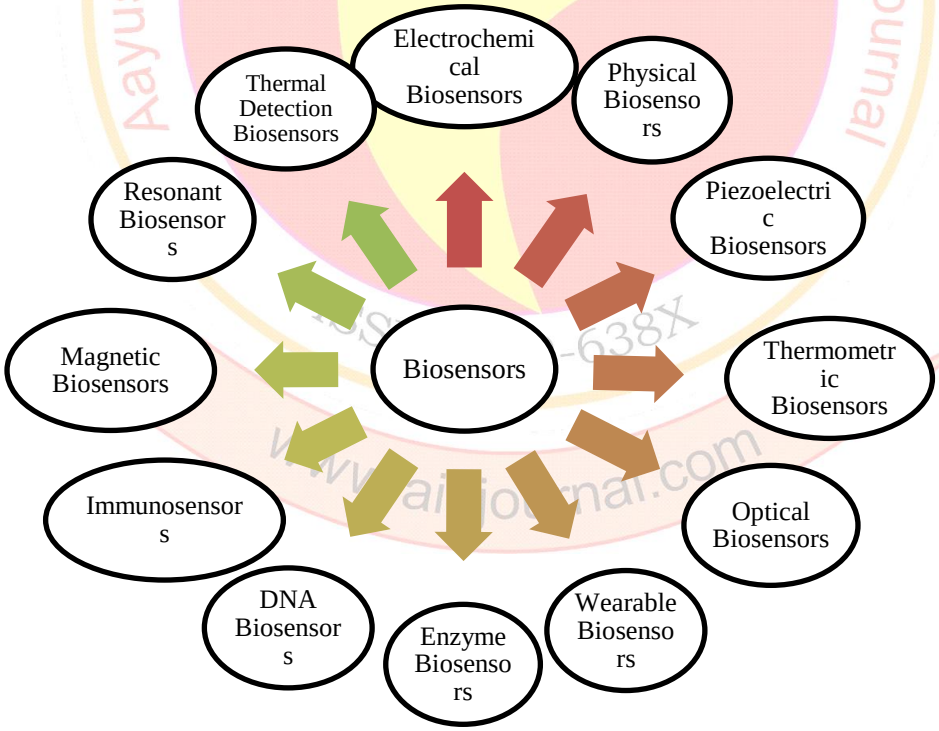

Figure1.https://www.elprocus.com/what-is-a-biosensor-types-of-biosensors-and-applications/

Paper based diagnostic technologies are affordable, robust, rapid, user friendly and scalable for manufacturing for the determination of blood glucose in real time is very important for diabetic patient [3]. Polymers are studied in the different field of polymer science that is polymer chemistry and polymer physics, biophysics and materials science and engineering. Conducting polymers are attracted more interest in the field

of gas sensor, biosensor, actuators, super capacitor and electronic devices due to their unique attribution, ease of production and often ductile nature and light weight [4]. A variety of conducting polymer such as polyaniline, polypyrrole, polythiophene and PEDOT (Poly-3,4ethylenedioxythiophene) has given more attention toward nanoscience and nanotechnology [5]. There are a lot of progress remain in the field of biosensor. Now a day's researcher focus on PEDOT polymer has been a significant and promising one of the conducting polymers family due to its high electrical conductivity, superior optical transparency, long term electrochemical stability, highly mechanical strength and very less study has been happened using graphene and titania nanoparticles [6]. The homogeneous entrapment on the paper, antistatic and electrochemical property has turned a new page for the paper based biosensing application [7-9]. Different type of oxides are radially used in the field biosensor such TiO_2, MnO_2, ZnO_2, iron oxide and phytic acid. Titania is identifying better dopant in the PEDOT-PSS polymer to enhance the conducting ability by several order of magnitude and biosensing and humidity response due to its porous morphology. Moreover reliable glucose detection methods with high sensitivity, excellent selectivity, good stability, fast response and portability have been the focus of scientist [10].

1. Electrochemical Biosensors

The biosensor is device of biological recognition element using transducer [11]. The basic principle of electrochemical biosensors that convey the biological signal such as enzymes, tissues, cells etc. that can detect with the help of transducer element then transducer signal may converted into an electric signal and amplified with the help of detector circuit; get physical parameters and measurements from computer software for the analysis [12].

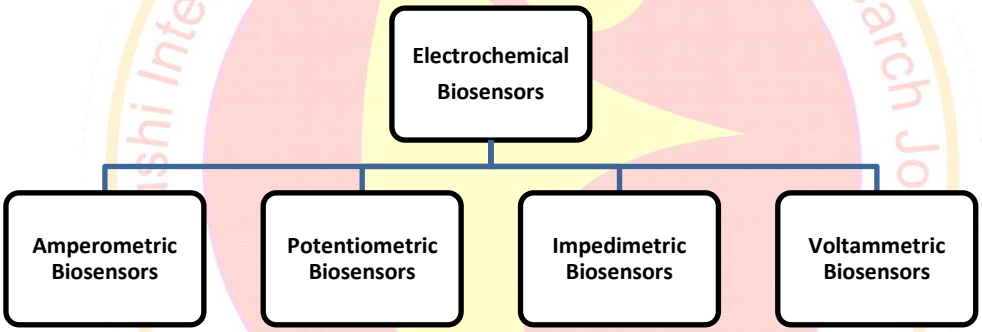

Figure 2. These show the different types electrochemical biosensors.

The commonly used paper substrate for the fabrication of electrochemical biosensors is whatman No.1 chromatography paper. This whatman paper having uniform structure, excellent wicking properties, smooth surface, high content of α- cellulose and free hydrophobic binders [13]. Researcher have special attention towards that certain enzymeless glucose sensors have numerous advantages of high sensitivity, simplicity in the development, high stability and no need to be immobilize enzyme [14].

2. Process of Biological Sensing:

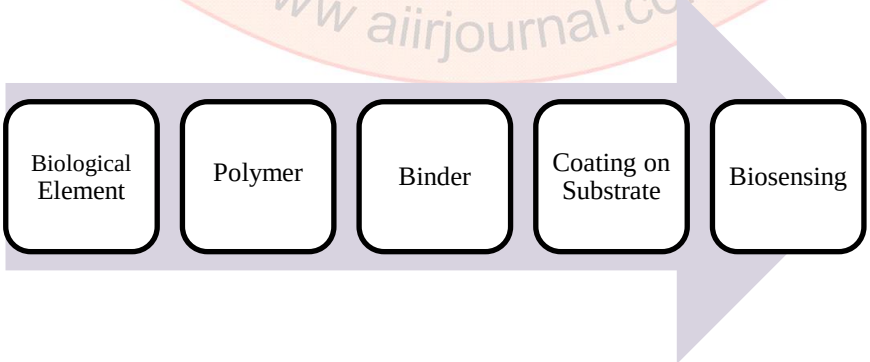

Figure 3. These show the procedure of biological detection.

Firstly take the biological element (e.g. glucose oxidase, antigen, H_2O_2, etc.) that use as sensing then this element attach to the surface of polymer with the help binder (e.g. n- butyl carbitol , ethyl cellulose, polyvinyl alcohol, etc.) after that it will be coated with the help of different method such as layer by layer [15], chemical bath deposition [16] , spin coat [17] and SILAR [18]. The biosensing response check by using electrochemical method. To increase the efficiency and capacity of the biosensor system certain dynamic and static measurement are necessary. Selectivity, sensitivity, linearity, response time, stability and reproducibility are the different characteristics of biosensors [19].

4. Biosensors:

According to the properties there are various types of biosensors and their recent development in most focus biosensor can be discussed as follows.

1] Urea Biosensor:

X. Hung and his team developed a disposable conducting paper based analytical device for measuring the salivary uric acid in human body based on electropolymerization of PEDOT and graphene composite on the ITO substrate. The electrochemical behavior of uric acid at different working electrode was determined by cyclic voltammetry in PBS with Ph 7.5. The linear range for uric acid detection is 2-1000 µM. The result indicated that the developed device is promising for non invasive monitoring of salivary uric acid [20]. The researcher Zhybak M. and his coworker developed creatinine and urea biosensors based on polyaniline-Nafion-Cu composite.Immobilisation of enzymes was shown the important step in the development of biological sensor. The electrochemical measurements done with the help of three electrode system and analytical performance were measured. It shows high selectivity for creatinine and urea biosensor. The sensitivity of urea and creatinine biosensor are found to be 112±3.36 mA $M^{-1}cm^{-2}$ and 85±3.4 mA M^{-1} cm^{-2}.The response time for analytes to be 15 sec and limit of detection foun to be 0.5 µM. The linear concentration range to respond the biosensor to be 1 to 125 µM [21]. Singh A.K. and his team studied urea biosensor and its application in milk sample. This sensor developed with the help of Fe_3O_4/MWCNT- polyaniline nanocomposite film. This composite polymer with enzyme characterized by scanning electron microscope, fourier transform infrared shows strong sharp band around 1031.09cm^{-1} and different electrochemical techniques were used for the analysis. The linear range of urea biosensor found to be 1.0-25.0 mM with detection limit 67 µM. The biosensor response gives great result up to 40 days with 90% activity and it can be responded up to 60 days with 70% activity [22]. The researcher Botewad S.N. and his coworker reported about fiber optic urea biosensor modified by polyaniline-cladding. The active cladding was obtained by depositing uniform layer of polyaniline. In UV-vis spectrum shows two peaks at ~ 227nm and 280 nm. The two broad diffraction peaks occur between 20 and 40°. The exposure time response for each concentration of urea solution was ~120 sec. It shown variation in absorbance at ~250 nm with different concentration urea sample. The stability of sensor tells us about that the sensor is stable about 28 days. It shows lower sensing limit up to 100 nm [23].

2] Cancer Biosensor :

S. Kumar and his team developed a flexible, lightweight and disposable paper based elctrode modified with nFe_2O_3:PEDOT:PSS for the detection of carcinoembryonic antigen (CEA), a cancer biomarker. The electrochemical response measured with the help of chronoamperometry method and concluded the sensitivity of 2.1µAng^{-1}mL.cm^{-2}which is nearly 4.8 times lower than electrochemical paper electrode. The electrical conductivity was found to be 2.4 ×10^{-2} Scm^{-1}. The proposed electrode was verified by ELISA for the CEA detection in serum sample of cancer patients [24]. S. Kumar and his team developed PEDOT-PSS and reduced grapheme oxide (RGO) composite based paper sensor studied for cancer biosensor. The incorporation of RGO into the conducting paper results in improved electrochemical performance and signal stability. The conductivity found to be 1.16×10^{-4} S$cm^{-1}$to~3.57×10^{-2} Scm^{-1}(nearly 300 times increases) on the treatment with ethylene glycol increase in electrical conductivity is due to the conformational rearrangement in the polymer [25]. Kivrak E. and his Coworker studied aptamer based electrochemical biosensing on human non small cell lung cancer. The sensing response done by using polyacrylonitrile and polypyrrole polymers with the help of nanofiber modified disposable pencil graphite electrodes. The surface morphology of composite nanofibers was confirmed

using scanning electron microscopy. Analytical performance of the aptasensor achieves high sensitivity and sample of optimization condition were tested. The aptasensor showed low detection limit of 1.2× 10^3cells/mL [26]. Soni A. and his team gives information about cancer biomarker detection. The sensing of cancer biomarker done with the help of polyaniline-MoS_2 hybrid nanostructures. The composite material detect the chronic myelogenous leukemia (CML) using electrochemical impedance spectroscopy method. The composite material has wide range of target DNA concentration (10^{-6}-10^{-17}M).The low limit of detection found to be 3×10^{-18} M. This biosensor was found the high stability of 6 weeks and retained 87.5% to the original signal [27].

3] **Glucose Biosensor:**

L. Yang and his co-worker studied an electrochemical two step synthesis route to produce CuNPs(copper nanoparticale) /PEDOT/PA(Phytic acid) nanocomposite through electrochemical oxidation of EDOT and PA substrate and reduction of CuNPs. This shows a wide analytical range (5-403µM), high sensitivity upto 79.27 $\mu A.\mu M^{-1}.cm^{-2}$, low detection limit of 0.278µM and response time of the glucose sensor 4 sec. The hospital provided glucose value 3.8mM, 5.5mM, 7.5mM and biosensor detected values 3.6mM, 5.3mM, 7.6mM matches approximately 98% for enzymeless glucose sensing [28]. J. Liu and his co-worker studied organic thin film transistor for glucose sensor with the help of spin coating technique using PEDOT conducting polymer film. This showed that a linear increase in the OTFT drain current was observed resulting from the increase in glucose concentration. This developed glucose sensor showed rapid response time within 20 sec and give high sensitivity of 1.65 µA per mM. The result was indicated that the OTFT based glucose sensor retain the enzyme bioactivity [29]. Z. Amirzadeh and his co-worker developed a non-enzymatic glucose sensor based on a pencil graphite electrode (PGE) using PEDOT-PSS/CuO/MWCNTs composite. A cheap electrode, as well as simple modification process, make the developed glucose sensor economic as the modifier film were simply prepared by drop coating of the modifier suspension on the surface of a pencil graphite electrode. At an applied potential of +0.70V gave an acceptable sensitivity of 663.2 µA $mM^{-1}cm^{-2}$ in wide linear range upto 10mM [30]. Popov et.al. has prepared, rGO in combination with PANI,Nafion and Gox for an amperometric biosensor. The developed glucose biosensor showed a wide linear range (0.5-50) mM, low limit of detection 0.089 mM, good selectivity, better reproducibility, and good stability. The PANI nanostructure and rGO dispersion is proved to be an excellent material for the glucose biosensor [31]. Yang J and his team developed non-enzymatic an amperometric glucose biosensor. The investigation done with the help of polypyrrol nanowires electrode loaded with nickel hydroxide nanoflakes by chemical bath deposition method on substrate. The surface morphology of the composite material characterized by scanning electron microscopy and verified by X-ray photoelectron spectroscopy. The electrochemical behavior showed excellent performance and result tell us about the current was increased from 0.4 V to 0.7 V in glucose solution. The sensing characterization was evaluated by its dynamic detection range, stability, selectivity and reproducibility.The performance of the glucose biosensor detected range of 0.001-4.863 mM with sensitivity 1049.2 $\mu A\cdot mM^{-1}\cdot cm^{-2}$ and low detection limit found to be 0.3 µM [32]. Sheng L. and his team developed enzyme-free glucose sensor with novel nanocomposite of Ni(OH)2 over reduced graphene oxide and PEDOT with the help of electrodeposition method and show that Ni(OH)2 nanoparticles uniformly deposited on PEDOT-RGO hybrid film for detecting glucose. This sensor gives ultrafast response time (< 1 S), low detection limit, a wide linear range up to 7.1mM and the sensitivity found to be 346 µA mM^{-1} cm^{-2} [33]. Paul G. and his coworker developed the conducting paper-based biosensor using PEDOT-PSS grafted reduced graphene oxide-titanium dioxide [rGO-TiO2] nanohybrid. The different dopant like ethylene glycol, methanol and glycerin were doped and their effect on the conductivity of sample was investigated. Electrochemical results show that modified conducting paper (CP) shows high sensitivity with a low limit of detection 0.01mM [34]. The information regarding the other biosensor can be given in the following table.

Table : The below table represent the development in biosensor based conducting polymer.

Sr. No.	Material	Biosensor Analyte	Limit of Detection	Stability	Response Time	Linear Range	References
1.	(P(3HT-co-3TAA))	Urea	5mM	-	6 min	1.3-3.5 mM	[35]
2.	polythiophene-AgBr (PT-AgBr)	glucose	310 nM/10.4 µA mM^{-1} cm^{-2}	14 days	<1 min	370 nM/756 µA mM^{-1} cm^{-2}	[36]
3.	PANI-MMT	glucose	0.1 µM	40 dayes	-	10 µM-1.94mM	[37]
4.	Polythiophene	small RNA	0.7 pM miR-221	-	1.2 h	1-100 pM	[38]
5.	functional Polythiophene	cancer cell (sialic acid)	10 cells mL^{-1}	-	10 min	$1x10^1$-$1x10^6$ cells mL^{-1}	[39]
6.	pdAg NSPs-PPy	Dopamine	0.0258 -0.0860µM	-	-	0.001-200 µM	[40]
7.	Pt-PPy-Uri-Grap	Uric acid	0.541$nmol^{-1}$	-	-	0.002 to 0.024 $nmol^{-1}$	41]
8.	Ppy-CS-TiO_2	non enzymatic Glucose	614µM	14 days	<3 sec	1-14 mM	[42]
9.	PPY-(MWCNT-COOH)	DNA	0.08 µmol L^{-1}	15 days	150 sec	0.2–100.0 µmol L^{-1}	[43]
10.	PPY-NrG	epirubicin	1.0nM	-	-	0.004-55.0 µM	[44]
11.	PPy-PtPd	H_2O_2	(sensitivity)	60 days	-	2.5-8000 µM 1360.83 µA.mM^{-1}.cm^{-2}	[45]
12.	PANI-AuNPs	DNA	0.01fM	10 week	5 Min	1000-0.001 pM	[46]
13.	GRA-PANI	glucose	2.769 µM	-	400 sec	10.0 µM-1.48 mM	[47]
14.	PANI-CQD	dopamine	0.1013 µM	-	50-300 sec	0.1-100 µM	[48]
15.	PANI-Ni-MOF	HCV	0.75 fM	-	15 min.	1f -100 nM	[49]
16.	TiO_2/ PANI / GCE	glucose	18 µM	30 days	10sec	0.02 mM to 6.0 mM	[50]
17.	HCS@PANI	AChE	0.16 ng mL^{-1}	15 days	-	1.0 ng mL^{-1} to 10 µg mL^{-1}	[51]
18.	rGO-PANI	Hg^{2+}	0.035 nM	-	-	0.1 nM to 100 nM	[52]
19.	SiO_2($LuPc_2$)PANI-(PVIA)-CNB	Glucose	0.1 mM	45 days	~2 sec	1-16 mM	[53]
20.	GCE/PEDOT:PSS-AuNPs	xanthine	3.0×10^{-8}	4 week	5 min	5.0×10^{-8} to 1.0×10^{-5} M	[54]

Conclusion:

The present review article, we have discussed the electrochemical paper based biosensors due to their unique properties such as low cost, light weight , easily portable and gives instant result. Also discuss the procedure of analyte the biosensing element these can be done with their various coating methods. The sensitivity , selectivity, stability , limit of detection , linear range and fast response time in biosensor can be understood on different conducting polymer such as Poly(3,4-ethylenedioxythiophene), Polypyrrol, Polyaniline and Polythiophene with their composition. A very few of the biosensors were achieved sensitivity, fast response time and made their stability. The researchers need to focus on this parameter and try to evolve another method to reach the efficiency of biosensor.

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AC conduction of Polythiophene composite thin films doped with Bromine

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Abstract
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges. The impedance spectra of PTh-PVAc doped with Bromine films (323-343K over frequencies from 0.1-200 KHz) found to consist of only one arc suggest various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. Comparison of impedance spectra was done on the basis of various AC conduction parameters
Keywords: Poly(vinyl acetate) (PVAc), Polythiophene (PTh), Bromine, dc,ac

1.Introduction
The conjugating polymers thin films have been studied by many workers, because of special electrical properties, considerable thermal stability and oxidation resistance that are favorable in applications such as optoelectronic, biosensors, electro chromic displays and chemical sensors [1-3]. Roncali [4] surveyed the electrochemical synthesis and the electronic properties of substituted PThs in 1997. The overall review on chemical synthesis of PThs and applications as chemical sensors, organic memory devices, photo conductivity, etc., is given by many researchers [5,6]. Temperature-dependent conductivity, in the case of ion conducting solid electrolytes, is more completely explained by Vogel-Tamman-Fulcher (VTF) [7-9] rather than other models. Ryu et al. [10-11] predicted that PTh powder prepared by electrochemical method, shows better results than that prepared by the fast oxidation method. The present paper focuses on comparison in electrical properties of Polythiophene composite thin films doped with Bromine.

2 Experimental Procedures
2.1 Sample preparation
Thin solid films of PTh-PVAc doped withBromine (3.5, 5.5, 10.4, 14.9, 18.9 and 22.5 wt %) were synthesized by chemical oxidative polymerization method in order to study the ac conduction at various temperature ranges.

2.2 ac conductivity measurement
ac conductivity of the samples were recorded on LCR meter (Wayne Kerr, UK) having range of frequencies from 0.1-200 KHz at temperature in the range 323-343K with heating rate 1°C min^{-1}. A constant voltage is applied to the sample and corresponding impedance and phase angle was measured at constant temperature for all frequency range. ac conductivity of the pure PTh-PVAc sample and doped with different Bromine wt % was measured at various temperatures 323-343K by applying a wide range of frequencies from 0.1-200 KHz.

3 Results and discussion
3.1 ac conductivity of PTh-PVAc films doped with Bromine
Fig.3.1.1-3.1.3 shows Nyquist plots of the samples DD7, DD8 and DD9 and it is observed that the resistance of all the samples decreases with the rise of temperature. From the fig., it is observed that the sample shows similar trend of semicircle for temperature 323-343 K. Many researchers [12-15] reported a similar behavior in the Nyquist diagram. The impedance spectrum of PTh-PVAc films doped with Bromine is found to consist of only one arc.

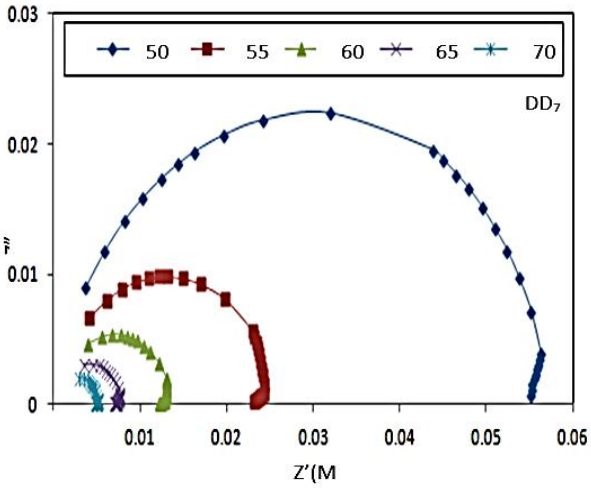

Fig.3.1.1

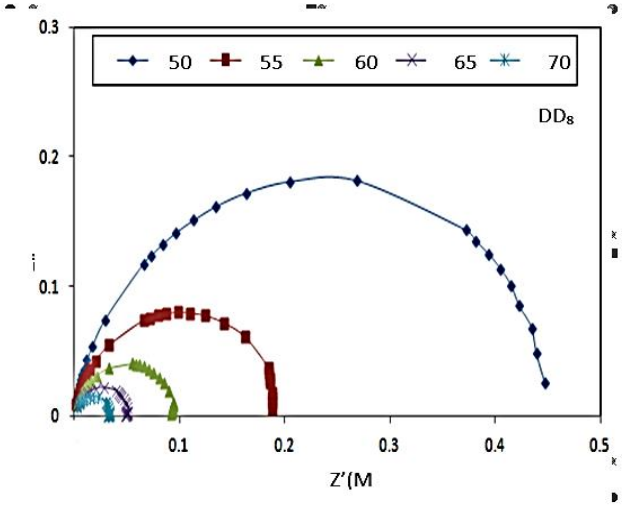

Fig.3.1.2

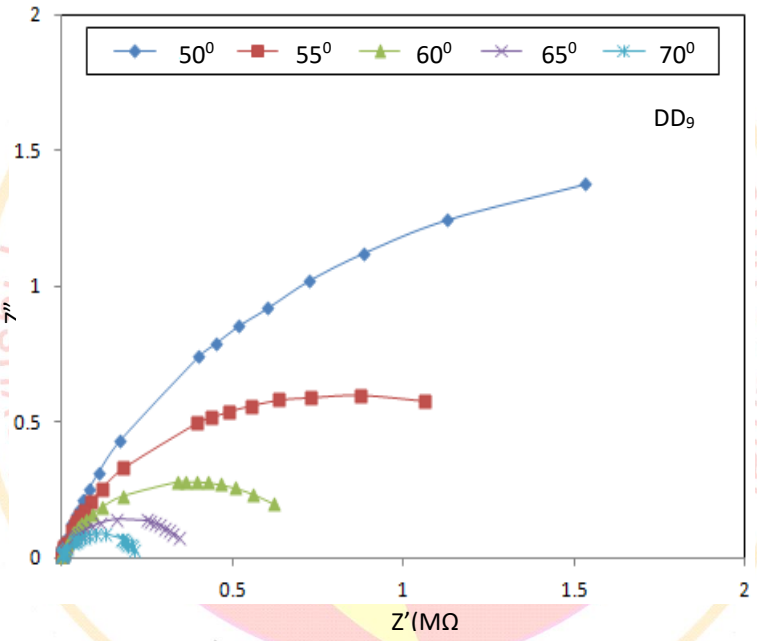

Fig.3.1.3

Also it may be argued that as the temperature increases for PTh-PVAc films doped with Bromine reduces the arc of semicircle indicating the increase in conductivity. The impedance spectra in figure 5.24 exhibited a single capacitive time constant at high frequencies and a finite length transport impedance with a permeable boundary at the low frequency end. The basic features of the spectra seem to be qualitatively similar to those obtained by Johnson et al. [14] for polythiophene films and Komura et al [23] for polypyrrole polystyrenesulfonate composite films. The arcs are found to be highly depressed for all films for different temperatures which indicate the distribution of relaxation times [15]. From the semicircle, the values of bulk resistance are calculated and noted in table 3.2.2. The variation of log f versus Z' at different temperature is as shown in fig 3.1.4-3.16.

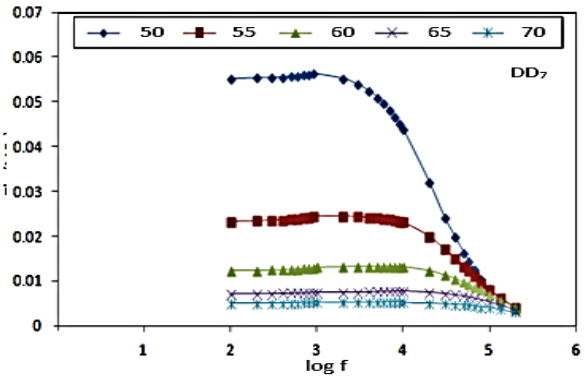

Fig.3.1.4

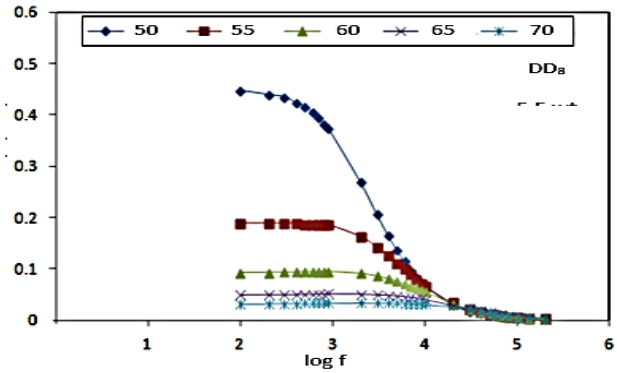

Fig.3.1.5

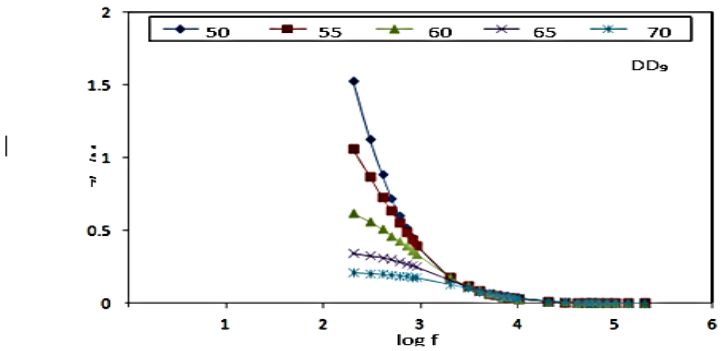

Fig.3.1.6

From the figure it is observed that the pure PTh-PVAc sample shows the wide variation of resistance with all frequencies. The resistance of the sample is found to be decreased with increase in frequency. Also as the concentration of the dopant Bromine is increasing, the sample constitutes much lesser resistance for increasing frequencies. The magnitude decreases on increasing temperature in the low frequency range which merges in the high-frequency region irrespective of temperature. This nature may be due to the release of space charge [16].

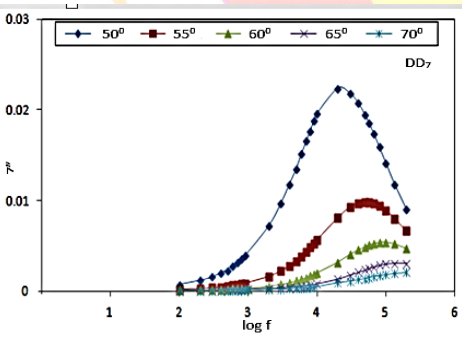

Fig.3.1.7

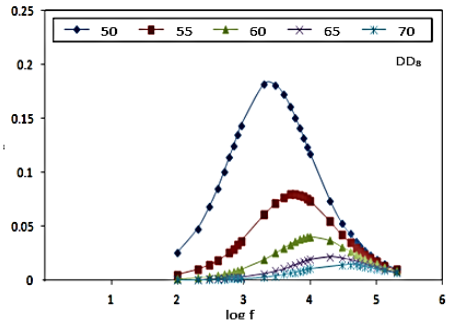

Fig.3.1.8

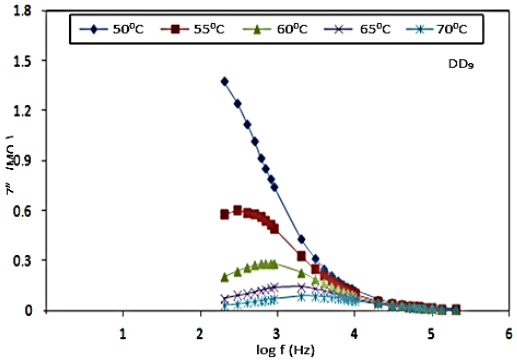

Fig.3.1.9

The reduction in barrier properties of the materials with rise in temperature may be a responsible factor for enhancement of a.c. conductivity of the materials at higher frequencies [17-18]. Further, in the low frequency region, there is a decrease in magnitude with rise in temperature showing negative temperature coefficient of resistance (NTCR) behavior [19]. This behavior is changed drastically in the high frequency region showing complete merger of plot above a certain fixed frequency. The variation of log f versus Z" is as shown in fig.3.1.7-3.1.9 which shows asymmetric peaks at different temperatures. Each peak is associated with a maximum frequency called as relaxation frequency. As the temperature increases the relaxation frequency is found to be shifting towards higher frequency [20-21]. The relaxation frequency (fr) follows the Arrhenius behavior as same in **equation no 3.2.1**. This equation is explored to find out the dielectric relaxation activation energy (ΔE) and relaxation time (τ).

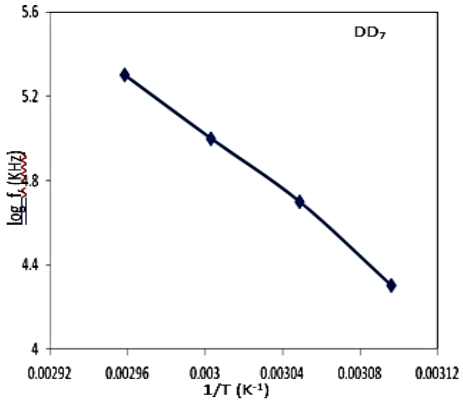

Fig 3.1.10

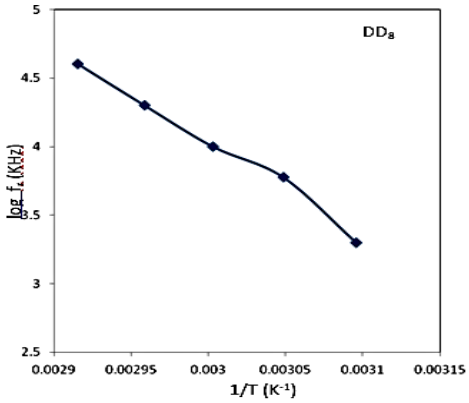

Fig 3.1.11

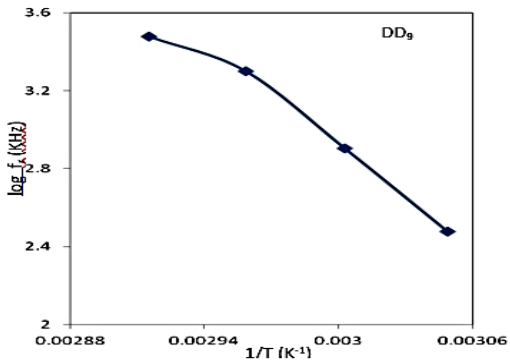

Fig. 3.1.12

The variation of 1/T versus log fr for samples DD7, DD8 and DD9 in fig.3.1.10-3.1.12. shows a straight line nature [20-22]. The values of peak frequencies (log f) are plotted against the 1/T as shown in fig 3.2.10-3.2.12. From this straight lines dielectric relaxation activation energy (ΔE) and relaxation time (τ) is calculated and tabulated in table 3.1.1.

Table 3.1.1: Dielectric relaxation activation energy and Relaxation time of PTh-PVAc with doped Bromine

Sr.No.	Bromine wt %	ΔE (eV)	τ (μs)
1	3.5	0.6224	2.51
2	5.5	0.5985	17.78
3	10.4	0.6619	199.52

From the table it is observed that, dielectric relaxation activation energy and relaxation time is maximum for the sample 10.4 wt % of Bromine and minimum for 3.5 wt % of Bromine.

Table 3.1.2: Bulk resistance and Bulk capacitance of PTh-PV Ac doped with Bromine at different temperature

Bromine wt %	323K		328K		333K		338K		343K	
	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)	R_b(KΩ)	C_b(pF)
3.5	57	139.7	24.2	131.6	13	153.1	7.9	150.2	5.3	-
5.5	450	176.9	185	172.1	98	180.3	51.8	153.7	35	113.7
10.4	3800	-	1700	312.2	750	303.3	380	209.5	225	235.1

The values of bulk resistance (Rb) and bulk capacitance (Cb) at peak frequencies are noted in table 3.1.2.From the table it is observed that the bulk resistance of the sample is decreasing as the temperature increases but the bulk capacitance of the samples almost remain constant at all temperature. The bulk capacitance is found maximum for the sample with 10.4 wt % of dopant Bromine.

4. Conclusion

The impedance spectra of PTh-PVAc for the samples 5.5, 10.4, 14.9 and 22.5 wt % of Bromine dopant consist of only one arc which may be taken to mean that the conduction processes have identical time constants. The variation of real axis Z' with log f shows negative temperature coefficient of resistance (NTCR). The variation of imaginary axis Z" versus log f shows asymmetric peaks at different temperatures that lead to Debye type of relaxation. On the basis of impedance spectra various parameters such as relaxation time, bulk resistance, bulk capacitance, dielectric activation energy etc. are calculated. Dielectric relaxation activation energy and relaxation time is maximum for 5.5wt% of Bromine and minimum for 10.4 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 5.5 wt % Bromine. Dielectric relaxation activation energy and relaxation time is minimum for 5.5 wt % of Bromine. The bulk capacitance is found to be maximum for the sample with 10.4 wt % Bromine.

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Synthesis And Experimental Evaluation of New Chalcone Derivative.

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Abstract:

Chalcones which are also known as α,β-unsaturated ketones is an important class of organic compounds and reported to possess a wide spectrum of biological activities such as antibacterial, antifungal, anticancer, anti-inflammatory etc. This compound is the main precursor in the synthesis of a variety of heterocyclic compounds, therefore it is very important to develop the latest strategies in the synthesis of Chalcone. Chalcones are a valuable molecule of medicinal importance due to presence of reactive ketoethylenic group –CO–CH=CH–, belonging to the flavonoid family. These reactive α,βunsaturatedketo function in chalcones are responsible for their biological activity. Chalcone can be synthesized by several methods using aldehydes and ketones as starting material.

This paper is focused about different methods of synthesis and characterization done by NMR, MASS and IR spectroscopic techniques and physical properties with experimental data such as melting point, molecular weight,density,refractive index and viscosity of chalcones.

Keywords :Chalcone, Molecular weight,Density, Refractive index, Viscosity etc.

Introduction:

Chalcones are the aromatic ketones which belong to 1, 3-diaryl-2-propen-1-ones, which forms the central core for the synthesis of variety of important biologically active compounds.They are ubiquitous in natural products and belong to the family of flavonoids examples - licochalcone and morachalcone[1,2].

The compounds with the backbone of chalcone have been reported to exhibit a wide variety of pharmacological activity including antimalarial[3],antibacterial [4], antitubercular[5,6], antiviral[7], anticancer [8], anti-inflammatory [9], antifungal [10], antioxidant [11], antileishmanial[12], antidiabetics[13] etc.. Furthermore, chalcones are industrially used as light stabilizing agent[14], Sweetening agent[15], analytical reagent in amperometry[16] ,spectrometric reagent[17] and synthetic reagent for the synthesis of pharmacologically active heterocyclic compounds[18–20].Chalcones are also present in nature and can be obtained from plant species like Angelica, Glycyrrhiza, Humulus and Scutellaria, which are widely used as traditional folk remedies. Chalcones are important intermediates for the biosynthesis of flavonoids. The bright yellow-colored chalcones found in many plants and in some families contribute significantly in the pigmentation of corolla. Chalcones can be synthesized in the laboratory by Aldol condensation between a benzaldehyde and an acetophenone in the presence of base.

In this study we synthesized,characterize and physical interpretation of the new substituted chalcone. The structure of the compound was characterized by NMR,MASS and IR spectroscopic studies.

Refractive Index along with density, molecular mass andviscosity is very useful in the evaluation of variousthermodynamics properties of chemical materials. The number of atoms, groups, radicals and bonds present in thecompound can also be calculated by refractive indexmeasurement.

Scheme for Synthesis of Chalcone derivatives :

Substituted acetophenone [21] and substituted benzaldehyde[22] were mixed in a round bottom flask. Ethanol was annexed and then sodium hydroxide.The mixture was stirred at room temperature, then left to stand for 24 h. The mixture was poured into a beaker containing crushed ice to quench the reaction and then neutralized with HCl. The precipitates formed were filtered, washed with distilled water and dried. They were then recrystallized fromabsolute ethanol to obtain the desired products[23-29].

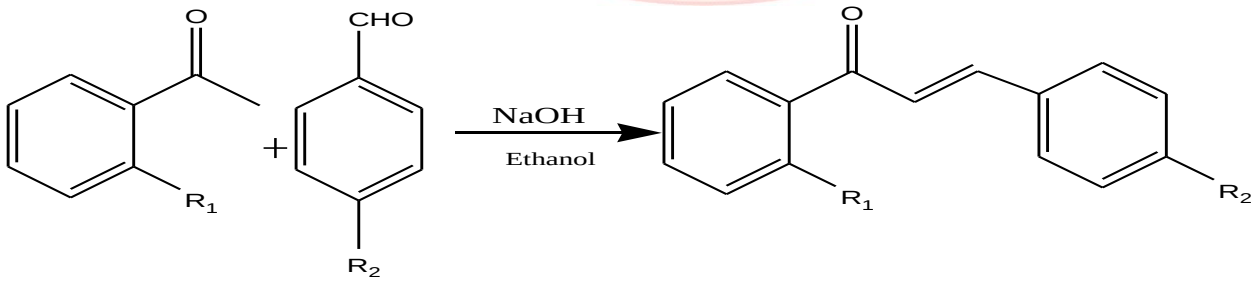


Table : 1 : Physical parameters of synthesized Chalcone.

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH and Cl	C15H11O2Cl1	258.5	75 %

Experimental

I.Synthesis :

Substituted chalconehave been synthesized andtheir general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, Table 3,Table 4and Table 5 shows thevarious physicalparameters of synthesized Chalcone.

II.Physicochemical studies:

The synthesized chalconewas recrystallized from DMF. The solvents dimethylformamide(DMF) and dimethylsulfoxide (DMSO) were used for thephysicochemical studies.The selection of solvents indifferent physicochemical study is due to solubility andother practical problems.

III.Density and Refractive index:

Solutions of differentconcentrations were made in DMF and DMSO of the synthesized compound. The density and refractive index ofsolutions were measured at various temperatures and various concentrations. Abbe refractometer was used to determine the refractive index of all the solutions. Table shows the refractive index of synthesized chalcone at various temperatures and various concentrations.

Results and Discussions:

I.Refractive Index of synthesized Chalcone:

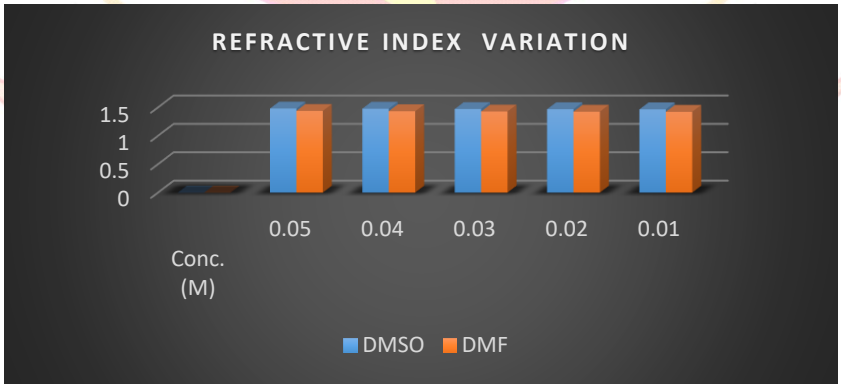
Values of refractive index are varies with various concentrations of solution at 313.15 K temperatures.The below table shows the dynamic values of refractive index.

Table :2 **Temperature: 313.15 K**

Conc. (M)	DMSO solvent	DMF solvent
	RI	**RI**
0.05	1.482	1.440
0.04	1.479	1.434
0.03	1.474	1.429
0.02	1.470	1.426
0.01	1.468	1.424

Space Graph:

Below space graph clarifies that the refractive index with solvent DMF is lesser than that of solvent DMSO.



II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table :3 **Temperature: 303.15 K**

Conc.	DMSO Solvent	DMF Solvent

(M)	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1209	12.349	0.9619	7.882
0.04	1.1199	12.297	0.9612	7.789
0.03	1.1192	12.274	0.9608	7.753
0.02	1.1187	12.135	0.9602	7.691
0.01	1.1170	12.058	0.9576	7.651

Table :4 **Temperature: 308.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1204	11.190	0.9642	7.281
0.04	1.1201	11.082	0.9644	7.202
0.03	1.1193	11.031	0.9633	7.139
0.02	1.1188	10.929	0.9629	7.088
0.01	1.1171	10.899	0.9617	7.002

Table :5 **Temperature: 313.15 K**

Conc. (M)	DMSO Solvent		DMF Solvent	
	Density(ρ) ($g.cm^{-3}$)	Viscosity($\eta.10^{-3}$)poise	Density(ρ) ($g.cm^{-3}$)	Viscosity ($\eta.10^{-3}$)poise
0.05	1.1198	10.397	0.9658	6.583
0.04	1.1193	10.331	0.9653	6.494
0.03	1.1180	10.294	0.9641	6.437
0.02	1.1175	10.184	0.9632	6.382
0.01	1.1172	10.131	0.9605	6.284

The above physical parameters show that, decrease in concentration of solution,the density and viscosity are decreased,while the same values were increased in increased temperatures.Table 1 shows the experimental values of refractiveindex of solutions of the newsynthesized compound in DMF and DMSO at 313.15 K.Table 2,Table 3 and Table 4 shows the dynamic valuesof densities and viscosities of compound in various concentration and various temperatures with solvent DMF and solvent DMSO.

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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A short theoretical view on fundamental aspect of material science

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Abstract:
Materials science still incorporates elements of physics, chemistry, and engineering. The interdisciplinary field of materials science, also commonly termed materials science and engineering, covers the design and discovery of new materials, particularly solids. The basis of materials science is studying the interplay between the structure of materials, the processing methods to make that material and the resulting material properties.
Key word: *chemistry, physics, engineering, phenomenological, ancient,*

Introduction:

Beginning in the 1940s, materials science began to be more widely recognized as a specific and distinct field of science and engineering, and major technical universities around the world created dedicated schools for its study. Materials scientists emphasize understanding, how the history of a material (*processing*) influences its structure, and thus the material's properties and performance. The understanding of processing-structure-properties relationships is called the materials paradigm. This paradigm is used to advance understanding in a variety of research areas, including nanotechnology, biomaterials, and metallurgy.

Methodology:

Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property. Such investigations are key to understanding, for example, the causes of various aviation accidents and incidents.

1. **Fundamental**
   The main classes of materials are metals, semiconductors, ceramics and polymers.
   A material is defined as a substance (most often a solid, but other condensed phases can be included) that is intended to be used for certain applications. There are large numbers of materials around us they can be found in anything from buildings and cars to spacecraft. New and advanced materials that are being developed include nonmaterials, biomaterials, and energy materials. The complex combination of these produces the performance of a material in a specific application. Many features across many length scales impact material performance, from the constituent chemical elements its microstructure and macroscopic features from processing. Together with the laws of thermodynamics and kinetics materials scientists aim to understand and improve materials
2. **Structure**
   Structure is one of the most important components of the field of materials science. Materials science examines the structure of materials from the atomic scale, all the way up to the macro scale. Characterization is the way materials scientists examine the structure of a material. This involves methods such as diffraction with X-rays, electrons or neutrons, and various forms of spectroscopy and chemical analysis such as Raman spectroscopy, energy-dispersive spectroscopy, chromatography, thermal analysis, electron microscope analysis, etc. Structure is studied in the following levels
3. **Atomic structure**
   Atomic structure deals with the atoms of the materials, and how they are arranged to give rise to molecules, crystals, etc. The length scales involved are in angstroms (Å). The chemical bonding and atomic arrangement (crystallography) are fundamental to studying the properties and behavior of any material. Much of the electrical, magnetic and chemical properties of materials arise from this level of structure.
4. **Bonding**
   This involves the study and use of quantum chemistry or quantum physics. Solid-state physics, solid-state chemistry and physical chemistry are also involved in the study of bonding and structure. To obtain a full understanding of the material structure and how it relates to its properties, the materials scientist must study how the different atoms, ions and molecules are arranged and bonded to each other.
5. **Crystallography**
   Crystallography is a useful tool for materials scientists. Crystallography is the science that examines the arrangement of atoms in crystalline solids. In single crystals the effects of the crystalline arrangement

of atoms is often easy to see macroscopically because the natural shapes of crystals reflect the atomic structure. The understanding of crystal structures is an important prerequisite for understanding crystallographic defects. Further physical properties are often controlled by crystalline defects. Mostly materials do not occur as a single crystal but in polycrystalline form as an aggregate of small crystals or grains with different orientations.

6. **Nanostructure**
   Nanomaterials are subject of intense research in the materials science community due to the unique properties that they exhibit Materials which atoms and molecules form constituents in the nanoscale (i.e., they form nanostructure) are called nanomaterials. Nanostructure deals with objects and structures that are in the 1 - 100 nm range. In many materials, atoms or molecules together to form objects at the nanoscale. This causes many interesting electrical, magnetic, optical and mechanical properties in describing nanostructures it is necessary to differentiate between the numbers of dimensions on the nanoscale
7. **Microstructure**
   Microstructure is defined as the structure of a prepared surface or thin foil of material as revealed by a microscope above 25× magnification. It deals with objects from 100 nm to a few cm. The microstructure of a material (which can be broadly classified into metallic, polymeric, ceramic and composite) can strongly influence physical properties such as toughness, strength, hardness, ductility, corrosion resistance, high/low temperature behavior wear resistance and so on. Most of the traditional materials such as metals and ceramics are micro structured
8. **Macrostructure**
   Macrostructure is the appearance of a material in the scale millimeters to meters, it is the structure of the material as seen with the naked eye
9. **Thermodynamic**
   Thermodynamics is concerned with heat and temperature and their relation to energy and work. Thermodynamics describes the bulk behavior of the body not the microscopic behaviors of the very large numbers of its microscopic constituents such as molecules. It defines macroscopic variables such as internal energy, entropy, and pressure that partly describe a body of matter or radiation. These general constraints are expressed in the four laws of thermodynamics. It states that the behavior of those variables is subject to general constraints common to all materials. The behavior of these microscopic particles is described by and the laws of thermodynamics are derived from statistical mechanics the study of thermodynamics is fundamental to materials science.

Result and Discussion:

Materials science is a highly active area of research. Together with materials science departments, physics, chemistry, and many engineering departments are involved in materials research. Materials research covers a broad range of topics. Materials science is also an important part of forensic engineering and failure analysis – investigating materials, products, structures or components, which fail or do not function as intended, causing personal injury or damage to property.

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Fabrication of FeSe thin films deposited by successive ionic layer adsorption and reaction method.

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Abstract
Fabrication of Iron chalcogenide materials has been the subject of much interest in essential research because of their novel physical and chemical properties. In this paper, FeSe thin films were deposited on glass substrates by successive ionic layer adsorption and reaction deposition method and the number of cycle varies. These deposition techniques are a very simple and produce thin films at room temperature. The spaceman were investigated by X-ray diffraction techniques and SEM. The XRD pattern confirmed that Iron Selenide thin film. The SEM image exhibited that the obtained sample is homogonous in nature.
Key Words: *Thin Films, XRD, SILAR method, Morphological properties*

1. Introduction
Chalcogenide thin films are persistently under development to extend new potential materials appropriate for photo-voltic devices. The chalcogenides materials have magnetized scientists maybe due to their potential uses in a variety of optoelectronic devices[1,2]. The structural, morphological, magnetic, electrical, and optical properties of FeSe thin film materials are strongly dependent on production methods. Among these methods, it is known that parameters such as solution temperature, molarity, pH value, annealing temperature and time, drying atmosphere, substrate have an influence on the quality, thickness, and production cost of the film. When the literature is reviewed, It is seen that a wide variety of methods like Pulsed Laser Dep, chemical method and other method[3,4] The most important plan of this learning is to set up a successive ionic layer adsorption and reaction deposited FeSe thin films and studies its morphological and structural characteristics.

2 Experimental
2.1 Deposition of thin films
The thin films of iron selenide (FeSe) have been grown on glass substrates by successive ionic layer adsorption and reaction deposition technique. The chemicals used in this work were of analytical reagent grade (99% purity). Before the deposition the glass slides with dimensions 75 × 25 × 1 mm^3 ultrasonically were cleaned and rising with distilled water for each 6 min. The Na_2SeSO_3 solution was prepared by mixing 100 g anhydrous sodium sulfite in 500 ml of distilled water with 10 g selenium powder (99% purity, Merck) with constant stirring for 10 h at 80 ^{0}C. It was sealed and kept overnight, since on cooling, a little selenium separated out from the solution. It was then filtered to obtain a clear solution. The deposition of FeSe films was done at room temperature in a reactive solution prepared in a beaker. Glass substrates were immersed in the 60 ml of Fe $(NO_3)_3.9H_2O$ solution for 10 s. It was then immersed in the 30 ml of EDTA solution for 10 s and then to immersed in 60 ml of freshly prepared Na_2SeSO_3 solution for 10 s. This forms one SILAR deposition cycle. Deposition cycles were varied from 100 to 250 cycles in the steps of 25 cycles. All the prepared samples were annealed for 24 h for the complete transformation. The X-ray diffraction was used to study the structure of the film. X-ray diffraction patterns of the films were taken with a PANalytical X'Pert PRO MRD X-ray diffractometer with Cukα radiation in the 2θ range from 20^0 to 90^0. The morphological study of the film was carried out using scanning electron microscopy (SEM) with a Park Scientific Instruments and SEM/EDAX with JOEL's JSM -7600F.The scanning electron microscope gives topographical and elemental information at various magnifications.

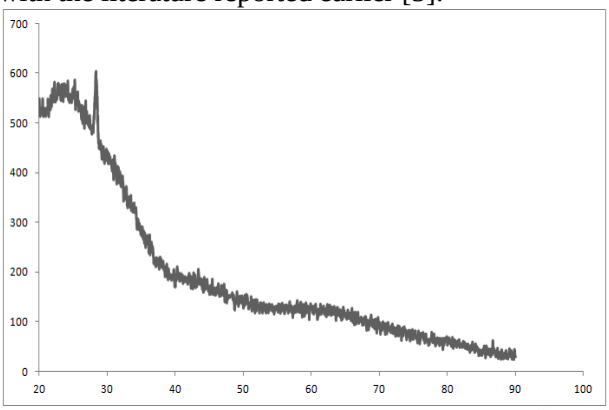
2.2 X-ray diffraction
X-ray diffraction technique is an appropriate system for studying the crystal formation of the deposited thin films. The inter-planar spacing's d was calculated using the relation,

$$D_{hkl} = (\lambda/2)\ Sin\theta$$

Fig.1. shows the x-ray diffraction pattern of FeSe thin film deposited on glass substrate at room temperature. The differaction peakes of FeSe is found at 2θ values of 28.3912, corresponding to the lattice plane (100). The d value calculated using equation confirm well with available JCPDS standered for FeSe. The average crystallite size of the deposited material is determined by using Debye-Scherer's formula,

$$d = \frac{0.9\,\lambda}{\beta \mathrm{Cos}\,\theta}$$

where β is Full Width at Half Maximum of the peak in radians, λ is the wavelength of CuKα radiation (λ=1.5418 A^0), θ is the Bragg diffraction angle at peak position in degrees. These results are in good agreement with the literature reported earlier [5].



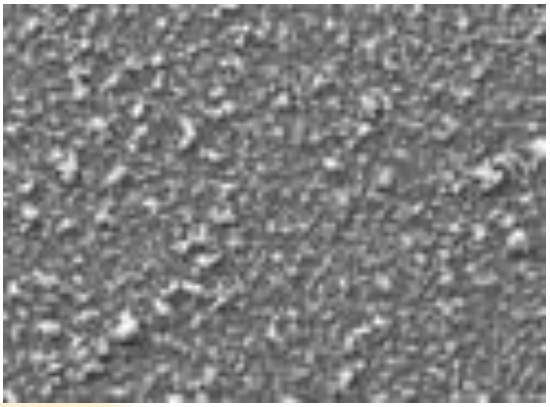


Fig.1. shows the x-ray diffraction pattern of FeSe thin film and Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate

2.3 Surface morphology

Fig.2. shows, the SEM image of as deposited FeSe thin film on to glass substrate. From SEM, we can examined that as-deposited FeSe film is homogeneous and covering the substrate. The surface investigation from two dimensional micrograph showed that the film surface is uneven which confirms its absorbent nature observed in SEM image.

3. Conclusions

The structural properties of FeSe thin films deposited by successive ionic layer adsorption and reaction deposition technique have been studies. These results are in good agreement with the literature reported earlier.

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Application of PANI-Mn Nano-composite for Removal of Dyes from Wastewater

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Abstract

The waste water generated from industries creates severe public health issue and environmental pollution concern, create a major challenge to existing conventional water treatment systems. The different biological and physiochemical treatment process have been studied, but they shows different removal ability on the basis of their experimental condition. Among them, adsorption methods is most efficient due to its high removal efficiency, cost-effective, easy to operated and recyclability of adsorbent. In this research Facile synthesis of Polyaniline-Mn Nano-composite was done by oxidative polymerization methods and used as an adsorbent for removal of methyl orange dyes from waste water. The effect of some important parameter such as Initial Concentration of dyes, pH of water, temperature and contact time on the removal and efficiency was investigated in adsorption system. The adsorption capacity of PANI-Mn Nano-composite was high 94%at pH of 3-4 and the adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC.

Keyword: *Polymer, PANI-Mn, Polyaniline, Methyl Orange, Dyes.*

1. Introduction

The dye may be defined as a coloured substance which when applied to the fibres gives it a permanent color. The dyes contain Chromophore which are responsible for producing color to a dye because they are capable of absorbing light in near U.V region.[1]The dyes are classified mainly on the basis of structure and their application. Depending upon the type of chromophore present in their structure the dyes are Nitro and Nitroso dyes, Azo dyes, Triphenyl methane dyes, Phthalein dyes, Indigoid and Thioindigoid dyes, Anthraquinone dyes, Miscellaneous dyes.[2] The Methyl Orange dyes an azo dye containing one azo (-N=N-)group. It contain sulphuric acid (-SO_3H) group and hence it is acidic Azo dye. This –SO_3H group make the dye more soluble and It is also used as reactive point for fixing the dyes. This –SO_3H group act as auxochrome.[3] The IUPAC name is dimethyl amino azobenzene sulphonic acid. In our country the use of dye is high and wastewater from textile industries causes damages to water living organism. Consequently these are affecting to the ecological system of environment. It also affect to public health, hence its removal from waste water is big challenge.[4] It also affect to soil if it is not degradable because most of the dyes are stable to light and non-degradable.

The many researchers are attracted towards its removal with the help of Nano scale material. When polyaniline doped with any transition metal then it is called Nano-composite. Some researchers used the Nano-composite for different dyes for example, the polyaniline sawdust is used to removal of Acid Violate 49 dyes.[5] The removal of cationic dye using a new magnetic Nano-composite based on starch-g-poly (vinylalcohol) and functionalized with sulphate group.[6] Polyaniline Nano-composite for the adsorption of Acid dyes from aqueous solution. The polyaniline Nano-layer composite for removal of tartrazine dyes from aqueous solution.[7] The basic blue dye adsorption from water using Polyaniline/Magnrtite (Fe3O4) Composite.[8] The green synthesis of magnetic nano- composite by Cordia Africana(CA) leaves extract for the treatment of Methylene blue.[9] An Eco-Friendly NiO/Polydopamine Nano-Composite used for efficient removal of Dyes from wastewater.[10] polyacrylamide/Ni,ZnO, Nano-composite an efficient adsorbent capacity for toxic dyes.[11] The various adsorbents such as bio-adsorbents, carbon-based Nano-adsorbent,[12] Transition metal oxides-based adsorbent,[13] Polymer-based adsorbent[14] are used to treat waste water containing dyes. It can be observed that adsorbents such as polymer-based material and activated carbon are studied more for the removal of dyes. There has been increasing interest in finding the easy and efficient Nano-composite for removal of dyes from waste water.

In present research the facile synthesis of Polyaniline–Mn Nano-composite and its application in removal of methyl Orange dyes from waste water. The Factors which affects removal from waste water i.e Initial dyes concentration, pH, temperature describe here.

2. Materials and Methods

The chemicals used such as Ammonia, aniline, ammonium persulphate, manganese dichloride, ethanol, concentrated HCl, aldehyde, dethyl phosphite are of analytical grade, The Distilled water used for experimental work.

2.1 Synthesis of Polyaniline:

The 0.5 M aniline monomer (99%) and 0.5 M ammonium persulphate (APS) was prepared in 0.5M Cons. HCl solution, In a round bottom flask. These are mixed slowly with constant stirring on magnetic stirrer. This mixture was kept in ice bath maintaining the temp below 0-4ºC for 8-10 hours. The reaction mixture was

poured into 200 ml water to complete the precipitation, washed with distilled water and HCl solution to remove un-reacted monomers.[15] After some time polymerization take place and the dark suspension becomes green in color. The green colored residue like paste was obtained. The final product was washed 2-3 times with D.W. and ethanol. Finally the dark-green powder is dried at 80°C for 6-8 Hours in Oven[16] The final product was grinded to form a green powder is known as conducting PANI (ES).Fig-1.

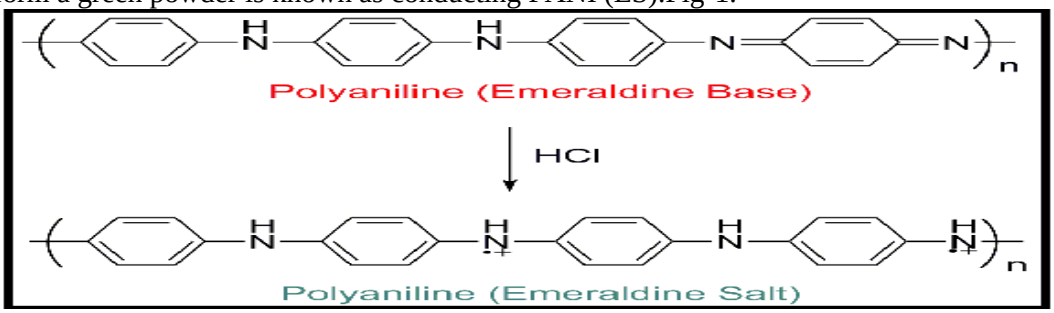

Fig-1 Structure of Polyaniline

2.2 Synthesis of PANI-Mn Nano-composite:

After formation of Polyaniline Emeraldine Salt (ES) the accurate amount of 0.2 M solution of Manganese chloride ($MnCl_2$) slowly and carefully dissolved in polyaniline. The Polyaniline Manganese chloride solution was kept in R. B. flask and kept for vigorous stirring with the help of hot plate with magnetic stirrer (700 RPM) is adjusted, about 3-5 hours. The dark green suspension is formation in the R. B. flask after that this R B flask was kept in Ice bath for 12 Hours. After filtration, The product were washed with 2 times with distilled water and 3 times with ethanol. The prepared Nano catalyst was kept in hot air oven for 7 hours at 70^0C.[17] In this method the Nano particle of Mn is uniformly distributed in Polyaniline. There is formation of Nano- catalyst having dark green color, The surface morphology was studied on Scanning Electron Microscopy. **(Fig-2)**

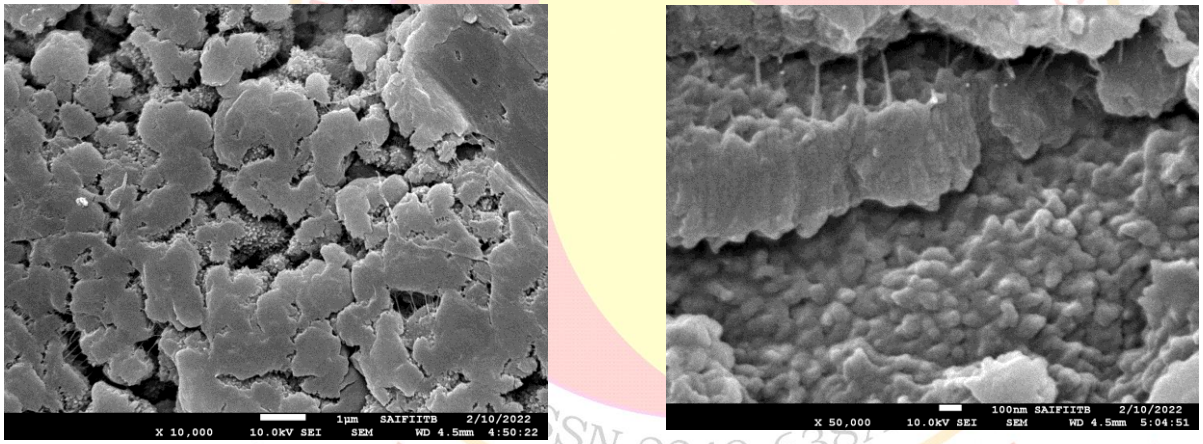

Fig-2 SEM images of PANI-Mn Nano-composite at 1nm and 100 nm

On the basis of scanning electron microscope structure the manganese molecule is uniformly distributed in the polyaniline. The size of particle is 1-100nm. The high surface area is available for electrostatic attraction to methyl orange dyes.

3. Adsorbate

The dyes used in this studies was methyl orange it is an acidic dyes. Having molecular formula $C_{14}H_{14}N_3NaO_3S$ and Molecular weight 327.34g mol^{-1} The molecular structure is given in Fig-2. The stock solution of 1000mg/L prepared by by dissolving appropriate amount of dyes in 1 litre of Distiled water. The solution were obtained by diluting the dye stock solution in accurate proportion to different initial concentration.

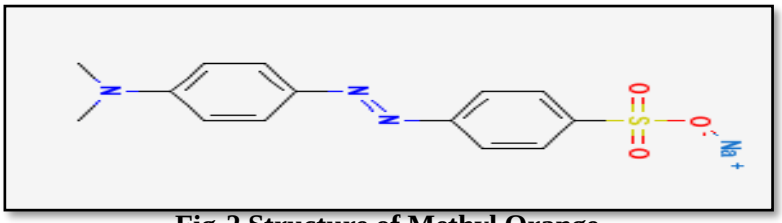

Fig-2 Structure of Methyl Orange

4. Batch mode adsorption experiments

The adsorption experiments were carried out by agitating 100 mg adsorbent with 200 mL of dye solutions of 25 to 100 mg/L concentration at 150 rpm on Hot Plate with magnetic stirrer. The mixture was withdrawn at specified intervals, centrifuged using electrical centrifuge at 4500rpm for 20 minutes and un adsorbed supernatant liquid was analyzed for the residual dye concentration using spectrophotometer. at 558 nm.

The effect of temperature on adsorbent was studied at four different temperature i.e. 25ºC, 30ºC, 35ºC, 40ºC. The effect of pH was studied by using dilute HCl and NaOH solutions. . All experiments were carried out repeated and the mean values are reported, where the maximum deviation was within 5%.

5. Desorption Studies

The main aim to study the Desorption to analyze the mechanism of adsorption and recovery of the adsorbate and adsorbent. The supernatant Liquid was separated after centrifugation and the adsorbent was separated and allowed to agitate with 100 mL of distilled water at different pH i.e. 3-12 above the equilibrium time of adsorption. The desorbed dye solution was estimated as given in the adsorption studies. [18-19]

6. Mechanism of adsorption

In process of adsorption firstly Nano-composite having high surface area. On this surface the surface diffusion process take place and molecules of dyes attracted towards surface area of Nano-composite. It should be noted that adsorption of methyl orange dye present in waste water on surface of adsorbent is mainly due to electrostatic attraction, pi-pi interaction, “van der waals” forces, hydrogen bonding, acid base reaction, and hydrophobic interaction.[20] Out of which adsorption of methyl orange dye on surface of adsorbent mainly due to electrostatic attraction and ion exchange phenomenon. In electrostatic attraction -SO3H groups having negative charge and adsorbent surface having positive charge they attract each other and easily removed. In ion exchange mechanism involves exchange of ion between dyes solution and solid phase adsorbent.

Fig-3

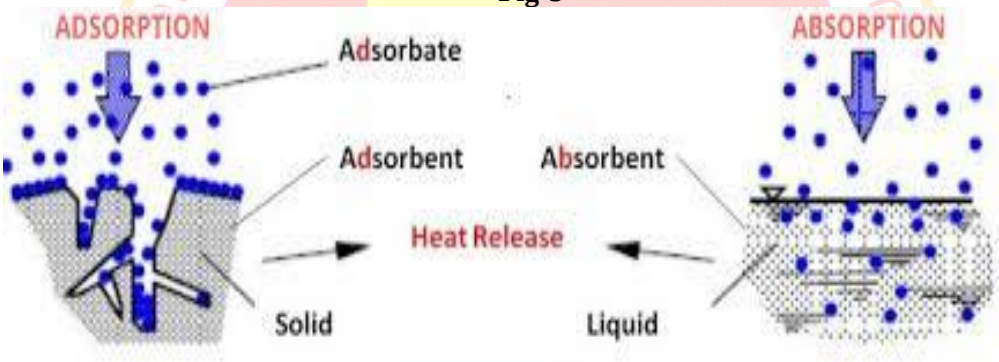

Fig-3 Mechanism of Adsorption

6.1 Effect of Initial dye concentration

The effect of time on the removal of Methyl orange dye is observed. The percentage of removal increases with time and attains equilibrium at 50 minutes for all concentrations studied (30 to 100 mg/L). After that no significant change was observed in the extent of adsorption. The amount of dye adsorption increases from 49.45 mg/g to 174.51 mg/g. while increasing the initial dye concentration from 30 to 100 mg/L. This is due to the fact that with increase in dyes concentration, it shows that dyes molecule near the adsorbent also increased.

6.2 Effect of pH

It is found that the percentage removal of Methyl Orange was higher when the pH is below 4. After pH 4, the adsorption rate decreased. In acidic conditions, the surface of the adsorbent is positively charged due to high concentration of H^+ ions, so electrostatic attraction between the adsorbent and the adsorbate is enhanced.[21] Lower adsorption of Methyl Orange under alkaline conditions is due to the presence of hydroxyl ions on the surface of adsorbents competing with the adsorbate for adsorption sites . Methyl Orange has anionic dipositively fixed charged sites which are balanced with the anions originating from monomer or oxidant solution during their synthesis. The small size dopant anions can be exchanged with other anionic species in treated, solutions which have stronger interactions with the polymer . It may be suggested that the rate of anionic dye removal is high due to the ion exchange mechanism between mobile cation and anionic dye molecules. It was observed that The removal of Methyl Orange dyes 94% at lower pH i.e 3-4.

6.3 Effect of temperature

It has been observed that the percentage removal of Methyl Orange by PANI-Mn Nano-composite increases from 92.60 % to 96.42% on increasing the temperature from 35°C to 50°C. This indicates that the adsorption of anionic dyes is endothermic in nature[19]. These adsorption data were further analyzed with adsorption isotherm models to find out the suitable model.

7.Equilibrium adsorption isotherm

The Langmuir adsorption isotherm has been used successfully for many adsorption processes of monolayer adsorption. Langmuir model[21] is represented by the following equation

Equation-1

$$C_e/q_e = 1/Q_o b_L + (1/Q_o) C_e$$

where, qe is the amount of dye adsorbed at equilibrium (mg/g), Q0 is the monolayer adsorption capacity (mg/g) and bL is Langmuir constant related to energy of adsorption, Ce is the equilibrium concentration (mg/L) It shows a linear plot of Ce / qe against Ce for the removal of AV49 by PAC. The Langmuir adsorption capacity varies from 187.77 mg/g to 212.18 mg/g for Mehyl orange onto PANi-Mn Nano-composite with increase in temperature from 35°C to 50°C. This indicates that the adsorption is favored at high operating temperature.

7.1 Kinetics of Adsorption

In this present research paper, the following two kinetic models were applied for the experimental data. Adsorption kinetics is necessary for the design of adsorption systems[22]

Pseudo first - order kinetic model assumes that the rate of change of solute uptake with time is directly proportional to difference in saturation concentration and the amount of solid uptake with time.[23-24] The rate constant of adsorption is expressed as a first – order rate expression given as: Eq-2.

Equation-2

$$\log (q_e - q_t) = \log q_e - K_1/2.303\, t$$

Where, k1 is the pseudo-first-order rate constant (min^{-1}). The plot of log (qe-qt) versus t should give a straight line with slope of –k1/2.303 and intercept log qe which allows calculation of adsorption rate constant k1 and equilibrium adsorption capacity qe . Calculated values of k1 and qe for the adsorption of Methyl orange dyes on PANI-Mn Nano-composite.

7.2 The pseudo second-order kinetic equation

$$t/q_t = 1/k_2 q^2_e + t/q_e$$

Equation-3

In Eq-3. Where, 2 k is the rate constant of pseudo second –order adsorption (g/mg min) and e q is the equilibrium adsorption capacity (mg/g). The pseudo second -order plot for the adsorption of Methyl Orange at various initial dye concentrations (Temperature 30°C). A plot of t/qt against t should give a linear relationship from which 2 k and qe can be determined from the intercept and slope of the plot.[25-26] The correlation coefficient values are greater and the data points give a linear straight line. It indicates that the adsorption of Methyl Orange by PANI-Mn follow the pseudo second order kinetic model.

7. Conclusions

In this present research paper The Polyaniline-Mn Nano-composite was easily synthesized by Oxidative polymerization. The removal of Methyl orange is pH dependent and the maximum removal is observed below pH 4, due to its mechanism. The adsorption of dyes increased with 92.60% to 96.42% increase in temperature from 35ºC to 50ºC. The kinetic study shows that adsorption of Methyl orange followed pseudo-second order kinetics model. It was observed that PANI-Mn Nano-composite having potential to remove Methyl Orange dyes from waste water.

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Graphene Based Space Qualified Battery Materials

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Abstract

Space craft's require different technologies that envisioned for power generation, storage and its management. Generally, in the CubeSats, solar cells are the power generator and secondary batteries serve as energy storage. The primary task of the battery is to deliver power when the production of power from solar panels is stop or not sufficient to cover the consumption. When a satellite passes through an eclipse and no light available for solar cells to produce power, that time batteries take charge of power supply. If the battery fails to provide power to satellite, it leads to interruption of the mission or loss of the satellite. Hence battery is very crucial component in satellites for smooth functioning. Therefore, by considering the need of battery system in space mission, present review paper reports some noteworthy contribution in this field. In this review, some recent advances in the graphene-containing materials used in lithium-ion batteries are summarized and future prospects are highlighted.

Key words: *Space Qualified, Rechargeable Battery, Non-Rechargeable Battery*

Introduction

Graphene is single layered atomic sheet of carbon atoms, which has outstanding mechanical, electrical and optical properties [1]. A continuous and conductive composites formed by graphene can effectively improve the electron and ion transportation of the electrode materials. Therefore, the use of graphene can greatly boost Li-ion battery's properties with considerable chemical stability, higher electrical conductivity and higher capacity [2]. Figure 1 shows the single sheet graphene.

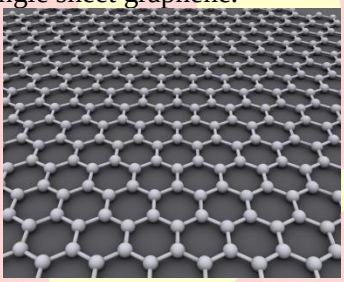

Figure 1. Single sheet of graphene.

CubeSats and small satellite are very useful solutions for space missions they enable a fast, cheap, and agile. To make them powered, crucial component of satellite system is the energy storage device, which is practically equal to a battery. In power system of space vehicle, group of several batteries used as secondary power source for a space mission.

The desired characteristics from Space Batteries are,

- Reliability and robustness
- Light weight and compact for reducing the launch costs
- Capability to perform under extreme temperatures
- Long calendar life
- Tolerance to high intensity radiations.

The small satellites have mainly two benefits, first is they are cost effective due to their size and shape. Second, their compactness fit to the structure and combability [3].

In light of above discussion, this brief review is planned to reports some recent developments in space qualified rechargeable and non-rechargeable battery materials. In subsequent section, some noteworthy reports in this field are discussed. Figure 2 depicts the batteries which are used in space missions.

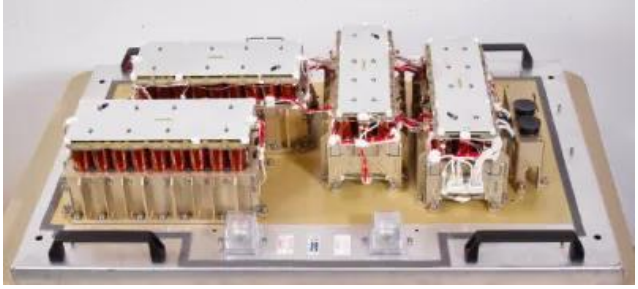

Figure 2. Batteries used in outer space.

Literature survey

In order to meet all above listed qualities, graphene-based materials are the key option. Due to two-dimensional structure of graphene, it has many outstanding characteristics such as high conductivity, mechanical strength, high charge carrier mobility and high surface area which make graphene a suitable electrode material for Li-ion battery.

However, graphene-based composites face many problems like low tap density, volumetric energy density and more capacitor-like behavior. But all these issues which are associated with graphene can resolve by incorporating proper metal oxide on graphene surface, which results in improving the electrochemical properties.

During literature survey, we came across with two significant contributions. First is reported by Mussa et al, which reports a microwave irradiation method for the preparation of reduced graphene oxide (RGO) based Co_3O_4 nanocomposites as anodes for lithium-ion (li-ion) batteries. The Co_3O_4/RGO nanocomposites displayed good electrochemical behavior as anodic materials for li-ion batteries when compared to pure Co_3O_4. The Co_3O_4/RGO nanocomposites with low RGO content resulted in stable electrochemical performance with 100% coulombic efficiency at a high current density of 500 mA/g for 50 cycles. The enhanced capacity of the Co_3O_4/RGO nanocomposites is due to the incorporation of RGO, which resulted in a four times larger surface area than that of Co_3O_4. This increased surface area could facilitate the absorption of more lithium ions, resulting in excellent electrochemical performance. Interestingly, the novelty of this work is that the designed li-ion batteries showed stable electrochemical performance even at a high temperature of 100 °C, which might be useful for rechargeable battery applications in a wide temperature range [4].

And second report made by Cheng et al, which reports carbon material called graphene-like-graphite (GLG) as anode material of lithium-ion batteries that delivers a high capacity of 608 mAh/g and provides superior rate capability. The morphology and crystal structure of GLG are quite similar to those of graphite, which is currently used as the anode material of lithium-ion batteries. Therefore, it is expected to be used in the same manner of conventional graphite materials to fabricate the cells. Based on the data obtained from various spectroscopic techniques, this work propose a structural GLG model in which nanopores and pairs of C-O-C units are introduced within the carbon layers stacked with three-dimensional regularity. Three types of highly ionic lithium ions are found in fully charged GLG and stored between its layers. The oxygen atoms introduced within the carbon layers seem to play an important role in accommodating a large amount of lithium ions in GLG. Moreover, the large increase in the interlayer spacing observed for fully charged GLG is ascribed to the migration of oxygen atoms within the carbon layer introduced in the state of C-O-C to the interlayer space maintaining one of the C-O bonds [5].

Due to cost effectiveness, easy availability and environmental friendliness, $LiMn_2O_4$ is used as cathode material since 1990s. But the disadvantages like its low electrical conductivity and low-rate capacitance make it less commercial for use in battery. Bak et al experimentally shows that graphene sheets are very efficient in improving the electrical conductivity and rate capacity. This study prepares the $LiMn_2O_4$-graphene composites using microwave assisted hydrothermal method which showed the reversible capacities of 117 mAh/g and 101 mAh/g at 50 C and 100 C [6]. Figure 3 shows the TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

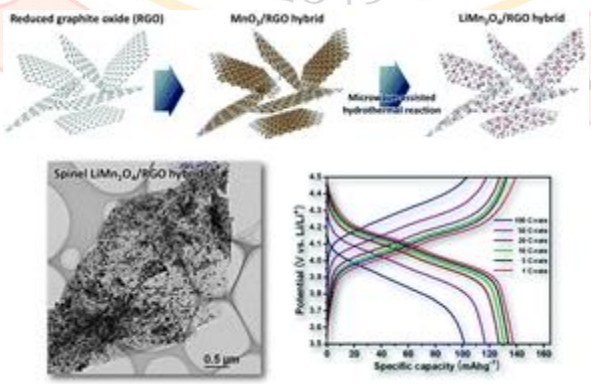

Figure 3. TEM image and Specific Capacitance response of $LiMn_2O_4$-graphene composites.

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$ is another potential cathode material for battery application due to its outstanding properties such as high energy density, good stability, enhanced safety and low cost. Jiang et al demonstrated that

$LiNi_{1/3}Mn_{1/3}Co_{1/3}O_2$-graphene composites are prepared as cathode materials for battery application which deliver a capacity of 115 mAh/g at 6C [7].

Relevance with ISRO's Activities

Presently, ISRO pressing on exploration and envisions to send humans/space craft to Mars, spacecraft into the atmosphere of Venus, onto the surface of outer planetary icy moons, and even boring through the ice covering liquid oceans on these moons. To complete these challenging missions, presently available space-rated Li-ion batteries are not satisfactory. Therefore, it is extremely necessary to extend the operational temperature range, increase the specific energy of the electrodes, to improve the radiation tolerance of Li-ion batteries.

In 2018, ISRO offers Technology Transfer of Lithium-ion cells intends to qualify and shortlist suitable industries in India/Start-ups based on eligibility criteria through an open evaluation process.

Conclusions

Current studies demonstrated that pristine graphene can't become straight substitute for current carbon-based commercial electrode materials in lithium-ion batteries. As it has low coulombic efficiency, high charge–discharge platform and poor cycle stability. However, when used as a matrix or in synergetic form in the composite electrode materials, graphene can play a very important role.

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Study of Infrared spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend

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Abstract :

InfraRed Spectra of PVC –PS Polymer blend and Polyaniline doped polymer Blend has been measured in the region 4000 to 650 cm^{-1} on spectrophotometer.The infrared absorption band frequencies , their intensities and tentative vibrational assignments are discussed.

Keywords *: PVC – PS Blend , InfraRed Spectra*

Introduction

Polymers having different properties and chemical structures are usually mixed togrther to obtain polymer blendswhich may acquire a set of valuable properties. A lot of attention has been devoted in recent years to the characterization of polymer blends as was studied by Ahn et al [1]and Straka et al [2] FTIR spectrum of 2-chloro-6-methyl benzonitrile in the region 2-4000 cm has been recorded in KBr pellet technique with a Braver IFS - Fourier transform spectrometer. FT-Raman spectrum in powder form has been recorded in the region 50-4000cm on a Bruker IFS 66 optical each with an FRA 106 Raman module attachment interfaced to a microcomputer. Geometry and vibrational wavenumbers were calculated using ab-initio calculations with HF method by Virendra Kumar et al [3].Sharma et al [4] characterised the super ionic AgI-$Ag_2O.V_2O_5$-TeO_2 glasses by X-ray FTIR and DSC studies. The FTIR spectra reveal that the network structure remains essentially the same with AgI concentrations.Pradeep kumar et al [5] measured near nomal incidence for infrared (FIR) reflectivity spectra of a single crystal of $TbMnO_3$ from 10K to 300 K in the spectral range of 50 cm^{-1} - 700 cm^{-1} Indulal and Raveendran [6] used The FTIR for study of the stretching and bending frequencies of molecular groups in the sample.The pressure of of naphthalene in PS thin film was confirmed by IR spectra of the sample taken on FTIR - 8400 spectrophotometer by Sangawar et al [7] IR spectra of undoped polyblend and 30% napthalene doped polyblend was studied by Dhokne et al The infrared spectra of undoped and naphthalene doped polyblend are observed in the range of 500 cm^{-1} to 4000 cm^{-1} FTIR spectra for gamma doses of 0, 10, 35 and 50 KGY was student by Tarafdar et al [8]. They showed the results of infrared absorption frequencies for doses 0, 10, 35 and 50 kGy. Thicknesses are nearly equal and salt concentration is 18% for all samples studied and so intensities of the peaks in the graphs can be directly compared. There are evident changes with gamma irradiation. The most prominent change is in the peak at 1150 cm^{-1} which has been attributed to C-C bond stretching and C-0-C asymmetric stretching The morphology of PVF_2, films grown from the selection has been studied by Mehendra and Chand [9]. The IR spectra in the frequency range $90-480 cm^{-1} were recorded at room temperature and compared with Murayama's spectra. Venkata Chalapathy et al [10] carried out the FTIR analysis of Neyvelilignite and fly ash samples. The extinction coefficient (K) values calculated for the bands at 3450, 2900, 2835, 1695, 1600 cm^{-1} etc. Saikia et al[11] have carried out FTIR and impedance spectroscopy studies of PVC-PMMA-NH_4 SCN-DBP based polymer blend electrolyte to see the formation of polymer-salt complex and to measure the bervity respectively. Deshpande and Tyagarajan [12] have recorded the polarised IR polyvinyl alcohol (PVA) film. Ishra [13] studied the IR spectra of pure and 1.0 wt% I_2 doped PVC/NBR blend. The results obtained by him showed that a new band of weak intensity appeared at 1670 cm^{-1} and the intensity of bands at 3510 cm^{-1} and 555 cm^{-1} decreased on doping with iodine. Agari et al [14] prepared 200 µm films of PVC/ PMMA gradient polymer blends containing a wide compositional gradient phase. They characterized the films with FTIR technique. The ideal blend was found to have significantly new or improved properties (eg a large half width of temperature of dissipation factor) which cannot be observed in any PVC,PMMA homogeneously (that is ordinarily) miscible blend or laminate system.

Experimental details

The polyvinyl chloride (PVO) and polysterene (PS) of standard grade product supplied by Polychem Industries, Mumbai were used for the study The conducting polymer (polyaniline)was prepared by chemical oxidation using ferric chloride by conventional procedure. Polyaniline was used as a dopant Sample Preparation For the preparation of PVC-PS polyblend, the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together. For the preparation of Polyaniline doped thin films the two polymers PVC (1.25g) and PS (0.25g) were taken in the ratio 5:1 by weight. 1.25 g of PVC in 15 ml tetrahydrofuran (THF) and 0.5g of PS in 10 ml of THF dissolved seperately and subsequently mixed together.

Polyaniline was taken in 25 wt % and was dissolved in 5 ml of THE to produce Polyaniline solution . After allowing them to dissolve completely. the three solutions were mixed together The solution was heated at 60° c for two hours to allow polymers to dissolve completely to yield a clear solution . A glass plate thoroughly cleaned with hot water and then with acetone was used as a substrate, To achieve perfect levelling and uniformity in the thickness of the film, a pool of mercury was used in a plastic tray in which the glass plate was freely suspended .The solution was poured on the glass plate and allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber maintained at a constant temperature (40°C). In this way, the film was prepared by isothermal evaporation technique [15.16]. The film was subjected to 12 hours heating at constant temperature of 50°C and for another 12 hours at room temperature to remove traces of solvent .Finally, the film was removed from the glass plate, it was cut into small pieces of suitable size which were washed with ethyl alcohol to remove the surface impurities Thickness measurement For measuring the thickness, micrometer screw guage [16] with least count 0.001cm (10 μ m) was used. But for greater accuracy and resolution, a compound microscope in conjunction with an acculometer which gives least count 1.3 μ m and 3.3 μ m, at the magnification of 1:10 and 1 100 respectively was used. A small section of the sample was taken mounted vertically to get a clear section of view of the thickness. The film used for the present study was of the thickness 70 μ m Electrode coating The electrode coating on the film of measured thickness was done by quick drying and highly conducting silver paste [16] supplied by Eltecks Corporation, Bangalore. A mask of a circular aperture of 25 cm diameter was used while coating to ensure uniformity in size of coated silver electrode

Study of Infrared Spectra

The infrared spectra of all the samples of series I and II are studied in the region 4000 to 650 cm^{1} on Perkin Elmer (Japan) spectrophotometer. The KBr technique was used. All the spectra were taken at the department of metallurgical and materials Engineering, Visvesvaraya National Institute of Technology, Nagpur - 440011 (India). Typical IR spectra of series I . (samples are J1, J2, J3, J4 and J5) and series II (samples are JPI, JP2. JP3, JP4 and JP5)are shown in fig 3.3.1 and 3.3.2 respectively

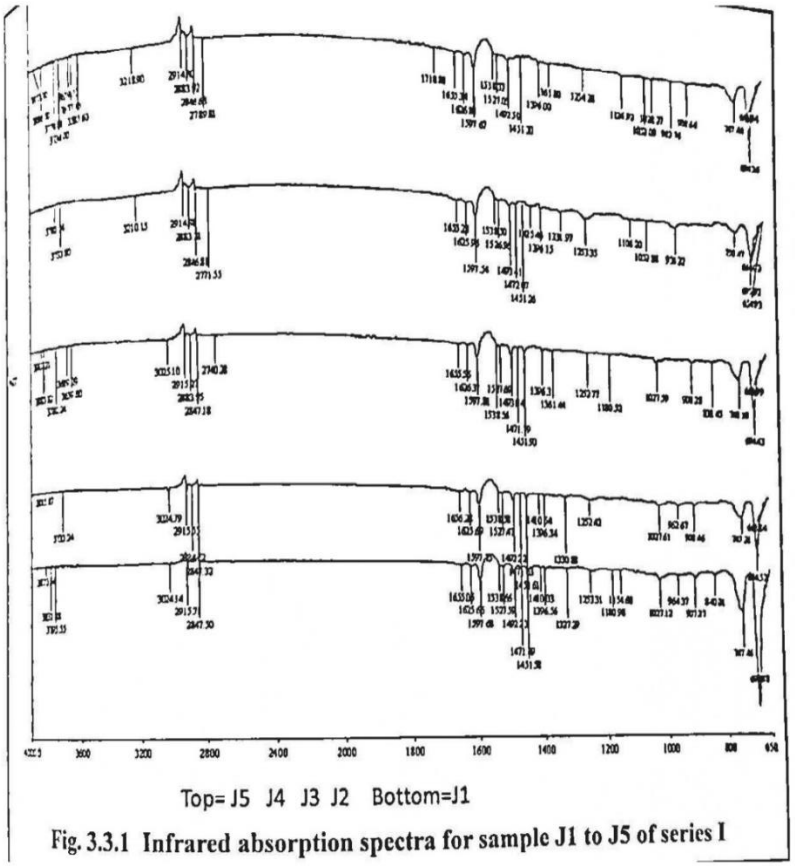

Fig. 3.3.1 Infrared absorption spectra for sample J1 to J5 of series I

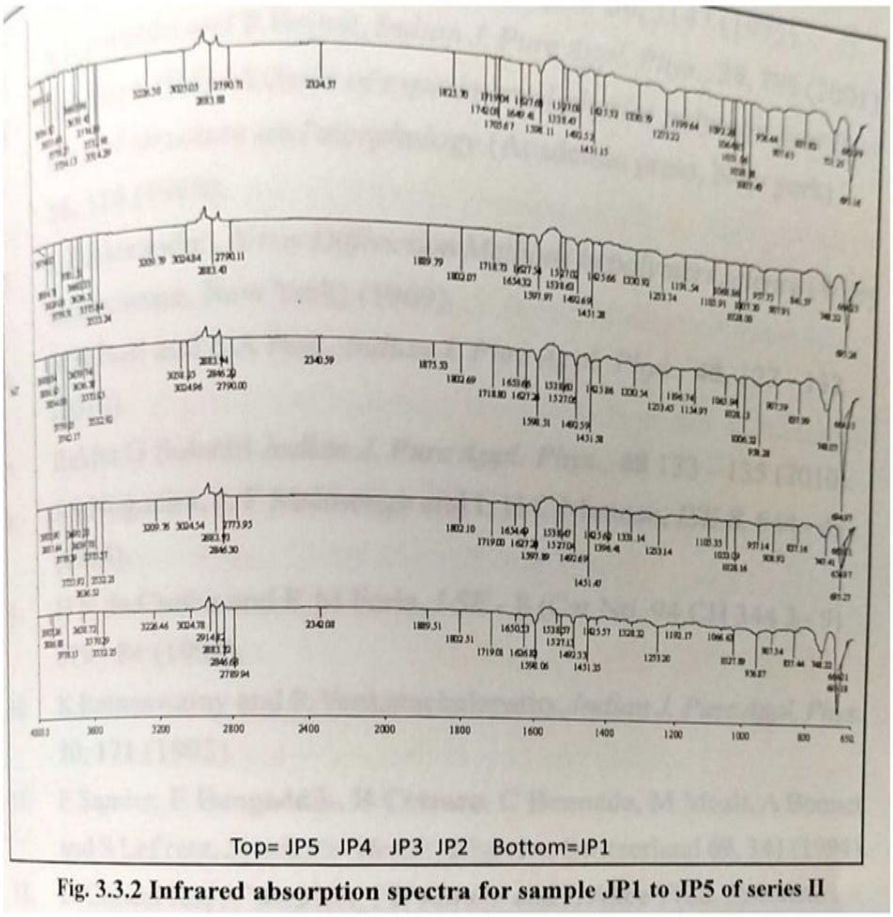

Fig. 3.3.2 **Infrared absorption spectra for sample JP1 to JP5 of series II**

Result and Discussion

A weak absorption band appeared for all the samples in the frequency 3024. 14 to 3025.13 cm^{-1} and attributed to C-H stretching due to aromatic ring (benzene ring) A strong absorption band appeared in all the samples range except JS (medium absorption band) in the frequency range 2914.76 to 2915.70 cm^{-1} which indicates the presence of C-H stretching of monosubstituted alkane. The medium absorption band appeared for all the samples in the frequency range 1625.57 to 1626.29 cm^{-1} which can be attributed to C-C stretching alkene nonconjugated.The strong absorption band appeared in all the samples in the frequency range 1597.57 to 1597.83 cm^{-1} which indicates the presence of C=C in aromatic (benzene ring).The strong absorption band appeared for all the samples in the frequency range 1492.22 to 1493.20 cm^{-1} which attributed to C-H bonding in methylene group.A medium absorption band appeared for all the samples except J5 (Weak absorption band) in the frequency range 907.29 to 908.81 which attributed to Ar - H bending.These strong absorption band observed at 747.23 to 750.42 cm^{-1} and 93.80 to 695.97 cm^{-1} in all the samples which is attributed to C-H out c ane bending and C-Cl stretching.

Similarly in the IR spectrum of PVC+PS +PANI (Samples JP1,JP2,JP3,JP4 and JP5), All the samples show a weak absorption band in the frequency range 3514.29 to 3533.24 cm^{-1} which indicates the presence of N-H amines.A weak absorption band for all samples in the frequency range 3024.79 to 3025.07 cm^{-1} which is attributed to C-H stretching due to aromatic ring.

There is medium absorption band for all samples in the frequency range 2883.32 to 2884.04 cm^{-1} and 1626.78 to 1627.52 cm^{-1} which is attributed to C-H stretching of monosubstituted alkane and C- C stretching alkene nonconjugated.The strong absorption band in the region 1597.93 to 1598.15 and 1492.31 to 1492.68 cm^{-1} for all samples are assigned as = C aromatic stretching and C-H bonding in methylene group. The presence of weak absorption band at around 1053.09 to 1068.86 cm^{-1} show the presence of C-N vibrations.There is medium absorption band for all samples in the frequency range 907.63 to 909.01 cm^{-1} which is due to Ar-H bending.The strong absorption band for all samples in the frequency 751-26 and 694.96 to 695.26 cm^{-1} which is due to C-H out of plane bending and C-Cl stretching.

Conclusions

The values of frequencies observed in the IR spectrum agree well standard IR spectrum frequencies. The orientation of NH, group in aniline makes ortho and para positions more susceptible towards electrophilic attack and as a result of this polymerization of aniline monomers into polyaniline molecule is occuring at these (ortho and para) positions. The polymer thus obtained still has possibility to expose its reactive sites towards suitable reactants under the influence of -NH-/- NH = groups . It was therefore thought that it is interesting to use polyaniline as PVC-PS blend to study the conductivity of the mixture (blend) The electron rich ortho and para positions of polyaniline aromatic nucleus also shows susceptibility towards the attack of electropositive sites of PVC-PS blend. The overall influence of -NH-/- NH= group on geometry of PVC-PS blend and the interaction of positive centres with ortho and para positions of aromatic nucleus enchances the conductive property to considerable extent, so also a protonic exchange between –NH-/-NH= groups of polyaniline helps to increase the conductance in PVC –PS blend

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Comparative Study of Blood Glucose Measurement Using Non- Invasive Method

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Abstract –
The past three decades has attracted tremendous attention in the diagnosis and monitoring of diabetes by non-invasive methods. The main objective of this paper is to compare measurement of blood glucose concentration using invasive and non-invasive method. Measurement of blood glucose levels was done using an existing invasive in the pathology laboratory and non-invasive tool that have been develop in this research. Non-invasive method based on NIR spectroscopy is used as it can be easy and safe to measure blood glucose concentration. In this study 50 patients glucose measurement test readings are recorded using both methods and has been compared. The result found is in the standard range.
Keywords: Diabetes mellitus, Invasive, Non-invasive, Optical Spectroscopy.

1. Introduction

In the 21st century diabetes is one of the fastest growing global health emergencies. It is estimated that 537 million people have diabetes in 2021[1]. Diabetes Mellitus is a condition in the human body wherein body does not produce enough insulin required to maintain normal circulating blood glucose. Insulin is a hormone that enables glucose to enter the body's cells to be used for energy [2]. Regular monitoring of blood glucose is very important as diabetes can lead to very serious and severe complications including heart failure, blindness, gangrene and amputation. Blood glucose measuring in day to day life is becoming a need of society. Regular monitoring of blood glucose is important to avoid complications of diabetes. In recent medical practice, glucose in blood is measured using an invasive technique which involves pricking of finger for blood sample. Non-invasive method is a pain free technology which helps patient's regular blood glucose monitoring [3,4,5].

There are two main types of diabetes, type 1 and type 2. The implications of your blood glucose results will depend on the type of blood glucose test used. For a fasting blood glucose test, a normal blood glucose level is between 70 and 100 mg/dL. For a random blood glucose test, a normal level is usually around or below 125 mg/dL. Mostly the exact level will depend on when you last ate [6].

II. Methods for glucose measurement

1) Invasive Method

Invasive method is used in recent medical practice to measure the concentration of glucose in blood. Invasive technique involves finger puncturing for the blood sample. This simple test involves giving a small sample of blood. In pathology laboratories, before drawing blood the healthcare provider cleans the area with an antiseptic to kill any germs and tie an elastic band around upper arm of patient, causing veins to swell with blood. Once a vein is found, they insert a sterile needle into it and then blood drawn into a tube attached to the needle. When drawing blood have been finished, the healthcare provider removes the needle and places a bandage over the puncture site and pressure will be applied to the puncture site for a few minutes to prevent bruising. The sample of blood is then passed through the standard chemical tests to measure glucose concentration.

In generic few ml of blood required where as recently patient can measure blood glucose at home using invasive glucometer, less than a drop of blood is taken out. The sample of blood will be placed on the strip and is inserted into the blood glucose meter. Inside a glucometer, a series of chemical reactions will take place and result is display on the screen.

Being a diabetic, it is necessary to check your blood glucose level regularly but regular use of an invasive method has many drawbacks such as,

1) For diabetics, measuring blood glucose level is an everyday thing so it is very difficult to incorporate pain into routine.
2) Both Laboratory and glucometer tests are costly. While using glucometer, one strip is used at a time and need to be replaced once finished.
3) Due to low immunity, diabetic people are more prone to infection. Invasive method has more risk of infection.
4) Non-compliance can be dangerous as it can increase the complications of diabetes. [7,8]

2) Non-Invasive Method

The advent of a pain free non-invasive technology would improve the patient's compliance for regular blood glucose monitoring. Subsequently the diabetic patient's life will improve considerably [9]. It prevents both chronic and acute complications, as this blood glucose measurement method is without drawing blood, puncturing the skin, causing pain or trauma. This technique is applied to overcome the pain, scare procedure, infections.

In non-invasive blood glucose monitoring the most commonly approaches are by using optical detection or optical scanning methods. i.e., Polarimetry, Raman Spectroscopy, Photo Acoustic Spectroscopy, Mid-Infrared (MIR), Spectroscopy using an Attenuated Total Reflection (ATR) Prism, and Near- Infrared (NIR) spectroscopy. The NIR spectroscopy is one of the most promising optical methods. NIR spectroscopy is very useful in Non- Invasive blood glucose monitoring [10].

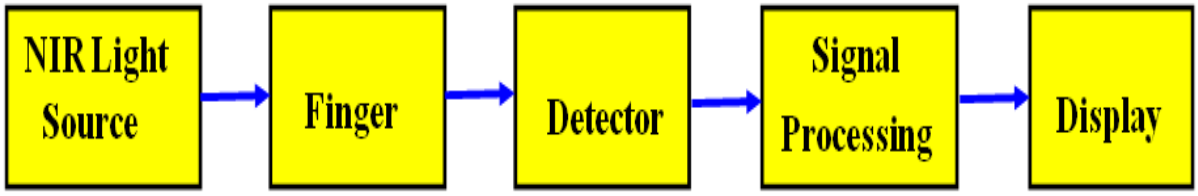

Figure-1

III. Comparative blood glucose measurement

Glucose concentration is measured non-invasively with the help of developed system and invasively with the help of pathology laboratories. Following figures are the result mapping chart of different age group, which shows the glucose concentration measured by the designed system and at the same time, for the same person glucose concentration measured in pathology laboratories. Good correlation is found between the blood glucose concentration value measured by the both methods.

To calculate error in measurement of invasive and non-invasive method the formula used is,

$$\% \text{ Error} = \frac{IV - NIV}{IV} \times 100$$

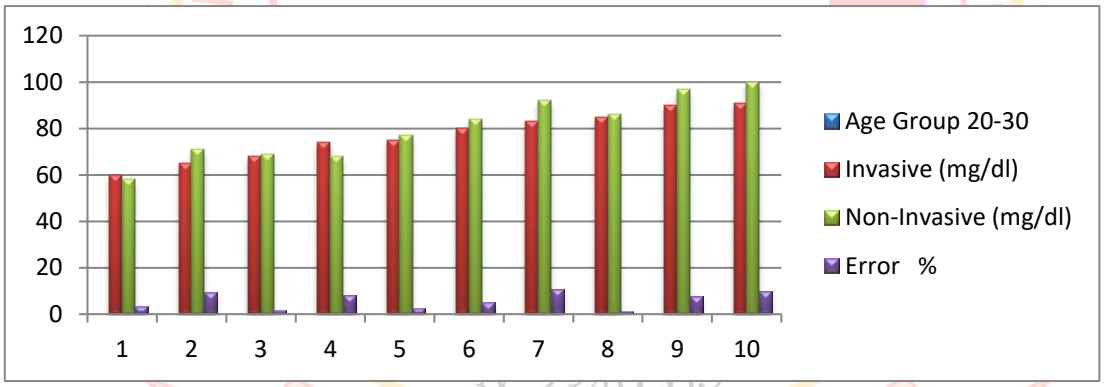

Figure-2: Blood glucose measurement of ten persons of age group 20-30

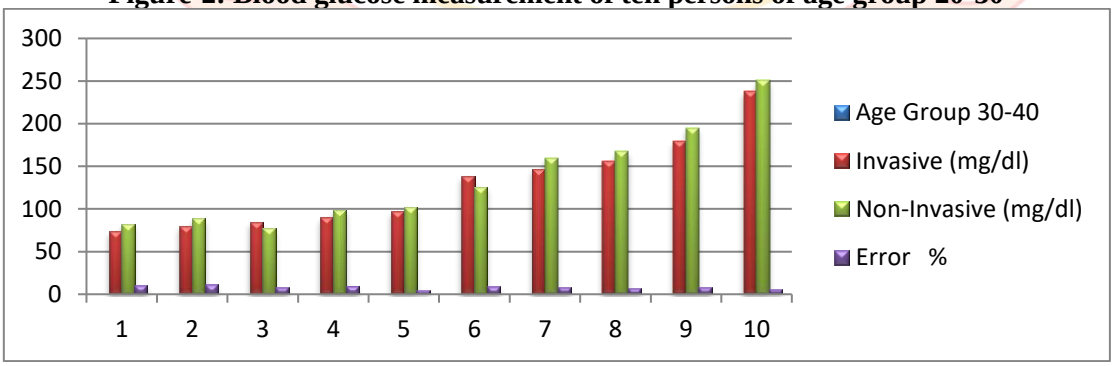

Figure-3: Blood glucose measurement of ten persons of age group 30-40

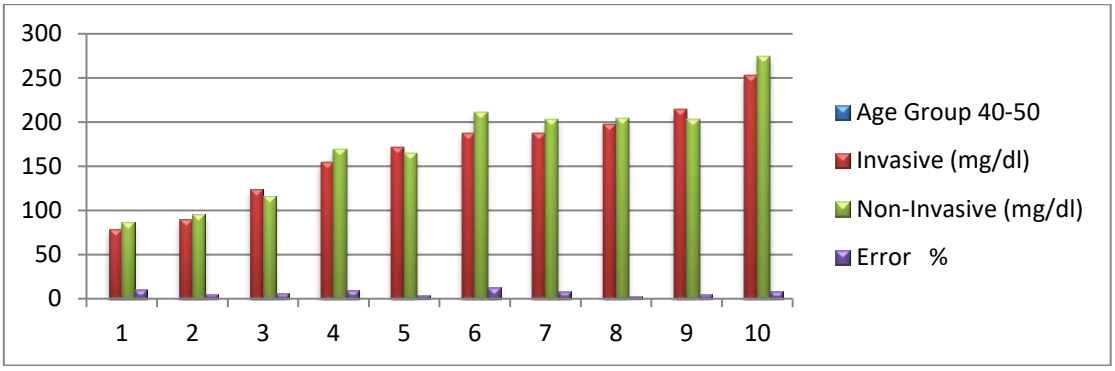

Figure-4: Blood glucose measurement of ten persons of age group 40-50

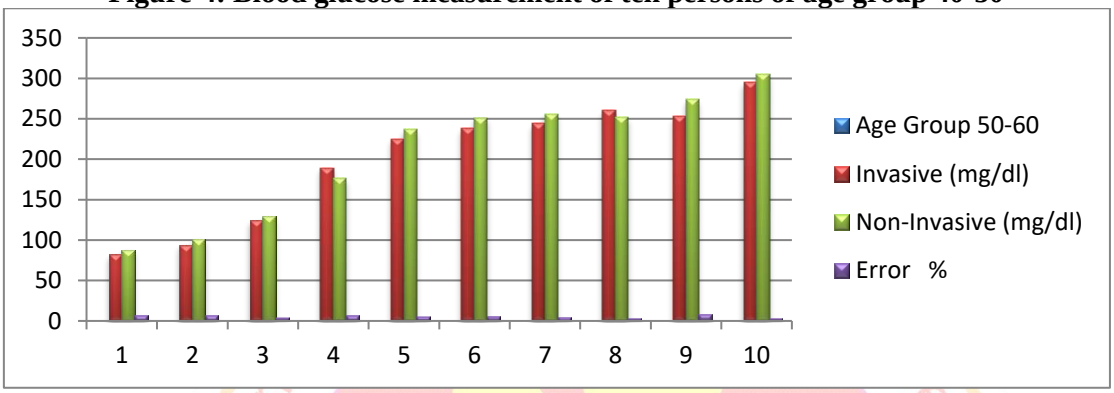

Figure-5: Blood glucose measurement of ten persons of age group 50-60

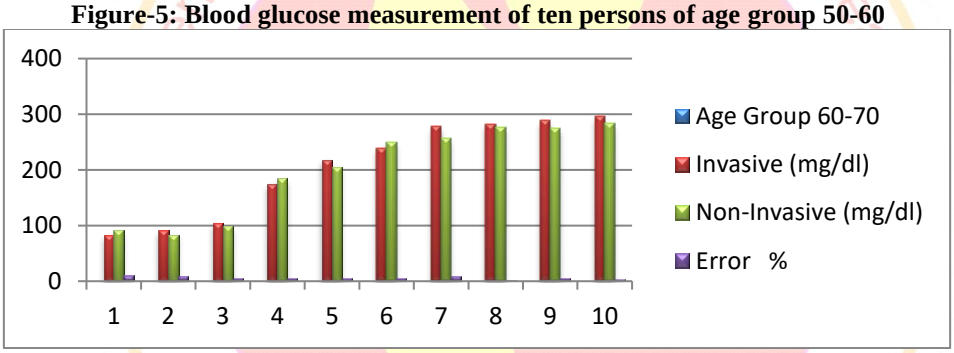

Figure-6: Blood glucose measurement of ten persons of age group 60-70

III. Result and Discussion

Regular monitoring of blood glucose level is important to avoid the long-term and short-term effects of diabetes. Data analysis was done by measuring the percentage error of invasive and non-invasive blood glucose measurement results. The result shows that the lowest percentage error measurement is 1.17% and the highest is 12.83%. In this research, lowest error was obtained in blood glucose measurement of 8th person from the age group of 20-30 and highest error was obtained in blood glucose measurement of 6th person from the age group of 40-50. The result obtained shows the feasibility of using NIR based non-invasive blood glucose measurement technique.

IV. Conclusion

Non-Invasive blood glucose monitoring system needs to improve for continuous monitoring in healthcare centres and homes hence, diabetic patient will monitor their blood glucose regularly. The performance of the system can be increased by developing suitable signal conditioning circuit to minimize error.

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Study Sem and Ftir Analysis of PEO: PVP: Naclbased Polymer Electrolyte

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Abstract

The sodium ion conducting polymer electrolyte complexes with PEO and PVP were prepared by solution caste technique with different compositions of PEO, PVP with NaClrespectively. Theoretical aspects of characterization technique such as Scanning electron microscopy (SEM) and Fourier transform infrared spectroscopy (FTIR) analysis were used to characterize these electrolyte.

SEM result shows the crystalline behavior of the polymer electrolyte. In FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}in pure PEO,PVP which is also found to be decreased with increased in concentration of salt.

Keywords: Polymer electrolyte, PEO, PVP, NaCl.

Introduction

The polymer electrolyte (Solutions) serve as electronic insulators between the anode and cathode but it must be a good ionic conductor. Polyethylene oxide (PEO) is used as the polymer matrix because it is chemically inert, able to dissolve in number of inorganic salts and it provides moderate ionic conductivity. Polymer electrolytes based on PEO complexed with $NaClO_3$, $AgNO_3$ and $NaYF_4$ etc. have been reported [1]-[6]. Also the polymer electrolytes based on PVP complexed with $NaClO_3$ have been prepared [7]-[8]. The polymer electrolyte based on PEO, PVP complexed with $NaClO_3$ were prepared [9].Keeping this view in mind, authors prepared polymer electrolyte based on PEO, PVP complexed with NaCland study their SEM and FTIR analysis.

Preparation of polymer electrolyte

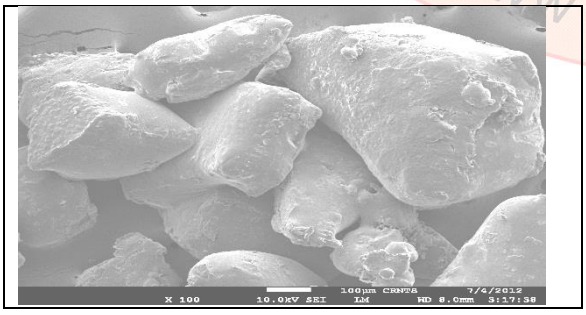
The polymers PEO and PVP were taken separately at different ratio with NaClwt% as (40:50:10) (35:50:15), (30:50:20), (25:50:25), (20:50:30) and (15:50:35). Each mixture dissolved in methanol for making polymer-salt mixture into solution. To obtain the perfect solution of this mixture, the solution was stirred well for 24 hours and powered into a polypropylene dishes. The solution was slowly evaporated at room temperature. Thus, thin film of polymer electrolyte was prepared by solution cast technique. Further these films were crushed into powder form. This powder is used for SEM and FTIR analysis.

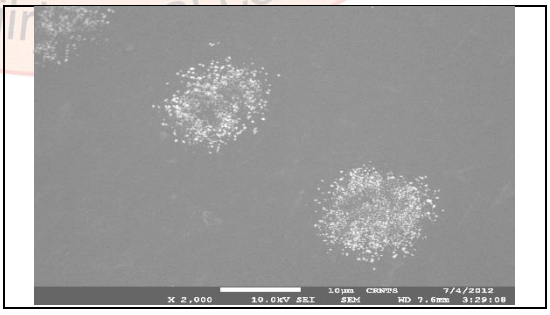
Result and discussion

4.1 Scanning electron microscopy (SEM)

The surface morphology of the composite films of 25wt% of NaCl was analyzed by SEM and the pictures are shown in Fig.1.The SEM pictures show crystalline behavior. The distorted crystals of NaCl are seen. Because of random size of crystals voids are created.

Energy dispersive X-ray analysis was performed for different wt% of NaCland pictures are shown in Fig.2 Energy dispersive spectroscopy (EDS) allows to identify particular elements and their relative proportions. From EDAX measurements the characteristics peaks corresponding to NaCl , PEO and PVP are identified which shows the existence of these in composite films.





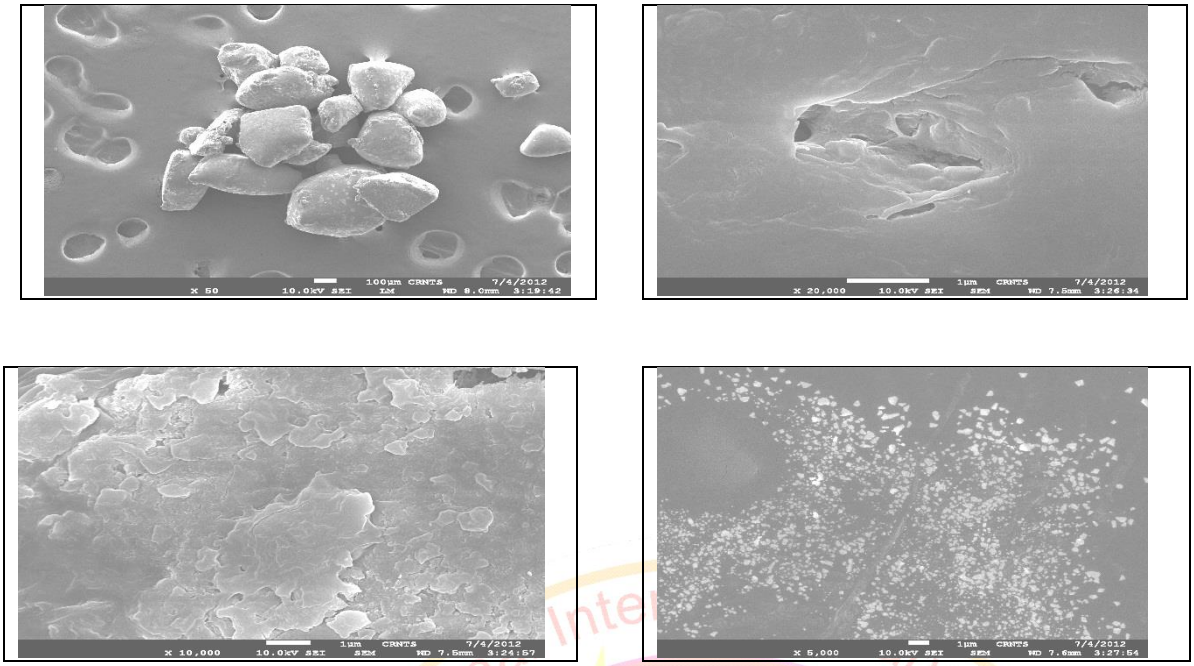


Fig.1 : SEM pictures of 25 wt% of NaCl at different magnification

Element	Weight%	Atomic%
C K	61.09	67.91
N K	9.48	9.03
O K	25.30	21.11
Na K	1.76	1.02
Si K	0.33	0.16
Cl K	2.05	0.77

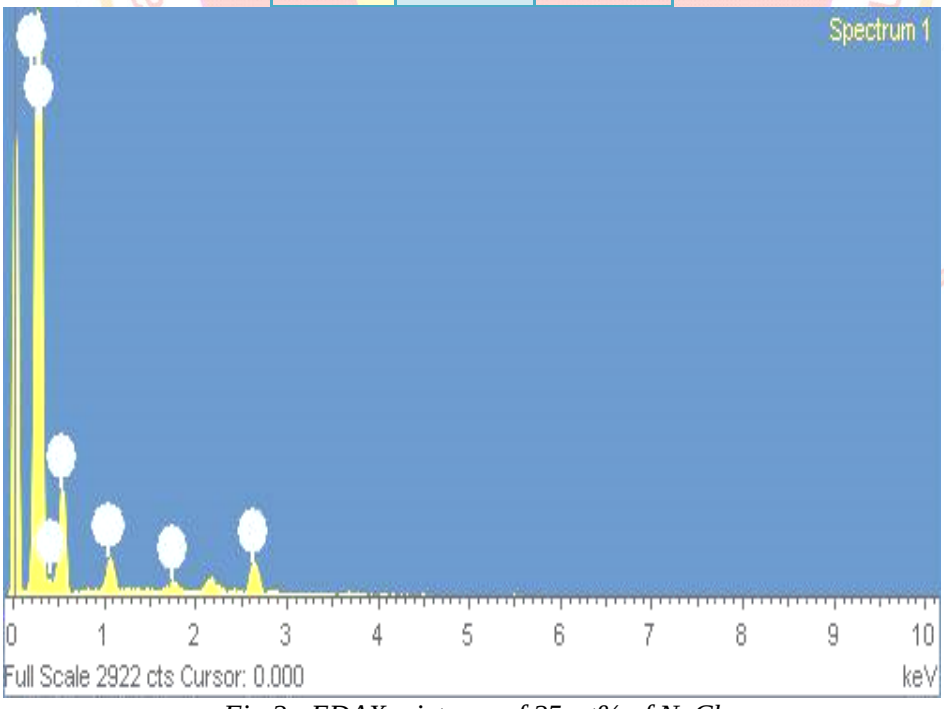


Fig.2 : EDAX pictures of 25 wt% of NaCl

4.3 Fourier transform infrared spectroscopy (FTIR) analysis

Sr. No	Composition Wt % NaCl	Peak Position cm^{-1}									
1	20	680	840	1100	1310	1500	1700	1880	2400	2900	3900
2	25	680	840	1100	1310	1500	1700	1880	2400	2900	3900
3	30	680	840	1100	1310	1500	1700	1880	2400	2900	3900

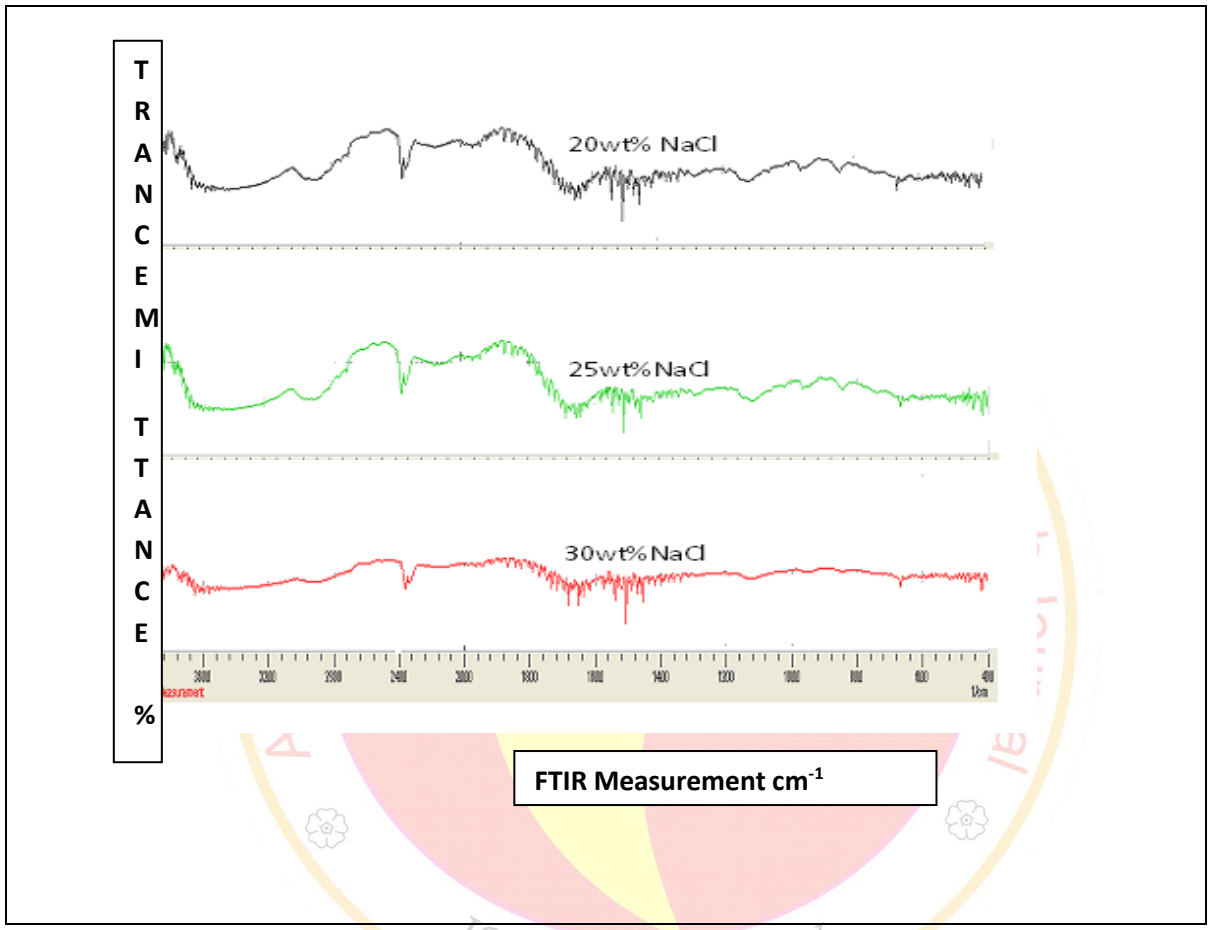


Fig.3 FTIR spectra of 20,25 and 30 wt% NaCl

The FTIR spectra of 20,25 and 30 wt% NaCl were recorded in the range 4000- 400 cm^{-1} and are shown in fig.3.

In the IR spectra of pure PEO and PVP strong broad absorption band is observed around 2900 cm^{-1} corresponds to the symmetric and asymmetric C-H stretching mode of CH_2 group. The width of the band decreased with increased in concentration of NaCl salt in the polymer. Also the band is observed around1100 cm^{-1}in IR spectra of pure PEO and PVP corresponds to the C-O stretching . The width of this band is decreased with increased in concentration of NaClsalt[10,11].Several new peaks are around 3900,2400,1880,1700,1500,1310,840 and 680 cm^{-1} have been observed in PEO:PVP complexed with NaClsalt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate thecomplexation of NaClsalt with PEO:PVP.

Conclusion

A sodium ion conducting polymer electrolyte based on PEO with PVP was prepared by solution cast technique. Polymers PEO and PVP were taken separately at three different ratios with NaClsalt. Each component was dissolved in methanol for making polymer salt mixture into solution. This solution was stirred well for 24 hrs. so that homogeneous solution was obtained and then polymer electrolyte was made.

PEO:PVP:NaCl polymer electrolyte was studied via structural , thermal characterization. Following conclusions were drawn.

In NaCl series distorted crystals of NaCl are seen. So, SEM result shows the crystalline behavior of the polymer electrolyte.

From FTIR spectra it is observed that, the intensity of the aliphatic C-H stretching vibrational band observed around 2900 cm^{-1} in pure PEO, PVP which is found to be decreased with increased in concentration of salt in the polymer. The width of the C-O stretching band observed around 1100 cm^{-1}inpure PEO,PVP which is also found to be decreased with increased in concentration of salt. The appearance of the new peaks along with the changes in existing peaks (and/or their disappearance) in the IR spectra directly indicate the complexation of salt with PEO:PVP.

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Development of Polyaniline -Metal oxide Nanocomposite: Brief Review

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Abstract:

Nanostructures and Nano composites of conducting polymers have developed as a new field dedicated to the manufacture of smart materials for use in forthcoming technologies. Preparation of Blends of inorganic nanoparticles in intrinsically conducting polymer matrix is believed to be an easy method to prepare and design Nano composites where delocalized □-electrons can interact with inorganic nanoparticles, which have a unique combination of mechanical properties, the processability of conventional polymers and the electrical property of conducting polymers. The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.
Keyword: (PANI)- Polyaniline Nano composites

Introduction:

In recent years, developments of inorganic–organic hybrid materials on nanometer scale have been receiving significant attention due to a wide range of potential applications and high absorption in the visible part of the spectrum and high mobility of the charge carriers. Polyaniline is the most attractive conductive polymer because of the presence of the reactive – NH– groups in polymer chain [1-2], and used in broad applications such as batteries, sensors , electronic devices , super capacitors and corrosion protection in organic coatings due to its physical and chemical properties, good electrical conductivity (p-type), high environmental stability, low cost, light weight, flexibility, facile fabrication and possibility of both chemical and electrochemical syntheses . Electrical conductivity of polyaniline is a very important parameter and it could be modified by the addition of inorganic fillers . Additionally, electrical conductivity of polyaniline depends on dopant ions . Metals and semiconducting nanostructure materials are used as stabilizers or capping agents of these conducting polymers. In recent decades, several reports have been published on the synthesis of the PANI nanocomposites with the inorganic nano-scale such as TiO2, CdS, Silica , Ag, CeO2 , Fe3O4 , Zn and MnO2 [3-5].

Polyaniline (PANI) is a promising conducting polymer due to its easy synthesis, environmental stability and high electrical conductivity on doping with protonic acids [5-6]. The highly ordered structures such as crystalline or self-assembled structures of ideal conducting polymer with conjugated structure is expected to have Metal - like electrical conductivity .To induce an ordered structure, other materials acting as filler for the composite are required [7-12]. The preparation of PANI composites with various materials has received great attention because of their unique properties and applications in various electrical and electronic devices.

Literature Review:

Among the various conducting polymers, Polyaniline (PANI) has been investigated as a potential material for gas sensing applications, due to its controllable electrical conductivity, environmental stability and interesting redox properties associated with the chain nitrogen's. It is the unique type of conducting polymer in which the charge delocalization can, in principle, offer multiple active sites on its backbone for the adsorption and desorption of gas analyte [8]. However, PANI is not as sensitive as metal oxides towards gas species, and its poor solubility in organic solvents limits its applications, but it is suitable as a matrix for preparation of conducting polymer nanocomposites [9-10]. Therefore, there has been increasing interest of the researchers for the preparation of nanocomposites based on PANI for gas sensing applications. Hybridization of metal oxide and conducting polymer could improve the properties of pure metal oxides or conducting polymers based gas sensor and the new synthesized material shows the synergistic effect of these two materials

PANI-ZnO with different weight percentage of zinc oxide were successfully synthesized and tested for hydrogen gas sensing. It was concluded that PANI-ZnO showed the best response compared to other composition[12].

A Mehata et al [13] synthesized polyaniline/ZnO nanocomposites for ammonia gas sensing application. The lower intensity polaron absorption bands for polyaniline/ZnO nanocomposites in the UV-Vis spectra indicate that the conducting state of the polymer has been improved. Observed results clearly indicate that polyaniline/ZnO nanocomposite is a good candidate for ammonia sensing with better sensitivity.

M. Sawarkar et.al. [14] studied PANI, ZnO and CdO nanoparticles along with PANI/ZnO, PANI /CdO nanocomposites had been successfully synthesized by a simple, cost effective technique. ZnO and CdO nanoparticles were synthesised by sol gel method. XRD studies clearly showed the crystalline and hexagonal quartzite nature of the ZnO nanoparticles and PANI/ZnO nanocomposites of 32 nm and 48 nm, respectively. A change in the lattice parameters of ZnO in the PANI/ZnO nanocomposites was observed which also indicated the interaction between ZnO particles and PANI matrix. The SEM study of PANI/ZnO nanocomposites revealed uniform distribution of ZnO nanoparticles in PANI matrix. FTIR spectra revealed that the absorption peaks of PANI/ZnO nanocomposite were found to shift towards lower wave number as compared to those observed in pure PANI. The shifting of absorption bands were attributed to the interaction of ZnO nanoparticles with the PANI molecular chains.

Meng, F et. Al. [15] Polyaniline (PANI) and MnO2/PANI composites are simply fabricated by one-step interfacial polymerization. The morphologies and components of MnO2/PANI composites are modulated by changing the pH of the solution. Formation procedure and capacitive property of the products are investigated by XRD, FTIR, TEM, and electrochemical techniques. We demonstrate that MnO2 as an intermedia material plays a key role in the formation of sample structures. The MnO2/PANI composites exhibit good cycling stability as well as a high capacitance close to 207 F g−1. Samples fabricated with the facile one-step method are also expected to be adopted in other field such as catalysis, lithium ion battery, and biosensor.

Conclusion

The current review paper will emphasize PANI composites with thermosetting polymer matrices Many studies special attention is given on synthesis of Polyaniline Nano composite have been reported in the quest to develop new advanced materials with improved mechanical, electrical, optical and catalytic properties or to improve conduction mechanism in electronic devices. These materials have found their use in many electronic and nanoelctronic devices.

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DC Conductivity and Thermal Analysis of Polyaniline Cadmium Sulphide nanocomposite

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Introduction

In recent years, with the rapid development of nanotechnology and composite materials, polyanline (PANI) nanocomposites have attracted considerable interest. PANI is one of the most promising conducting polymers due to its high conductivity, easy preparation, good environmental stability and large variety of applications [1]. Unlike other conjugated polymers, PANI has a simple and reversible acid/ base doping/dedoping chemistry, enabling control over properties such as solubility, electrical conductivity and optical activity [2]. Polymer nanocomposites show quite different properties from the constituent materials due to interfacial interactions between nanostructured semiconductors and polymers.

CPs join the electronic and optical properties of semiconductors and metals with the alluring mechanical properties and handling preferences of polymers. CPs have numerous profitable properties in chemical, electrical, physical and optical angles, contrasted with ordinary polymers. These properties cover high conductance, iridescence, electrochromism and high thermal soundness. This has set off the improvement of novel CPs, for example, polyaniline (PANI), polypyrrole (PPY), polythiophene, polyphenylene, etc. [3-5] and their application in batteries [6-9].

Polyaniline (PANI) has gotten much consideration in view of its electronic, thermoelectric and optical properties and additionally its great ecological solidness and simplicity of synthesis. Polyaniline is likewise one of a kind among natural conducting polymers in that its electrical properties are controlled by the two its oxidation state and level of protonation. Thus, polyaniline is generally utilized for different applications, for example, battery-powered batteries [10,11], chemical transtiors , supercapicitors , electrochromic shows , actuators, sensors and hostile to corrision covering .

Among conducting polymers, polyaniline (PANI) is presumably the most generally examined because of its few interesting properties [12,13]. It simplicity of arrangement, light weight, ease, better electronic, optical properties, exceptionally stable in air and dissolvable in different solvents, and great processibility [14-16]. Then again it very well may be utilized in numerous applications, for example, electromagnetic obstruction (EMI) protecting, electro-impetuses, battery-powered battery, light-producing diodes (LEDs), solar cell, chemical sensor, biosensor, erosion gadgets and microwave ingestion [17,18].

Experimental

Materials

The Aniline monomer (AR grade) and Ammonium Persulphate (AR grade). Cadmium Nitrate (AR grade), Ammonium Sulphide (AR Grade)

Synthesis of Polyaniline Cds Nanocomposite

In the Present work polymer composite film of Polyaniline (PANI)-CdS was prepared for different weight percent of Cadmium Sulphide (CdS).

Synthesis steps of PANI/CdS nanocomposite are similar to the synthesis method of PANI. Different amount of CdS were dispersed into the APS solution and stirred for 1 h prior to the addition of aniline. Aniline (0.4 mol) stirred with 0.4M H_2SO_4 in 100 ml of distilled water were added drop-wised using burette into the APS-CdS solution and stirred vigorously to form homogeneous dispersion. For convenience, PANI Composites were prepared with different weight percentages of CdS [19]. Same synthesis conditions were maintained for all composites as that of pure PANI.

Result and Discussion

1) TG/DTA

Thermogravimetric Analysis or thermal gravimetric analysis is a sort of testing performed on tests that decides changes in weight in connection to a temperature program in a controlled atmosphere.Such analysis relies on a high degree of precision in three measurements: weight, temperature, and temperature change. TGA is commonly employed in research to determine characteristics of materials, degradation temperatures, absorbed moisture content of materials, the level of inorganic and organic components in materials,

decomposition points of explosives and solvent residues. The TGA/DTA of PANI-CdS nanocomposite TGA/DSC temperature is maintained up to 973K. and heating rate of the sample was 10°C/min.

Thermal properties of pure Polyaniline polymer and PANI doped with Cadmium Sulphide (CdS) were evaluated by TGA/DTA in the temperature range 0 °C to 500 °C at a heating rate of 10 °C /min (Figure 1).

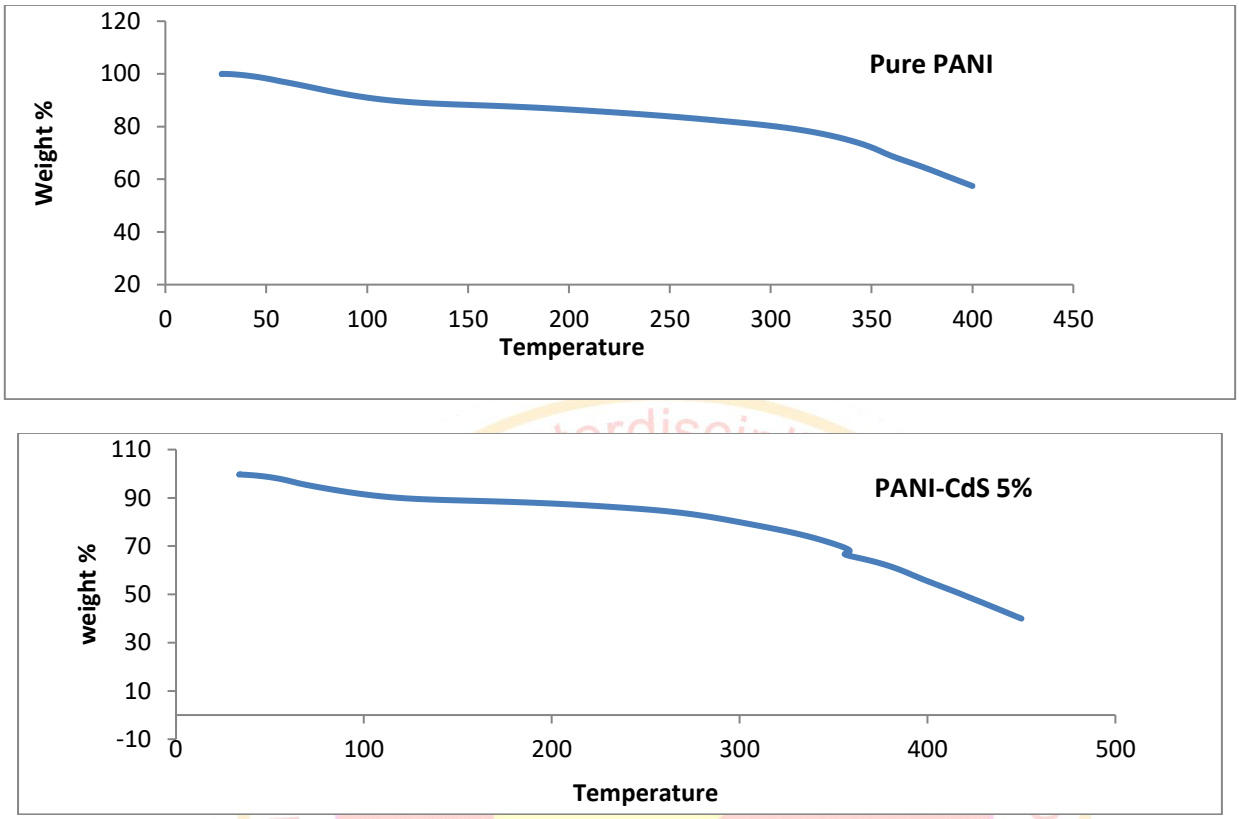
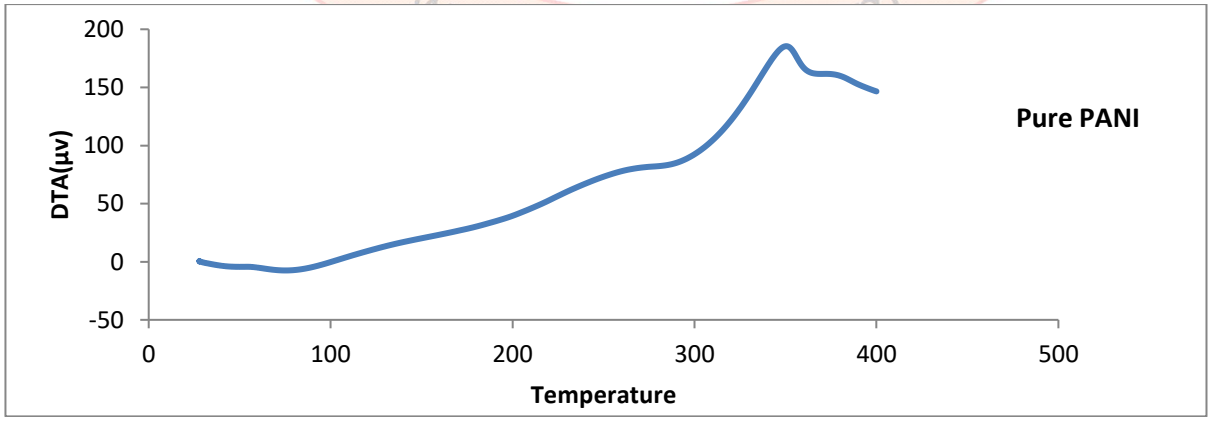


Fig. 1 TGA thermographs of pure PANI and PANI doped with 5 wt % of Cadmium Sulphide CdS

TGA thermograph of PANI-CdS nanocomposites shows two step degradation Figure 1 shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^{0}C. It indicates that 60-65 % of the sample consists of polymers and softeners. The residual about 35-40 % was considered to account for metallic compounds, added as sulphide and dopant. Residual was increases with increasing the wt. % of dopant. Addition of CdS weakens the structure of PANI as weight loss increases.

Figure 2 shows DTA curves of pure Polyaniline and PANI doped with CdS(10 %). In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer. The sample PANI-CdS nanocomposite shows the strong and broad exothermic peak in the range 340 to 400 °C accompanied by rapid weight loss can be ascribed to the decomposition of PANI-CdS nanocomposite.



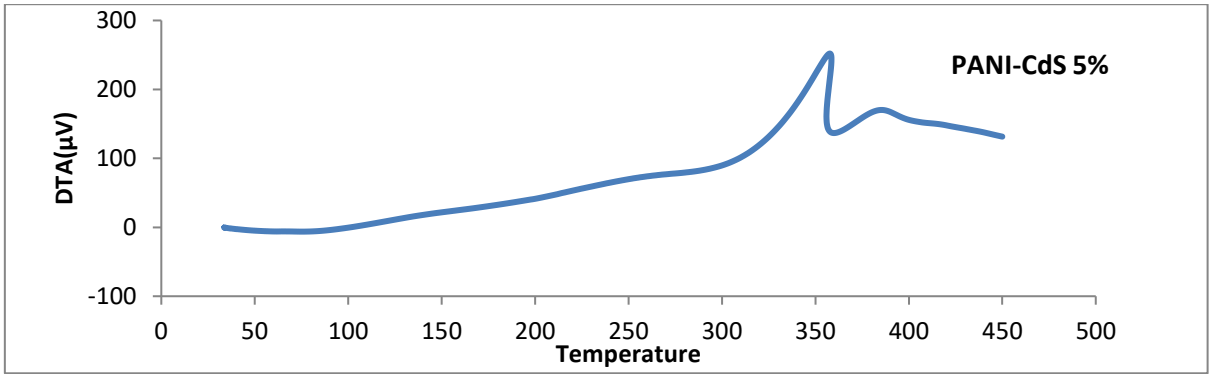


Fig. 2 DTA Curve of pure PANI and PANI doped with 5 % of Cadmium Sulphide CdS

ll) DC Conductivity

A suitable heating rate (2^0C/min.) was maintained with the help of dimmer stat. A digital temperature indicator connected to a thermocouple (resolution 1^0C) placed near the sample to measure the temperature of the sample. A constant voltage is applied to the sample and corresponding current (Pico-ammeter, Scientific Equipment Roorkee, resolution 1 pA) was measured at constant temperature, which gives resistance of the sample. Then the change in conductivity of the samples with temperature was estimated.

DC conductivity of the pure PANI polymer and doped with different wt. % of CdS was measured in the temperature range 308 to 328K by using Ohms law. The resistance of the samples was measured. It is observed that the value of resistance depends on temperature as well as on composition.

The variation of dc conductivity with different wt. % of CdS is shown in fig 3 As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity.

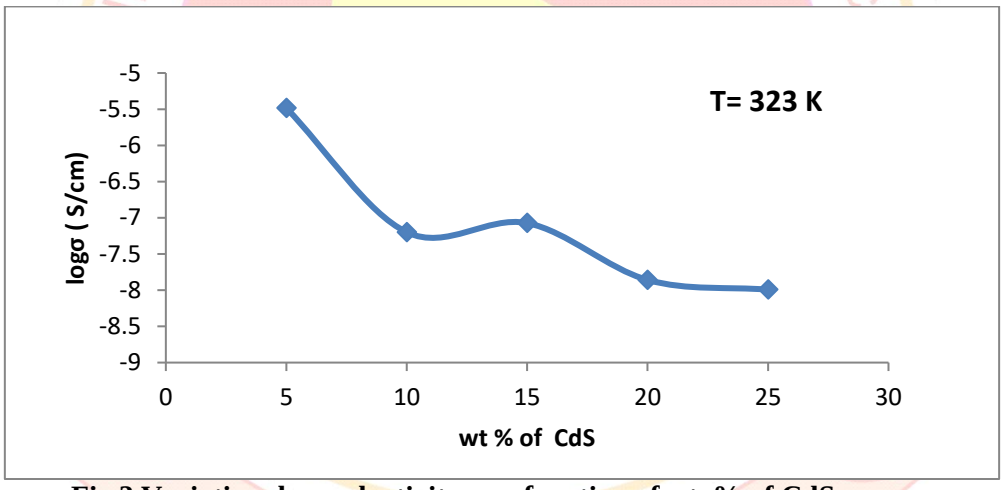


Fig 3 Variation dc conductivity as a function of wt. % of CdS

The variation of dc conductivity as a function of inverse temperature for Polyaniline polymer doped with the different wt. % CdS was estimated. The nature of plots is shown in Figure 4, over the temperature range 308 to 328 K. It can be observed that the dc conductivity for all the compositions of PANI doped with the different wt. % CdS increases with increasing temperature for the entire range.

It tends to be seen that the Arrhenius plots for every one of the examples show a comparative behavior. The dc conductivity esteems increments with the different wt. % CdS at various temperatures.

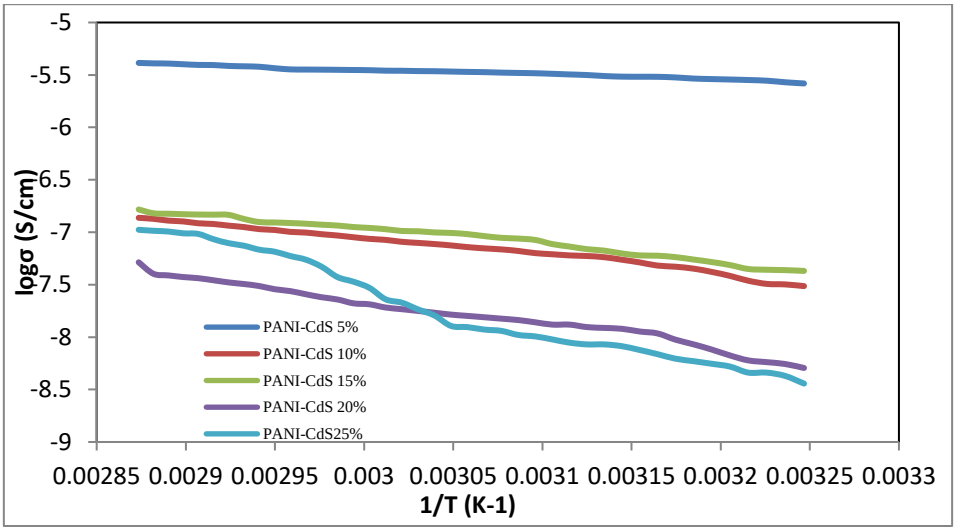


Fig 4 Arrhenius plots of the dc conductivity of PANI-CdS composite for different wt. % of CdS

As the temperature builds, versatility of the ions expands, which results the rise in conductivity . Uppermost curve belong to 5 wt % of CdS for which conductivity is maximum. The conductivity versus temperature curves of all synthesized samples shows the increase in conductivity. The rate of increase of conductivity is linear for the composite; which may be due to the segmental motion of the ions in the polymer [20].

The natures of the curves are consistent with Arrhenius type charge conduction in polymer composites and the conductivity relationship follows the equation,

$$\sigma = \sigma_0 \, ex \, (-E_a/kT) \qquad (1)$$

Where E_a is the activation energy, σ_0, is the pre-exponential factor and k is the Boltzmann's constant. The slope of each straight line gives the activation energy which lies between 0.039 and 0.36 eV. From the figure 5, DC parameters are calculated and noted in table 5.1.

Sr.No.	CdS wt %	Activation Energy E_a (eV)	Conductivity σ (S/cm)
1	5	0.039	3.2833×10^{-6}
2	10	0.146	6.3232×10^{-8}
3	15	0.135	8.4481×10^{-8}
4	20	0.201	1.3852×10^{-8}
5	25	0.364	1.0162×10^{-8}

Table 1 : DC parameter for the PANI-CdS Nanocomposite

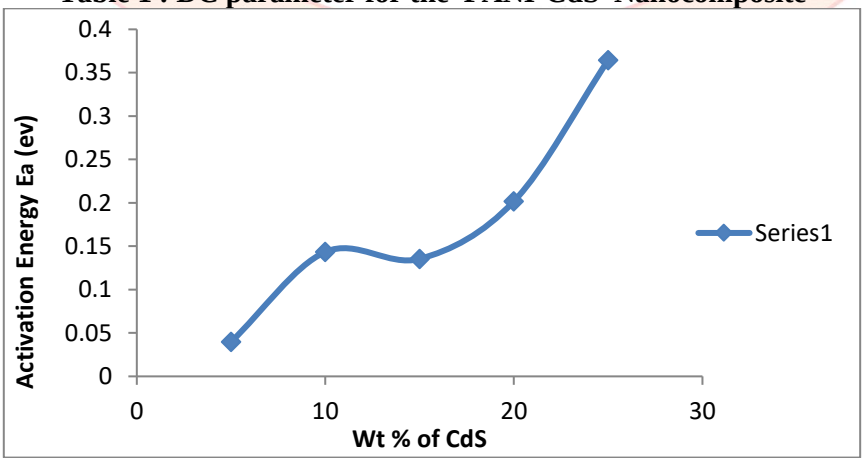


Fig. 5 Variation Activation Energy as a function of wt. % of CdS

Plot of activation energy with different wt. % of CdS is illustrated in figure 5.8, which shows that activation energy Ea is found to be maximum for the 25 wt % of CdS. The value of activation energy increases with wt. % CdS.

Conclusion

In this work PANI-CdS nanocomposites were successfully prepared by *insitu* polymerization method at room temperature. As compared to pure Polyaniline the conductivity increases with CdS wt. % . Polyaniline doped with the 5 wt. % CdS shows the maximum value of dc conductivity and 25 wt % CdS shows maximum activation energy. TGA shows the two step degradation of PANI-CdS nanocomposite having 60-65% of its weight loss when it was heated to 500^0C. In DTA curve, the endothermic peak appearing at ~ 70-80 ^{0}C is probably due to the melting point of PANI that identified as melting of crystalline phase of polymer.

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Density, Viscosity and Ultrasonic Velocity Studies of Aqueous Solution of D-(-) - Tartaric Acid at Different Temperature

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Abstract

At concentration range (0.01 to 0.1) mol/kg and temperature range T = (298.15 and 303.15) K, densities (ρ) , ultrasonic speeds (u) and viscosities (η) of aqueous solutions of D-(-) - Tartaric acid were measured. From these experimentally measured values the parameters such as Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (V_f), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}), Relaxation Time (τ), Molar Volume (V_m) and Rao Constant (R) have been evaluated. The results have been interpreted in terms of solute-solvent and solute-solute interactions in these systems. It has been observed that there exist strong solute-solvent interactions in these systems and these interactions increases with concentration of solute in aqueous medium.

Keywords: *Density, Ultrasonic speed, Viscosity, molecular interaction.*

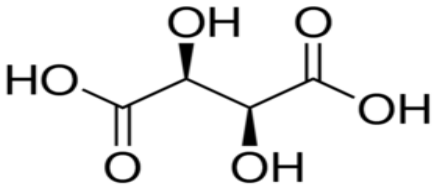
Introduction

Tartaric acid is a white, crystalline organic acid that occurs naturally in many fruits, most notably in grapes, but also in bananas, tamarinds, and citrus. Tartaric acid has three stereoisomeric forms dextrorotatory tartaric acid, levorotatory tartaric acid and racemic tartaric acid. Tartaric acid is an alpha-hydroxy carboxylic acid, and is diprotic organic acid [1]. All the forms of tartaric acid are readily soluble in water. It can form salts with bases, and some of the important salts of tartaric acid are cream of tartar (potassium hydrogen tartrate) and Rochelle salt (potassium sodium tartrate).Tartaric acid plays an important role in the preparation of many food additives. Tartaric acid is used in pharmaceutical products, skin care, beverages, agriculture products and textiles. The studies on Tartaric acid solute solvent interactions are most important for the field of biosynthesis, medicine, immunology and pharmacology. The study of physiochemical behaviour and molecular interaction in liquid mixtures is of considerable importance and number of techniques has been used to investigate the interaction between the components of binary liquid mixtures. In recent years, the measurement of ultrasonic velocity has been extensively applied in understanding the nature of molecular systems, physiochemical behavior and molecular interactions in liquid mixture.

In the present article, we report the densities, ρ, ultrasonic speeds u and viscosities η of solutions of Tartaric acid in water at different temperatures and atmospheric pressure have been computed using standard relations given by literature [2-4]. Various physicochemical parameters, viz., Adiabatic Compressibility (β_a), Free Length (L_f), Free Volume (Vf), M_{eff}, Internal Pressure (P_i), Acoustic Impedance (Z), Gibbs free energy (ΔG), Molar Cohesive Energy (M_{CE}),Relaxation Time (τ),Molar Volume (Vm) and Rao Constant (R) have been calculated using the experimental data.

Material and Methods

Tartaric acid (AR 99%) having molecular weight of 182.65 was obtained from Sigma Aldrich chemicals Ltd. The molecular structure of this compound is as follows



D-(-)-tartaric acid

The aqueous solutions of Tartaric acid of different concentrations were freshly prepared by using double distilled water. The required amount of solute was measured by using a digital weighing machine. The solutions were made on the basis of molality and stored in special airtight bottles to avoid contamination and evaporation. The densities measurements have been done by using specific gravity bottle (10ml). Ultrasonic velocities have been determined by using digital ultrasonic pulse echo velocity meter (VCT -70A). The viscosities of the solutions were measured by using Ostwald's type viscometer. The instrument has been calibrated with double distilled water at certain temperatures before taking measurements. The flow time has been measured with a digital stopwatch and average flow times were taken for each series of liquid solutions.

Mathematical Formulation

Apparent molal volume measurements (v_φ)

$$\emptyset_v = \frac{1000(\rho_0 - \rho)}{m\rho\rho_0} + \frac{M}{\rho} \quad (1)$$

Where, m= molality of the solute

ρ = density of solution

ρ_o= density of solvent

M= molar mass of the solute (tartaric acid)

Where f = frequency of the ultrasonic wave

Apparent molar compressibility (k_s, φ)

$$K_s, \varphi = \frac{1000(K_s\rho_0 - K_s^0\rho)}{m\rho\rho_0} + \frac{K_s M}{\rho} \quad (2)$$

Where, $k_s$and k_s^0= isentropic compressibility of the solution and solvent (water) respectively.

Isentropic Compressibility

$$K_s = \frac{1}{u^2}\rho \quad (3)$$

Acoustic Impedance (Z)

The specific acoustic impedance is given by

$$Z = U\rho_s \qquad Kg\, m^{-2}s^{-1} \quad (4)$$

ρ_s = Density of solution

U = ultrasonic velocity of solution

Relaxation Time (τ)

$$\tau = \frac{4}{3\beta\eta} \quad (5)$$

where η is the viscosity of solution

Classical absorption $(\alpha/f^2)_{cl}$

$$(\alpha/f^2)_{cl} = \frac{8\pi^2\eta}{3\rho U^3} \quad (6)$$

Where f = frequency of the ultrasonic wave

Free Length (L_f)

$$L_f = K\beta^{1/2} \quad (7)$$

K= temperature dependant constant

Result and Discussion

The experimental values of basic parameter of Ultrasonic velocity (u), Density) and Viscosity obtained are given in table 1 and by using these basic parameter the various acoustic parameter such as Acoustic Impedance (Z), Adiabatic compressibility (βa), Relaxation Time (T), Free Length (Lf), Free Volume (Vf),Meff (kg), Internal Pressure (Pi), MCE,Molar Volume (Vm), Rao Cont. Molar Sound Velo.etc are calculated in table2,3,4 and 5 the various acoustic parameter's calculated values are given.

Composition M(mol/kg)	298.15 K			303.15 K		
	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)	Velocity U(m/s)	Density ρ (kg/m^3)	Viscosity η (N.s.m^3)
0.01	1410.19	1035.1220	9.81E-04	1503.14	1020.2290	8.67E-04
0.02	1493.54	999.0480	9.58E-04	1503.75	1020.2290	8.62E-04
0.03	1494.14	1001.0520	9.60E-04	1503.76	1020.2290	8.43E-04
0.04	1494.14	1002.0540	9.45E-04	1504.35	1021.2520	8.48E-04
0.05	1494.73	1000.0500	9.37E-04	1504.96	1022.2760	8.24E-04
0.06	1495.33	1001.0520	9.76E-04	1504.96	1023.2990	8.38E-04
0.07	1495.33	1003.0560	9.83E-04	1505.56	1023.2990	8.73E-04
0.08	1495.93	1004.0580	9.63E-04	1505.56	1026.3690	8.55E-04
0.09	1496.53	1005.0600	9.42E-04	1506.17	1025.3460	8.17E-04
0.1	1497.53	1006.0620	9.48E-04	1506.17	1027.3920	8.53E-04

Experimental Values of density, viscosity and ultrasonic velocity of aqueous D- (-)-Tartaric Acid and other parameters

Table 1
Table 2.

	298.15 K			303.15 K		
Composition M	Adiabatic Compre. βa ($10^{-10}N^{-1}.m^2$)	Free LengthL$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)	Adiabatic Compre. βa	Free Length L$_f$ (10^{-11}m)	Free Volume V$_f$ ($10^{-8}m^3.mol^{-1}$)
0.01	4.858E-10	4.534E-11	1.5E-08	4.338E-10	4.324E-11	2E-08
0.02	4.487E-10	4.357E-11	1.7E-08	4.335E-10	4.322E-11	2.0E-08
0.03	4.475E-10	4.351E-11	1.7E-08	4.335E-10	4.322E-11	2.1E-08
0.04	4.470E-10	4.349E-11	1.7E-08	4.327E-10	4.318E-11	2.1E-08
0.05	4.476E-10	4.352E-11	1.8E-08	4.319E-10	4.314E-11	2.1E-08
0.06	4.468E-10	4.348E-11	1.6E-08	4.315E-10	4.312E-11	2.1E-08
0.07	4.459E-10	4.343E-11	1.6E-08	4.311E-10	4.310E-11	2E-08
0.08	4.451E-10	4.340E-11	1.7E-08	4.298E-10	4.304E-11	2E-08
0.09	4.443E-10	4.336E-11	1.8E-08	4.299E-10	4.304E-11	2.2E-08
0.1	4.432E-10	4.331E-11	1.7E-08	4.291E-10	4.300E-11	2.1E-08

	298.15 K			303.15 K		
Composition m	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m-^{2}.s^{-1})	Meff (kg)	Internal Pressure Pi (10^9pas)	Acoustic Imped. Z (kg. m-^{2}.s^{-1})
0.01	1.80E-02	3.004E+09	1.460E+06	1.80E-02	2.709E+09	1.534E+06
0.02	1.80E-02	2.817E+09	1.492E+06	1.80E-02	2.701E+09	1.534E+06
0.03	1.81E-02	2.805E+09	1.496E+06	1.81E-02	2.654E+09	1.534E+06
0.04	1.81E-02	2.785E+09	1.497E+06	1.81E-02	2.663E+09	1.536E+06
0.05	1.81E-02	2.769E+09	1.495E+06	1.81E-02	2.626E+09	1.538E+06
0.06	1.81E-02	2.827E+09	1.497E+06	1.81E-02	2.650E+09	1.540E+06
0.07	1.82E-02	2.823E+09	1.500E+06	1.82E-02	2.687E+09	1.541E+06
0.08	1.82E-02	2.796E+09	1.502E+06	1.82E-02	2.664E+09	1.545E+06
0.09	1.82E-02	2.766E+09	1.504E+06	1.82E-02	2.602E+09	1.544E+06
0.1	1.82E-02	2.776E+09	1.507E+06	1.82E-02	2.663E+09	1.547E+06

Table 3.
Table 4.

	298.15 K		303.15 K	
Composition m	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})	Gibbs free energy ΔG (Jmol^{-1})	Molar Cohesive Energy MCE (kJ mol^{-1})
0.01	4.616E-21	5.224E+04	3.748E-21	4.780E+04
0.02	4.238E-21	5.076E+04	3.724E-21	4.765E+04
0.03	4.235E-21	5.072E+04	3.642E-21	4.708E+04
0.04	4.174E-21	5.031E+04	3.657E-21	4.719E+04
0.05	4.147E-21	5.012E+04	3.545E-21	4.650E+04
0.06	4.290E-21	5.112E+04	3.603E-21	4.687E+04
0.07	4.309E-21	5.122E+04	3.750E-21	4.779E+04
0.08	4.227E-21	5.067E+04	3.663E-21	4.725E+04
0.09	4.139E-21	5.009E+04	3.497E-21	4.619E+04
0.1	4.154E-21	5.022E+04	3.648E-21	4.717E+04

Table 5.

	298.15 K			303.15 K		
Composition M	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)	Relaxation Time T (10^{-13}sec)	Molar Volume Vm ($10^{-5}m^3.mol^{-1}$)	Rao Const. (Mol. Sound Velo.) R ($10^4m^5.N^{-2}$)
0.01	6.354E-13	1.739E-05	1.95E-04	5.015E-13	1.764E-05	2.02E-04
0.02	5.732E-13	1.802E-05	2.06E-04	4.982E-13	1.764E-05	2.02E-04
0.03	5.728E-13	1.808E-05	2.07E-04	4.872E-13	1.774E-05	2.03E-04
0.04	5.632E-13	1.806E-05	2.06E-04	4.892E-13	1.772E-05	2.03E-04
0.05	5.592E-13	1.810E-05	2.07E-04	4.745E-13	1.771E-05	2.03E-04
0.06	5.814E-13	1.808E-05	2.07E-04	4.821E-13	1.769E-05	2.03E-04
0.07	5.844E-13	1.814E-05	2.07E-04	5.018E-13	1.779E-05	2.04E-04
0.08	5.715E-13	1.813E-05	2.07E-04	4.900E-13	1.773E-05	2.03E-04
0.09	5.580E-13	1.811E-05	2.07E-04	4.683E-13	1.775E-05	2.03E-04
0.1	5.602E-13	1.809E-05	2.07E-04	4.880E-13	1.771E-05	2.03E-04

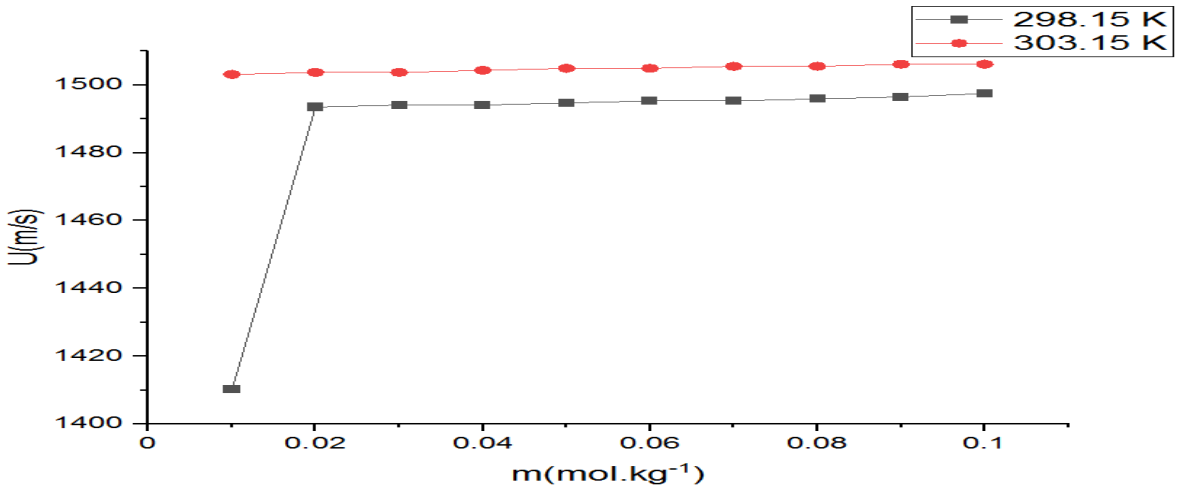


Fig.1 Variation of Ultrasonic Velocity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

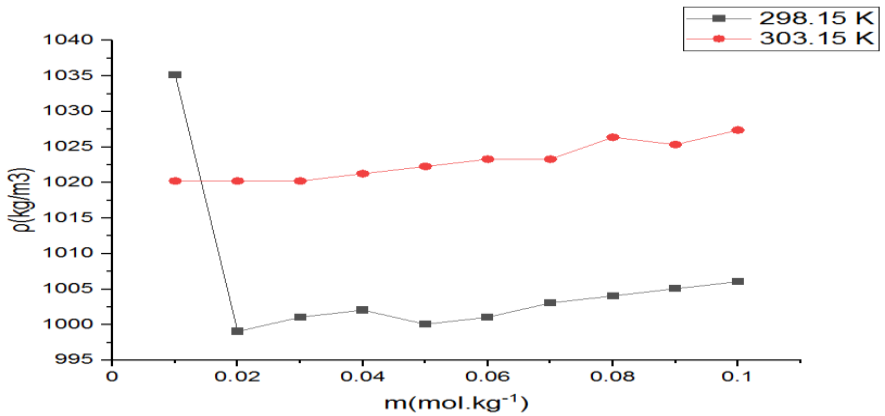


Fig.2 Variation of Ultrasonic Density with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

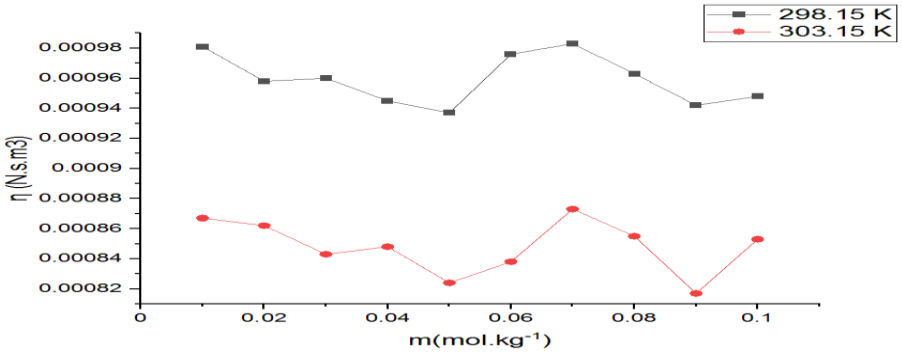


Fig.3 Variation of Ultrasonic Viscosity with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

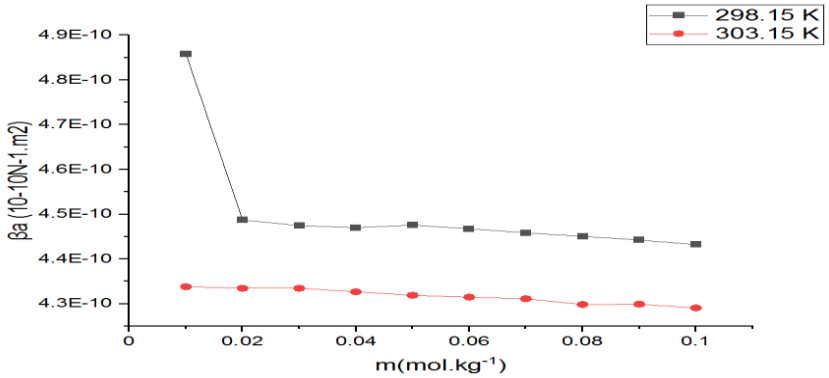


Fig.4 Variation of Adiabatic Compressibility with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

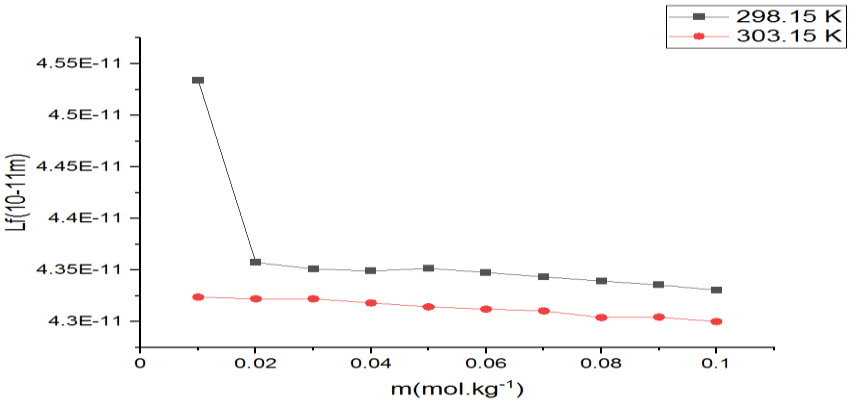


Fig.5 Variation of Free Length with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

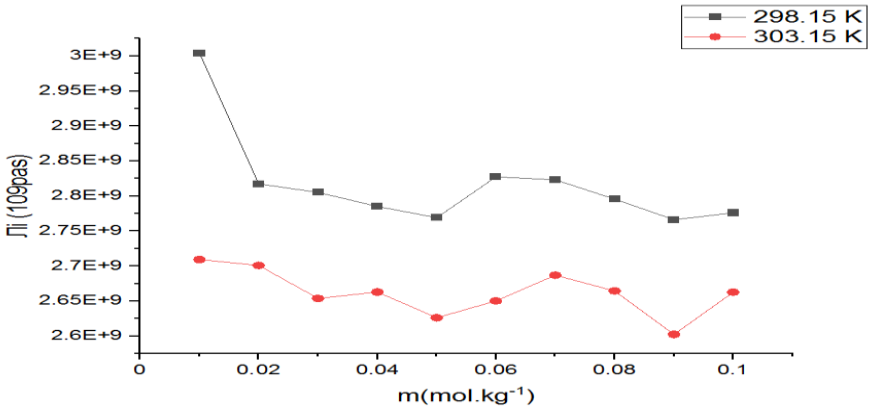


Fig.6 Variation of Internal Pressure with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

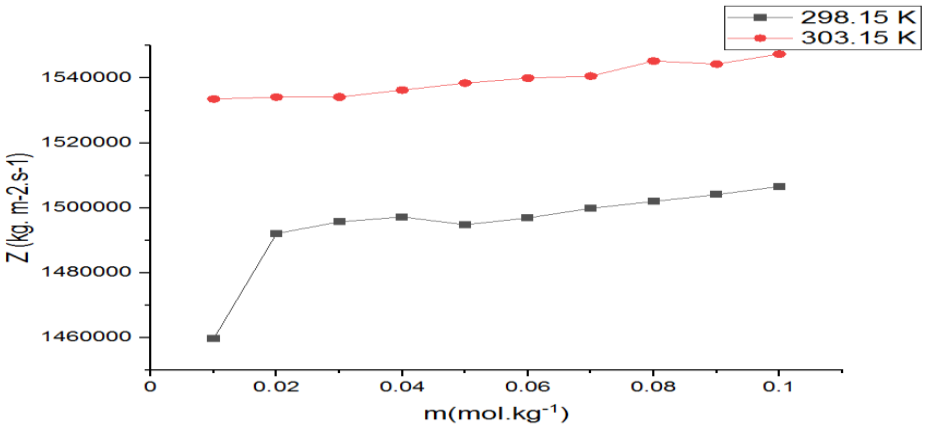


Fig.7 Variation of Acoustic Impedance with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

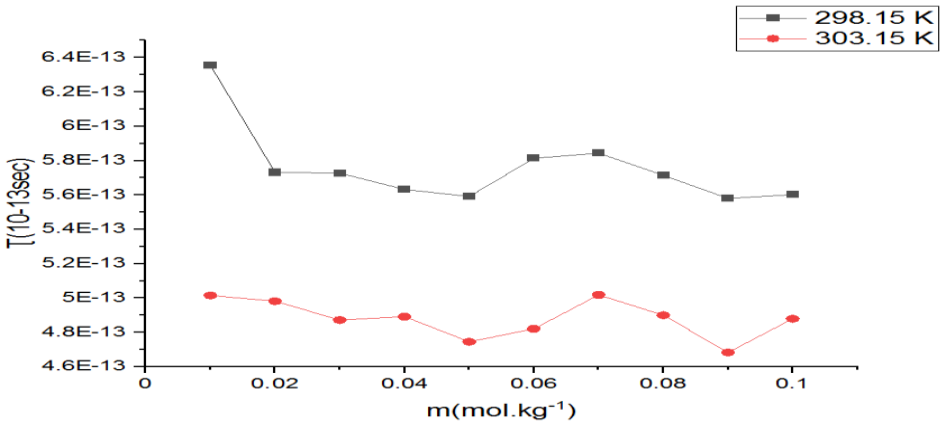


Fig.8 Variation of Relaxation Time with molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

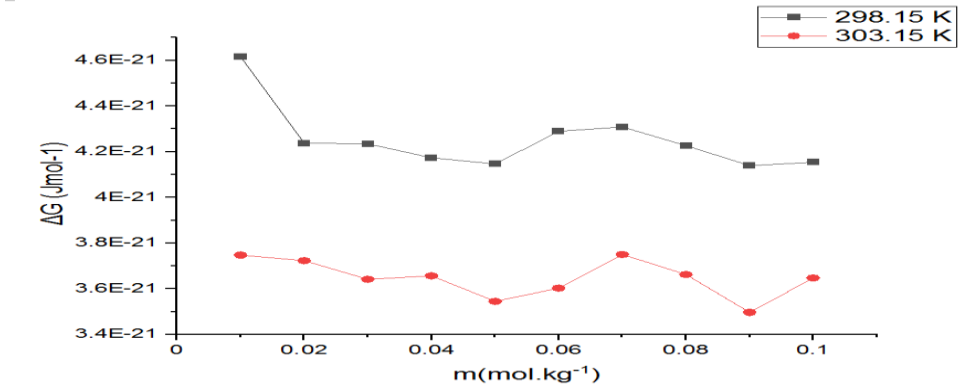


Fig.9 Variation of Gibbs free energy molality at 298.15K,303.15K for D-(-)-Tartaric Acid.

In the present study, the experimental value of ultrasonic velocity, density and viscosity with different concentration of D-(-)-tartaric acid in distilled water at temperature 298.15K and 303.15K are tabulated table 1. While other parameters such as adiabatic compressibility ,free length, free volume, internal pressure , acoustic impedance , relaxation time, molar volume, Gibbs free energy , meff , rao constant and molar cohesive energy are tabulated table 2 to table 5 Fig.1. Shows that the ultrasonic velocity increases with increasing number of solute particle in solvent double distilled water and also with rise in temperature. The increase in ultrasonic velocity is an indication of enhanced solute solvent molecule interaction and structure making tendency of solute D-(-) - Tartaric acid in water.

Fig.2. shows that density of solution increases with increase in concentration due to increase in number of particle in solution. It is predict that there strong interaction in molecule of solution. The density of solution increases with rise in temperature.Fig.3. shows that Viscosity is inversely proportional to the adiabatic compressibility means that adiabatic compressibility decreases at that time viscosity is increases. Fig.4. It

represents the adiabatic compressibility decreases with increase in the concentration also with temperature. The decrease in the compressibility shows that there are enhanced molecular association in this system with increase in the solute content as the new entities become compact and less compressible [5].Fig.5. It is observed from this figure that the free length of aqueous D-(-) - Tartaric acid solution decrease with rise in concentration . This indicates that there exists a significant solute-solvent interaction which leads to a structure promoting behavior. The decreasing trends of free length with rise in concentration is due to decrease in spacing between the molecule of D-(-) - Tartaric acid solution. The free volume increases with increase in concentration as well as temperature. The increase in free volume may be attributed to lose packing of the molecule inside the shield. This may be brought about by weakness of molecular interaction. The free volume is inverse function of internal pressure.Fig.6. shows that the internal pressure decrease with increase in concentration which indicates the decrease in cohesive forces. The reduction in internal pressure may be due to loosening of cohesive force leading to breaking the structure of the solute. Decrease in internal pressure indicates that there is a weak interaction between the solute and solvent molecule [6]. Fig.7. It is observed that acoustic impedance increase with concentration and also with temperature. This may be due to the variation of pressure from one particle to another particle and the increase in acoustic impedance value with solute concentration can be attributed to the effective solute solvent interaction.Fig.8. shows that relaxation time decreases with increase in concentration also with temperature. The relaxation time is order of 10^{-12} sec is due to structural relaxation process in such a case it is suggested that molecule get rearranged due to co-operative process. It was reported that if the variation in Rao's constant is linear then it show that there is complex formation and so is found in the present investigation which means that there is no complex formation.Fig.9. Gibbs free energy first decreases and then increase with concentration of solution also with temperature. This result are in accordance with clathrate like structure of D-(-) - Tartaric acid.

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Synthesis and Characterization of Bis-Schiff Bases Derived from Vaniline

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Abstract

The Schiff Bases are the utmost extensively used organic compounds . Schiff bases are significant class of compounds in medicinal and pharmaceutical field as they have also been shown toexhibit wide range of biological activities, including antifungal, antibacterial,antiferative, anti inflammatory, antiviral, and antitumor properties.

The Bis-schiff bases are the product of the reaction between Bis-aldehydes and triazole amine. Some Bis-Schiff base derivatives of 1,2,4- triazole amine and their reduced derivatives have been also found to posses pharmacological activities[6-8].

Keyword *Synthesis of Bis-schiff base,anti inflammatory, antifungal, antibacterial, antitumor etc.*

Introduction

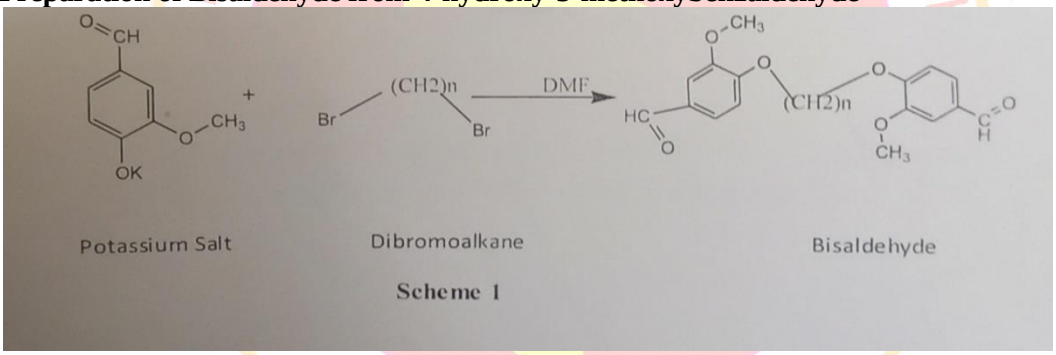
Schiff bases are the condensation products of primary amines and carbonyl compounds[1]. In present investigation,we report synthesis, characterization of Schiff Base derived from 1,2,4-triazole-4-amine and 4-hydroxy 3-methoxy benzaldehyde. Synthesis of various triazole derivatives have been reported[10-11].

In general Schiff base are most widely used compounds. They have been shown to exhibit a broad range of biological activities.

Litrature survey has revealed several advantages of Schiff bases derived from triazole. In vitro antibacterial , antifungal and cytotoxic activities of some Schiff bases and their complexes give the more research focus on this compounds[4-5].

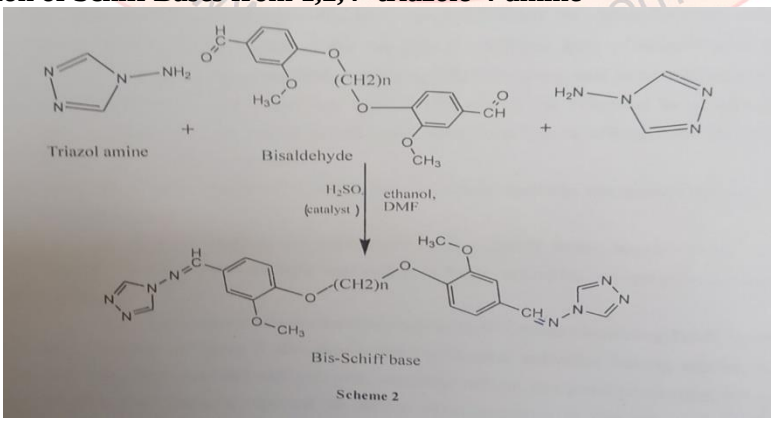
Methods for synthesis of Schiff base

Scheme I- Preparation of Bisaldehyde from 4-hydroxy-3-methoxybenzaldehyde



Take 1.5 g of 4-hydroxy-3-methoxybenzaldehyde dissolve in methanoic KOH. Stirr for 15 min. and remove solvent. Dissolve remaining in DMF and add Dibromoalkane. Reflux the reaction mixture for half an hour . Pour the content in crushed ice after ther completion of reaction . Collect solid Bis aldehyde from recrystalisation.

Scheme II – Preparation of Schiff Bases from 1,2,4- triazole-4-amine



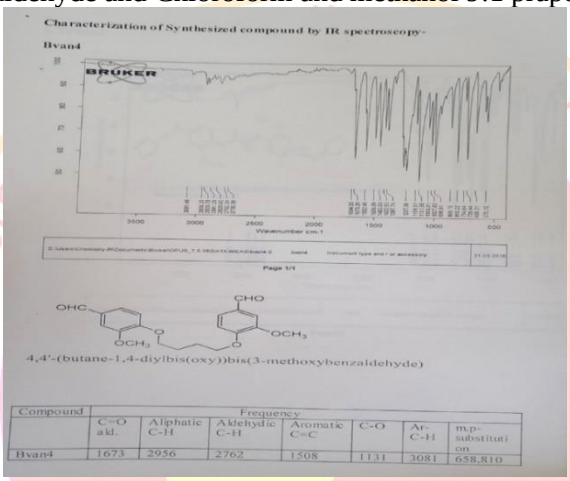
Take 0.86 g of Bisaldehyde and 0.42g of triazole in round bottom flask. Add ethanol and DMF in 9:1 praportion resp. Heat the solution till it will be completely soluble . Add 2-3 drops of H_2SO_4 to it. Reflux the solution till ppt appears.

Properties of the compound synthesized-

Compound	N	Molecular Formula	Molecular Weight	Melting Point
TrVan 2	$-(CH_2)_2-$	$C_{22}H_{22}N_8O_4$	430.198	228^0C
TrVan 3	$-(CH_2)_3-$	$C_{23}H_{24}N_8O_4$	444.208	244^0C
TrVan 4	$-(CH_2)_4-$	$C_{24}H_{26}N_8O_4$	458.218	240^0C
TrVan 5	$-(CH_2)_5-$	$C_{25}H_{28}N_8O_4$	472.228	216^0C

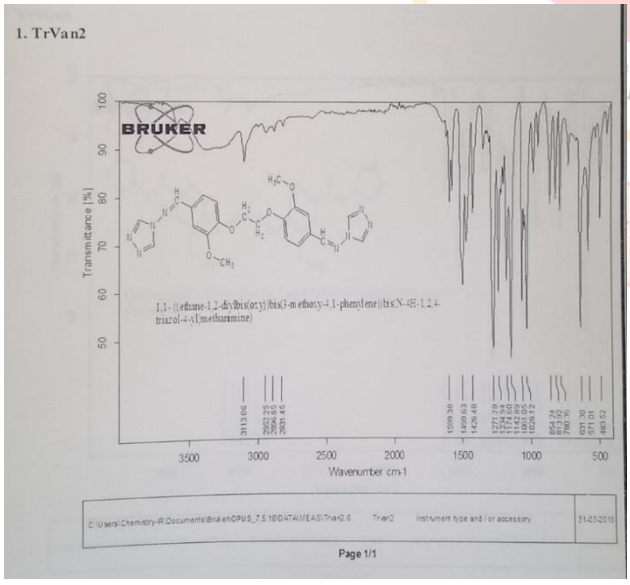
Result and Discussion-

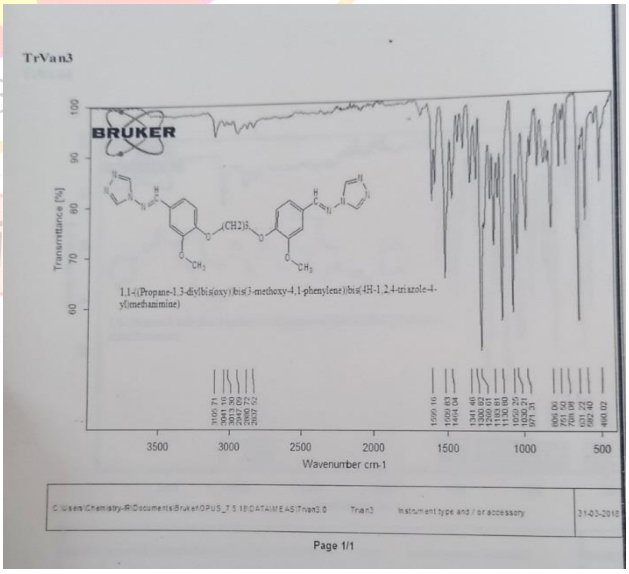
The synthesis of Schiff bases from triazolamine and bisaldehyde is very efficient required short reaction time , atom economical and with better yield. In present investigation the reaction of the various bisaldehyde with triazole were studied. The purity of the product obtained was checked by TLC using ethyl acetate and cyclohexane in 6:4 ratio for bisaldehyde and Chloroform and methanol 9:1 praportion for Schiff bases.

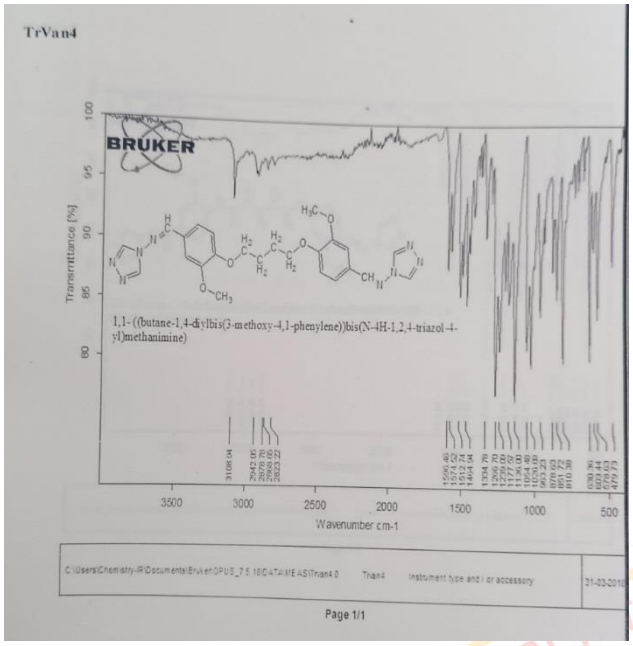


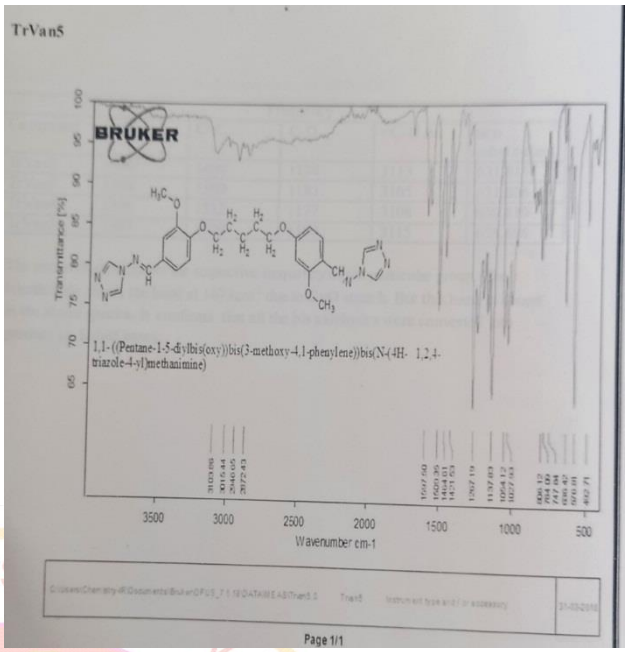
Compound	Frequency						
	C=O ald.	Aliphatic C-H	Aldehydic C-H	Aromatic C=C	C-O	Ar. C-H	m,p-substituti on
Bvan4	1673	2956	2762	1508	1131	3081	658,810

The conventional method take more time for the completion of reaction. But by using H_2SO_4 as the catalyst we can increase the rate of reaction . After addition of catalyst we get the product immediately within 5-10 min. This process is energy efficient and also autoeconomical. All the new compounds are tested with TLC , purified and crystalize with ethanol.

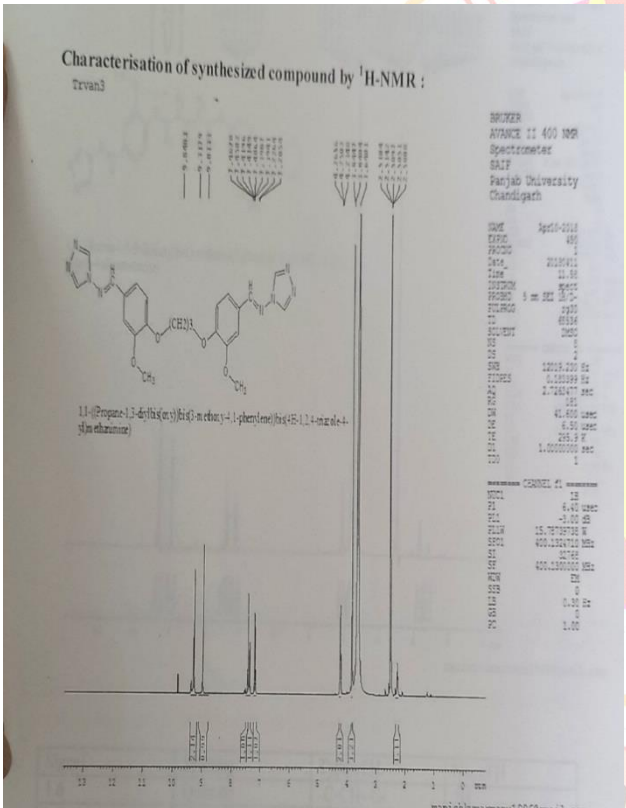






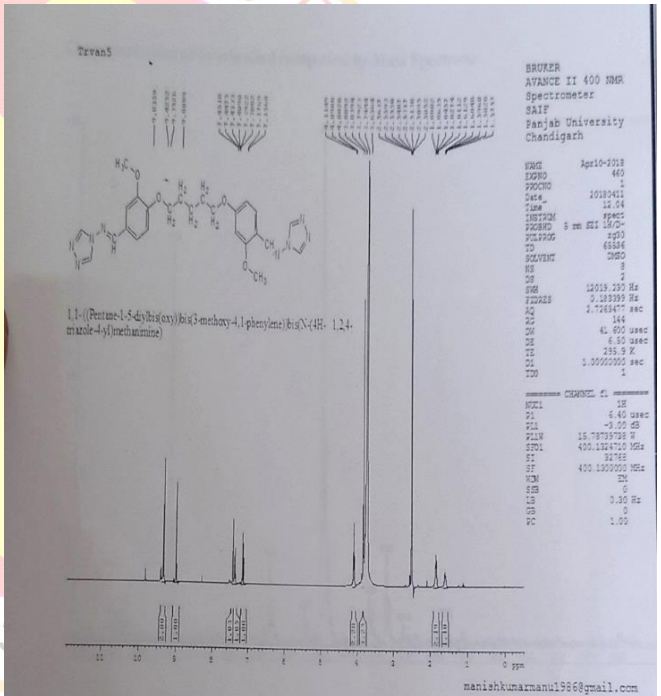


Characterisation of synthesized compound by ^{1}H-NMR :



Signal	Splitting	Type of H	No. of H
2.5	Quintate	-CH_2-	2H
3.84	Singlet	-OCH_3	6H
4.2	Triplet	-OCH_2-	4H
7.2	Doublet	o-Ar H	2H
7.3-7.4	Doublet of doublet	o-m-Ar H	4H
9.01	Singlet	N=CH-Ar	2H
9.3	Singlet	N=CH-N Trz.	4H

The above spectra shows the peak for the respective group. The coupling constant for the meta coupling is 1.88 in aromatic ring and ortho coupling value is 8.4. This gives clear the idea about coupling H .



Signal	Splitting	Type of H	No. of H
1.6	Quintate	-C-CH_2-C-	2H
1.8	Multiplate	O-C-CH_2-C-O	4H
3.8	Singlet	-OCH_3	6H
4.0	Triplet	-O-CH_2-C-	4H
7.1	Doublet	o-Ar H	2H
7.39	Doublet of doublet	o-Ar H	2H
9.00	Singlet	N=CH-Ar	2H
9.3-9.4	Singlet	N=CH-N	4H
7.45	Doublet	m-Ar H	2H

The above spectra also give the significant peaks for the given compound. Here the meta coupling constant is 1.72 which is nearly equal to 2. And the ortho coupling constant is 8.4. Thus confirms the structure of compound.

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Thermokinetic Studies of Cr(III), Mn(III) and Fe(III) Complexes Derived From Thiazole Schiff Base.

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Abstract:
Thiazole Schiff base ligand was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with Cr(III), Mn(III) and Fe(III),) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.
Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[1] synthesis, characterisation and various methods of Schiff base derived from sulphanilic acid and salicylaldehyde and Comparative study of Schiff base using various synthesis methods and their theoretical prediction of activities[2] The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[3] There is the combination of the azo group, the imidazole unit and the Schiff base fragment to studies the synthesis, characterization, and optical properties of four different Schiff bases ligands. They are reported the possible use of such systems in biological applications for their antifungal properties and antioxidant activities[4]. Synthesis and structural diversity transition metal coordination complexes with diverse Schiff base ligands and macrocyclic systems[5] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

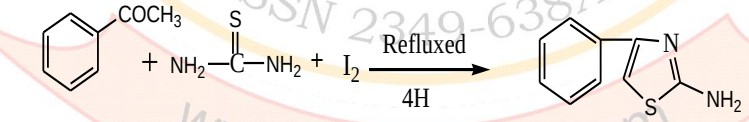
Experimental :

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods6-9. The solvents were purified by standard methods10.

Synthesis of 2-amino-4-phenylthiazole;

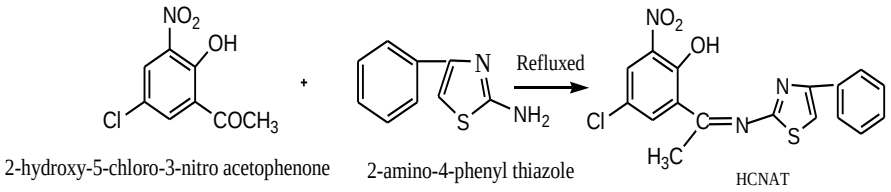
The synthesis of 2-amino-4-phenylthiazole prepared by known method7-9. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out.

Yield: 9g (75%); m.p.: 148-1500C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and 1H NMR spectral studies. Yield:75%; m.p. 3050C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes:

All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%. The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method.

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B. M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[CrL_2(H_2O)Cl]$ H_2O	868.7	Green	5.42	44.98	2.56	11.18	3.6	17.6
			(5.96)	(45.29)	(2.98)	(11.19)		
$[MnL_2(OAc)]$ H_2O	895.1	Brown	5.46	46.35	3.23	7.41	4.8	17.4
			(5.80)	(46.59)	(3.42)	(7.53)		
$[FeL_2(H_2O)Cl]$ H_2O	872.6	Black	6.12	44.85	3.22	11.46	5.4	21.2
			(6.19)	(45.10)	(3.28)	(11.72)		

Result and Disscution:

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10^{-3} M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The ^{1}H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) [11,13-15].

IR spectra of ligand and metal complexes shows ν(C=N) peaks at 1622 cm^{-1} and absence of C=O peak at around 1700 – 1750 cm^{-1} indicates the Schiff base formation[16-19].

Table 3. IR spectra of ligand and metal complexes

Compound	□(O□H) hydrogen bonded	□(C=N) imine	□(C□O) phenolic	□(M□O)	□(M□N)	□(C□S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[CrL_2(H_2O)Cl]\ H_2O$	--	1595	1500	478	406	1118
$[MnL_2(OAc)]\ 2H_2O$	--	1567	1462	498	418	1095
$[FeL_2(H_2O)Cl]\ H_2O$	--	1605	1505	513	436	1085

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ $mole^{-1}$)**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[CrL_2(H_2O)Cl]\ H_2O$	550.32	9.78	12.92	12.92	259.78	208.14	183.62
$[MnL_2(OAc)]\ 2H_2O$	710.34	11.15	18.54	11.16	222.34	208.83	217.88
$[FeL_2(H_2O)Cl]\ H_2O$	429.25	3.78	9.48	8.40	169.78	208.34	156.57

Thermogravimetric studies : Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Conclusions

In conclusion, we have synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Fabrication and Characterization of Ce modified $SmFeO_3$thick film

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Abstract
Thick films of $SmFeO_3$ were prepared onto a glass substrate by screen printing technique and fired at 500^0C for 30 min. As-prepared pure $SmFeO_3$ thick films were then dipped into 0.1 M aqueous solution of Cerium Chloride for 5 min. The films were then fired at 550 ^{0}C for 30 min to obtainCe modified $SmFeO_3$ thick films. Structural and morphological properties ofboth pure and surface modified $SmFeO_3$ thick films were characterized by Field Effect Scanning Electron Microscopy (FE-SEM) and Energy Dispersive X-Ray Analysis (EDAX) techniques. The effect of cerium doping on microstructure and surface morphology of pure $SmFeO_3$ thick film was discussed.
Keywords: $SmFeO_3$, Surface modification, Perovskite, Gas sensor.

Intruduction
Presently, environmental pollution due to hazardous gases emitting from auto and industrial exhaust has become a big challenge for human being. Therefore, detection and monitoring these gases is strongly required for better air quality. Different techniques have been employed for environmental monitoring. Among them metal oxide based gas sensors are of practical interest due to their small size. In 1962, Seiyama et al reported first semiconductor metal oxide gas sensor and since then different semiconducting metal oxides have been studied for ethanol, benzene, NO_2 and VOCs [1-3].But, their gas sensing characteristics such as sensitivity, selectivity, stability and operating temperature are still unsatisfactory.

Over a past few decade, perovskites of type ABO_3 (A: rare earth, B: transition metal) have attracted a great deal of attention for gas sensordue to their improved physical and chemical properties.Due to its doping flexibility, adsorption and desorption behavior can be controlled and sensor performance can be optimize. Properties of perovskite such as ionic and electronic conductivity, chemical stability and reactivity depends on the nature and amount of A and B cations. These properties can be tuned for particular application by partial substitutions at A-site, B-site and/or both A-site and B-site. Therefore perovskites have extensively studied for wide range of applications including solid oxide fuel cell[4], catalysis[5] and gas sensors[6-7].Among various perovskite oxides, $SmFeO_3$is reported to be a promising material for gas sensor due to its stability in thermal and chemical atmosphere. $SmFeO_3$is one of the rare earth orthoferritep-type semiconducting material[8]. It is extensively used in gas sensor for oxidizing gases like O_3,NO_2, ethanol. However, its use for reducing gases, like CO and $H_2$is limited because of its lower reduction stability and electrical conductivity[9-10] .Both reduction stability and electrical conductivity depends on nature of A and B cations. ABO_3 type perovskite structure of $SmFeO_3$ permits the modification in microstructure by partial substitution at A-site and/or the B-site. Literature survey showed that doping of A-site with bigger cation enhances reduction stability whereas doping at B-site affects electrical conductivity as well as thermal stability. Researchers have reported the advantages of introducing Ce at A-site and Co, Ni and Mg at B-site[11-12] . S.M. Bukhari et al have reported that the partial substitution of Sm by Ce within the solubility limit improves the electrical conductivity of perovskite as well as prevents it from decomposing under reducing conditions[13] . This creates the possibility of using Ce doped $SmFeO_3$ as a gas sensor for reducing gases.

For the synthesis of $SmFeO_3$ perovskite different methods like sol-gel method[14] and hydrothermal method [15] have been adopted. Sol-gel method in citric system has advantage of providing $SmFeO_3$ perovskite powder with high sensitivity and selectivity.
In our previous work, we reported the synthesis of pure $SmFeO_3$ perovskite powder by Sol-gel method. In the present work, surface modification in $SmFeO_3$ thick films prepared by screen printing method was achieved by dipping technique.

Methods And Material
2.1.Preparation of $SmFeO_3$ powder
Stoichiometric amounts of samarium nitrate$Sm(NO_3)_3.6H_2O$, iron nitrate $Fe(NO_3)_3.9H_2O$and citric acid monohydrate were mixed in the ratio 1:1:1. The mixture was grounded in Agate mortar for 30 minutes. Ethylene glycol was added to this mixture under constant stirring at 75^0C for 2 hours to obtaina sole which was then dried into a gel. The gel was dried in oven at 110^0C for 12 hours and allowed to cool naturally. Finally, sample was calcined at 800^0C for 4 hours.

2.2.Preparation of $SmFeO_3$ thick films

The thixotropic paste was formulated by mixing the fine powder of $SmFeO_3$ with the solution of ethyl cellulose in a mixture of organic solvent The ratio of inorganic to organic part was 75:25 .This paste was then screen-printed on glass substrate in desired pattern.The films were fired at 500^0C for 30 min. and termed as pure $SmFeO_3$thick film.

2.3.Preparation of Ce surface modified thick films

As-prepared pure $SmFeO_3$thick films were dipped into 0.1 M aqueous solution of cerium chloride for 5 min. After drying, these films were fired at 550 ^{0}C for 30 min and termed as Ce surface modified $SmFeO_3$thick film.

Results And Discussion

3.1. X-ray diffraction and surface morphology analysis of pure $SmFeO_3$ powder

X-ray diffraction pattern of synthesized pure $SmFeO_3$ powder was reported in our previous paper [16]. The crystallite size was estimated to be 50.08 nm.

3.2. Surface morphology of pure and modified $SmFeO_3$ thick films by FESEM analysis

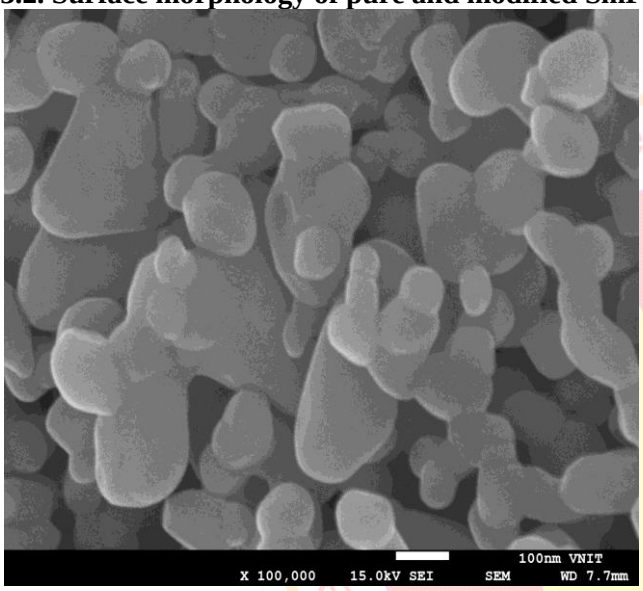

Fig. 1: FESEM of pure $SmFeO_3$ thick film.

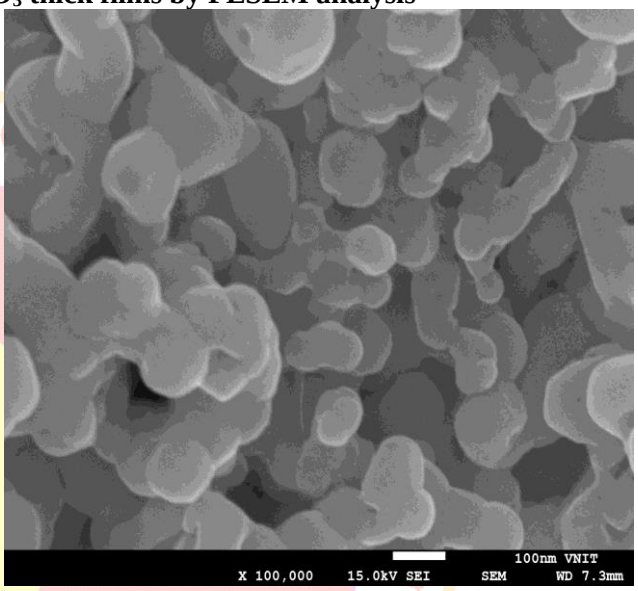

Fig. 2: FESEM of Ce doped $SmFeO_3$ thick film.

Fig. 1 represents the FESEM images of pure $SmFeO_3$ thick film fired at 500 ^{0}C for 30 min. The micrograph shows the presence of large number of grains with grain size ranging from 53 nm to 131 nm on the film. The films were highly porous with inner layer of perovskite type oxide adhere to the substrate.Due to the firing temperature, sintering proceeded and growth of the grains was observed. The composition of organic vehicle also influences the morphology of film. The presence of α-terpineol favored the sintering of grains.Fig. 2 depict FESEM image of Ce doped $SmFeO_3$ thick film for dipping time interval 5 min and fired at 550 ^{0}C for 30 min. The micrograph shows the distribution of smaller particles around the larger grains. The smaller particles may be attributed as Ce species. The modified thick film appears to have comparatively high porosity and large surface area for oxygen adsorption.

3.3.Elemental composition of pure and modified $SmFeO_3$ thick films by EDS analysis

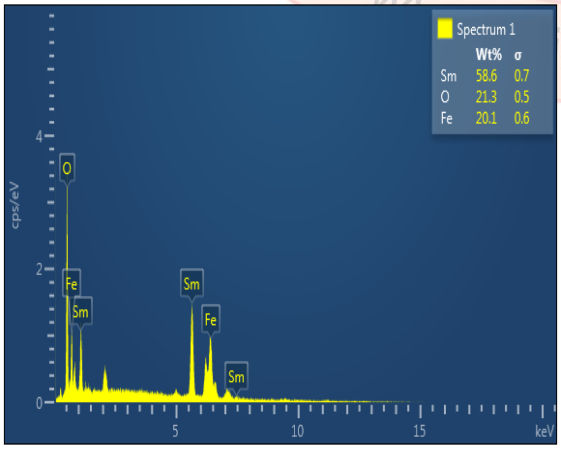

Fig 3: EDS of pure $SmFeO_3$ thick film.

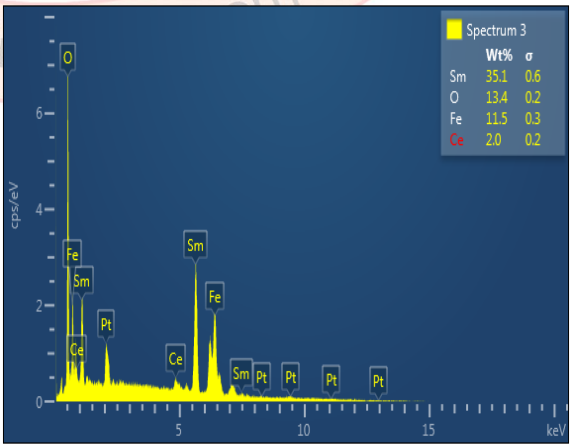

Fig 4: EDS of Ce doped $SmFeO_3$ thick film.

Elemental analysis of pure and Ce doped thick films was carried out by EDS technique. Table 1 represents the wt % of constituent elements of both pure and modified films.

Table 1: Quantitative elemental analysis.

	Pure $SmFeO_3$ thick film	Ce modified $SmFeO_3$ thick film
Sm (wt.%)	58.6	35.1
O (wt.%)	21.3	13.4
Fe (wt.%)	20.1	11.5
Ce (wt.%)	---	2.0
Total	100	100

It is observed from table 1 that weight percentage of oxygen decreases due to Ce doping. Further it was observed that both the samples are oxygen deficient but oxygen deficiency is more in Ce doped thick film than pure SmFeO3 thick film. Therefore,Ce doped SmFeO3 thick film may facilitate increased oxygen adsorption.

Conclusions

The results demonstrated that surface modification of SmFeO3thick films can be achieved by dipping technique.Moreover Surface modification promotes increased oxygen adsorption. FESEM analysis and EDX analysis respectively confirm the structural morphology and the elemental composition of both pure and modified thick films .

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X-ray diffraction, Uv-Vissible and Photoluminescence Study of Dysprosium Doped Lanthanum Calcium Borate La_2O_3-8CaO-$3B_2O_3$ Glasses

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Abstract.

In the present work, borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x = 0 (LaCOB), 0.01, 0.03, 0.05 and 0.07 (Dy:LaCOB) were prepared by melt-quench technique. The synthesized amorphous material confirmed by the X-ray techniques. The various optical transition states of dysprosium ions doped in glasses are analyzed by using ultraviolet-visible spectroscopy. The optical band gaps of the grown glasses have been evaluated form optical transparency data. The results show that there are decreases in the optical band gap as the concentration of dysprosium ions increases. The luminescence properties of LaCOB glasses doped with different concentrations of Dy^{3+} ions show emission bands at 470 nm ($^4F_{9/2}\rightarrow{}^6H_{15/2}$) and 575 nm ($^4F_{9/2}\rightarrow{}^6H_{13}$) under the excitation of 358 nm. The chromacity colour coordinates have also been calculated.

Introduction

The rare earth ions doped borate glasses and crystals find important application in the area of solid state laser, fiber laser, waveguide laser, laser amplifier in optical communication, optical data storage and amplifier in integrated optical components [1-4]. Different glassy materials like as borate, phosphate, fluoride, fluoroborate and tellurite have been usually investigated to understand the outcome of host glass on the lasing properties of rare earth ions [5, 6]. Borate glasses as a host material doped with different rare earth (RE) ions are being developed and their suitability as laser material has been tested by studying optical properties [7, 8]. The chemical composition of borate and oxide glass plays a vital purpose in the photoluminescent properties of RE ions, affecting the usefulness of the energy transition process. Oxide glasses are classical stable hosts for obtaining efficient luminescence in rare earth ions due to their high thermal stability, high transparency, and good rare earth ion solubility [6, 9-11].

Recently, the physical and optical properties of rare earth ion Dy^{3+} doped Li_2O–K_2O–B_2O_3 glasses were reported by Azizan et al [10]. Luminescence and spectroscopic properties of Dy^{3+} doped sodium fluoro-phosphate (FP) glasses useful for white light emission were reported by Babu et al [11]. Optical properties of lead borate glasses containing Dy^{3+} ions have been studies by Pisarska et al [12]. Glasses doped with trivalent dysprosium are being considered as promising laser materials due to their optical transitions. Dy^{3+} ions have two strong emission transitions with $^4F_{9/2}\rightarrow{}^6H_{15/2}$ transition corresponding to magnetic dipole at 470 nm in the blue wavelength region and $^4F_{9/2}\rightarrow{}^6H_{13/2}$ transition corresponding to electric dipole at 575 nm in the yellow wavelength. The currently transition is hypersensitive and is effectively dependent lying on the host glass composition. This transition is also significantly affected by the radial integral of 4f and 5d electrons. Thus, by providing suitable environment and varying Dy^{3+} ion concentration we can tailor the intensity ratio of yellow to blue transition so as to generate white light [3, 5, 8].

This report, present the synthesis of borate glasses doped with dysprosium in the system (x)Dy_2O_3-(1-x)La_2O_3-8CaO-$3B_2O_3$ with x =0 (LaCOB), 0.01(1%Dy:LaCOB), 0.03 (3%Dy:LaCOB), 0.05 (5%Dy:LaCOB) and 0.07 (7%Dy:LaCOB) prepared by melt-quench technique. Prepared glasses were subjected to optical and luminescence studies.

Experimental

The Lanthanum oxide (La_2O_3) was purchased from Central Drug House (CDH) Ltd, India. Calcium carbonate ($CaCO_3$) was purchased from Fisher Scientific, Dysprosium oxide (Dy_2O_3) was purchased from LOBA, India and boric acid (H_3BO_3) was purchased from sd Fine chemicals. All materials were of analytical reagent grade.

An alkali borate glasses (LaCOB), (1%Dy:LaCOB), (3%Dy:LaCOB), (5%Dy:LaCOB) and (7%Dy:LaCOB) were prepared by the melt-quenching method. The chemicals La_2O_3, $CaCO_3$, Dy_2O_3 and H_3BO_3 with 99.99% purity used as the starting raw materials. Dy_2O_3 in appropriate amount was mixed with La_2O_3, $CaCO_3$, and H_3BO_3. The raw materials were crushed in a mortar with the help of pestle to make the homogeneous mixtures. The mixtures were calcinated at 550^{o}C for 6 hours to remove moisture. The material was removed from the crucible and once again crushed and calcinated at 950 ^{o}C for 12 hours. This process was repeated two times. The obtained polycrystalline powders of LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB,

5%Dy:LaCOB and 7%Dy:LaCOB compound were melted in a platinum crucible in an electric furnace at 1000 ^{o}C and kept it for 120 minutes [6]. The obtained melt was poured on a stainless steel plate and immediately pressed with second one for immediate quenching to form amorphous phased solid. The formed glass samples were allowed to cool gradually to room temperature. The obtained glasses were cut into rectangular slabs of dimensions 4x2x1 mm^3 and polished to use for further characterizations.

Characterizations

Powder X-ray diffraction (XRD) patterns of powdered glass samples were recorded on a X-ray diffractometer (Rigaku, Miniflex-600, Japan) using Cu-Kα (λ=1.504 Å) radiation to check the amorphous state of the prepared glass sample at the scanning rate of 8 deg/min and 2θ varied from 10–90^{o}. Ultraviolet-visible (UV-Vis) transmission and optical band gap studies have been performed using Black-CSR-50 Stellar Net Spectrophotometer, USA. Photoluminescence study has been done using FL-7000 Hitachi Fluorescence spectrophotometer.

Results and discussion

1.1. **Powder XRD study**

XRD patterns were taken to confirm the glassy nature for all the glass samples. The typical XRD profile of the LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB are shown in figure 1. The pattern doesn't exhibit any sharp peak that reflects amorphous nature of the material.

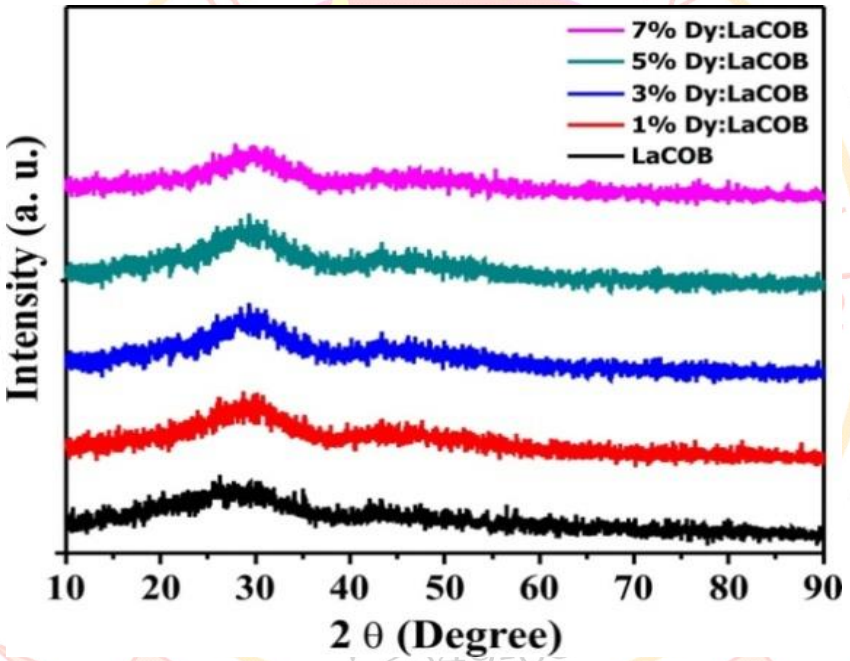

Figure 1. Powder XRD patterns of pure and Dy doped LaCOB glasses.

1.2. **UV-Vis spectroscopy**

Figure 2 a) shows the optical transmission spectra of prepared glasses recorded in the wavelength range 190-1083 nm. It can be observed that, the absorption peak for the grown glasses have lower cutoff wavelength in the range 204 - 220 nm. The glasses LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB show the optical transparencies around 75, 67, 53, 45 and 34% of in the UV and visible region, respectively. The optical transparencies of prepared LaCOB glasses doped with dysprosium are found to be decreased with increasing concentration of Dy^{3+}. The values of optical absorption coefficient (α) were determined using the relation (1) from the absorption data;

$$\alpha = (2.303/d)\log(1/T) \quad (1)$$

Where, T is the transmittance and d is the thickness of the glass [6]. The direct optical band gap of the glass can be determined by using relation (2);

$$(\alpha h\nu)^2 = A\,(Eg - h\nu) \quad (2)$$

Where, A is a constant.

Plotting a graph between $(\alpha h\nu)^2$ and photon energy ($h\nu$), as shown the figure 2 b), and drawing tangent to straight portion intercepting energy axis gives energy band gap and it was found to be 6.3, 6.2, 6.1, 5.7 and 5.3eV for LaCOB, 1%Dy:LaCOB, 3%Dy:LaCOB, 5%Dy:LaCOB and 7%Dy:LaCOB, respectively.

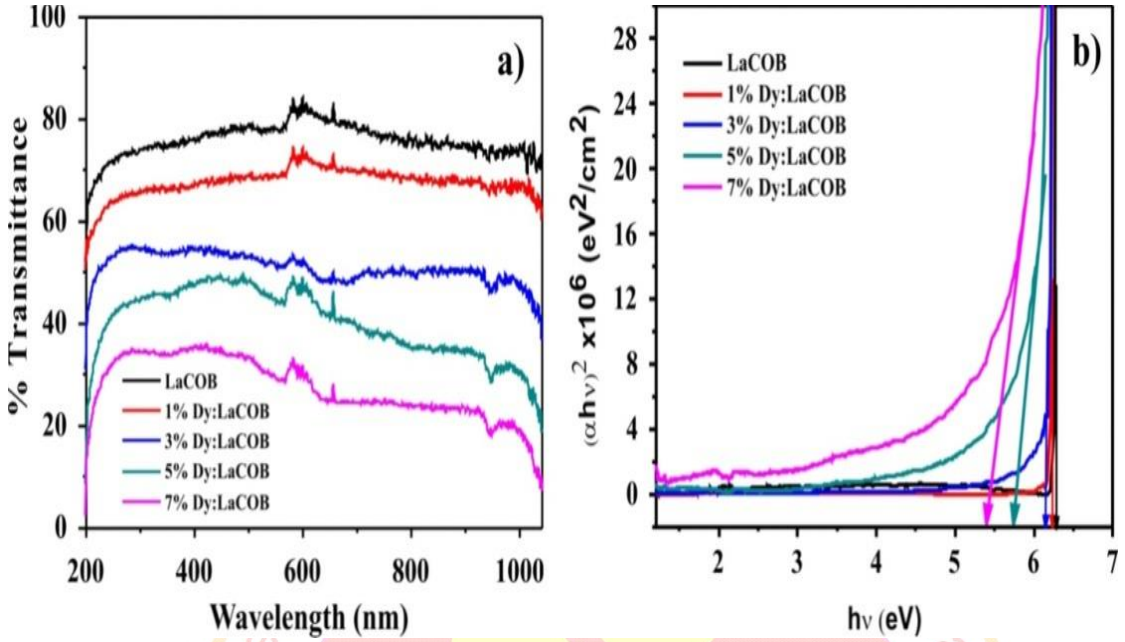

Figure 2.
a) UV-Vis transmission spectra and
b) a plot of variation of $(\alpha h\nu)^2$ versus hν pure and Dy doped LaCOB glasses.

1.3. Photoluminescence study and color quality of light Source (CIE)

The figure 3 (a) shows the photoluminescence spectra of Dy^{3+} doped LaCOB glasses. The glass shows emissions at 470 and 575 nm under the excitation at wavelength 358 nm. The peak centered at blue emission band (at 470 nm) is a typical emission of Dy^{3+} ions corresponding to transition $^4F_{9/2} \rightarrow {}^6H_{15/2}$ ground state, while the peak centered at yellow emission (at 575 nm) corresponds to the $^4F_{9/2} \rightarrow {}^6H_{13/2}$ optical transition of Dy^{3+} [2, 5, 13]. Similar results were reported for Dy^{3+} doped sodium aluminum phosphate and alkali lead tellurofluoro borate glasses [13-15]. The transition from $^4F_{9/2} \rightarrow {}^6H_{15/2}$ is a magnetic dipole transition which possess most intense blue emission band at wavelength 470 nm. The transition from $^4F_{9/2} \rightarrow {}^6H_{13/2}$ is electric dipole transition which possess moderate intense yellow emission band at 575 nm [1, 6, 7, 14]. The excitation spectrum Dy^{3+}:LaCOB shows narrows line in the UV range [15]. From figure 3 a), emission spectra also indicate that luminescence intensity increases with increase in concentration of Dy^{3+} dopant [10, 2]. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration quenching.

The excitation spectra of Dy^{3+} doped LaCOB glasses recorded at emission wavelength of 470 nm are as shown in the figure 3 (b). The spectra consist of excitation band ($^6H_{15/2} \rightarrow {}^4P_{5/2}$) at 358 nm for various concentrations of Dy^{3+} ions [3, 6, 16]. The energy level scheme for all the observed absorption of Dy^{3+} doped LaCOB glass is shown in Fig. 3 (c).

The emission spectra (as shown in figure 3 (d)) of Dy doped LaCOB glasses consist of two important emissions in blue color at 470 nm and yellow color at 575 nm wavelengths. The appropriate color combinations of blue and yellow light results into a white light emission. CIE diagram is provided for an understanding of color relationships [2, 5, 7, 17]. This outcome it is predict that Dy doped LaCOB glasses can be intended for white light emitting devices under ultraviolet excitation.

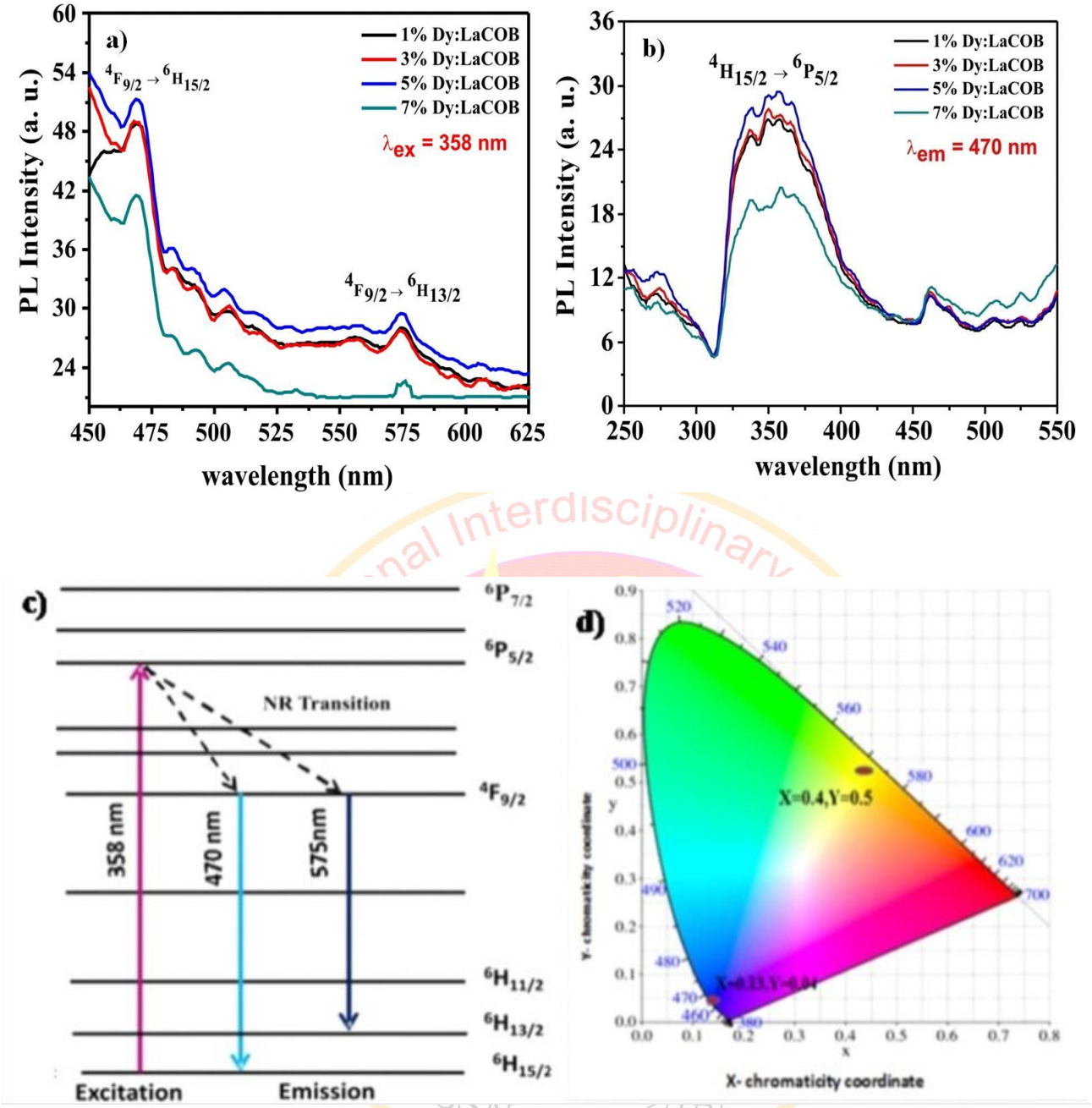

Figure 3.
a) Emission spectra, b) Excitation spectra,
c) Energy level diagram of Dy^{3+} ions showing transition and
d) The CIE diagram of Dy: LaCOB glasses.

Conclusion

The Pure and Dy doped LaCOB glasses are successfully synthesized by melt quenching method. The amorphous nature of the glasses was confirmed by XRD technique. Borate glasses pure and Dy doped LaCOB have been fabricated and characterized their properties through emission spectra and CIE 1931 color chromaticity studies. The photoluminescence of Dy^{3+} ions were studied and related to the host matrix nature. It is clear that there are two emission bands $^4F_{9/2} \rightarrow {}^6H_{15/2}$ and $^4F_{9/2} \rightarrow {}^6H_{13/2}$ over the excitation wavelength of 358 nm these bands correspond to the electron transitions from the discrete levels $^4F_{9/2} \rightarrow {}^6H_{15/2}$ and $^4F_{9/2} \rightarrow {}^6H_{13/2}$ transitions respectively for Dy^{3+} and which confirmed the presence of trivalent rare-earth ions in the glass matrix. The photoluminescence intensity for both blue and yellow emissions increased with the concentration of Dy^{3+} ions reaching a maximum at x = 0.05, and then it decreased for x = 0.07 because of concentration

quenching. It also provides guidelines for several applications in connection with industrial and technological needs. This outcome may potential to expand emission display and laser material applications.

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Optical Propertiesand IV characteristic of proton conductor solid polymer electrolyte

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Abstract:
In the present work proton conductor solid polymer electrolyte was prepared by solution cast technique. The dc conductivity was obtained from I-V characteristics by using Kitley 6487 picoammeter/voltage source meter instrument at various constant temperature. UV-Vis Double Beam Spectrophotometer in the wavelength range (190-700) nm were used to investigate the optical properties. It was found that the energy band gaps are decreased upon the increase of salts concentration. This is explained in terms of charge transfer complexes between the dopant and host matrix
Keywords: Polyvinyl alcohol, Ammonium Iodide, Optical properties

Introduction:

In recent year, there has been increase in focus on replacing traditional aqueous electrolyte by solid polymer electrolyte. Due to flexibility electrochemical stability, long life etc. Among solid polymer electrolyte proton conducting polymer electrolyte have receive considerable very much attention due to their large *applications.* Polyvinyl alcohol (PVA) is commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water-soluble polymer having good charge storage capacity [1]. The electrical and optical properties of polymers can be modified by the addition of suitable dopants. [2-6]. This paper presents the results of investigations on the electrical and optical properties of NH_4I doped PVA films.

Experimental technique

In the present study, polyvinyl alcohol, ammonium iodide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) with ammonium iodide (NH_4I) was prepared using solution cast technique. The film of pure and different composition of PVA -NH_4I has been prepared by solution cast technique. In this technique, appropriate amount of PVA and NH_4I have been dissolved individually in deionizedwater. These solutions have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and Discussion:

I-V Characteristics

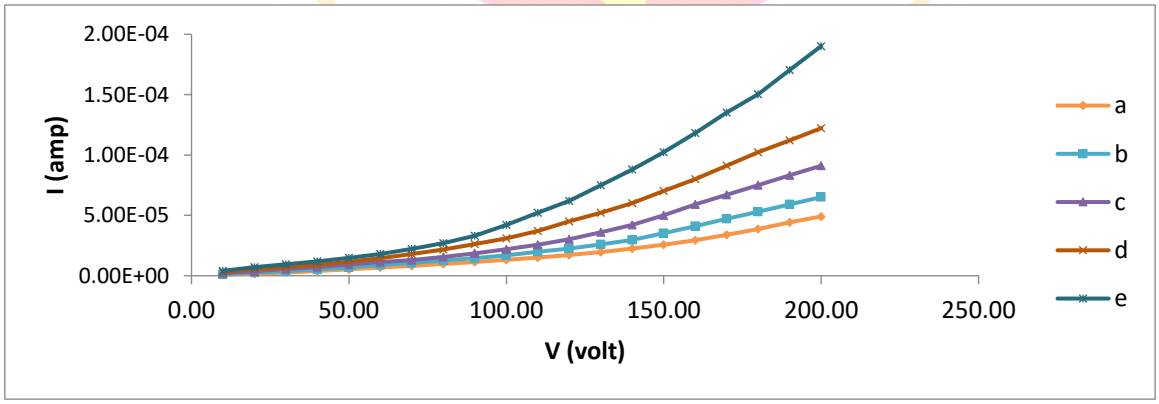

Fig 1: Variation of current (I) with voltage (V) for PVA with different (a) 5 mole %, (b) 10 mole %,(c) 15 mole %, (b) 20 mole %, (d) 25 mole % of NH_4I.

Current (I) with Voltage (V) characteristics of polyvinyl alcohol with ammonium iodide of different mole percent as shown in figure (1). The current increases linearly with applied voltage and followed ohmic conduction [7]. But in fig 1 when added the concentration of ammonium salts the current increases nonlinearly with applied voltage and absence of Ohmic conduction this mechanism is very different to intrinsic

semiconductor. There is no permanent dipole and random charge trap in sample. The localize motion of charge traped in the sample serves as effective electric dipole, when external electric field is applied. As a result, quasi particle was createdpolarons and bipolarons acts as charge, therefore the curve is nonlinear, when the strength of electric field is increases, the formation of charge are increases which contributing to increase in current with respect to voltage [8-9].

Optical properties:

Optical absorption spectra of PVA doped withammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. Most of the time, bandwidth divides semiconductors and insulations intotwo main parts, namely direct show energy bandwidth materials and indirect energy bandwidth materials. Valence and conduction bands both are exhibited a very less (zero) crystal momentum indirect bandgap. But in the indirect bandgap, the conduction band doesn't agree to crystal zero momentum and shift of the phonon energy. Shalliday and Davishad explained both the direct and indirect bandgap that occur near the basic edge of the band both direct and indirectand can be observed by plotting $(\alpha h\upsilon)^2$ and$(\alpha h\upsilon)^{1/2}$ as a function of energy hυ. [10]

The analysis of Thutpalli and Tomlin isbased on the following relations [11].

$(\alpha h\upsilon) = \beta_1(h\upsilon - E_{gd})^{1/2}$---------- (1)

$(\alpha h\upsilon) = \beta_2(h\upsilon - E_{gi})^{2}$---------- (2)

For direct and indirect electron transitions respectively, where hυis the photonenergy, $E_{gd}$is the direct band gap, E_{gi} is the indirect band gap, α is the absorption coefficient, and β_1, β_2 are constants. These expressions willbe helpful in the determination of the band structure of materials. To determine thenature and width of the band gaps $(\alpha h\upsilon)^2$ and $(\alpha h\upsilon)^{1/2}$ were plotted as a function ofincident photon energy.The direct band gap values are obtained from the plots of $(\alpha h\upsilon)^2$vs.hυshown in figure 2.

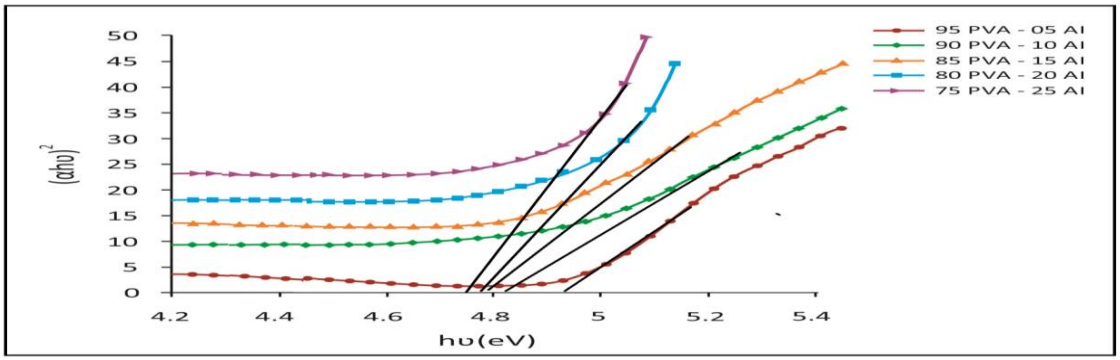

Fig:2 $(\alpha h\upsilon)^2$ as function of photon energy (hυ) for PVA with different ammonium iodide

The direct band gap value is determined byextrapolating the linear portion of the curve on to the energy axis. Theintercept on the x-axis gives the direct band gap energy value. It isshow that band gap decreases with increase in ammonium salt concentration. The direct band gap lies within 4.94ev to 4.74 ev.

For indirect transitions, which require photon assistance, the absorption coefficient has the following dependence on the photon energy

$\alpha h\upsilon = A(h\upsilon - E_g + E_p)^2 + B(h\upsilon - E_g + E_p)^2$

where Ep is the energy of the photon associated with the transition and A and B are constants depending on the band structure. The indirect band gaps were obtained from the plots of $(ahv)^{1/2}$ vs hν (photon energy) plots as shown in Fig 3.

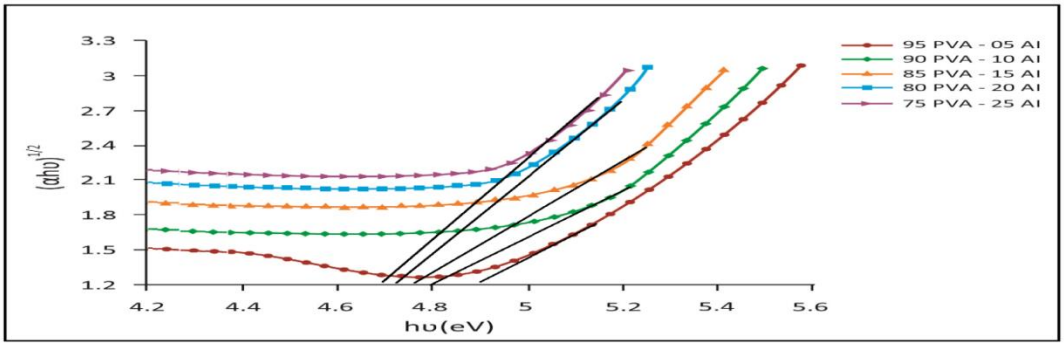

Fig: 3$(\alpha h\upsilon)^{1/2}$ as function of photon energy (hυ)for PVA with different ammonium salt

The indirect band gap value is determined by extrapolating the linear portion of the curve on to the energy axis. The intercept on the x-axis gives the indirect band gap energy value. The indirect band gap lies with 4.92 eV to 4.71 eV.It is observed that as the dopant concentration of polymer electrolyte is increased, thevalues of band gap energy have decreased gradually. This indicates theeffect of complexation on the value of band gap. Ammonium salt beingadded to the PVA polymer to enhance proton conduction. [12-15]

Conclusion:

Proton conductor solid polymer electrolyte of polyvinyl alcohol doped with different concentrationof ammonium iodidehas been successfully prepared by solution cast technique.In this investigation, I-V characteristics of prepared samples were studied. Optical absorption spectra of PVA doped with ammonium iodide in different molar percentages were carried out over a wavelength range 190-700 nmto determine the optical constants such as direct and indirect band gap. It was revealed that the energy band gaps are decreased with the increasing of salts concentrationdueto charge transfer complexes between the dopant and host matrix

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Study of Ac Electrical Conductivity and Dielectric Constant of 1:1 Pmma PVDF Polyblends At Various Temperatures and Frequencies

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Abstract

In the present work dielectric constant and ac conductivity of PMMA and PVDF (1:1) blend sample have been investigated at various constant temperatures ranging from (313K to 343K), in the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs. It has been found that the dielectric constant increases with increase of temperatures at constant frequencies, the dielectric constant decreases with decrease in temperatures at constant frequencies, the AC conductivity increases with frequencies at various constant temperatures. They attain almost saturation values as the frequency approaches its maximum value.

Index Terms: 'Solution cast method', percentage of amorphousness/crystallinity,1:1 (PMMA+PVDF), AC conductivity, dielectric constants etc.

Introduction

When two or more polymers are mixed together, polyblends or polymer alloys are obtained. This physical mixing or blending of two polymers produces alloys with quite different properties, which can be potentially useful. Two polymers are generally incompatible as they have very low combinatorial entropy of mixing for the components. This is insufficient to overcome the positive heat of mixing of polymers to make the Gibb's free energy of mixing negative. Only in the presence of specific interaction between two polymers (e.g. Hydrogen bonding, acid-base type interaction etc.), heat of mixing is negative that makes the free energy of mixing a negative quantity and then the mixing is spontaneous. Unlike the mixing of small molecules, the dictum like likens like does not hold good for mixing of macromolecules. However, both compatible and incompatible blends are industrially important materials. Two polymers may form the compatible blend, which exists as single phase. The incompatible blends on the other hand exist as two- phase system. Since most blends combine immiscible components and so the material that results contains tiny particles of one polymer in a matrix of the other. Controlled mixing and cooling of the blend makes it possible to form the .particles in the optimum concentration and range of sizes. Blending makes it possible to combine the good properties of several polymers. The most direct method to obtain a polyblend is to mix two component polymers in the molten state (melt mixing). In this case the extent of mixing depends on the rate of diffusion of the molecules. Since such a mixing requires high temperature, the polymer may decompose and undergo chemical changes.

Experimental Technique

Method of preparation of PMMA-PVDF (1:1) Undoped blends film:

Sample Preparation

Preparation of thin films using Pool of Mercury (As shown in fig 1).In the present work, Isothermal Evaporation Technique (Sangawar 1995,Belsare and Deogankar 1998) has been used, as it is best suited to the conditions in the laboratory. The two polymers PMMA-PVDF were taken in the ratio 1:1 were dissolved in the common solvent Dimethyl Formamide (DMF).The solution was kept for 1-2 days to allow polymers to dissolve completely to yield uniform solution. The solution mixture was stirrer with constant slow uniform speed for 1 hour at room temperature to get completely homogeneous solution. A glass plate (15 cm x 15 cm) thoroughly cleaned with water and later with acetone was used as a substrate. To achieve perfect levelling (and uniformity in thickness of the films), a pool of mercury was used (figure given below) in a plastic tray. The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 1 day to remove any traces of solvent.

Fig. 1 Pool of mercury

The solution was poured on the glass plate and was allowed to spread uniformly in all directions on the substrate. The whole assembly was placed in a dust free chamber at room temperature. The solvent in the solution was thus allowed to evaporate completely and get air-dried. The film on the glass substrate was then removed and cut into small pieces of suitable sizes. In this way the films were prepared by isothermal evaporation technique. Further it was dried for 3 days to remove any traces of solvent.

Thickness Measurement

The thickness of each sample film was measured at the four different places by using the Digital Micro meter (Mitutoyo Corporation, Japan) as shown in fig 2 . The average of four readings was taken as the sample thickness.

Fig 2. Digital Micrometer

Measurement of AC Electrical Conductivity and Dielectric Constant

The sample holder with temperature controlled electric oven supplied by **Pushpa Scientific, Hyderabad**, in conjunction with **4284 A Precision LCR meter (20 Hz - 1MHz) supplied by Agilent Technology, Singapore** has been used for the measurement of AC electrical conductivity and dielectric constant.

Fig.3 LCR meter and sample holder for the measurement of AC conductivity

The film sample was loaded into the sample holder in an oven. The entire experimental set up is as shown in fig 3.The AC frequencies were applied (in the range 1 KHz -1 MHz) across the sample by using the 4284 A precision LCR meter (20 Hz -1 MHz). The corresponding dielectric constants were measured by using LCR meter. From the dielectric data, the AC conductivity of the samples was calculated by using the relation [Rao, 2000],

$$\sigma_{ac} = \frac{f \cdot \varepsilon_r \cdot tan(\delta)}{1.8 \times 10^{10}}$$

Where,

f = Frequency applied in Hz

ε_r= Dielectric Constant at frequency f

$tan(\delta)$ = Dielectric loss tangent**.**

Results And Discussion

Several researchers [Shukla and Gupta 1987 , , Aziz and Aggour 1999, Khaled et al. 2003, Raghvendra et al. 2003, Muhammad Akram 2005] have studied the AC electrical conduction / Dielecrtic properties of various polymers composites . In the present work dielectric constant and ac conductivity of 1:1 PMMA-PVDF blend sample have been investigated at various constant temperatures ranging from (313K to 343K), In the frequency range of (1KHz to 500KHz).The results have been presented in the form of graphs (Fig no. 4, 5, 6, 7).

The graphs have been plotted for the variation of

1) *AC conductivity with frequencies at various constant temperature.*

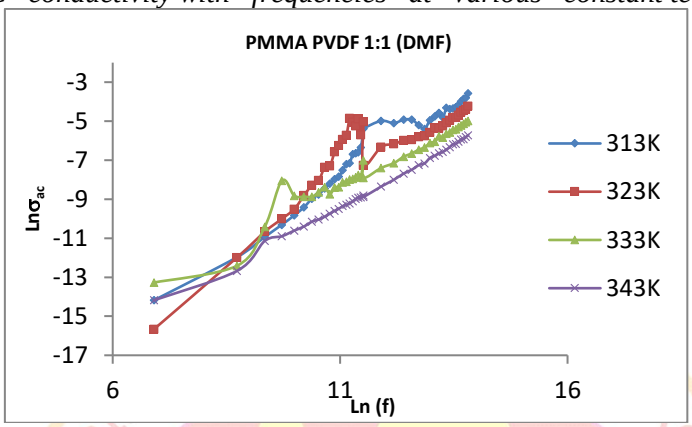

Fig. 4 $\log_e(\sigma_{ac})$s versus $\log_e(f)$

2) *Dielectric constant ε_r with frequency at various constant temperature.*

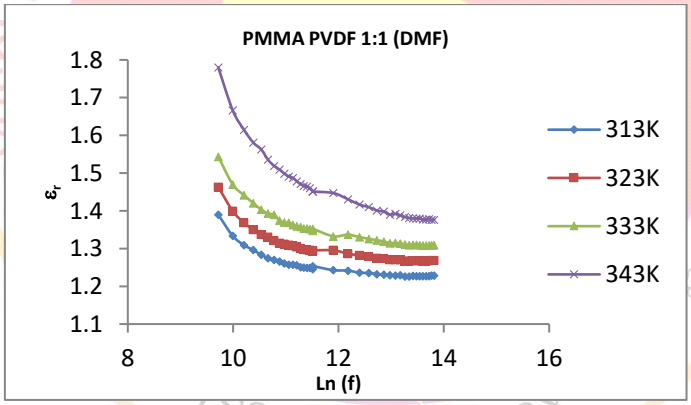

Fig. 5 ε_r *versus* $\log_e(f)$

3) *Dielectric constant with temperature at various constant frequencies.*

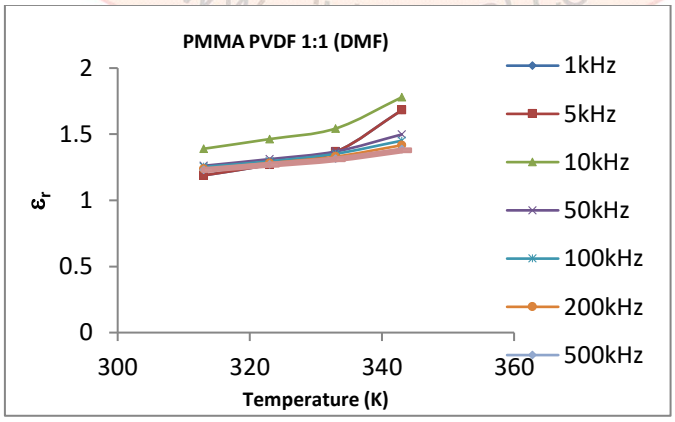

Fig. 6 ε_r versus temperature

4) *AC conductivity with temperature at various constant frequencies.*

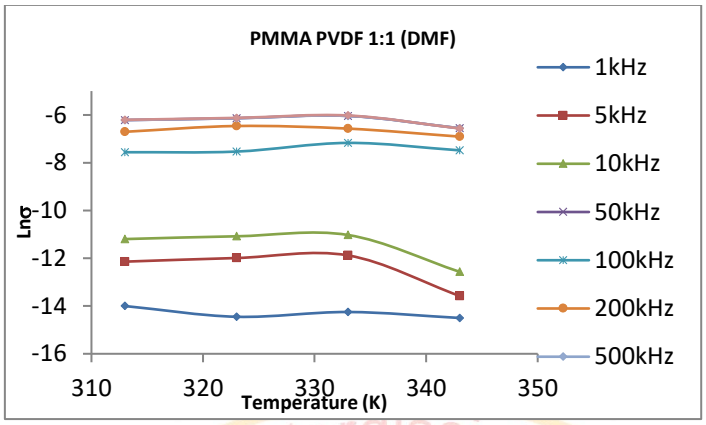

Fig. 7 $\log_e(\sigma_{ac})$s versus temperature

The following parameters have been consider for discussion
1) Dielectric constant(ε_r)
2) AC electrical conductivity(σ_{ac})

1) The Dielectric Constant (ε_r)
i) Increases with the increase of temperature
ii) Decreases with the increase of frequency

2) The AC conductivity (σ_{ac})
i) increases almost linearly with frequency above 1KH at the various constant temperatures and it attains almost constant saturation values as the frequency approaches its maximum value 1MH.
ii) At the constant frequency, seems to remain almost constant with the increases of temp in the range 313K to 363K.

Effect of temperature on dielectric constant:

It has been noticed that, there is an increase in the value of dielectric constant with the increase of temperature in case of 1:1 PMMA and PVDF polyblend samples.
Among two polymers used to form a blend system PVDF is non- polar while PMMA is weakly polar polymer. The introduction of polar polymer into the non-polar one is reported to reduce its resistance and hence increases the conductivity and also the dielectric constant.

Effect of frequency on dielectric constant:

The microscopic behaviour of the dielectric material under the influence of ac electric field can be understood from the polarization which constitutes a dielectric or which is introduced during its preparation. The polarization effect is dependent on the nature of dipoles and the frequency of the applied electric field.
As stated earlier, under the static electric field or the ac field of low frequency, the net polarization of the sample is contributed by electronic polarization, atomic polarization and orientational polarization. As the frequency is increased, orientational polarization becomes unable to follow field variation at higher frequencies. As a result dielectric constant decreases with the increase of frequency [Muhd. Akram et al.,(2005); Reda,(2006); Rao et al., (2000)].

Effect of frequency and temperature on ac conductivity:

The ac conductivity has been measured by increasing the frequency from 1KH to 1MHz at various constant temperatures 313K, 323K, 333K, and 343K for the blend system. It has been noticed that the ac conductivity increases with the increase in frequency. [Tripathi S. K. and Gupta A. (2012)]

Conclusions

1) The dielectric constant increases with increase of temperatures at constant frequencies
2)The dielectric constant decreases with decrease in temperatures at constant frequencies
3)The AC conductivity increases with frequencies at various constant temperatures
4)They attain almost saturation values as the frequency approaches its maximum value.
5) The dielectric constant does not significantly vary with temperature in the temperature range from (313K to 343K).

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Thermal Studies Of Thiazole Schiff Base Complexes Of Vo(Iv), Zr(Iv) And Uo_2(Vi)

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Abstract:

Newly synthesized product thiazole Schiff base was derived from the condensation of thiazole and 2-hydroxy-5-chloro-3-nitro acetophenone. The Schiff bases behaved as charge bidentade ligand. The ligand was characterized by elemental analysis and spectral methods. The coordinating ability of the ligand is investigated by preparing its metal complexes with VO(IV), Zr(IV) and UO_2(VI) have been prepared and characterized by elemental analysis, conductance measurements, molecular weight determinations, spectral and thermal studies. The synthesized products are coloured solids, soluble in DMF, DMSO and THF.

Keywords: *Schiff base, Magnetic susceptibility, Thermal*

Introduction :

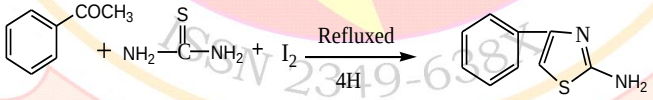
The newly synthesized Schiff bases, 2-acetylthiophene thiosemicarbazone and thiophene-2-aldehyde thiosemicarbazone and their metal complexes with Co(II), Cu(II), Zn(II) and Ni(II) complexes and Their Schiff bases metal complexes were tested for antibacterial activity[1] The Schiff bases play a significant role in the area of coordination chemistry. Synthesis, characterization and antifungal activity of manganese (II) complex with Schiff Base derived from acetylacetone andl leucine[2] and Spectral and thermal characterization of metal complexes containing schiff Base ligands.[3] Compounds containing an azomethine group (CH=N), known as Schiff bases, were formed by the condensation of a primary amine with a carbonyl compound. Schiff bases of aliphatic aldehydes were relatively unstable and were readily polymerizable. Schiff bases and their complexes are shows good progress in thermal analysis[4]. The thermogravimetric technique has been great significance research method on thermal stabilsation and thermal decomposition. Thermogravimetric could provide theory for material heating treatment and application.[5,] The aim of present investigation is to synthesize various transition metal complexes of Schiff base derived from 2-hydroxy-5-chloro-3-nitro acetophenone and 2-amino-4-phenylthiazole

Experimental ;

All the chemicals were of A.R. grade and used as received. 2-hydroxy-5-chloro-3-nitro acetophenone (HCNA) and 2-amino-4-phenylthiazole was prepared by known methods[6-9]. The solvents were purified by standard methods[10].

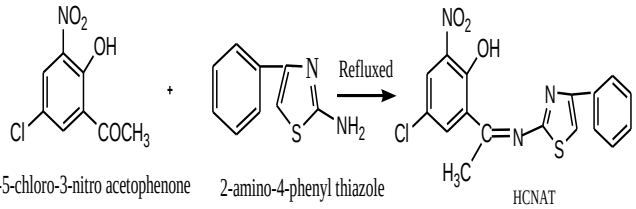
Synthesis of 2-amino-4-phenylthiazole;

The synthesis of 2-amino-4-phenylthiazole prepared by known method[7-9]. The product was filtered and crystallized from 70% ethanol, after several minutes the golden coloured product of 2-amino-4-phenylthiazole was separated out. Yield: 9g (75%); m.p.: 148-150^{0}C



Acetophenone 2-amino-4-phenylthiazole

Synthesis of 2-hydroxy-5-chloro-3-nitroacetophenone 4-phenyl-2 imino thiazole [HCNAT]: A solution of 4-phenyl-2 imino thiazole (0.02M) in 25ml of ethanol was added to an ethanolic solution(25ml) of 2-hydroxy-5-chloro-3-nitro acetophenone (0.02M) and the reaction mixture was refluxed on a water bath for 4h. After cooling a pale yellow coloured crystalline solid was separated out. It was filtered and washed with ethanol, crystallized from DMF and dried under reduced pressure at ambient temperature. The purity of ligand was checked by elemental analysis and m.p. It was also characterized by IR and ^{1}H NMR spectral studies. Yield:75%; m.p. 305^{0}C



2-hydroxy-5-chloro-3-nitro acetophenone 2-amino-4-phenyl thiazole HCNAT

Table1. Analytical data of the Ligands.

Ligand	Molecular Formula	Formula Weight	Color and nature	Elemental Analysis			
				C% found (Cal.)	H% Found (Cal.)	Cl% Found (Cal.)	S% Found (Cal.)
HCNAT	**$C_{17}H_{12}N_3O_3SCl$**	**373.06**	**Yellow Crystalline**	**52.35 (52.20)**	**03.20 (03.34)**	**9.22 (9.38)**	**08.34 (08.46)**

Preparation of complexes: All the metal complexes were prepared in a similar way by following method. To a hot solution of ligand HCNAT (0.02M) in 25ml of ethanol a suspension of respective metal salts was added drop wise with constant stirring. The reaction mixture was refluxed on a water bath for 3-5 h. The precipitated complexes were filtered, washed with ethanol followed by ether and dried over fused calcium chloride. Yield : 55-60%

The complexes are soluble in DMSO and DMF but insoluble in water and common organic solvents. The metal chloride content of complexes were analyzed by standard methods11,12 The 1H NMR spectra of ligand was recorded and obtained from RSIC Chandigarh. IR spectra of the compounds were recorded on Perkin Elmer 842 spectrophotometer in the region 400-4000cm-1, Carbon, Hydrogen and Nitrogen analysis were carried out at RSIC, Punjab University, Chandigarh. The molar conductance of the complexes at 10-3 M dilution in DMF were determined using equiptronic digital conductivity meter EQ-660 with a cell constant 1.00 cm-1 at room temperature. The magnetic moment measurement were made on a Gouy balance at room temperature using [HgCo(SCN)4] as the calibrant. The thermogravimetric analysis were performed on laboratory set up apparatus in air atmosphere at 100 C min-1 heating rate. The molecular weights of the complexes were determined by Rast method

Table 2. Analytical data and molar conductance of the compounds.

Ligand	Formula weight g $mole^{-1}$	Colour	Elemental Analysis Found (Calcd.)				μ_{eff} B.M	Λ_M (Ω^{-1} cm^2 mol^{-1})
			M%	C%	H%	Cl%		
$[VOL_2]$	812.2	Green	5.65	48.23	2.35	8.42	1.5	12.1
			(6.09)	(48.29)	(2.86)	(8.69)		
$[ZrL_2(OH)_2]$ $2H_2O$	906.4	Yellow	9.42	43.23	3.26	7.46	Dia	16.8
			(9.61)	(43.68)	(3.39)	(7.64)		
$[UO_2L_2]$	1015.3	Orange	22.34	38.58	2.12	6.52	Dia	14.7
			(22.62)	(38.63)	(2,22)	(6.86)		

Result and Disscution :

The Schiff base HCNAT and its complexes have been characterized on the basis of ^{1}H NMR, IR spectral data, elemental analysis, molar conductance, magnetic succeptibility measurements and thermogravimetric analysis data .

All these values and analytical data is consistent with proposed molecular formula of ligand . All the compounds are coloured solid and stable in air. They are insoluble in water but soluble in coordinating solvents like DMF and DMSO. The molar conductance values in DMF(10-3 M) solution at room temperature (Table2) shows all the complexes are non electrolytes.

The 1H NMR spectra of ligand shows signals at δ 12.14,(1H, s phenolic OH), δ 7.56, 7.54, 7.53 and 7.52 (4H, m, phenyl) δ 6.81,6.80, and 6.78 (3H, s, Phenyl), 6.68 (1H,s, thiophene), and 2.56 (3H, s, methyl) 11,13-15.

IR spectra of ligand and metal complexes shows □(C=N) peaks at 1622 cm-1 and absence of C=O peak at around 1700 – 1750 cm-1 indicates the Schiff base formation16-19.

3. IR spectra of ligand and metal complexes

Compound	□(O□H) hydrogen bonded	□(C=N) imine	□(C□O) phenolic	□(M□O)	□(M□N)	□(C□S)
HCNAT (LH)	3119	1622	1514	--	--	1126
$[VOL_2]$	--	1595	1508	515	438	1092
$[ZrL_2(OH)_2]\ 2H_2O$	--	1605	1499	448	418	1102
$[UO_2L_2]$	--	1590	1448	542	485	1074

Thermogravimetric studies: Thermogravimetric study indicates all the complexes are stable up to 60-700C. All the complexes shows half decomposition temperature(Table 4). The Thermal activation energy was calculated by Freeman-Carroll,20 Horowitz-metzger21 and Broido22 method.

Table 4. Thermal decomposition data of HCNAT and its complexes.

Compounds	**Half Decompo-sition** Tempera-ture **(°C)**	**Activation Energy (kJ mole^{-1})**			**Frequency Factor** Z **(sec^{-1})**	**Entropy Change -ΔS (J mol^{-1} K^{-1})**	**Free Energy Change ΔF (kJ mol^{-1})**
		B*	H-M**	F-C***			
HCNAT (LH)	260.46	3.22	5.47	4.31	87.28	211.42	118.65
$[VOL_2]$	400.35	5.22	8.62	6.36	138.82	211.82	148.78
$[ZrL_2(OH)_2]\ 2H_2O$	711.30	7.43	18.56	11.18	222.62	208.72	217.68
$UO_2L_2]$	800.00	19.88	22.16	17.69	353.24	207.74	239.69

Conclusions :

There is synthesized new ligand 2-hydroxy-5-chloro-3-nitro acetophenone 4-phenyl-2 imino thiazole and their metal complexes. Ligand was found to bind the metal ion monobasic (ON) bidentate manner. Conclusion of thermal decomposition temperature and activation energy of synthesized Schiff base metal complexes

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Investigation on Ionic Conductivity of PVA-PEG with NH_4Br Polymer Electrolyte

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Abstract:
A solid polymer film based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The ionic conductivity of the films was measured in the temperature range 323K–363 K. Dielectric constant and temperature dependant values of PVA –PEG poly blend film with NH_4Br where measured in the frequency range 20Hz-1MHz. The decrease in dielectric constant was observed with increase in frequency and also observed increase in temperature.
Keywords: PVA-PEG, NH_4Br, Ionic conductivity.

Introduction

In recent year, electrical conduction in polymer have been studied to understand the nature of charge transport. Polymer is a good insulating material with low ionic conductivity. PEG are synthetic water soluble polymers. They have a wide range of applications, including use in pharmaceutical experiments, food additives and plasticizers [1-2]. Polyvinyl alcohol (PVA) are commercial availability, dopant dependent electrical and optical property, good film forming ability, mechanical strength, low cost etc. It has carbon chain backbone with hydro-oxyl group attach to the methane carbon. PVA is a nontoxin and water soluble polymer having good charge storage capacity [3]. To increase the ionic conductivity depend on the addition of some dopant (ammonium salts) in polymer. Ammonium salts have been a very good proton doner to the polymer matrix system and to increase the conductivity [4-6]. Over the course of a year, a number of approaches were tested to increase the ionic conductivity of these polymeric electrolytes in the addition to developing new electrolytes **[7-9].** This system has been studied on account of the fact that both polyethylene glycol (PEG) and polyvinyl alcohol (PVA) are separately reported to form highly amorphous complexes and gels with salts and acids [10–13].

Eperimental technique

In the present study, polyvinyl alcohol, polyethylene glycol, ammonium bromide and deionized water were used to prepare solid polymer electrolyte. A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The film of pure and different composition of PVA-PEG-NH_4Br has been prepared by solution cast technique. In this technique, appropriate amount of PVA-PEG and NH_4Br have been dissolved individually in double distilled water .These solution have been mixed together in different molar ratio and stirred well by using magnetic stirred for 10-12 hr to obtained homogenous mixture. The obtained mixture is casted in petri dish. The whole assembly was placed in dust free chamber. The solvent was allowed to evaporate slowly at room temperature for 3-4 days. The films have been formed with uniformed thickness.

Result and discussion

Ionic conductivity

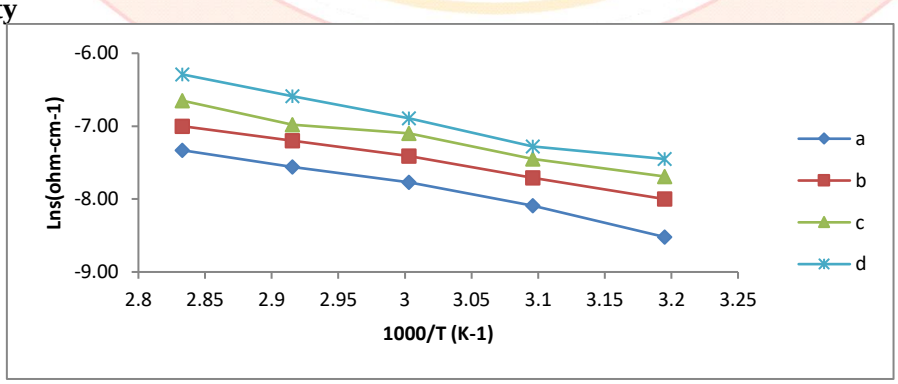

Fig 1:Variation of conductivity ln (σ) with temperature (Arrhenius plots) for (a) PVA-PEG with different (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The temperature dependence conductivity, lnσ verses 1000/T as shown in fig 1. The conductivity of solid polymer electrolyte PVA-PEG-NH_4Br is mostly depend on temperature. The temperature increases conductivity also increases in accordance with Arrhenius equation is given by -

$\sigma_T = \sigma_0 \exp(-Ea\backslash kT)$

Where σ_0 is the pre exponential factor, E_a is the activation energy and k is the Boltzmann constant [11-12]. The ionic conductivity is enhanced with increase of temperature and added with mole percent of ammonium bromide which suggest that the free volume around the polymer chain system increases causes the mobility of ions and polymer segments [13]. The segmental motion either allows the ions to hop from one side to another side. Hence ionic motion in polymer electrolyte is due to hopping of ions from one side to another site and the dynamic segmental motion of polymer , and accordingly the conductivity of polymer electrolyte becomes high. The ionic conductivity studies shows that the conductivity has been greatly affected by the addition of salt and the maximum conductivity has been observed for 25 mole % of salt doped in poly blend electrolyte.

Dielectric constant:

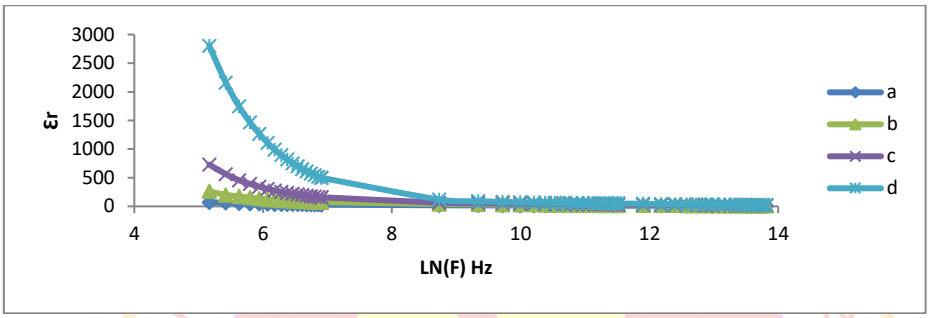

Fig 2: Variation of Dielectric constant with frequency (a) PVA-PEG (b) 5 mole %, (c) 15 mole %, (d) 25 mole % of NH_4Br.

The frequency dependent dielectric constant of PVA-PEG-NH_4Br mole % as shown in (figure 2) . It is observed that dielectric constant is high at low frequency. Due to contribution of charge accumulation at electrode-electrolyte interface. But in high frequency dielectric constant decreases and nearly constant value with increases in frequency. This is due to the dipole not being able to follow apposite of electric field variation at higher frequency [14-15].

Conclusion

A solid polymer electrolyte system based on polyvinyl alcohol (PVA) and polyethylene glycol (PEG) complexed with ammonium bromide (NH_4Br) was prepared using solution cast technique. The frequency dependant dielectric constant decreases with increase in frequency. It is reveal that electrical conductivity of PVA-PEG doped with NH_4Br increases with increasing salt concentration as well as temperature, which is attributed to the formation of charge transfer complexes.

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Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) Composite for Arsenic Removal

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Abstract:
The article focuses on the development of magnetic Fe_3O_4 over the activated charcoal for the removal of arsenic (III) from synthetic aqueous solution. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal. Again, to enhance its adsorption capacity it was loaded with magnetic Fe_3O_4 which was synthesized by hydrothermal process. Batch study was conducted in which effect of pH, effect of contact time, effect of adsorbent dose on the arsenic adsorption were studied. The results shows that the activated charcoal loaded with magnetic Fe_3O_4 could remove arsenic very effectively at pH 8 at maximum adsorbent dose 1.2 g/L with the contact time 45 min at room temperature. Furthermore, the adsorption data were studied with Langmuir and Freundlich adsorption isotherm to analyze the equilibrium of the experiment. Langmuir model best fitted with the experimental results with the maximum adsorption capacity 7.28 mg/g. this finding indicated that the activated charcoal loaded with magnetic Fe_3O_4 could be used for the removal of trivalent arsenic from aqueous solution.
Keywords: Arsenic (III), Fe_3O_4, Activated charcoal, Langmuir model, Freundlich model

Introduction:

The whole countries in the world facing a problem of waste water contamination and its purification [1]. The government agencies around the world searching out the solution of wastewater contamination and its treatment by making various policies and in that Indian government specially focus on the swachchabharatabhiyan through that the treatment water of ganga river is the mainline task now a days. For the treatment of wastewater and also for the removal of toxic metal ions, organic and inorganic pollutants there are many methods available like reverse osmosis, physico-chemical treatment, advance oxidation treatment, coagulation-flocculation process, ion exchange, membrane filtration etc [2]. But treatment of wastewater is not an easy task because many facts have to be considered if we are looking for the treatment of wastewater. In to that first one is the process should be feasible, it should be carryout at any suitable workplace, it should be cost effective and as the green parameter consist it should not generate waste [3]. Looking in to that view the current work was carries out in which the removal of toxic metal i.e., arsenic from the synthetic aqueous solution onto the Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC). The activated charcoal is well known for the purification of wastewater because of its high porosity, easy availability, cost effective and Regenerability [4-6]. Furthermore, is surface is available for the modification by using surface active agents, nanomaterial, polymers etc. which will enhance its BET surface area and ultimately the adsorption capacity increases. Arsenic contamination is the major concern the various parts of the India [7]. As per the WHO guideline the maximum permissible limit for the arsenic in groundwater is 10 µg/L but in India highest concentration of arsenic was found to be in the range 0.003 - 3700µg/L. Usually inorganic arsenic is more toxic than the organic arsenic. In natural water arsenic persist in two oxidation state: arsenite (+3) and arsenate (+5). Long-term exposure to arsenic from drinking-water can cause diverse types of cancers, including skin, lungs, urinary bladder, kidney liver, and prostate cancers [8-9]. In developing countries two methods are widely used for the arsenic removal from wastewater one is precipitation and another is adsorption. A large amount of chemicals is required in precipitation method which finally creates sludge in the form of arsenic sulfide, calcium arsenate or ferric arsenate. On the other hand, adsorption method is easy to handle, cost effective and efficient and can be applied for the treatment of wastewater containing trace amount of pollutants [10]. Hence, the objective of this study was to find out the adsorption capacity of Magnetite Iron Oxide/Activated Charcoal (Fe_3O_4-AC) composite for the removal of As (III) from aqueous solutions

Material and Method

Synthesis of Adsorbent (Fe_3O_4-AC Composite)

Magnetic Fe_3O_4 was prepared by dissolving 0.8 g of $FeCl_3.6H_2O$ in 40 ml deionised water to it 2 ml ammonia solution were added under constant magnetic stirring at room temperature stir this mixture for about 30 min. Chemical activation of activated charcoal was done using HNO_3 at 200°C to enhance the adsorption capacity of activated charcoal.In beaker 0.1 g of activated charcoal were dissolve in 20 ml distilled water and 8 ml ethanol. Both this mixture was then transferred to Teflon crucible. For the hydrothermal treatment at 120°C, Teflon crucible was inserted in to stainless steel autoclave for 3 h. After the hydrothermal reaction, the autoclave was cooled down to room temperature. After that, the product was filtered, washed with deionised water and ethanol several times. The sample was dried in an oven at 60°C for 10 h Then, the obtained product designated as Fe_3O_4-AC composite and kept in cold condition for further studies.

Batch Adsorption Experiment

In the batch study various parameter like effect of pH, adsorbent dose, contact time were studied for the removal of Arsenic on Fe_3O_4-AC composite. A known concentration of Arsenic (III) solution was taken in a stoppered bottle to which definite amount of Fe_3O_4-AC composite were added and shaken at 500 rpm on rotary shaker for 1 h. After equilibrium the reacting solution was then filter and concentration of As(III) before and after was determine by molybdenum blue method at 840 nm using spectrophotometer.

Result And Discussion

Effect of pH: To study the effect of pH on As(III) removal in pH range 1-12 on Fe_3O_4-AC composite using 1.2 g of adsorbent, 5 mg/L initial As concentration and contact time 60 min are kept constant. 0.1 N HCl and 0.1 N NaOH was used to adjust the desired pH.

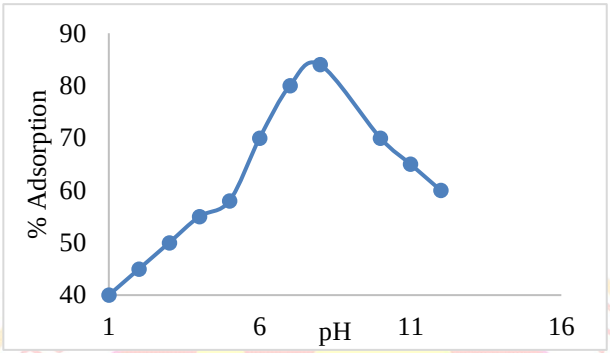


Fig. 1: Effect of pH

Effect of dose: To study the effect of adsorbent dose on As(III) removal on Fe_3O_4-AC composite by varying the dose of adsorbent from 0.1 g to 1.2 gm. pH 8, 5 mg/L initial As concentration and contact time 60 min are kept constant

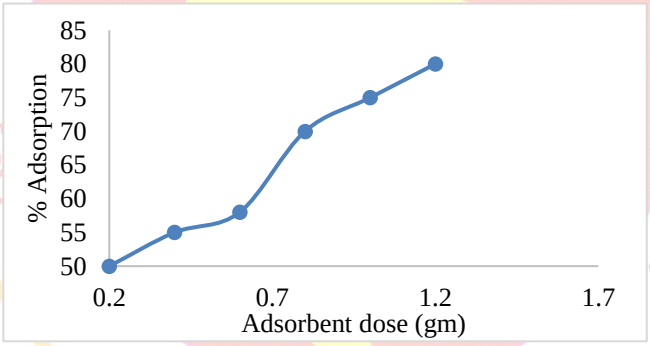


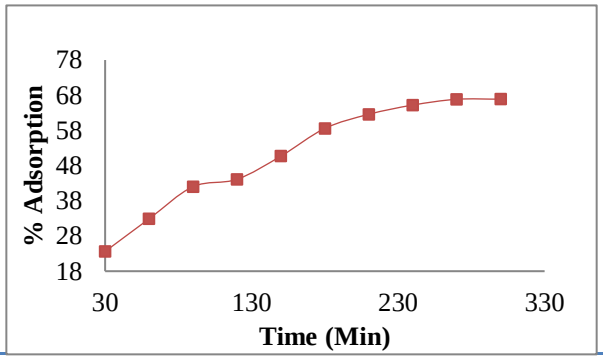
Fig. 2. Effect of adsorbent dose

Effect of contact time: The effect of contact time on the percentage of As(III) removal by Fe_3O_4-AC composite adsorbent was studied at different contact time from 5 to 120 min. Other parameters were kept constant,such as the adsorbent dose 0.5 g/L, initial As(III) concentration 5 mg/L, and pH 8. All the experimentswere carried out at room temperature. The percentage removal of As (III) adsorbed was calculated byusing the following equation.

$$\%\ \mathrm{As(III)Removal} = \frac{(\mathrm{Co} - \mathrm{Ce}) \times 100}{\mathrm{Co}}$$

Where Co = Initial concentration of Arsenic (mg/L) and Ce= final concentration of Arsenic (mg/L).

Fig.3. Effect of contact time



Adsorption Isotherm

To study the interaction between As(III) and magnetite Fe_3O_4-AC composite the equilibrium data was scrutinized and studied by using Langmuir and Freundlich adsorption model.TheresultsinAs(III)removal experimental datatobothFreundlichandLangmuirequation

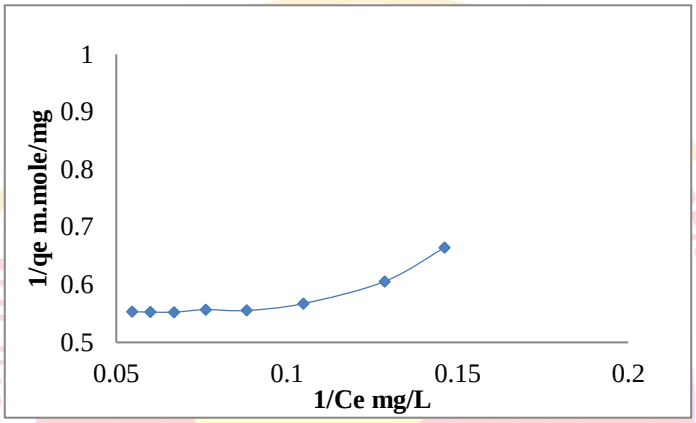
Isotherm Modelling

***Langmuir Adsorption Isotherm*: -**The Langmuir isothermmodel can be given as:

$$\frac{1}{q_e} = \frac{1}{Q^0 b} \times \frac{1}{Ce} + \frac{1}{Q^0}$$

The Langmuir constant Q^o is a measure of adsorption capacity and b is the measure of energy of adsorption. In order to observe whether the adsorption is favourable or not, a dimensionless parameter 'R_L' obtained from Langmuir Isotherm. The values of Q^o and b were evaluated from the intercept and slope of linear plots of $1/q_e$ vs. $1/C_e$ respectively.

***Freundlich Adsorption isotherm*: -** It is most commonly used adsorption isotherm model which describes adsorption on heterogeneous surfaces with interactions among adsorbed molecules. It helps to investigate the nature of adsorption and the adsorption capacity of an adsorbent. The linear form of Freundlich isotherm model is



$$\log q_e = B.\log C_e + \log K_f$$

Fig.4: Langmuir Adsorption Isotherm

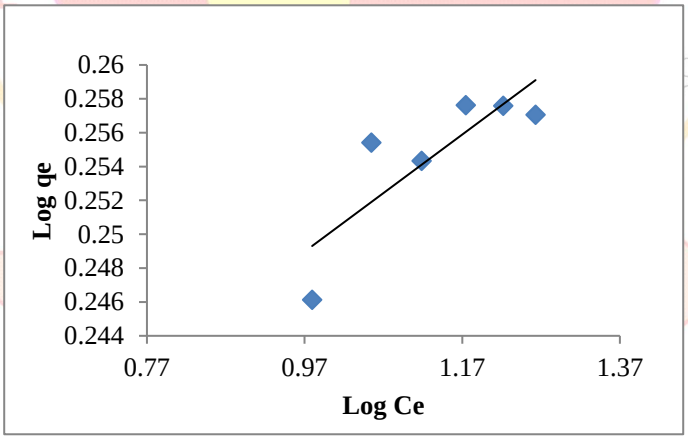


Fig. 5: Freundlich Adsorption Isotherm

Conclusion

Fe_3O_4-AC composite shows good adsorption efficiency for the removal of As (III). The removal efficiency was found to be rapid at initial stage and then slow down because it is depending upon the concentration of metal ions and active sites on the adsorbent for the binding of metal ions. The adsorption isotherm data was best revealed by the Langmuir adsorption isotherm. The maximum removal efficiency was found to be at pH 8. Batch study indicates that as the adsorption dose, contact time increases adsorption capacity increases.

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Conflict of interest: Nil

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A Efficient Synthesis of Nanoparticleof Some Benzothiazoles Derivative of Glucose

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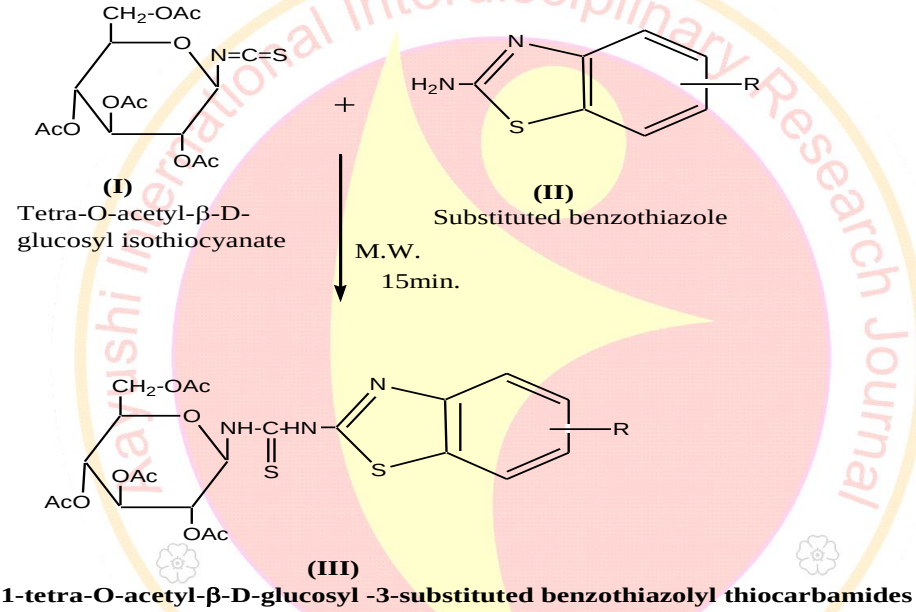
Abstract :-

Benzothiazoles have played an important role in the field of biochemistry and medicinal chemistry due to their highly pharmaceutical and biological activity. The development of synthetic processes is undoubtedly one of the most significant problems facing researchers.Nanotechnology also involves the synthesis of nanoparticles. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives. To achieve the principle of green chemistry process, it leads to in search of green synthesis of nanoparticles.Here we havesynthesized 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamides by reaction of Tetra-O-Acetyl-B-D-glucosyl isothiocyanate with various substituted benzothiazole. The identities of newly synthesis compounds have been established based on usual chemical transformation and U.V, IR, NMR, Mass and Partical Size analysis Analytical studies.

Keywords: *TAG Isothiocyanate , substituted benzothiazoleand 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- benzothiazolyl thiocarbamidesnanoparticles.*

Graphical Abstract :-



Introduction :-

Benzothiazole is a representative class of sulfur-containing heterocycles and involves a benzene ring fused to a thiazole ring. The benzothiazole ring system was originally found in various marine and terrestrial natural compounds, which is widely used as vulcanization accelerators, antioxidants, plant growth regulators, anti-inflammatory agents, enzyme inhibitors, imaging reagents, fluorescence materials, and electroluminescent devices due to its highly pharmaceutical and biological activity [1,2,3,4]. Especially, benzothiazole plays an important role in the field of medicinal chemistry and renders an extensive range of biological activities including anti-cancer [5,6], anti-bacterial [7,8], anti-tuberculosis [9,10], anti-diabetic [11], anthelmintic [12], anti-tumor [13,14,15], anti-viral [16,17], anti-oxidant [18], anti-inflammatory [19,20], anti-glutamate and anti-parkinsonism [21], anticonvulsant [22], muscle relaxant activities [23], neuroprotective [24], inhibitors of several enzymes and so on [25]. Hence, the synthesis of benzothiazoles is of considerable interest due to their potent and significant biological activities and great pharmaceutical value.

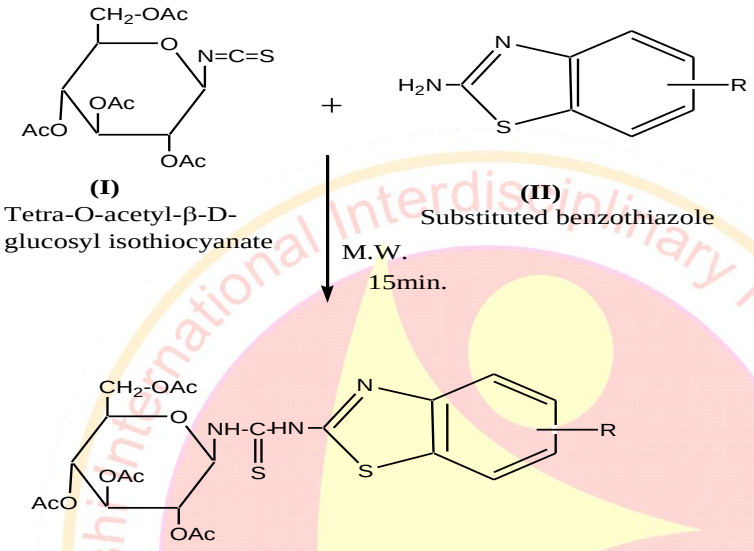
Nanotechnology, as defined by size, is naturally very broad, including the field of science as diverse as surface science, organic chemistry, molecular biology, semiconductor physics, energy storage, microfabrication, molecular engineering, etc. The associated research and applications are equally diverse, ranging from extensions of conventional device physics to completely new approaches based upon molecular self-assembly, from developing new materials with dimensions on the nanoscale to direct control of matter on the atomic scale. Nanotechnology may create many new materials and devices with various applications, such as in Nanomedicines, Nanoelectronics, and biomaterial energy production and consumer products.

Results And Discussion:

Nanoparticles:

A nanoparticle isa sub-classification of the ultrafine particle with lengths in two or three dimensions greater than 0.001 micrometer (1 nanometer) and smaller than about 0.1 micrometer (100 nanometers) and which may or may not exhibit a size-related intensive property. This term is a subject of controversy regarding the size range and the presence of a size-related property. Current usage emphasizes size and not properties in the definition. The length scale may be a hydrodynamic diameter or a geometric length appropriate to the intended use of the nanoparticle. The chemistry of thiourea of carbohydrates is extensively elaborated and well documented. These compounds arouse interest as potential biologically active substances and versatile intermediates for preparing various derivatives

Reaction Scheme:-



(I)
Tetra-O-acetyl-β-D-glucosyl isothiocyanate

(II)
Substituted benzothiazole

(III)
1-tetra-O-acetyl-β-D-glucosyl -3-substituted benzothiazolyl thiocarbamides

Here Tetra-O-Acetyl-β-D-Glucosyl-3-substitute benzothiazolyl thiocarbamide was synthesized by both methods; conventional and Microwave method.Tetra-O-acetyl-β-D-glucosyl isothioyanate was react with Substitute benzothiazole in benzene medium after that reaction mixture was titurate several times with petroleum ether . The product is confirmed based onthe melting point and other studies.

Experimental

Melting points were recorded on electro thermal melting point apparatus are uncorrected. Specificrotations were measured on Equip-Tronic digital polarimeter model no. EQ 800 at 30^0C in $CHCl_3$. IRspectra were recorded on a Perkin Elmer spectrometer. ^{1}H NMR were obtained on a Bruker DRX-300(300 MHz FT NMR) NMR spectrometer in $CDCl_3$ solution with TMS as an internal reference. The massspectra were recorded on a DART mass spectrometer were recorded. Partical Size was analysis by Malvern particalsizeanalysizer.

I) Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

This has been prepared by the interaction of tetra-O-acetyl-α-D-glucopyranosyl bromide and lead thiocyanate, the former was prepared according to the procedure described earlier. Details of typical experimental are as follows :

a) Microwave assisted preparation of glucose penta acetate :-

Peracetylation of glucose to give the acetyl derivative with small excess of acetic anhydride under the catalyst of either Potassium or Sodium acetate (anhydrous) was found practically quantitative in less than 15 min with microwave heating.

Herein, we reported first time peracetylation of glucose in molecular proportion of acetic anhydride (30 ml) using catalyst sodium acetate 0.8 gm. Under Microwave heating the reaction was complete less than 10 min. Product was isolated by pour in ice cold water with constant stirring and cooling.

The glucose penta acetate is separated out; purification of product was done under water, ethanol system. Melting point of Glucose penta acetate was found to be 110°C.

b) **Synthesis of Tetra-O-acetyl-α-D-glucopyranosyl bromide** :

The finely powdered glucose pentaacetate (21.0g) was added gradually to the brominating reagent. After the addition the flask was kept for 2 hr. at room temperature. The reaction mixture was mixed with chloroform (50 ml) then the mixture was shaken vigorously for about 15 min. The resultant mixture was pour in ice cold water.

The chloroform layer was then separated. It was washed several time with aqueous sodium bicarbonate to removed excess of acetic acid followed by the aqueous sodium meta-bisulphate to remove the excess of bromine and finely 2-3 times with water. To the chloroform layer addition of petroleum ether afforded a solid (15 g). This solid was expected tetra-O-acetyl-ά-D-glucopyranosyl brominde, it was crystallized from ethanol, m.p. 88-90°C.

d) **Preparation of lead thiocyanate :**

Lead thiocyanate was prepared by mixing aqueous solution of lead nitrate and ammonium thiocyanate. The white granular lead cyanate was filtered washed with distilled water and dried at 50°C.

Preparation of Tetra-O-acetyl-β-D-glucopyranosyl isothiocyanate :

To a suspension of tetra-O-acetyl-α-D-glucopyranosyl bromide (21 g) in sodium dried xylene (80 ml) was added lead cyanate (15g). The reaction mixture was refluxed gently for 3 hr. with frequent shaking. This solution was then cooled and liberated lead bromide was removed by filtration. The xylene filtrate was then treated with petroleum ether (60-80°) with stirring, a pale yellow solid obtained (12 g). This solid was expected tetra-O-acetyl-β-D-glucopyranosyl isocyanate. It was purified by dissolving it in a minimum quantity of chloroform and reprecipitating with petroleum ether. m.p 115-120°C

Table No-2-: Study of synthesis of 1-tetra-*O*-acetyl-β-D-Glucosyl isothiocyanate under microwave irradiation[11]

Sr. No.	Amount of G-Bromide	Amount of Xylene	Time	Power in watt	Temp. °C	% Yield
1	10.0 gm	80 ml	35 min	P-70	120-130	**90%**
2	20.0 gm	120 ml	40 min	P-80	130-140	**80%**
3	**30.0 gm**	**150 ml**	**40 min**	**P-80**	**135-145**	**65%**

- Lead thiocyanate was taken in equimolar proportion of G-Bromide.
- G-Bromide :- 1-tetra-*O*-acetyl-□-D-Glucosyl-Bromide

Experiment No. 1:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

A benzene solution of tetra-O-acetyl- β -D-glucosyl isothiocyanate (0.005 M, 1.9 g, in 20 ml) was mixed with the suspension of 2-amino benzothiazole (0.005 M, 0.75 g in 10 ml) and mixture was under microwave irradiation After, benzene was distilled off and sticky mass obtained as a residue was triturated several time with petroleum ether to afford white solid. It was crystallized from ethanol water, m.p. 135-142°C. [Found: C, 52.00; H, 4.85; N, 8.14; S, 6.23, $C_{22}H_{25}O_{10}N_3S$. requires; C, 52.07, H, 4.93; N, 8.28; S, 6.31%].

The product was found soluble in ethanol, acetone, chloroform and benzene while insoluble in water and petroleum ether. It charred when heated with conc. sulphuric acid. It was non-desulphurisable when boiled with alkaline plumbite solution. It was found to be optically active and its specific rotation $[\alpha]_D^{29}$ = +74.46° (c, 0.94 in chloroform). The purity was checked by TLC and recorded Rf value 0.86 (CCl_4 : EtOAc, 3:2.1).

Analytical And Spectral Data Of Compounds:

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides (IIIa).

(IIIa) IR (KBr) : ν 3374 (N-H), 2969 (Ar-H) 1743 (C=O), 1588 (C=N), 1382 (C-N), 1239 (C-O) and 753 cm-1 (C-S); 1H NMR (CDCl3) : δ 7.57-7.20 (m, 5H Ar-H), 6.3-6.2 (s 1H N-H), 5.1-5.5 (m, 7H Glucopyranosyl ring), 2.1-1.9 (m, 12 H, 4COCH3); Mass : m/z 508 (M+), 331, 169, 109, Anal. Calcd. for C22H25N3O8S2; C, 48.97; H, 4.63; N, 8.24; S, 6.31; found C, 48.84; H, 4.59; N, 8.45; S 6.51%

Synthesis of 1-tetra-O-acetyl-β -D-glucosyl-3(2)-4-chloro benzothiazolyl thiocarbamide (IIIb).

(IIIb) IR (KBr) : ν 3340 (N-H), 2966 (Ar-H), 1745 (C=O), 1615 (C=N), 1378 (CN), 1231 (C-O) and 753 cm-1 (C-S) ; 1H NMR (CDCl3) : δ 7.7-7.6 (m, 1H, N-H), 7.4 - 7.1 (m, 4H, Ar-H), 5.1-4.7 (m, 7H, glucopyranosyl ring), 2.2-1.9 (m, 12H, 4 COCH3); Mass : m/z 544 (M+), 331, 169, 109; Anal. Calcd., C22H24N3O8S2-Cl, C, 46.07; H, 4.18; N, 7.72; S, 5.88 Found C, 46.13; H, 4.23; N, 7.21; S, 5.98%

Synthesis of 1-Tetra-O-acetyl-β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thiocarbamide (IIIe) :

(IIIe) IR (KBr) : ν 3468 (N-H), 2997 (Ar-H), 1743 (C=O), 1610 (C=N), 1383 (C-N), 1238 (C-O) and 845 cm-1 (Glucopyranosyl ring); 1H NMR (CDCl3) : δ 7.4-7.0 (m, 4H, ArH), 5.15 (s, 1H , N-H), 2.3 (m, 3H, Ar-CH3)

5.4-5.5 (m, 7H, Glucopyranosyl ring), 2.2-1.8 (m, 12H, 4COCH3) Mass: m/z (Not predictable) 331, 109; Anal. Calcd. for C23H27N3O8S2; C, 49.90; H, 4.33; N, 8.04; S, 6.13; Found C, 4997; H, 4.26; N8.22; S , 6.21%.

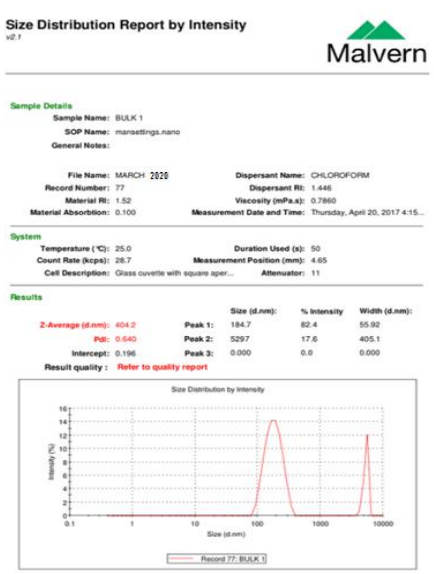
Preparation of Nanoparticles of 1-tetra-O-acetyl-β-D-glucosyl-3-(2)-methyl benzothiazolyl thiocarbamide:

Take about 1 gm of 1-tetra-O-acetyl-β-D-glucosyl-3-*(2)*-methyl benzothiazolyl thiocarbamide and dissolve it completely in the 20ml of solvent in a 250 ml beaker and add poly vinyl alchole as a stibilizer 1.5ml . Now put this beaker in a sonicator. The highly penetrating acoustic waves are passed through the mixture, which creates high-pressure bubbles in the beaker due to which breakdown of the bulk material took place and desired sized nanoparticles are formed. Then stirred mixture about 6hr. in magnetic stirrer at room tempeture. The size determination of nanoparticlesis done by the partical size analysizer studies

Characterization of Nanoparticles:

1. Characterization using UV-Spectrophotometer: Single Beam UV-Spectrophotometer with software BI/CI/SP/SB-S-03 of Bio Era make. The UV-Visible Spectroscopy reveals the formation of Nanoparticles Characterization of Nanoparticles was done using a visible Spectrophotometer by using a model by showing different absorption those from bulk material.

2. Size determination ofGlucose Penta Acetate, Nanoparticles by X-ray Diffraction studies(Particle Size Analysis): From the X-ray diffraction, it comes to know that size of nano Glucose Penta Acetate is 97.57 nm.



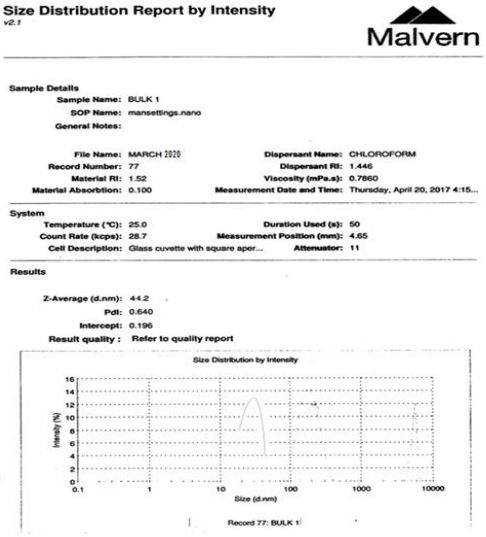


Table No. 2:- Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolylthiocarbamides

Sr.No.	-Nano of synthesis of Tetra-O-acetyl-β-D-glucosyl-(3)-2-substituted benzothiazolyl thio carbamides	M.P. °C	Particle Size
1	1-Tetra-O-acetyl- β -D-glucosyl-3-(2)- amino benzothiazolyl thiocarbamides	135-142	122.2nm
2	Synthesis of 1-tetra-O-acetyl- β -D-glucosyl-3(2)-4-chloro benzothiazolyl thio carbamide	112-120	153nm
3.	Synthesis of 1-Tetra-O-acetyl- β -D-glucosyl-3-(2)-4-methyl benzothiazolyl thio carbamide	152-155	97.57nm

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A three component synthesis of fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido [1,6-*a*]pyrimidine-3,9-dicarbonitriles with evaluation of their antioxidant activity

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Synthesis of novel fused 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) have been accomplished via three-component reaction of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3), ethyl-2-cyano-3,3-bis(methylthio)acrylate and nucleophiles such as substituted anilines/phenols/ hetryl amines/compounds containing active methylene group by using anhydrous K_2CO_3 as catalyst and DMF as solvent. Compound (3) was prepared by reaction between, simple condensation product of acetamidine hydrochloride (1) and bis(methylthio)methylene malononitrile (2) with same reaction condition which is used for title compounds. The chemical structures of newly constructed derivatives were corroborated by IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral analysis. Furthermore, these synthesized fused heterocycles were examined for their plausible antioxidant activity.
Keywords: Antioxidant, Bis(methylthio)methylene malononitrile, DMF and Potassium carbonate.

Introduction

Heterocyclic chemistry play a vital role in modern society and posses varied application in different fields due to which unabated research has been going on to synthesize new organic compounds including derivatization of naturally occurring scaffolds such as alkaloids, nucleic acids, vitamins, proteins and hormones etc. Synthetic heterocyclic compounds which contain N, S and O have enormous potential in the field of agrochemicals and medicinal chemistry.

Pyrimido[4,5-*d*]pyrimidines and pyrido[2,3-*a*]pyrimidines undoubtedly belong to the most ubiquitous heterocycles in nature. They are an important class of annulated uracils of biological importance [1], because of their connection with purine pteridine system [2]. Several patent have been reported for the synthesis of these fused heterocycles, derivatives of these are useful as antiallergic [3],vasodilators [4], bronchodilators [5], antihypertensive [6] agents. Fused pyrimido[4,5-*d*]pyrimidine ring system represent attractive target owing to divers pharmacological applications of these molecule that includes potent inhibitory properties regarding the tyrosine kinase domain of epidermal growth factor receptor [7], dihydrofolate reductase [8], 5-phosphoribosyl-1-pyrophosphate synthetase [9], antimicrobial [10], antitumor [11], antifungal [12], antiviral [13], antioxidant [14], hepatoprotective [15] activities.

Multicomponent reactions (MCRs) have been proved as simple and convenient way to produce diverse chemical libraries of 'drug like' molecules for biological screening, since the combination of three or more small molecular weight building blocks in a single operation leads to high combinatorial efficacy. In last decades many synthetic methods have been reported for the synthesis of pyrimido[4,5-*d*]pyrimidines and its derivatives [16-21]. Recently our research group have reported synthesis and antimicrobial activity of fused pyrido pyrimido pyrimido derivatives [22]. Hence in present investigation by considering the application of multicomponent reactions, it was thought to construct a novel multifunctionalized ring system such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives with evaluation of their antioxidant activity.

Material And Methods

All compounds were purchased from SD-Fine, Spectrochem and Avra chemical companies and used without any additional purification. Melting points of synthesized compounds were determined by Electrothermal IA 9000 SERIES digital melting point apparatus and were uncorrected. Purity of all the products were routinely checked by thin layer chromatography (TLC) on pre-coated sheets of silica gel-C plates of 0.25 mm thickness. FT-IR spectra were recorded in Nujol or as KBr pallets on infrared spectrophotometer. Brukner advance spectrophotometer 400 MHz was used to record ^{1}H-NMR and ^{13}C-NMR spectra using tetramethylsilane (TMS) as internal standard, Mass spectra were recorded on FT-VC-7070 H Mass spectrometer using the EI technique at 70 eV.

General procedure:

Synthesis of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3)

A mixture acetamidine hydrochloride (1) (0.01mol) and bis(methylthio)methylene malononitrile (2) (0.01mol) in 10 ml of DMF and anhydrous potassium carbonate (10mg) was refluxed for 6 hours. The progress of the reaction was monitored by thin layer chromatography (TLC). After completion of reaction, the reaction

mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol mixture to give pure compound (3).

Synthesis of 8-substituted derivative of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d).

A mixture of compound (3) (0.001mol) and ethyl-2-cyano-3,3-bis(methylthio)acrylate refluxed independently with substituted anilines/ phenols/ hetryl amines/ compound containing active methylene groups (0.001mol) in 10 ml of DMF and anhydrous potassium carbonate(10mg) for 5-6 hours. The reaction progress was checked by TLC. The reaction mixture was cooled to room temperature and poured into ice cold water. The separated solid product was filtered, washed with water and recrystalized from DMF-ethanol (2:8) mixture to give pure compounds (4a-4d, 5a-5d, 6a-6d & 7a-7d).

Table 1. Physicochemical data.

Com.No.	MolecularFormula	Mol. Wt.	Colour	Yield %	M.P °C
3	$C_7H_8N_4S$	180	Gray	72.17	135-36
4a	$C_{18}H_{14}N_6OS$	362	Brown	68.31	184-85
4b	$C_{18}H_{14}N_6O_2S$	378	Brown	77.47	178-79
4c	$C_{17}H_{11}N_6OSCl$	382	Brown	56.82	136-38
4d	$C_{17}H_{11}N_7O_3S$	393	Yellow	62.24	181-82
5a	$C_{18}H_{13}N_5O_2S$	363	Brown	70.11	147-48
5b	$C_{17}H_{10}N_5O_2SCl$	383	Yellow	82.33	192-93
5c	$C_{17}H_{10}N_5O_2SBr$	426	Brown	61.65	206-07
5d	$C_{17}H_{10}N_6O_4S$	394	Yellow	63.94	173-74
6a	$C_{15}H_{14}N_6OS$	326	Brown	69.42	155-57
6b	$C_{16}H_{16}N_6OS$	340	Yellow	75.81	134-35
6c	$C_{15}H_{15}N_7OS$	341	Brown	72.56	139-40
6d	$C_{15}H_{14}N_6O_2S$	342	Brown	68.05	174-76
7a	$C_{14}H_7N_7OS$	321	Brown	65.89	197-98
7b	$C_{16}H_{12}N_6O_3S$	368	Brown	62.17	211-12
7c	$C_{16}H_{13}N_5O_3S$	355	Brown	54.46	160-61
7d	$C_{17}H_{15}N_5O_4S$	385	Brown	66.94	143-44

Spectral Analysis:

4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3).

IR (KBr/cm^{-1}) 2206 (CN), 3359 (NH_2): ^{1}H-NMR (400 MHz,DMSO-d_6): δ 2.38 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 7.5 (s, 2H, NH_2): ^{13}C-NMR (DMSO-d_6): δ 11.84 (SCH_3), 25.98(CH_3), 81.79 (C-CN), 114.54 (CN), 162.59 (C=N), 168.04 (C=N), 172.10 (C-SCH_3) EI-MS(m/z: RA%): 180 (M^+).

8-(4-chlorophenylamino)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (4c).

IR (KBr/cm^{-1}) 1631 (N-C=O), 2210 (CN), 3356 (NH): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.51 (s, 3H, CH_3), 2.80 (s, 3H, SCH_3), 6.82 (s, 1H, NH), 7.12-7.39 (m, 4H, Ar-H): EI-MS(m/z: RA%): 382 (M^+).

8-(4-chlorophenoxy)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (5b).

IR (KBr/cm^{-1}) 1650 (N-C=O), 2221 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.50 (s, 3H, CH_3), 2.73 (s, 3H, SCH_3), 6.97-7.66 (m, 4H, Ar-H): EI-MS(m/z: RA%): 383 (M^+).

6-methyl-2-(methylthio)-8-morpholino-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (6d)

IR (KBr/cm^{-1}) 1673 (N-C=O), 2204 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.64 (s, 3H, SCH_3), 3.42 (S, 4H, NCH_2), 4.26-4.28 (S, 4H, OCH_2): EI-MS(m/z: RA%) : 342 (M^+).

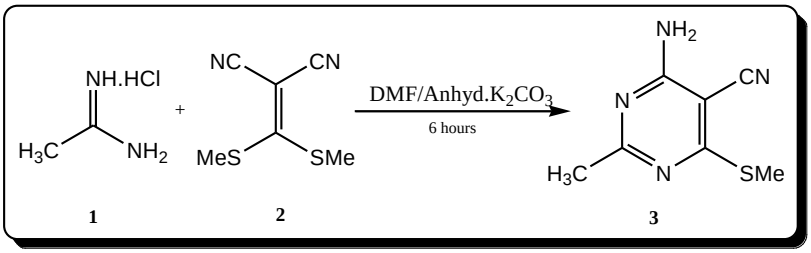
8-(dicyanomethyl)-6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile (7a)

IR (KBr/cm^{-1}) 1640 (N-C=O), 2203 (CN): ^{1}HNMR (400 MHz,DMSO-d_6): δ 2.37 (s, 3H, CH_3), 2.53 (s, 3H, SCH_3), 3.73 (S, 1H, CH): EI-MS(m/z: RA%): 321(M^+).

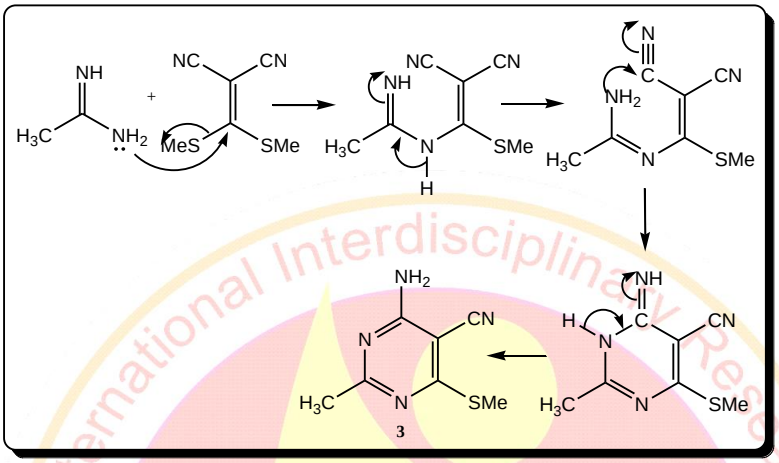
Result And Discussion

In present communication the most promising multicomponent method have been developed for synthesis of novel heterocyclic compound such as 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile its 8-substituted derivatives. Our synthetic plan commences from readily available acetamidine hydrochloride, which offers large number of annulated heterocycles. The requisite

starting material i.e. 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) was prepared from condensation of acetamidine hydrochloride and bis(methyltio)methylene malononitrile **Scheme-1**.



Scheme-1. Formation of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile

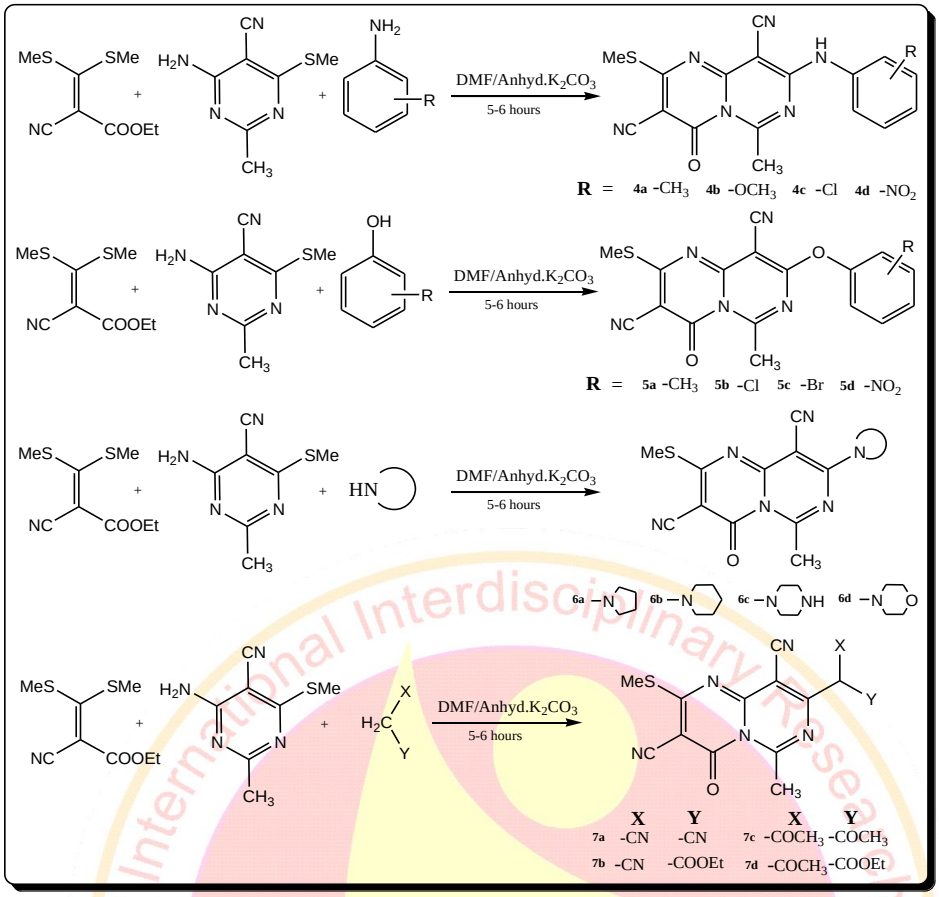


Scheme-1. Plausible mechanism for the formation of compound (3)

The presence of tautomerisable 1,3 nucleophilic positions of 4-amino-2-methyl-6-(methylthio)pyrimidine-5-carbonitrile (3) made itself more facile for attack on ethyl-2-cyano-3,3-bis(methylthio)acrylate, simultaneously compound (3) undergo nucleophilic substitution reaction due to presence of good leaving thiomethyl group resulting in the building of fused pyrimido[1,6-*a*]pyrimidine ring system via elimination of simple thiomethyl and ethoxy groups. **Scheme-2.**

The structure of newly synthesized compounds were assigned on the basis of IR, ^{1}H-NMR, ^{13}C-NMR and Mass spectral data. In IR spectrum of compounds absorption bands appear in the region 1675-1630 and 2221-2203 cm^{-1}for N-C=O, -CN respectively. ^{1}H-NMR spectra of compounds shows singlet peaks in the region of 2.30-2.52 and 2.53-2.80 ppm due to -CH_3, -SCH_3 protons respectively . ^{13}C-NMR spectrum of parent compound (3) shows peaks at 11.84, 25.98, 114.54 and 172.10 for –S<u>C</u>H$_3$, -<u>C</u>H$_3$, -<u>C</u>N and -<u>C</u>-SCH$_3$ carbons respectively. MASS spectra shows molecular ion peak which is corresponds to the molecular weight of respective compounds. Spectral studies of all compounds shows that compounds were stable and do not exhibit any tautomerism.

The overall DPPH radical scavenging activity of examined 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d) were in a range of 09.08-37.89 % as compared to the standard ascorbic acid (90.15%). The highest DPPH radical scavenging activity was exhibited by **6a** whereas **5c** demonstrate lowest activity. From the result of present work, it can be concluded that 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives are essential to boost the antioxidant activity.



Scheme-2. Formation of 6-methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitrile derivatives (4a-7d)

Antioxidant activity:

DPPH radical scavenging assay :

The DPPH radical scavenging assay has been used for preliminary screening of the sample for antioxidant activity. The proton radical scavenging action is known as an important mechanism of antioxidants. The odd electron in DPPH radical gives a strong absorption maximum at 517 nm and is purple in colour. The colour turns from purple to yellow when the odd electron of DPPH radical becomes paired with hydrogen from free radicals scavenging antioxidants to form reduced DPPH:H. 1ml (1 mM) of test sample was added in to equal quantity of 0.1 mM solution of DPPH in ethanol. After 10 minutes of incubation at room temperature, the DPPH reduction was measured by reading the absorbance at 517 nm. Ascorbic acid was taken as standard reference. The result of DPPH reduction is summarized in table-2.

Table 2. Antioxidant activity of selected compounds.

Sr. No.	Compounds	Antioxidant activity
		DPPH radical scavenging activity (%)
1	4a	12.82±0.62
2	4b	31.78±0.47
3	5b	15.26±0.03
4	5c	09.08±0.88
5	5d	14.25±0.52
6	6a	37.89±0.93
7	6c	26.84±0.08
8	6d	12.59±0.76
9	7a	23.60±0.18
10	7d	36.32±0.55
6	Ascorbic acid	90.15±0.53

Conclusion

In summary with the aim of have a good contribution to design new heterocyclic compounds, we have developed new proficient multicomponent methodology for the synthesis of novel fused heterocles such as 6-

methyl-2-(methylthio)-4-oxo-4*H*-pyrimido[1,6-*a*]pyrimidine-3,9-dicarbonitriles with excellent product yield. The major advantage of this protocol is higher purity of derivatives, operational simplicity and short reaction time.

Acknowledgement

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Development of biobased acids cross linking of tamarind seed polysaccharide films and their coating

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Abstract

In the present study, Tamarind seed polysaccharide (TSP) was obtained by water-based extraction. For characterization of the extracted tamarind seed polysaccharide phytochemical screening was done and micromeritic properties were determined. It was also found that extracted tamarind seed polysaccharide had good flow properties and pH was 6.4, this showed that it can be used in dosage form without any irritation.

Further these tamarind seed polysaccharides modified by reacting with biobased acids such as citric acid and lactic acid and cast a film which can be further used as in packing. It has been used for coatings on various fruits and their effect has been studied and weight loss test.

Introduction

Edible polymers are the polymeric materials which can be easily consumed by human as well as animals without any harm on the health. Edible polymers have appeared as a substitute to synthetic plastic for food applications and have received significant attention in recent years because of their advantages over synthetic polymers. The main advantage of edible polymers over traditional synthetics is that they can be consumed along with the products. Edible polymer coatings can provide replacement and/or fortification of natural layers to prevent moisture losses, while selectively allowing controlled exchange of important gases, such as oxygen, carbon dioxide, and ethylene, which are involved in respiration processes.

Materials and Methods

All laboratory grade chemicals/reagents were acquired either from SD Fine Chemicals and Spectrochem, India and used as such with no further purification. The tamarind was obtained from Local market, Akola, Maharashtra and used as received.

Extraction procedure

Tamarind seeds were purchased from the seeds shop situated in the old Delhi, India. Seeds were boiled and mucilage was taken out to extract xyloglucan. Mucilage was dried, powdered and further passed from sieve # 20 and stored in air tight container until used.

Extraction of tamarind polysaccharide includes two steps:

Step 1: Extraction of tamarind polysaccharide

Xyloglucan extracted by tamarind seeds were done as follows:

Crude tamarind seeds were washed neat and clean then kept for 3 hrs boiling. After completion of boiling, boiled seeds were kept for cooling for 24 hrs so that mucilage is being expelled out from the seeds. Completing 24 hrs of expulsion of mucilage from seeds, heat them for few minutes then set for cooling. Pour seeds with mucilage in the muslin cloth and press till all the mucilage is squeezed from the seeds. Temperature of extraction media was maintained at 70C and duration of extraction was adjusted about 6 hrs [1].

Step 2: Isolation of tamarind seed polysaccharide

In hot water boiled tamarind seeds were kept for 24 hrs so that the mucilage can come out from the seeds. After 24 hrs, boiled the seeds containing xyloglucan for 1 hr. Water extracted juice were squeezed with muslin cloth bag and the concentrated juice was cooled to 4C. Tamarind seed polysaccharide xyloglucan was precipitated by alcohol- juice treatment 2:1(v/v) followed by continuous stirring for 15 min and mixture was further allowed to stand for 2 hrs for better tamarind seed polysaccharide precipitation. This allows filtering of polysaccharide substances because tamarind seed polysaccharide remains float on the surface of alcohol-water mixture. Floating tamarind polysaccharide coagulate was filtered through muslin cloth, washed with alcohol (95%) and squeezed. Squeezed tamarind seed polysaccharide was further dried to constant weight at 35-45°C in hot air oven. Hard tamarind seed polysaccharide cake was ground and sieved through sieve # 20, stored in desiccators for further use [1].

Physicochemical characterization of Xyloglucan consisted in Tamarind Seed Polysaccharide Identification tests for carbohydrates

Extracted mucilage was mixed with Molish's reagent followed by addition of sulfuric acid [4, 5].

Determination of Purity of Xyloglucan in Tamarind Seed Polysaccharide

For determination of purity of extracted xyloglucan test for alkaloids, proteins, gum. Fats tannins and amino acids were performed [1, 2].

Solubility behavior

One part of dry tamarind seed polysaccharide powder was shaken with different solvents and their solubility was determined. Solubility of tamarind seed polysaccharide was determined in basic solvents i.e Acetone, Chloroform, Hexane, Butanol and Water. It has been observed that polysaccharide is soluble in every solvent [1,2,].

pH of Xyloglucan in Tamarind Seed Polysaccharide:

Firstly, extracted Xyloglucan was weighed and then dissolved in water separately to get a 1% w/v solution. The pH of solution was determined using pH meter [1, 2].

FT-IR Study

The FTIR spectral analysis of tamarind seed polysaccharide and cross-linked biopolymers was carried out by KBR pellet technique using FTIR spectrophotometer and the FTIR spectral analysis was scanned between 500 to 4000 cm-1.

Cross-linking of Xyloglucan with Citric acid/ Lactic acid

The preparation of thin film proposed by Reddy et al. was performed with slight modification. The extracted polysaccharide was diluted with distilled water at 25 °C for 10-15 min. Citric acid/ Lactic acid (30% w/w polysaccharide) as a cross linking agent and glycerol (10 % v/w) as a plasticizer were added into the polysaccharide solution for preparing the film. The whole solution was stirred vigorously using a mechanical stirrer (speed 500 rpm) at 85-90 °C for 2-3 hrs. The viscous reaction mixture thus obtained was used for preparation of thin film and coating on fruits and vegetables. Film forming solution was poured immediately on a hot plate and cast film was cured at room temperature for 48-50 hrs [3].

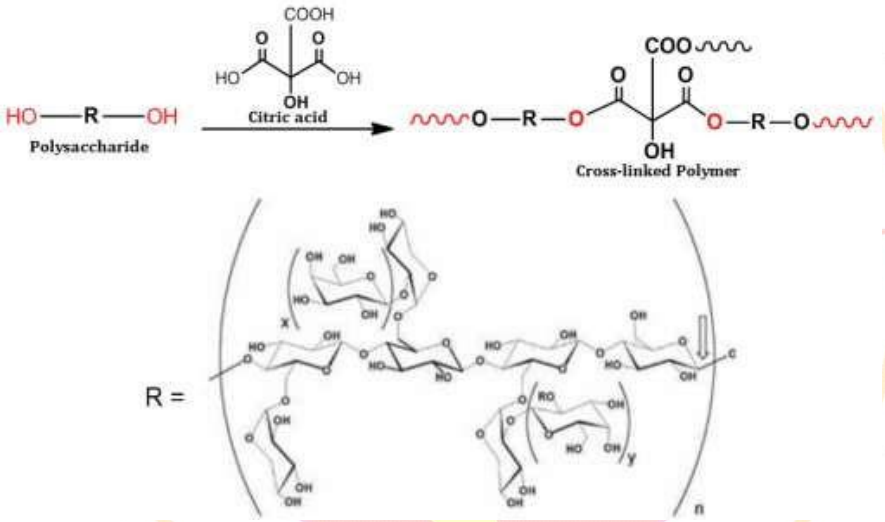


Figure 3.1: Synthesis scheme of cross-linked polymers (TSP-CA/TSP-LA)

Result and Discussion

Determination of purity of isolated tamarind seed polysaccharide

It has been observed that isolated tamarind seed polysaccharide was pinkish brown in color. It consist no odor and taste along with irregular shape as well as hard and rough in sensation and texture. The pH of 1% solution of TSP was found 6.4, which indicated that it should be non-irritating for mucus membrane. Solubility study showed that it was sparingly soluble in cold water, freely soluble and form viscous colloidal solution in warm water [1].

The isolated sample of TSP was subjected to identification. The violet color ring appeared at junction of mixture in test tube that confirms the presence of carbohydrates in sample powder. Confirmation test was also carried out for tamarind seed polysaccharide which gave positive test for mucilage, gums whereas negative for tannins, alkaloids and proteins. Other phyto-constituents were absent in the isolated powder [2]. This can be considered as proof for purity of the isolated tamarind seed polysaccharide as depicted in Table 3.1.

Polysaccharide is use for making edible plastic by using glycerol and CA as a plasticizer and crosslinker. This work investigated and developed the physical and chemical properties of polysaccharide based edible plastics and attempted to determine if they could be alternative to petrochemical plastics in the near future.

Multi-carboxyl structure of CA could induce interaction between CA and polysaccharide which will improve the barrier properties, moisture absorption, solubility of films etc. Modifiers have been used to

plasticized polysaccharide such as glycerol. Plasticizers have hydroxyl groups allowing compatibility with starch granules and they plasticized polysaccharide by breaking the internal hydrogen bonding between the glucose rings in starch. An effective plasticizer needs to be polar, hydrophilic and small enough to fit between the starch chains. Additionally, the boiling point of the plasticizer should be higher than manufacturing conditions so that it does not evaporate.

Table 3.1: Determination of purity of isolated tamarind seed polysaccharide

Test	Present/Absent
Carbohydrates	+
Hexose Sugar	+
Monosaccharides	-
Proteins	-
Fats and oils	-
Alkaloides	-
Amino acids	-
Mucilage	-
Gums	-

+ Present and - Absent

Percentage Yield of Tamarind Seed Polysaccharide

The % yield of the polysaccharide was found to be 70.0% for tamarind. During the processing of tamarind xyloglucan isolation washing is required many times which may result in loss of dissolved polysaccharides. However extraction processes tamarind is easy and hence gives better yield.

Solubility of Tamarind Seed Polysaccharide in various solvents

The solubility was checked in common solvents depending on their polarity such as water, phosphate buffers pH6.8, 0.1N HCl, acetone, ethanol, methanol etc. The polysaccharide was found to be soluble inorganic solvents and is also soluble in the aqueous solvents and swells to make a viscous solution. Hence the polysaccharides are hydrophilic in nature.

Rheological Behaviour of Tamarind Seed Polysaccharide

The viscosities of the different concentration (0.5%, 0.75% and 1%, w/v) of TSP solutions were determined by Brookfield viscometer at different shear. All the solutions showed sufficient viscosity at different shear rate and shows pseudoplastic flow. This was observed that viscosity decreases correspondingly with increasing shear. TSP shows consistent change behavior upon application of pressure

Fourier transforms infrared spectroscopy (FT-IR)

The FT-IR spectroscopy is simple but influential technique to study the curing of cross-linking. The FT-IR spectrum of tamarind seed polysaccharide (TSP), cross linked biopolymers TSP-CA and TSP-LA with citric acid and lactic acid respectively are shown in Figure 3.1.

In the FT-IR spectrum of TSP (Figure 3.1a), the vibration band at 3303.06 cm-1 is represented for the OH stretching. Two highly pronounced bands observed at vibrations 2924.09 cm-1 and 2862.36 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1375.25 cm-1 and corresponds to - CH2 bending vibration. The vibration at 1238.30 cm-1 and 1150 cm-1 is corresponds to - OH plane bending and glycosidic C-O-C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with citric acid film (TSP-CA) is shown in Figure 3.1b. In FT-IR spectrum, the broad band at 3277.06 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1712.79 cm-1 and is associated with carboxyl and ester carbonyl bands [3]. The presence of the carbonyl peak confirms the crosslinking reaction between citric acid and polysaccharide. Two highly pronounced bands observed at vibrations 2983.88 cm-1 and 2889.37 cm-1 are result of -CH2 asymmetric and symmetric stretching vibrations respectively. A band observed at vibration 1352.10 cm-1 and corresponds to -CH2 bending vibration.

The vibration at 1276.88 cm-1 and 1143.79 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. While the other vibration bands such as 945.12 cm-1, 898.83 cm-1 is corresponding to -CH bending.

The FT-IR spectrum of TSP cross linked with lactic acid film (TSP-LA) is shown in Figure 3.1c. In FT-IR spectrum, the broad band at 3296.35 cm-1 is assigned for -OH stretching. The main peak of interest occurs at 1728.22 cm-1 and is associated with carboxyl and ester) carbonyl bands [3]. The presence of the carbonyl band confirms the crosslinking reaction between lactic acid and polysaccharide. A band observed at vibration 1375.25 cm-1 and corresponds to -CH2 bending vibration. The vibration at 1230.58 cm-1 and 1141.86 cm-1 is corresponds to -OH plane bending and glycosidic C-O- C stretching respectively. All other vibrational bands are in their respective region as similar to the TSP and TSP-CA spectrum.

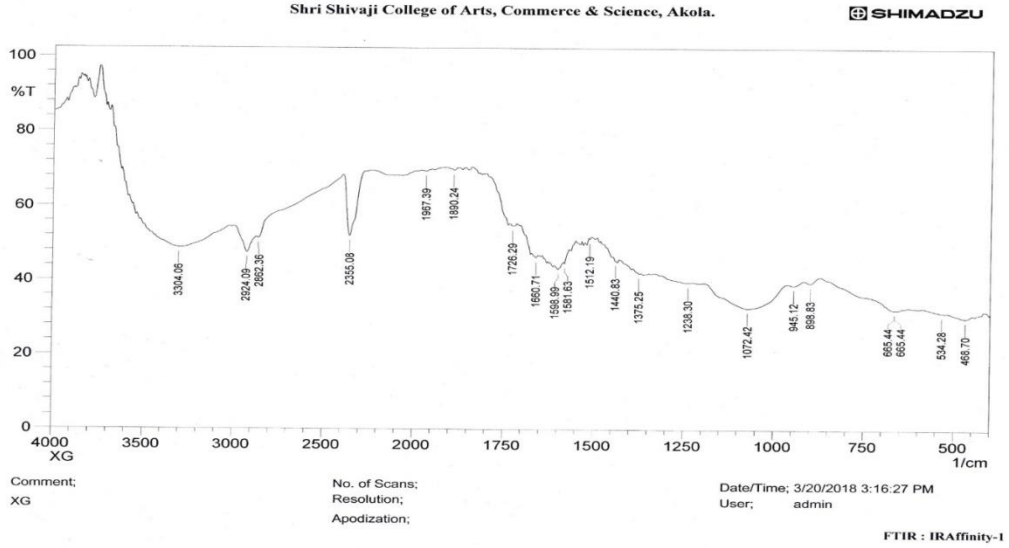


Figure 3.1: a) FTIR Spectrum of Tamarind seed Polysaccharide (Xyloglucon)

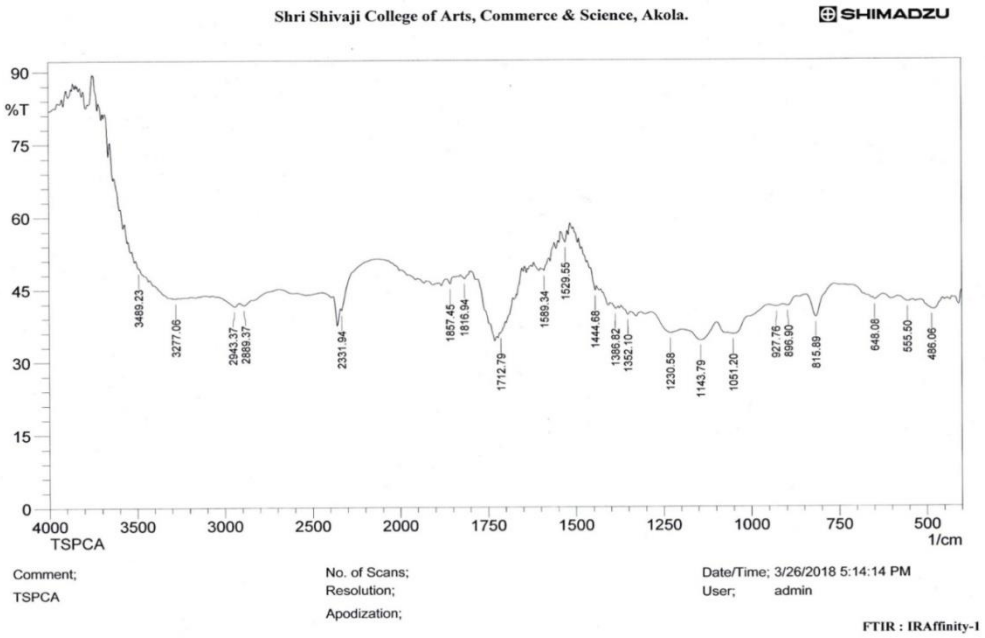


Figure 3.1: b) FTIR spectrum of Tamarind Seed Polysaccharide with Citric acid (TSP-CA)

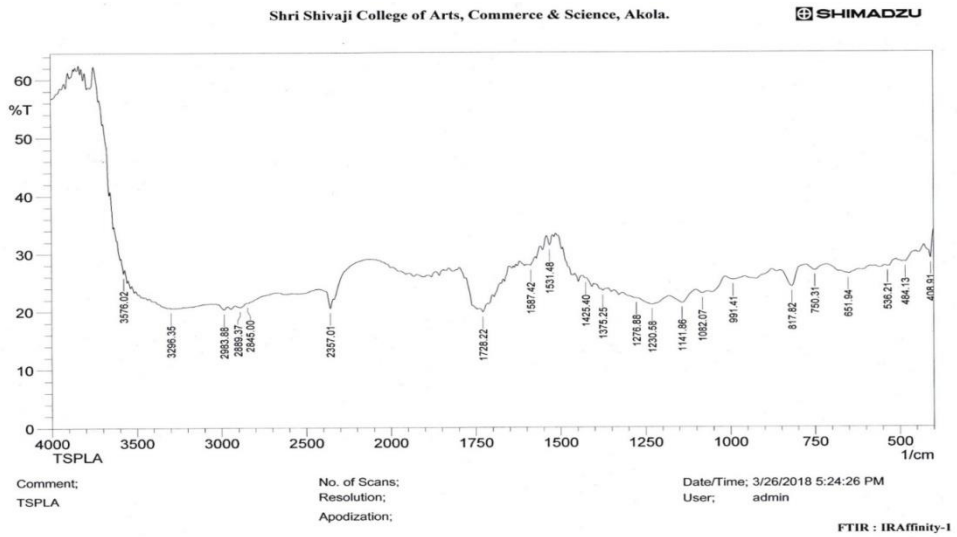


Figure 3.1: c) FTIR spectrum of Tamarind Seed Polysaccharide with Lactic acid (TSP-LA)

Chemical resistivity of cross-linked biopolymers TSP-CA and TSP-LA

The resistances to chemical factor test of TSP-CA and TSP-SA were studied using thin film in range of different protic as well as aprotic solvents such as NaOH, H2SO4, xylene, castor oil, dimethyl sulphoxide etc., The pieces of thin films were placed in different solvent for 5 days in a closed jar and the result were monitored at an interval of 24 h, by observing the change in their weights. The data has been tabulated in Table 3.2.

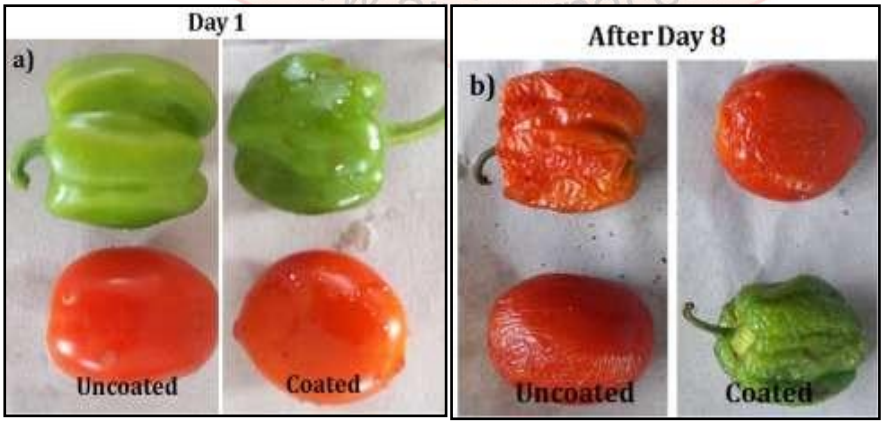
It was found that thin film is solubilized in both H2SO4 and NaOH solution as well as in DMSO and xylene solvent. However, it is resistance in all other solvents such as ethyl methyl ketone, acetone and chloroform etc.

Table 3.2: Determination of Chemical resistivity against different solvents

Solvents	TSP-CA	TSP-LA
Acetone	-	-
Ethyl methyl ketone	-	-
1 M NaOH	+	+
1 M H2SO4	+	+
Xylene	+	+
Castor oil	#	#
Chloroform	-	-
DMSO	+	+
Distilled water	#	#

Note: '+' is Soluble, '-' is Insoluble and '#' is Swelling.

Weight loss study of TSP-CA coating on fruits



The coating of TSP-citric acid crossed linked polymer on fruits and vegetables is shown in Figure 3.2. Coating is carried out to check the shelf life of fruits and vegetable by weight loss method. The weight loss and self life of data of coated fruits and vegetable are as shown in Figure 3.3. The data of weight loss study showed that weight loss is lower and shelf life is higher in case of coated capsicum and tomato compared to the uncoated. A result indicates that shelf life of fruits and vegetables increases by coating.

Figure 3.2: a) Uncoated and coated with TSP-CA cross-linked polymer and b) Uncoated and coated with TSP-CA cross-linked polymers after 6 days.

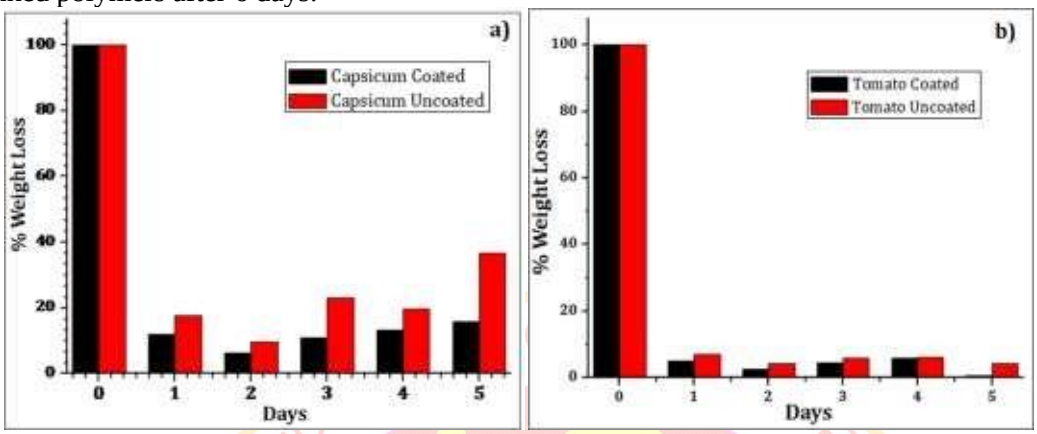


Figure 3.3: a) Comparative % weight moisture loss of Capsicum coated and uncoated and b) Comparative % weight moisture loss of Tomato coated and uncoated against 5 days.

Summary and Conclusion

The increasing interest in biodegradable and edible materials is being developed to solve the disposal of petroleum based conventional synthetic plastic materials. Petroleum based plastics requires lot of time for their degradation and most of them end up overwhelming the environment. In terms of end-use applications, packaging remains one of the major uses of plastics in the world.

Food packaging has become a centre of focus for waste reduction efforts, because in food packaging, a variety of petroleum-derived plastic materials are used at large scale due to their availability in large quantities at low cost and favorable functional characteristics. The use of edible films and coatings is constantly increasing in the food industry. Coatings can help to meet the many challenges involved in the storage and marketing of foods that are nutritious, safe and of high quality, stable and economic. The polysaccharide was isolated and characterized in terms of various physicochemical parameters of powder. From these characterized parameters it was observed that they possess substantial viscosity and very good mucoadhesive property. The mucoadhesive character of TSP may be due to resemblance with mucin structure. The other properties like pH, solubility etc. also found to be satisfactory. The observations showed that TSP exhibited good compatibility, cohesiveness and would be able to produce better flow properties in its granular form. It may be concluded that these polysaccharides can be chosen for the development of cross-linked edible polymeric materials. The tamarind seed polysaccharide was successfully utilized for modification by reacting with biobased acids such as citric acid and lactic acid. The developed cross- linked films are being resistant to most organic solvents whereas susceptible to acid alkali solution respectively. The weight loss study i.e., the coating on fruits and vegetable concluded that there is increase the shelf life of coated fruits compared to uncoated. The cast film can be further used as food packaging materials for future applications.

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Trace Elements Analysis in Ground Water Used for Drinking Purposes

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Abstract:

In this paper, assessment of trace metals in ground water used for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. All samples were analyzed for 10 trace and macro elements (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) and using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Results recommended that an adequate and suitable treatment must be applied to the water bodies having elevated concentrations of the metals and supplying drinking water to the consumers.

Metal contamination issues are becoming increasingly common, with many documented cases of metal toxicity. Metals are a natural part of our ecosystem occurring in soil, rock, air, water and organisms. A few metals, including Cu, Mn, Zn, Co and Fe are however essential for metabolism in humans & plants in trace amounts. It is only when metals are present in bio- available forms at excessive levels that they have the potential to become toxic. Chronic poisoning occurs due to heavy metal content in the drinking water. Estimation should be made to differentiate between the possible cause and source of such poisoning case.

Keywords: Metal contamination, Drinking water Toxicity, Trace metals in ground water bodies

Introduction:

Providing quality drinking water to all citizens who are deprived of access to water will serve as the breaking point of poverty alleviation in most developing cities. Water supply systems and drinking water inaccessibility in developing countries is a global concern that calls for immediate action. About 884 mil-lion people in the world still do not get their drinking water from approved sources, and almost all of these people are in developing regions [1].

Water related diseases can often be attributed to exposure to elevated heavy metal concentrations of both organic and inorganic contaminants. Many of these compounds exist naturally, but their concentration has increased as a result of anthropogenic activities [2].

Living organisms require trace amounts of some metals including cobalt, copper, iron, manganese, molybdenum, vanadium, strontium and zinc. Excessive levels of these essential metals are detrimental to the organisms [3]. Non- essential metals like cadmium, chromium, mercury, lead, arsenic and antimony are of more concern to surface water system because these metals produce undesirable effects on human and animal life. Once these metals enter in a system, they remain for relatively longer periods [4]. Once absorbed, inorganic metals are capable of reacting with a variety of binding sites in the human body and have strong attraction to biological tissues. Natural water contains toxic metals in traces. All metals exist in surface water in colloidal, particulate and dissolved forms, although dissolved concentrations are generally low [5].

The magnitude of danger of environmental pollution by heavy metals was probably for first time realized with the Minimata disaster in Japan, where thousands of peoples suffered with mercury poisoning after consuming the fish caught in Minimata Bay. The bay got contaminated with mercury released from vinyl chloride plant between 1953 and 1960[6]. Similarly, it was also reported in Japan in 1955 that cadmium caused itai-itai Byo' disease in human beings, mainly in women over forty [7].

Heavy metals are important environmental pollutants and their toxicity is a problem of increasing significance for ecological, evolutionary, and environmental reasons. Heavy metals have played great roles in genesis of present-day civilization. In ancient times, the wealth of Emperors and Kings was attributed to the possession of metals like iron, gold, silver copper etc. in different forms. Still today, the dependence of heavy metals has not decreased as these are very commonly used in agriculture, medicine, engineering etc.

This was due to high level of cadmium in local foodstuffs attributable to irrigation water from soil heaps of an abandoned mine. Minimata raised its ugly head once again, not in Japan this time, but in fishing communities of Amazon rain forest. Heavy metal pollution has been worked out in recent days. Thus, in view of this widely used practice; it was of interest to undertake further investigation on these lines. The purpose of study is to promoting and coordinating activities in the field of environmental chemistry as well as health related water organizations.

Materials And Methods:

Collection of Samples: Assessment of trace metals in water supplied for drinking purposes in Nagpur city, Maharashtra, was carried out. Samples were collected from 10 Water Bodies supplying drinking water to the inhabitants in the region. Water samples were collected in one- liter plastic bottles, which were previously thoroughly washed with tap water and rinsed with distilled water. These were immediately acidified to pH 2 with HNO3 in order to keep metals in solution and prevent them from adhering to the walls of the bottles. All samples were transported to the laboratory in iceboxes and refrigerated at 4°C until analyzed. Sampling protocol was designed in such a way that samples collected in one sampling schedule were analyzed in the shortest possible time.

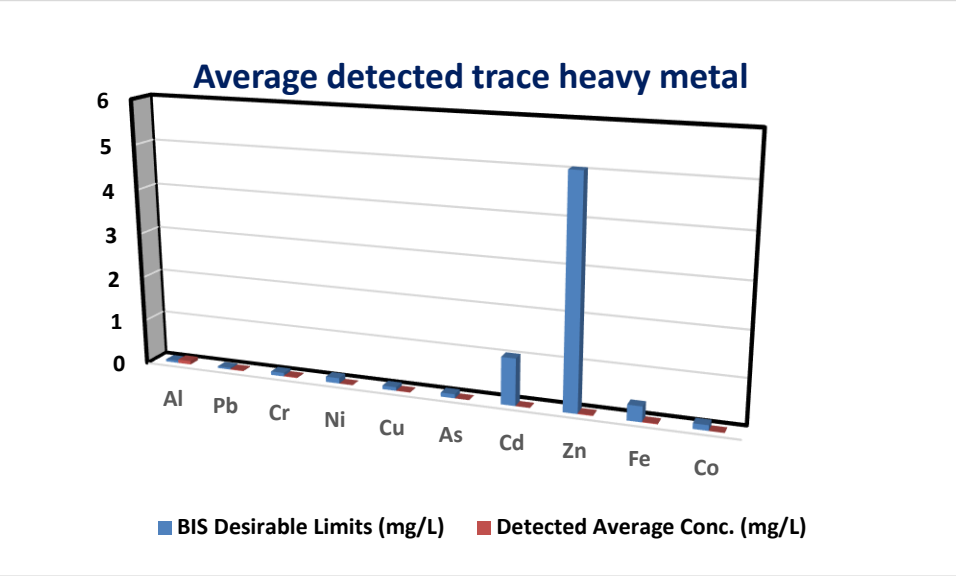
Sample Analysis: All samples were analyzed for 10 trace and macro elements using Inductively Coupled Plasma (ICP) spectrophotometer equipped with an ultrasonic nebulizer. Samples were analyzed for trace metals (Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co) using a Perkin Elmer model 1000 Inductively Coupled Plasma. (ICP) spectrophotometer equipped with an ultrasonic nebulizer model Cetec-U 5000 AT. The use of the ultrasonic nebulizer instead of a pneumatic nebulizer provided a 5-to-50-fold improvement in detection limits and a 10-fold enhancement resulting in better reproducibility on trace metal level determinations. Analysis was carried out in duplicate and average values are reported. The ICP was calibrated with relevant Perkin Elmer Pe-Pure spectroscopy grade standards.

Results And Discussion:

The average detected trace heavy metal concentrations in the drinking water samples obtained from different parts of the Nagpur region has been presented in Table 1 and Fig-1.

Sr. No.	Trace Elements	BIS Desirable Limits (mg/L)	Detected Average Conc. (mg/L)
1.	**Al**	0.05	**0.008**
2.	**Pb**	0.04	**0.017**
3.	**Cr**	0.08	**0.018**
4.	**Ni**	0.12	**ND**
5.	**Cu**	0.08	**0.008**
6.	**As**	0.09	**ND**
7.	**Cd**	1.04	**0.001**
8.	**Zn**	5.06	**0.018**
9.	**Fe**	0.34	**0.014**
10	**Co**	0.12	**0.001**

Table 1



Aluminium (Al) - Soluble, colloidal, and insoluble aluminium may be present in treated water in residual form of coagulation with aluminium-containing material. BIS desirable limit is 0.05 mg/L Average Aluminum concentration in the analyzed drinking water samples was found to be 0.08mg/L.

Lead (Pb) - Tap water that are inherently not corrosive or not suitably treated may contain lead resulting from an attack on lead service pipes, lead interior plumbing, brass fixtures and fittings on solder pipe joints chiefly from galena (PbS). The BIS desirable limit is 0.04 mg/L Average Lead concentration in the analyzed drinking water samples was found to be 0.017mg/L.

Chromium (Cr) - Chromium may exist in water supplies in both the hexavalent and the trivalent state although the trivalent form rarely occurs in potable water. BIS desirable limit is 0.8 mg/L. Average Chromium concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Nickel (Ni) - The average abundance of Ni in the earth's crust is 1.2 ppm; in soils it is 2.5 ppm; in streams it is 1 µg/L, and in groundwater it is <0.1 mg/L. BIS desirable limit is 0.12 mg/L. Arsenic was not detected in the analyzed drinking water samples. Nickel is a well-known human carcinogen and it affects the activity of α-tocopherol, the most common antioxidant in human body.

Copper (Cu) - Corrosion of copper-containing alloys in pipe fitting may introduce measurable amounts of copper into the water in a pipe system. BIS limit for copper is 0.08 mg/L. Average copper concentration in the analyzed drinking water samples was found to be 0.008mg/L.

Arsenic (As) - For the protection of aquatic life, the average concentration of As3+ in water should not exceed 72µg/L. And maximum should not exceed 140 µg/ L. BIS desirable limit is 0.09 mg/L. Arsenic was not detected in the analyzed drinking water samples.

Cadmium (Cd) - A cadmium concentration of 200µg/L is toxic to certain fishes. Cadmium may enter water as a result of industrial discharges or the deterioration of galvanized pipe. BIS desirable limit is 1.04 mg/L. Average cadmium concentration in the analyzed drinking water samples was found to be 0.001mg/L.

Zinc (Zn) - Zinc most commonly enters the domestic water supply from deterioration of galvanized iron and dezincification of brass. Zinc in water also may result from industrial waste
pollution. BIS desirable limit is 5.06 mg/L. Average Zinc concentration in the analyzed drinking water samples was found to be 0.018mg/L.

Iron (Fe) - Elevated iron levels in water can cause stains in plumbing, laundry and cooking utensils and can impart objectionable taste and colour to foods. The BIS standard desirable limit is 0.34 mg/L. Average Iron concentration in the analyzed drinking water samples was found to be 0.014mg/L.

Cobalt (Co)- The samples analyzed showed Co concentration in raw and treated water to be 0.06 and 0.02 ppm. BIS desirable limit is 0.09 mg/L, average Cobalt concentration in the analyzed drinking water samples was found to be 0.001mg/L. Cobalt is an integral part of vitamin B and essential for the production of

red blood cells. Its deficiency is thought to cause megaloblastic anemia called pernicious anemia. Salts of cobalt such as acetate, chloride, and sulphates are highly toxic to human beings.

Overview: In brief, Al exceeded the maximum desirable limits in the drinking water of Nagpur region. The detected average concentrations of Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co did not exceed the maximum desirable limits in any of the drinking water samples in the Nagpur region.

Conclusions And Recommendations:

- Water samples were collected from 10 drinking water sources covering Nagpur.
- The minimum and maximum trace metals concentrations in different areas for Al, Pb, Cr, Ni, Cu, As, Cd, Zn, Fe, and Co ranged between ND-008, ND-0.017, ND- 0.018, ND, ND- 0.008, ND, ND-0.001, ND- 0.018, ND- 0.014 and ND-0.001 mg/L respectively.
- It is recommended to adopt some kind of inexpensive treatment to reduce the levels of trace metal Al in areas supplying water directly to consumers without any type of treatment.
- Further study in this area is required to access the quantity of trace heavy metals in various water bodies supplying drinking water, groundwater bodies as well as other natural water bodies.

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Study And Phytochemical Analysis Of Fenugreek (*Trigonella Foenumgraecum*)

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Abstract-

Fenugreek (*Trigonella foenumgraecum*) is an annual plant belongs to the family Leguminosae. It belongs to the class Magnoliopsida and order Fabales. It is the famous spices in human food. Fenugreek is a legume and it has been used as a spice throughout the world to enhance the sensory quality of foods. It is known for its medicinal qualities such as antidiabetic, anticarcinogenic, hypocholesterolemic, antioxidant, and immunological activities. Beside its medicinal value, it is also used as a part of various food product developments as food stabilizer, adhesive, and emulsifying agent. More importantly it is used for the development of healthy and nutritious extruded and bakery product. The present paper reviews about Phytochemical analysis of Fenugreek.

Keywords- Fenugreek, Seeds & Leaves, Phytochemical screening.

Introduction

Plants possess medicinal and drug activities. Current study on plants primarily focuses on its medicinal uses[1]. Plant can be extracted and used for chronic and infectious diseases[2].

The active drugs which play role are secondary metabolites. The antimicrobial activities of plant extract which produces different components including aldehyde and phenolic compounds[3]. Fenugreek, one of the earliest spices known to man belongs to the bean family trigonella foenumgraecum. It blooms white flowers in the summer and has very aromatic seeds. The herb can grow to be about two feet tall. Small and oblong shaped yellowish brown seeds of the fenugreek plant have a warm and slightly bitter taste. It is rich in vitamins and minerals and is high in protein. It has a long history as both a culinary and medicinal herb in the ancient world. Fenugreek leaves, which are high in iron, are used as a leaf vegetable in curries. The seeds and green leaves of fenugreek are used in food as well as in medicinal application that is the old practice of human history. It has been used to increase the flavoring and color, and also modifies the texture of food materials. Fenugreek (*Trigonella foenum-graecum*) being rich in phytochemicals has traditionally been used as a food, forage and medicinal plant[4]. Seeds of fenugreek spice have medicinal properties such as hypocholesterolemic, lactation aid, antibacterial, gastric stimulant, for anorexia, antidiabetic agent, galactogogue, hepatoprotective effect and anticancer. Fenugreek is a widely used herbal medicine for diabetes[5,6,7].

Phytochemistry

Fenugreek is well known for its fiber, gum, other chemical constituents and volatile contents.

These days it is used as food stabilizer, adhesive and emulsifying agent due to its high fiber, protein and gum content. The protein of fenugreek is found to be more soluble at alkaline pH Fenugreek is having beneficial influence on digestion and also has the ability to modify the food.

Leaves- The leaves contain seven saponins, known as graecunins. These compounds are glycosides of diosgenin. Leaves contain protein, fat, minerals, fiber, and carbohydrates which has therapeutic effects.[8] The mineral and vitamins present in leaves include calcium, zinc iron,phosphorous, riboflavin, carotene, thiamine, niacin and vitamin C.

Seed- Fenugreek is known for its pleasantly bitter, slightly sweet seeds. The seeds are available in any form whether whole or ground form is used to flavor many foods mostly curry powders, teas and spice blend.

List of chemical constituents is shown in table 1. The chemical composition of fenugreek showed that endosperm had the highest saponin and protein content. As against this, husk contains higher total polyphenols[9]. Seeds also contain the saponin (fenugrin B)[9]. Fenugreek seeds have been found to contain several coumarin compounds as well as a number of alkaloids (e.g., trigonelline, gentianine, carpaine). The major bioactive compounds in fenugreek seeds are believed to be polyphenol compounds, such as rhaponticin and isovitexin.

Methodology

Phytochemical test are performed. Extract is prepared then test for carbohydrate, protein amino acids, alkaloids, tannins, flavonoids, saponin, polyphenols are performed.

Materials and Methods

The fresh leaves of Fenugreek were collected. Collected fresh leaves were washed and used for the study of microscopic characteristics. The dried leaves and seeds of the plant were powdered and stored in an airtight container for further use.

Extraction and Isolation-

Near about 500gm leaves of Fenugreek dried and pulverized to powder using pestle and mortar in the laboratory. The plant material was macerated with hexane/methanol at room temperature and the extract store in refrigerator until the need of further study.

Phytochemical screening–

The chemical tests were performed for testing different chemical groups present in n-hexane and methanolic extract of leaves & Seeds of test plants Fenugreek.

Table 1: Qualitative Analysis of Phytochemicals

Sr.No	Test	Observation
1	**Test of Alkaloids**	
	1.0ml of plant extract was taken and then adds 1.0 ml of saturated solution of picric acid was added.	Yellow colour appears
2	**Test of Steroid**	
	About 0.5 g of the extract with few drops of acetic acid anhydride boil and cool .Then conc. H2SO4 was added from the side of the test tube.	Brown ring is formed at the junction two layers and upper layer turns green
3	**Test of Saponins**	
	0.5g of extract was added in 5ml of distilled water in a test tube. The solution was shaken vigorously. The frothing was mixed with 3 drops of olive oil and shaken vigorously.	Stable persistent froth appears. Formation of an emulsion
4	**Test for Flavonoids**	
	5 ml of dil. Ammonia solution were added to a portion of the crude extract followed by addition of conc. H2SO4.	Yellow coloration occurs.
5	**Test of Tannins**	
	About 0.5 g of the extract was boiled in 10 ml of water in a test tube and then filtered. A few drops of 0.1 fecl3 was added	Brownish green or blue- black coloration.
6	**Test for Polyphenol**	
	2 ml of extract was taken and add 2 ml of Folin's reagent.	Appearance of violet or Brown colour.
7	**Test for Amino Acid**	
	2 ml of extract was taken and boiled with 0.5 mL of a 0.1% solution of ninhydrin	Appearance of blue colour.
8	**Test of glycosides**	
	1 ml glacial acetic acid few drop of ferric chloride solution and conc. Sulphuric acid added	Appearance of reddish brown colour at the junction of liquid presence of deoxy sugar.

Conclusion

The preliminary phytochemical screening of Trigonella foenum gracum gives good results in the presence of flavonoids, alkaloids, phenolic compounds, tannins, saponins, carbohydrates and proteins. These phytochemical showed that Trigonella foenum gracum (fenugreek) seeds have good medicinal and therapeutic compounds. By observing the recent research studies it can also be used to reduce the level of glucose levels and can be used as one of the best anti-diabetic component.

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Overview of Recent Advances in Solar Cell Technologies

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Abstract

Earth will be facing the problem of energy crisis in near future. Use of renewable energy sources is the only way to tackle it efficiently. Solar energy is the important aspect of it. This paper reviews the different types of solar cells. Further, with different types of materials' utilization, study is done that how the performance of solar cells is enhanced. This paper consists of comparison between efficiencies of different types of solar cells with different materials. The future technologies in the solar cell technologies are studied briefly. The performance attained by the new technologies is also studied.

Keywords: Solar Cell, Solar Photovoltaics

Introduction

The sunlight which we get from the Sun is directly available to us as a renewable source of energy and it is non-vanishing also in nature. The energy derived from sunlight is also free from the pollutants of environment and noise. It can be easily used to compensate the energy which we draw from other sources like non-renewable sources of energy viz. fossil fuels, petroleum products and deposits found under the earth. To fabricate solar cells with high efficiency it has been put under large number of improvement stages from a long time. Earlier solar cells were developed by fabricating them on a single crystal of Si wafer. Those were regarded as the first generation solar cells. After that due to the development of thin films, organic materials as substitute to silicon, and dye sensitized solar cells the efficiency of conventional solar cells has been increased. The development and progress in the field of solar cell fabrication is generally hindered due to cost and efficiency factors.

The sun provides us daily with a tremendous and huge amount of energy which is in the form of heat and also the radiations known as solar energy. The energy received from the sun is available free of cost and is limitless in nature. It also has numerous advantages as solar energy can be easily harvested and used over other available conventional sources of power generator. The solar energy can be used by harvesting the sunlight in the form of solar energy by using the photovoltaic device called solar cell. The sun is basically a huge mass of gases made up of helium and hydrogen atoms. The hydrogen nuclei combine by emission of huge amount of energy by process called nuclear fusion. During the process of fusion, four of the H atoms unite and release energy to form one He atom. This energy which is released from the fusion reaction is pollutant- free, free from gases or any by product from the reaction.

The solar energy is utilized in two ways 1) photothermal and 2) photovoltaic. In first case the heat from solar radiation is either directly used for applications such as drying, water heating, space heating etc. or is converted into electricity. In photovoltaic conversion, the devices called as solar cells directly convert the solar radiation falling on them into electricity. Increasing the efficiency of solar cells and limiting the production cost is the key factors on which most of the research in this area are based upon.

Different Solar Cell Technologies And Other Efficiencies

Solar cells represent the building block and main component of PV systems. A solar cell is defined as an electrical device that directly converts the energy of photons into direct current (DC) electricity through a chemical/physical phenomenon called the photovoltaic effect. Photons with energy exceeding the cell material band-gap are absorbed causing excitation of charge-carriers and thus electric current and voltage. The conversion efficiency (η) is calculated as the percentage of the incident light power on the cell surface that is converted into electrical energy under standard conditions.

Solar cell technologies can be broadly divided as 1) solar cells based on Silicon 2) thin film solar cells 3) multijunction solar cells and 4) next generation solar cells.

Theoretical maximum solar cell efficiency value for homojunction cells can be about 29% (Sukhatme, S. P. &Nayak, J. K., 2018) assuming incident global radiation to be AM1.5 under a clear sky (1000W/m2) and with band gap energy in the range 1.1eV to 1.7eV. Many semiconductors like Si, GaAs, CdTe have band gap in this range. However, even with sustained research and development the highest reported values (2) from laboratories for solar cells and PV modules can barely reach the maximum theoretical values.

The efficiency values (Green, M.A. et al, 2016; Sukhatme, S.P. &Nayak, J. K., 2018) attained in laboratory with some first generation and second generation solar cells are listed in Table I for comparison purpose.

A. Crystalline Silicon Solar Cells

Single-junction c-Si is currently the dominant cell technology in the global PV market. The wafer-based conventional cells are classified according to their crystalline structure into four main types: Mono-crystalline, Poly-crystalline (i.e. multi-crystalline), Heterojunction with Intrinsic Thin layer (HIT), and Microcrystalline. Both single crystal and multicrystalline, are widely popular because silicon is abundant and non-toxic. With increasing production of solar PV cells and with need to reduce their cost, multicrystalline Silicon is used for commercial modules, though its efficiency is lower.

Due to high cost of making crystalline silicon, thin film cells based on a hydrogenated alloy of amorphous silicon (denoted by a-Si:H) have been commercialized.

Table I. Efficiency values attained in laboratory with some first generation and second generation solar cells. Measurements under global AM1.5 spectrum (1000 W/m2) and at cell temperature 250 C (Green, M.A. et al , 2016; Sukhatme, S. P. &Nayak,J. K., 2018)

Type of Solar Cell	Area (cm2)	Efficiency (%)
Silicon (single crystal)	143.7	**25.6**
Silicon (multicrystalline)	242.74	**21.3**
Silicon (amorphous)	1.001	**10.2**
Gallium arsenide GaAs (multicrystalline)	4.011	**18.4**
Thin Film:		
Cadmium telluride CdTe	1.0623	**21.0**
Copper indium gallium diselenide CIGS	0.9927	**21.0**
Gallium arsenide GaAs	**0.9927**	**28.8**

B. Thin Film Solar cells

To avoid the high economic and environmental cost of c-Si cells (in terms of material and energy) , a second generation of technology has been introduced since 1970s. Thin-film PV cells are manufactured by depositing thin layers of photovoltaic materials (thickness < 2 μm) to form a heterojunction barrier. Due to the direct and wide bandgap of most thin-film semiconductor materials (1.5-1.8 eV), 2G cells have better temperature coefficients as well as a good performance in indirect light. Furthermore, the main advantage of thin-film cells stems from their very small thickness. Accordingly, they can be deposited on flexible substrate materials, they can be connected into modules during the manufacturing process of the cells through laser cutting, and they can be vertically stacked to form the 3G tandem (multi-junction) cells.

Technology has helped to reduce the cost as compared to Silicon wafer based technology due to less material requirement. Other advantages of thin film modules are, they can be made in large sizes and can be mounted on curved surfaces with use of suitable substrates. However, the efficiencies of thin film solar cells are lower as compared to wafer based cells.

C. Multijunction Solar Cells

Based on amorphous silicon as well as compound semiconductors from group III and V elements of periodic table have shown greatly improved efficiencies. However, their manufacturing is expensive. An efficiency of 40.7% has been reported (King, R. R. et al., 2007) for a three-junction GaInP/ GaInAs/ Ge cell under the standard spectrum for terrestrial concentrator solar cells at 240 suns (24.0W/cm2, AM1.5D, low aerosol optical depth, 25°C). Multijunction cells based on III-V compounds are primarily used with solar concentrators, mainly providing power in space applications.

Gallium arsenide (GaAs) is a compound semiconductor which has replaced silicon in many applications due to high efficiency. GaAs solar cells have been made in various forms: thin film, single crystal, multicrystalline and multijunction. The thin film GaAs single junction solar cells have shown efficiency of 28.8% in laboratory and multicrystallineGaAs solar cells have shown 18.4 %. Thin film GaAs solar cell modules have shown 24.1% efficiency in laboratory (Green, M.A. et al, 2016). Multijunction solar cells with GaAs have shown efficiency of 31.6 % (Green, M.A. et al, 2016). Other advantages of GaAs are: its bandgap 1.42eV is close to ideal value for PV applications, its high performance in high temperature environment and better resistance to radiation. All these characteristics make it suitable for use in space applications and solar concentrators (Sukhatme, S. P. &Nayak,J. K. ,2018).

D. Emerging technologies

1) Pervoskites Solar Cell

Perovskites are a group of compounds having crystal structure similar to a mineral called perovskite which is composed of calcium titanate (CaTiO3). Perovskite solar cells are based on organometallic halides.

They have been recently reported with efficiency 25.5 % in single-junction architectures and 29.1% in silicon-based tandem cells (https://www.nrel.gov/pv/cell-efficiency.html). Perovskite solar cells are the fastest-advancing solar technology with the potential of achieving even higher efficiencies at low production costs. However, the commercialization of this technology faces certain issues, like stability against moisture and oxygen, heating under applied voltage (Yuan, Y., et al, 2016), photo-unstability , mechanical fragility (Rolston, N., et al, 2016) and environmental concerns due to toxicity of lead halides used in perovskite solar cells.

2) Organic Solar Cell

Organic solar cell or plastic solar cell is thin film cells which use organic semiconductors. The advantages of this type of cell are: they are inexpensive, flexible, light weight and involve solution based processing. But these cells suffer from low efficiency. Various architectures and different materials have been tried with organic solar cells. Recently efficiency for organic photovoltaics of 17.3% was reached via tandem structure (Chen, Y., et al, 2018).

3) Dye Sensitised Solar Cells (DSSC)

Dye sensitised solar cells (DSSC) or Gratzel cells are photoelectrochemical cells. The cell consists of photoanode, sensitizer, electrolyte and counter electrode. The sensitizer can be an organic dye, inorganic dye or metal-organic dye. The DSSC has attracted the attention mainly because it is simple to make using conventional roll-printing techniques and most of the materials used are low-cost. Conversion efficiencies of over 11% and 15% have been obtained with single junction and tandem cells, respectively, in the laboratory (Nazeeruddin Md. K., et al, 2011).

4) Kesterite Solar Cells

Kesterite solar cells are based on two synthetic compounds copper zinc tin sulphide (Cu_2ZnSnS_4) (CZTS) and copper zinc tin selenide ($Cu_2ZnSnSe_4$) (CZTSe). The optical and electronic properties of CZTS and CZTSe are similar to CdTe and CIGS. However, the advantage with CZTS and CZTSe is they do not contain toxic or rare earth elements like cadmium and indium respectively. Efficiency of 7.6% has been reported with CZTS cell and 9.8% CZTSe cell (Green, M.A., et al, 2016). Some loss mechanisms limiting the performance of these cells are dominant interface recombination, high series resistance and low minority carrier lifetime .

5) Quantum Dots

Quantum dots are a special class of semiconductors, which are nanocrystals, composed of periodic groups of II-VI, III-V or IV- VI materials. Quantum dot solar cells (QD) are structures with tunable bandgap to match the spectral distribution of solar spectrum, which reduces cost/ watt ratio of solar electricity. QDs offer the advantages like: they can be moulded into a variety of different types, in two-dimensional (sheets) or three-dimensional arrays; they can be processed to create junctions on inexpensive substrates such as plastics, glass or metal sheets; they can easily be combined with organic polymers and dyes. Recently scientists at the University of Queensland achieved 16.6% efficiency by synthesizing a quantum dot solar cell from a halide perovskite. U.S. National Renewable Energy Laboratory (NREL) set the previous record for quantum dot cell efficiency in 2017 at 13.4%, working with a similar lead halide perovskite (Sanehira, E. M. et al, 2017).

Future Trends

Continuous research and development in the field of solar photovoltaics is providing innovative materials to harvest maximum solar energy. Not only the materials but design of the products also plays important role in commercial application of the technology. Many interesting applications have been realised and some are expected in near future like : floating solar farms, where photovoltaic panels floating on reservoirs, dams and other water bodies save on large land area occupied by solar panels (Choi, Y. K., et al, 2016) ; building integrated photovoltaics (BIPV) blend into building architecture in the form of roofs, canopies; photovoltaic glasses act as energy generating device as well as allow natural light inside houses and offices; anti-solar panels working exactly opposite to conventional solar panels i.e. by using heat radiated from earth's surface so that energy can be generated around the clock (Deppe, T. &Munday, J. N., 2020) and perhaps the most promising would be solar paint with quantum dot solar cells and perovskite solar cells.

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Per formic acid: Effective reagent for preparation of Carene diol from Δ^3-Carene

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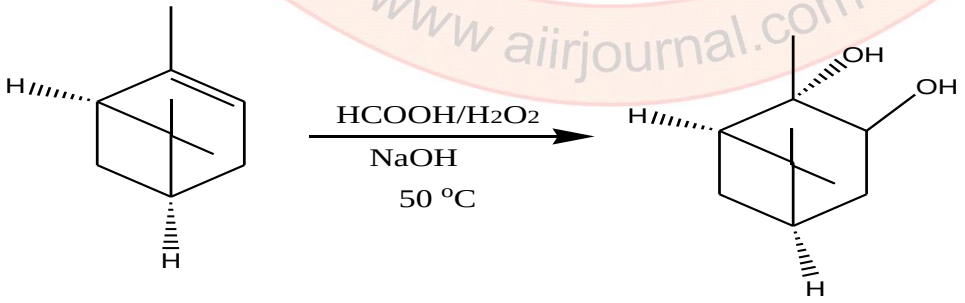
Abstract:
In the natural product, terpenoids are important because of its valuableimportance in various sectors. The terpenoids occur only in the volatile oils and they are normally colourless liquids or solids with pleasant smell and insoluble in water. They are soluble in organic solvents,alcoholand fixed oils. These terpenoids are very sensitive to prepare its various different derivatives. Terpenes are one of that terpenoids which can gives oxygenated derivatives like alcohols, ketones, aldehydes etc. Monoterpene is one of the terpenoids having molecular formula $C_{10}H_{16}$ used to prepare various derivatives. (+)3-Carene is one of the monoterpene which on oxidation by using oxidising agent performic acid which gives epoxide as intermediate product, (epoxidation of carene). Which on hydrolysis, it gives carene diol as final product.
Keyword: *terpenoids, volatile oils, Δ^3-Carene, α- pinene, carene diol.*

Introduction:

In the natural product, terpenoids are valuable natural product because of its importance in various sectors. The terpenoids occur only in the volatile oils they are normally colourless liquids [1] or solids with pleasant smell and are insoluble in water. They are soluble in, organic solvents,alcohols and fixed oils. Terpenoids normally contains one or more double bonds and forms additive compounds with halogens[2-3], nitrosyl chloride[4], and nitrosyl bromide. They are readily volatilise in stem and most of them are optically active [5].Then get oxidized by oxidizing agent. Terpene [No. of isoprene units two, M.F. $C_{10}H_{16}$] by virtue of their pleasant flavour the compounds of terpene [6] used in several industries specially perfumery, cosmetics, soaps, foods, pharmaceuticals [7], beverages and many others. Apart from flavour in food and pharmaceutical industries they are also used as mosquito repellents [8], insecticides, pesticides and deodorant [9] Antibacterial and Antifungal Properties [10]. Therapeutically they owe their action due to several compounds and find applications as antiseptic [11], stimulant, and diuretic, analgesic [12] and for several other purposes.

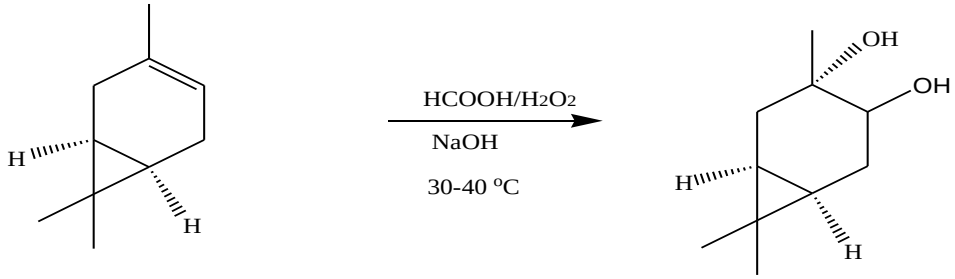
Terpenoids are classified on the basis of no. of isoprene units (C_5H_8).In that monoterpenes or terpene contains two units of isoprene ($C_{10}H_{16}$). Terpene or carene is present in (+) and (-) form. (-) form is isolated from root oil of kaempferia galangal [13-14] and from cedrus deodar oil and (+) form is wide spread plant product found specially in abies, citrus and janipenus oil with pleasant odour B.P.$_{200}$ =123-124°C and $\{\alpha\}_D^{30}$ =5.72, The (+) form of Δ^3-Careneis obtained from geranyl diphosphate[15]. Already recorded reaction of peracid such as Performicacidonterpene such as α-pinene epoxidation [16]takes place andepoxideofα- pinene is obtained. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol [17].The present work was done as same procedure given above on Δ^3-Carenewhich gives final product is 3α, 4β-carenediol.

Scheme I



α- pinene 2α, 3β- pinenediol

Scheme II



Δ^3-Carene3α, 4β-carenediol

General Experimental Procedure:

In the 150 ml three necked round bottom flask,equipped with a mechanical stirrer and dropping funnel was placed formic acid (90% 26 ml) and freshly distilled Δ^3-Carene (10gm)was added with stirring through a dropping funnel H_2O_2(30% 15ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. The solution of sodium hydroxide (8 gm in 20 mlH_2O) was added slowly to the mixture under stemming keeping the temperature around 25°C(1hrs) the reaction mixture was transpired to 150 ml separating funnel and the layer s were allowed to separate the upper oily layer approximately 13 gm was transferred back to the reaction flask and further amount of solution of sodium hydroxide (2 gm in 40 mlH_2O)was added slowly under vigorous stemming maintaining the temperature at 25°C to 30°Cafter stemming of one half hours and cooling to 5°Cto 10°C the solid diol separate out. It was filtered the residue washed with cold water and dried yield was 7 gm (64%) melting point 68°C. The crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). Themelting point was87°Cto 88 °C

2.1*Spectral data of obtained compound:*
3,4-Hydroxy-3,7,7-Trimethyl-1- Bicyclo-(4,1,0)-Heptane.
IR(KBr):3448,2900,1460, 1375, 1058, 945 & 815 cm^{-1}

Result and Discussion:

Already recorded reaction of peracid such as Performic acid with terpene such as α- pinene epoxidation of reactant was takes place and epoxide of α- pinene is obtained as intermediate. Which on hydrolysis, This epoxide is converted into 2α, 3β-pinenediol of yield 40% .Whensuchreaction is carried out on Δ^3-Carene by using same reagenti.e.performic acid which is obtained from formic acid (90%, 26 ml) and with constant stirring through a dropping funnel H_2O_2 (30% 15 ml) was then added drop wise maintaining the temperature of the reaction mixture between 30-40°C (2 hrs) stirring was continued at that temperature for 6 hrs. And reaction was allowed to stand overnight. Then solution of sodium hydroxide (8 gm in 20 ml H_2O) was added slowly to the mixture. This mixture then cooling to 5°C to 10°C the solid diol separate out dried yield was 7 gm (64%) melting point 68°C. crude diol was crystallized from pet ether + 5% ethyl acetate to give about 4 gm of diol (45%). the melting point was 87°C to 88 °C

Table- 1

Sr. No.	Terpene			Yield (%)
1	α- pinene			40
2	Δ^3-Carene			45

In the present study preparation of carene diol from Δ^3-Careneby using simple & same procedure, Per formic acid in presence of base as same reagent and maintaining temperature between 30 to 50°C. Which is used for preparation of diol of α- pinene. The yield of product is also nearly equal in range i.e. between 40 to 45 %.

Conclusion:

We have been able to introduce an efficient procedure for preparation of terpene diol by using easily preferable, more efficient catalyst which gives good yield, easy to work up, purification of compounds by simple method are the key advantages of this method.

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Synthesis And Physicochemical Studies of Chalcone

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Abstract:
Chalcone compound is synthesized and its characterization was done byspectroscopic techniques such as IR, NMR and mass spectrometry.Some physicochemical properties such as melting point, density, viscosity, refractive index, etc. have been studied for newly synthesized chalcone in different solvents, different concentration and different temperature.
Keywords- Chalcones, Density, Viscosity, Refractive Index, Concentration, Temperature etc.

Introduction:

Chalcones are one of the most important compounds.The framework 1,3-diphenylprop-2-en-1-one is well known by the generic term ‘‘chalcone,’’ a name coined by Kostanecki and Tambor[1]. It is also known as benzalacetophenone and benzylidene acetophenone. The chalcones has most important properties like anticancer [2], antimalarial[3], antimicrobial[4] and antiinflammatory[5]etc. 2-Hydroxy chalcones are a group of naturally occurring compounds and are used as the intermediates for the synthesis of various other flavanoids[6,7]. The unsaturated carbonyl system in chalcones makes them biologically active[8].Indeed,chalcones constitute an important group of natural compoundsthat are especially abundant in fruits (e.g., citruses,apples), vegetables (e.g., tomatoes, shallots, bean sprouts,potatoes) and various plants and spices (e.g., licorice),many of which have been used for centuries in traditionalherbal medicine.[9]

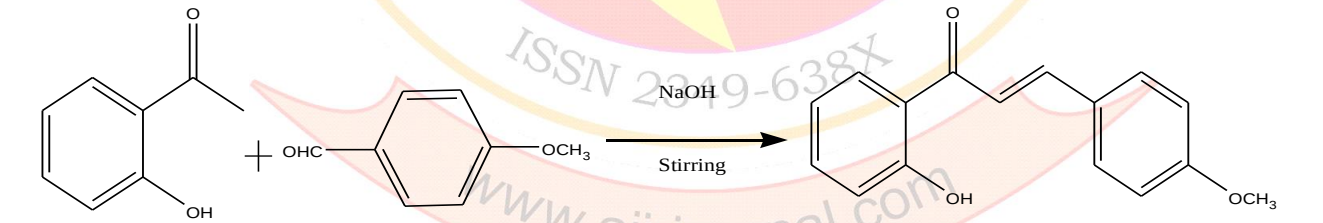
The physicochemical properties has lot of applications. The refractive Index ,density, molecular mass and viscosity are very useful in the evaluation of variousthermodynamics properties of chemical materials. The solubility is a main key factor in pharmaceutical industries.The crystallization process is also helpful in purifications and increases in crystal size.[10-12]

Thus, the present work was undertaken to synthesized new chalcone derivative and study of its physicochemical properties such as density, viscosity, refractive index etc. in different solvents, different concentrations and different temperatures.

Experimental

1. Synthesis

The chalcone was obtained by Claisen-Schmidt Condensation process.It contain equimolar quantity of aromatic ketones that is acetophenone derivatives and aromatic aldehyde as benzaldehyde derivatives will combine together in presence of base like NaOH to produce chalcone derivatives[13-20]. The structure of synthesized chalcone was confirmed by IR, 1H NMR and mass spectral data.



1-(2-hydroxyphenyl)ethanone 4-methoxybenzaldehyde (*E*)-1-(2-hydroxyphenyl)-3-(4-methoxyphenyl)prop-2-en-1-one

Table 1 shows the physical parameters of synthesized chalcone

Sr. No.	Compound	Substitution	Molecular Formula	Molecular Weight	Yield
1	Chalcone	OH & OCH_3	$C_{16}H_{14}O_3$	254	76%

2. Physicochemical studies:

The chlacone is recrystallized with DMF. All physicochemical properties were studied in dimethyl formamide (DMF) and dimethyl sulfoxide (DMSO) solvents.The different concentration of synthesized clacone prepared in DMF and DMSO. The selection of solvents for physicochemical properties on the basis of solubility.

2.1 Density and Viscosity:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents.The density of different concentration solutions were measured by using pycnometer while viscosity were measured by Ostwald viscometer at differenttemperatures**.**

2.2 Refractive Index:

The different concentrations of synthesized chalcone were made in DMSO and DMF solvents. The Abbe's refractometer was used for the measurement of refractive index of solutions of synthesized chalcone.

Results and discussion

1) Density and Viscosity of synthesized chalcone:-

The experimental values of density (ρ), and viscosity (η), at different temperature and different concentration are mention in fallowing tables

Table-2 Temperature:303.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.202	13.2924	0.9710	8.3102
0.04	1.1190	13.2507	0.9698	8.2964
0.03	1.1188	13.1962	0.9690	8.2845
0.02	1.1178	13.1626	0.9681	8.2202
0.01	1.1168	13.1104	0.9678	8.1626

Table-2 Temperature: 308.15 K

Conc.	DMSO Solvent		DMF Solvent	
(M).	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ) (g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.206	11.3022	0.9626	7.9422
0.04	1.1194	11.2824	0.9610	6.9125
0.03	1.1186	11.2268	0.9572	6.8947
0.02	1.1174	11.1917	0.9555	6.878
0.01	1.1160	11.1364	0.9518	6.8262

Table-3 Temperature: 313.15 K

Conc. (M).	DMSO Solvent		DMF Solvent	
	Density (ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise	Density(ρ)(g.cm^{-3})	Viscosity (η.10^{-3}) poise
0.05	1.1190	10.4612	0.9662	7.1522
0.04	1.1184	10.2643	0.9654	6.5844
0.03	1.1180	10.1107	0.9646	6.5005
0.02	1.1152	9.8215	0.9638	6.3863
0.01	1.1138	9.6276	0.9602	6.2084

The density of newly synthesize chalcone is higher in DMSO solvent than DMF solvent. The density decreases by decreasing concentration of solution because density is depend on the amount of substance present in solvent.The density in the two solvents is different.The different values in different solvents suggest that interactions of solute and solvent particles play an important role. In solutions, molecular interactions exist which differ in different solvents. Further, these interactions differ due to different concentration of solute insolution. Due to these interactions, there may be somechanges in mass and volume, which affects density

The viscosity of solution is depends on the interaction between solute and solvent particles, temperature, concentration etc. The viscosity in DMSO solution is higher than DMF due to strong solute solvent interaction in DMSO solvent. Viscosity in each solvent decreases as concentration decreases.

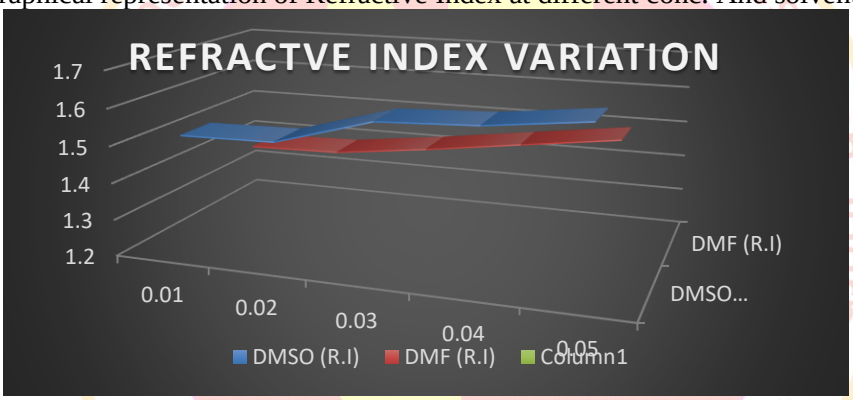
2) Refractive Index of synthesized chalcone:-

The experimental values of refractive index atdifferent concentrations and different solvents are mention in fallowing tables

Table-4

	DMSO	DMF
(M)	R.I.	R.I.
0.01	1.5126	1.3894
0.02	1.5168	1.3946
0.03	1.5914	1.4262
0.04	1.6021	1.4623
0.05	1.6322	1.4975

Graphical representation of Refractive Index at different conc. And solvents



It is observed that refractive index ofcompounds are different in each solvent as well as different concentrations . This again proves that in different solvents, inter molecular interactions are different which affects these parameter. In some solvents, aggregation or hydrogen bonding takes place whereas inothers, breakage of bonds takes place. As refractive index depends not only upon atomic refraction but also on single, double or triple bonds, these parameters are affected by the type of interactions taking place in solution.

Conclusion

It is concluded that physicochemical properties of a compound depends on concentration, temperature, solvents etc. The physicochemical properties play important role to explain the interaction between solute and solvent.

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A Biomonitoring of Plankton And Physico Chemical Properties of Kapileshwar Dam, Ashti, Dist-Wardha

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Abstract

The present study deal with biomonitoring of plankton and physico-chemical parameters of Kapileshwar dam. To cover the whole dam area the study area was divided into five sampling stations, comprehensively during the June 2017 to July 2018. The physico-chemical parameters were observed Temperature, Transparency, pH, Turbidity, Total Dissolved Solid, Total alkalinity, DO, Total hardness, Nitrate, Sulphate and Phosphate during the study. Water temperature exhibited feeble positive correlation with zooplankton. Transparency played an important role in flourishing population of phytoplankton as it established a positive correlation at 1% level of significance (r =0.729).The dissolved oxygen in water of the dam ranged from 5.00mg/l to 9.10mg/l at station I and II characterized as good level of water body. Nutrients like nitrates and phosphate present in the water body were found in the permissible limits as prescribed by WHO, BIS for drinking water quality which confirm that the water is unpolluted and safe for drinking purposes. At present the Kapileshwar dam is of mesotrophic nature.

***Key words**: Physico-chemical parameters, Kapileshwar dam, Plankton and Mesotrophic.*

Introduction

It is necessary that the quality of water should be checked periodically because due to use of contaminated water biotic fauna may suffer from a variety of water born diseases Sunkund and Patil (2004). In recent times limnological studies are often related to fisheries, biodiversity conservation, pollution assessment and rejuvenation of degraded inland freshwater ecosystems (Arlinghaus et al., 2008). Zooplankton diversity is one of the most important ecological parameters in water quality assessment. In many areas,the ecological impacts from human activities will far exceed the impacts from climate change, Scholze et al., (2006) have worked on a climate-change risk analysis for world ecosystems, Islam (2007) in a pond of Rajshahi University, has investigated the effects of abiotic parameters on the variations of zooplankton population. Zooplankton is good indicator of the changes in water quality because they are strongly affected by environmental conditions and respond. Nelson et.al.,(2009)carried out a detailed study on the combined effects of urbanization and climate change on stream ecosystems: from impacts to management options. Similarly, Durance and Ormerod (2009) have investigated existing trends in water quality and the consequent discharge confound long – term warming effects on river macroinvertebrates. The study of plankton and physico-chemical property of water was carried out by various people like

Mishra and Saksena (1991), Kuashik and Saksena (1995). Patel et al., (2013), Vasanthkumar and Vijay Kumar (2011), Garg et al., (2010). The water of Kapileshwar dam is utilized for drinking, irrigation and for fisheries activity. The present study was aimed to evaluate water quality and occurrence of zooplankton and phytoplankton with reference to physico-chemical parameters in a Kapileshwar dam.

Material And Methods

The Kapileshwar dam is a man made reservoir constructed on a river. It is at 780-17'-00" E longitude and 200-12'-00"N .The length of dam is 589 mtrs. and 7.31 meters high with a catchment area of 6.68 square km situated near Ashti Tahsil of Wardha District.Gross storage capacity of the reservoir is about 1.720 Mm3.The study area was divided into 5 sampling sites .Water samples were collected regularly on monthly basis in between 8 a.m. to 10 a.m. Water pH,DO,and TDS observed at sampling site using water analysis kit(Systronic make) while other abiotic components were analyzed at laboratory condition using the method prescribed by APHA(1989).

Result And Discussion

It is fact that maintenance of healthy aquatic ecosystem is dependent on the physico-chemical properties of water. Station wise mean values of physico-chemical parameters are summarized in Table 1.

Water Temperature(WT)

Temperature is one of the most important ecological factors, which controls the physiological behavior and distribution of organisms. In present study, lowest value of water temperature found in January190C and

highest in Jun 31.100C with the mean values 26.110C.that shows the optimum ranged for growth of aquatic fauna and flora. This result agrees with the reported by Swaranlatha and Rai (1998) in Banjara Lake. Salve(2006)also reported similar trends in Wan Prakalp reservoir, Nagpur.

pH

pH regulated most of biological processes and bio-chemical reactions. pH value ranged from minimum 6.05 to maximum 7.48 at station-I. The pH of water tends towards alkaline nature.Minimum pH was found in the month of April(summer) and reached to the maximum in the month of December (winter).This is in agreement with the findings of Manjare et al.,(2010) who studied the Vadgaon tank of Kolhapur.Mean and range pH value of all the five stations observed was 6.98 ± 0.10.

Transparency

Fresh water body in the present investigation showed no typical trend.Average mean value of water transparency evaluated is 47.68 cm. The lower values of transparency during rainy season may be attributed due to the rains which might have brought silt and mud from the catchment area making the water turbid. This is in the conformation with the observation made by Zafar (1966); Kaur et al., (2008). Mwara, (2006) also observed low transparency during rainy season in manmade reservoirs in Kenya.It was found higher in the summer season which might be due to suspended particles accumulated during summer months or may be attributed to human activity like washing and bathing.Jaybhaye (2009) also reported similar trends in Parola dam of Hingoli district.

Total dissolved solids (TDS)

TDS is measure of all the dissolved substances, both organic and inorganic in water. Higher TDS attributes to high dissolved and suspended particles in to the water.At station-I the total dissolved solid was found higher 400mg/l with the mean value considering all five station was 315.71 mg/l. It is in the range of permissible limit. Similar results were also reported by Chaturbhuj et. al.,(2004) in the Jamwa Ramgarh Lake, Jaipur.

Turbidity

The water was less turbid as observed during study period. Monsoon months particularly showed turbid water which is attributed to the surface runoff in the rainy season from the catchment area; recently Manjare et.al.,(2010) have reported higher turbidity in summer season. Average mean turbidity values of the entire sampling site calculated to 39.95 NTU.

Total alkalinity

Total alkalinity of water is the quality of water and kinds of components present in water such as bicarbonate, carbonate and hydroxide. Total alkalinity was in the ranged from 106mg/l to 330mg/l at sampling station –II and sampling station-V (Table-1) respectively. The maximum value recorded in the month of January(winter) and minimum in the month of August(monsoon).The alkaline water was found productive.Spence (1967) classified the lake into three categories based on alkalinity. On the basis of this classification, Kapileshwar dam considered as a nutrient rich dam.

Dissolved oxygen(DO)

Dissolved oxygen is an important limnological parameter indicating level of water quality , organic production and reflects the physical , biological processes prevailing in the dam water. It ranged was 5.00mg/l to 9.10 mg/l. The level of DO was found less during the month of may(summer). This is because of the low solubility of gases at high temperature Hynes,(1978); similarly during summer water volume also decreased and became more concentrated with the pollutants, Decreased DO in summer correlates with the higher solubility of oxygen at lower temperature. This is in agreement with the recent findings of Garg et al.,(2010) who found that dissolved oxygen was less during summer season. Average DO in the present study also exceeded the limit of 5mg/l as per European Environmental Commission Chapman (1997) and mean value observed in the present investigation was 7.91 mg/l. Therefore, it can be concluded that water is safe for human consumption.

Total hardness

The hardness of water is mainly governed by the content of calcium and magnesium which largely combine with bicarbonates & carbonates (temporary hardness) and with sulphate, chlorides and other anions of minerals (permanent hardness).In the present study,mean value of total hardness of five different stations was observed as 127.17 mg/l . The minimum and maximum evaluated was 86 mg/l and 226 mg/l respectively. It was found in permissible limit.

Nitrates

Nitrate is basic nutrient, which is determined the productivity of lake. In the fresh water nitrate content is meager. In the present study the average values of nitrate of all the sampling stations were observed to be 0.48 mg/l. there was no seasonal trend in the concentration of nitrates and minimum concentration was found

0.19mg/l at station-I while maximum 0.87 mg/l at station-IV.Nitrates were estimated more in winter season. This is in agreement with the findings of Islam(2007).

Sulphate

Most of the sulphate ions are probably derived from the solution of calcium & magnesium ions. Sulphate is naturally occurring ion found in all types of water and wide ranges in nature. Occurrence of sulphate in water is due to influx of runoff and leaching process. The average mean of water sulphate content was found to be 12.46 mg/l which is in permissible limit. Bhagat (2008) have also observed minimum sulphate content in Ambadi dam, near Akot Dt.Akola.

Phosphate

The lower and higher values fluctuated from 0.02 mg/l to0.60 mg/l at station- V and station-II respectively. Average mean of all the five stations calculated 0.25 mg/l. Winter months contribute higher concentration as compared to monsoon and summer seasons. Higher values may be due to accumulation of surface agricultural runoff and washing activities that contributed to the inorganic phosphate contents.

Conclusion

The pollution indicators phytoplankton and zooplankton were less in number at all the stations similarly As no industrialization has taken place in the surrounding areas, menace of effluent discharge and subsequent pollution is not evident in the dam. Abiotic components are found in the safe limit which confirms that the water is safe for drinking and also for healthy fish culture. The present status of water body is mesotrophic and unpolluted hence, the water can be utilized for irrigation, drinking and fishery activities.

Table 1 : Physico chemical quality of Kapileshwar dam during June 2017 to July 2018

Parameters	Sampling stations				
	I	**II**	**III**	**IV**	**V**
Water temperature(^{0}c)	25.82	25.36	25.66	26.11	25.76
Transparency(cm)	43.95	70.64	61.29	27.11	25.76
Total Dissolved Solid (mg/l)	251.43	264.29	260.00	315.71	282.86
pH	6.95	6.93	6.82	6.98	7.05
Turbidity(NTU)	41.57	32.40	38.17	44.40	43.20
Total alkalinity(mg/l)	153.00	163.57	158.14	185.14	208.29
DO (mg/l)	7.41	6.47	6.20	7.91	7.12
Total Hardness(mg/l)	128.57	128.57	126.29	117.43	135.00
Nitrate (mg/l)	0.43	0.45	0.49	0.49	0.52
Sulphate (mg/l)	9.68	9.27	13.69	19.89	9.75
Phosphate (mg/l)	0.31	0.29	0.16	0.32	0.18

Table - 2 : Numerical abundance of zooplanktons (org/l) at different stations June2017-July2018

S.No.	**Zooplankton**	**Stations**					Total	**%**
		I	II	III	IV	V		
1	Protozoa	8542	5670	9205	7437	8468	**39322**	15.09
2	Rotifera	14801	13917	14654	15316	14138	**72826**	27.95
3	Cladocera	9646	9204	10383	7878	6185	**43296**	16.61
4	Copepoda	8026	9205	6480	9205	7511	**40427**	15.51
5	Ostracoda	8247	8395	6185	5913	5913	**34653**	13.30
6	Worms & Larvae	5766	6775	4345	7585	5596	**30067**	11.54

Table- 3: Variation in the abundance of Planktons at different during June2017-July2018

Sr..no.	**Zoo planktons**	**Stations**				
		I	II	III	IV	V
1	Acantholeberis	+	+	+	+	-
2	Bosmina	++	+	+	+	-

3	Ceriodaphnia□	+	-	-	-	+
4	Chydorrus	+	+	+++	+	+
5	Daphnia	+++	++	+	++	-
6	Diaphanosoma□	-	-	+	-	+
7	Disparalona	+	+	++	++	+
8	Graptoleberis	+	-	+	+	+
9	Holopedium	+++	++	+++	+	+
10	Leydigia□	+	+	-	+	+
11	Moinodaphnia□	-	+	-	-	+
12	Polyphemus	++	+++	+++	+	+
13	Sida crystallina	++	+++	+	+++	++
14	Simocephalus	+	++	++	++	+
	(+)Denotes 500 org/l , (-) Denotes Absent, (□) Pollution indicator species					

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Green Chemistry and Environment: A need of Current Era

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Abstract:

It is broadly accepted that there is an emergent need for more environmentally acceptable processes in the chemical industry. This tendency gives rise to Green Chemistry. It dictate a exemplar shift from traditional concepts of process efficiency, that focus largely on chemical yield, to one that assigns financially viable value to eliminating waste at source and avoiding the use of toxic and/or hazardous substances. The paper describes the need of Green chemistry and its effect on the environment.

Introduction:

Green chemistry is the design of chemical products and processes that reduce or eliminate the use or generation of hazardous substances. Green chemistry applies across the life cycle of a chemical product, including its design, manufacture, use, and ultimate disposal. Green chemistry (Anastas PT, *et. al*, 2000) is also known as sustainable chemistry. Over the past decade, green chemistry has convincingly demonstrated how fundamental scientific methodologies can be devised and applied to protect human health and the environment in an economically beneficial manner. Significant progress has been made in key research areas, such as atom economy, alternative synthetic route for feedstock's and starting materials, biocatalysis, green solvent, biosorption, designing safer chemicals, energy and waste management.

Role of Green Chemistry in the current Scenario:

Green chemistry addresses the environmental impact of both chemical products and the processes by which they are produced. Green chemistry eliminates waste at source, i.e. it is primary pollution prevention (Anonyms, 2009) rather than waste remediation. There is no doubt that, in the twentieth century, organic synthesis has achieved a high level of sophistication with almost no molecule beyond its capabilities, with regard to chemo-, regio- and stereo selectivity, for example. However, little attention was focused on atom selectivity and catalysis was only sporadically applied. Hence, what we now see is a paradigm change: under the mounting pressure of environmental legislation, organic synthesis and catalysis. It is probably true to say that nowhere is there a greater need for green catalytic alternatives (McKenzie LC, *et.al, 2005*) in fine chemicals manufacture than in oxidation reactions. In contrast to reductions, oxidations are still largely carried out with stoichiometric inorganic (or organic) oxidants such as chromium (VI) reagents, permanganate, and manganese dioxide and periodate. There is clearly a definite need for catalytic alternatives employing clean primary oxidants such as oxygen or hydrogen peroxide. The key to waste minimization is precision in organic synthesis, where every atom counts.

Basic Principals of Green Chemistry:

1. **Prevention:** It is better to prevent the production of waste than to treat or clean up waste after it has been generated.
2. **Atom Economy:** Synthetic methods should be designed to maximize the incorporation of all materials employed in the process into the final product i.e. Reduce waste at the molecular level.
3. **Less Hazardous chemical synthesis:** Wherever possible, synthetic methods should be designed to use and create substance that possesses little or no toxicity to human health and environment.
4. **Designing Safer Chemicals:** Chemical products should be designed to perform their desired function while minimizing their toxicity and environmental destiny throughout the design of the process.
5. **Solvents and auxiliaries:** Safest available solvents must be selected for any given step and organic solvents must be avoided whenever possible.
6. **Design for energy efficiency:** Choose the least energy demanding chemical method. Ambient temperature and pressure are ideal.
7. **Use of renewable feed stocks:** Use chemicals which are made from renewable (i.e. Plant based) resources rather than chemicals obtained from depleting resources.
8. **Reduce derivatives**: Minimize the route of temporary derivation such as blocking group, protecting groups.
9. **Catalysis:** Use catalytic reagents rather than stoichiometric reagents in reactions.
10. **Design for degradation:** Design chemicals that degrade and break down into innocuous substances which do not persist in environment at the end of their function.

11. **Real time pollution prevention:** Monitor chemical reaction in real time, in process and control before the formation of hazardous substance.
12. **Safer chemistry for accident protection:** Choose and develop chemical techniques and substances that are safer and minimize the potential for chemical accidents, explosions and fires.

From the above Principles (Anastas PT, Warner JC., 1998), It is clear that the challenge for the future chemical industry is based on safer products and processes designed by utilizing new ideas in fundamental research. It has been said that the revolution of one day becomes the new orthodoxy of the next Green Chemistry is applied and must involve the successful implementation of more environmentally friendly chemical processes and product design.

Result and Discussion:

In country like India (Kidwai M. 2001), there is a great need of improvement in industries from the environmental point of view. Most of the industries are mainly confined to cost effectiveness rather than being eco effective. Some collaborative work has been done by the academic institutes and some industries to bring the eco friendly lab technologies to the industrial plants (J.H. Clark, D.J. Macquarrie, 2002). The best examples are the applications of enzymes in various industries ranging from drugs to leather. The textile industry (R. A. Sheldon, 1992) is one of the highly revenue generating industries in India, and they are now switching over to microbial Decolorization and degradation. Government can do a lot of good for the cause of green chemistry by increasing public awareness and by bringing and enforcing strict environmental legislations. One of the recent examples of government initiative is the conversion of diesel vehicles to compressed natural gas (CNG) and use of Electric vehicles (EV) in order to reduce pollution in the Country.

Conclusion:

Green Chemistry is new philosophical approach that through application and extension of the principles of green chemistry can contribute to sustainable development. Great efforts are still undertaken to design an ideal process that start from non-polluting materials. Though many exciting green chemical processes are being developed but there is far greater number of challenges lies ahead. A lot of efforts are being undertaken to design nonpolluting starting materials and to get safer products without side products. Development of better machines and fuels which produce lesser amount of polluting exhaust gases such as CO, CO2, SO2, nitrogen oxides etc. leading to air pollution and ultimately ocean acidification, has been proposed. Use of good fuel and modified green processes will also reduce the addition of heavy toxic metals and other toxic substances to the environment. Solvent free chemical processes or replacement of organic solvents by water reduces the addition of volatile organic compounds (VOC) in the environment. Use of microwave for chemical processes has reduced reaction time as well as amount of heat energy. Reduce, reuse and recycling, the principles of green chemistry will result in decrease of marine debris also in addition to pollution in surrounding environment. The greatest challenge is too incorporate the green chemistry in industrial, laboratory and day to day processes in order to control environmental pollution and hence ocean pollution at source. Many successful efforts have been made but still a lot has to be done. This can be achieved by training and educating new generation of chemists. Green chemistry has to be introduced in the syllabus of the students at all levels, so that each individual is made aware to choose greener ways in his or her life. Most importantly we need the relevant scientific engineering so, we can say that this approach in chemistry is helpful in protecting human health and environment and it represents a significant departure from the traditional methods previously used.

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GC-MS Analysis of *Colebrookeaoppositifolia* stem in acetone extract

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Abstract

The Lamiaceae (Labiatae) is one of the most important angiospermic aromatic families with wide application in term of traditional knowledge. The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide. Colebrookea is an important genus in the Lamiaceae, first described in 1806. It includes only one known species Colebrookeaoppositifolia Smith. The plants are commonly known as Indian Squirrel Tail (English). The indepth phytochemical examination of stem extracts revealed the presence of phytoconstituents in stemsnamely Resorcinol,Octanenitrile, Acetone extract

Key words :*Colebrookeaoppositifolia, GC-MS analysis,*

Introduction

The *Lamiaceae (Labiatae)* is one of the most important angiospermic aromatic families varying greatly in terms of ethno-medicine (Sarac*et al.*, 2007). The family is represented by 236 genera and 7,200 species with 256 endemic species, the members of family found in temperate regions worldwide (Cantino 1992).The members of this family are well known as aromatic species, as they contain large quantities of the essential oils (Kremer*et al.*, 2012). *Colebrookeaoppositifolia* is a monotypic genus of *Lamiaceae*, first described in 1806. The plant is evergreen, densely woolly shrubs or small tree, 1.2 to 3.6 m distributed mostly in subtropical regions of the world such as India, Pakistan, Nepal, Myanmar, Thailand, South west, China and in India widely in Northern and Southern slopes of the Himalayan range of Sikkim at elevation ranging between 3000-5000 ft. It also grows wild on hills and plains throughout India mainly occupying subtropical Madhya Pradesh and Deccan Peninsula (Rana*et al.*, 2009).It has been extensively used in the traditional system of Indian medicine for the treatment of various ailments such as headache, fever, dysentery, peptic ulcer, dermatitis, wounds, haemostatic, antifungal, as anti-fertility agent and the roots of the plant has been most widely used for the treatment of epilepsy (Kritikar*et al.*, 2007).

Collection of plant material

Collection of plant material was carried out from Chikhaldaraforest locality in the month ofSeptember. Frequent visits were made throughout the season to know the phenological events and collect the plant parts. Collected plant parts separated and washed with tap water followed by distilled water. Stem of plant grinded and converted to the fine powder and this stem powder used for the soxhlet extraction.

Preparation of Extract

5 gmair dried powder was extracted with four solventsnamely Petroleum ether, Acetone, Benzene and Water respectively. The extract so obtained was concentrated at room temperature and carried out preliminary phytochemical analysis. It revealed that, acetone solvent shows more positive results as compared to other solvents. Due to this reason acetone solvent was chosen for GC-MS analysis.

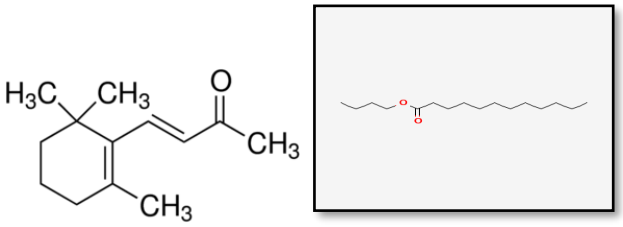
Gas Chromatography-Mass Spectroscopy (GC-MS) analysis.

The GC-MS analysis of stemin acetone extract was carried out using gas chromatography-high resolution mass spectrophotometer. 2 µl of sample was employed for GC -MS analysis. Analysis was carried out using AlegentHp 7880 with Colum 25m. Helium gas was used as carrier gas at constant flow rate.

Observation table

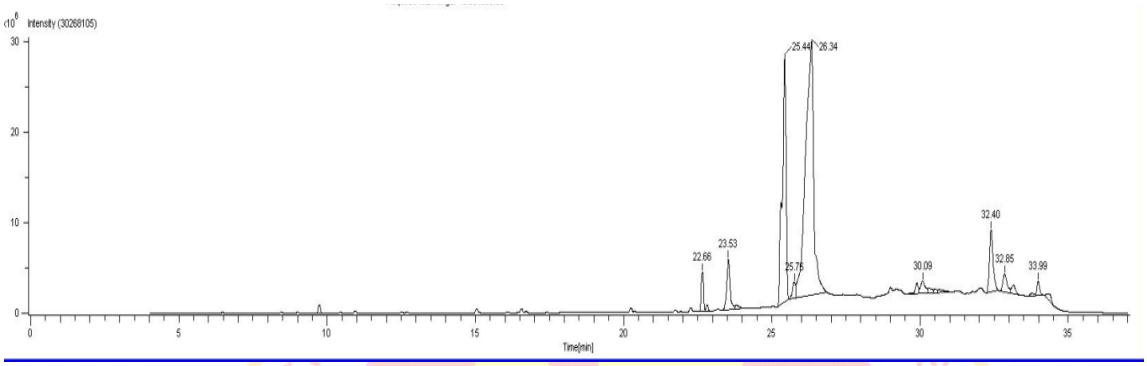
Sr. No.	R. T.	Compound	Percentage (%)	Mass	MF
1.	9.73	Resorcinol	0.48	110.10	$C_6H_6O_2$
2.	15.03	B-Ionone	9.66	192.15	$C_{13}H_{20}O$
3.	20.25	Octanenitrile	7.24	125.13	$C_8H_{15}N$
4.	23.53	n-Butyllaurate	2.41	256.24	$C_{16}H_{32}O_2$

Identified compounds in sample of*Colebrookeaoppositifolia*stemin acetoneextract

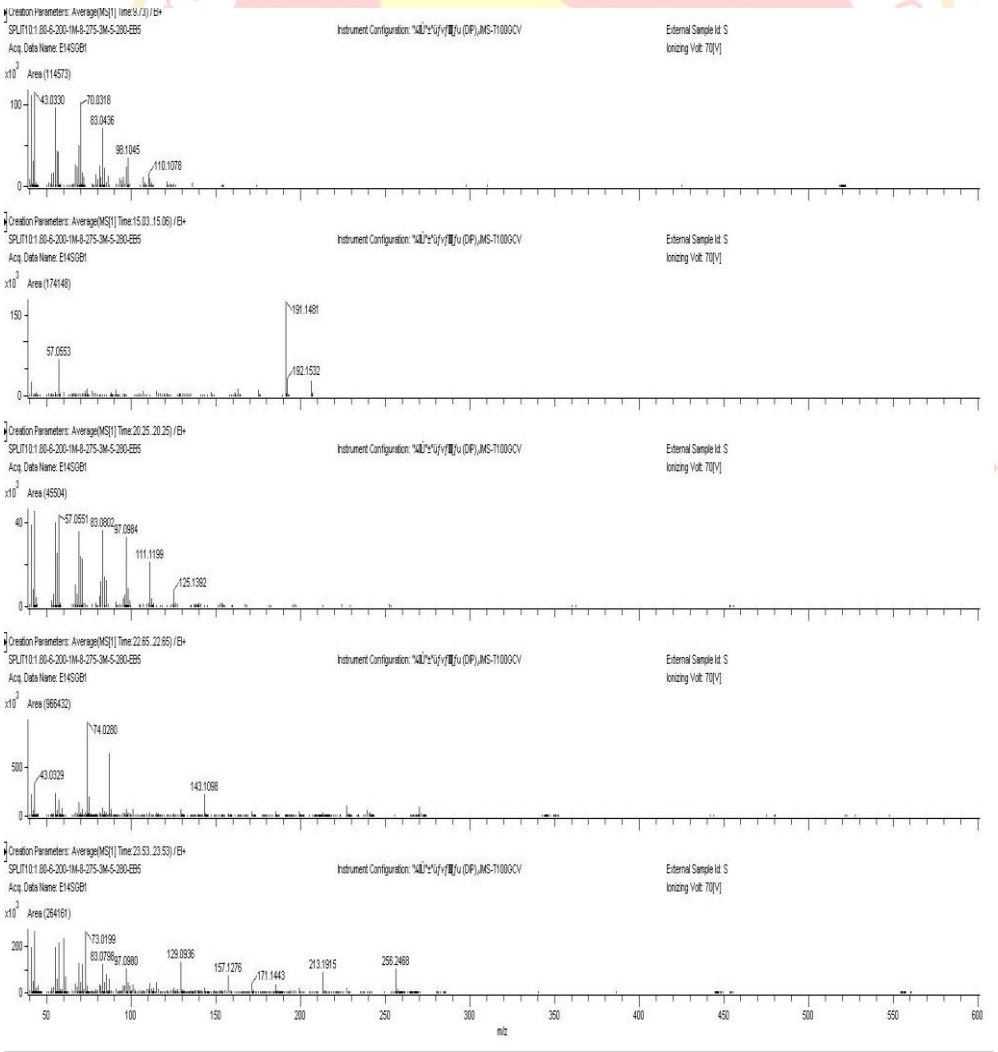


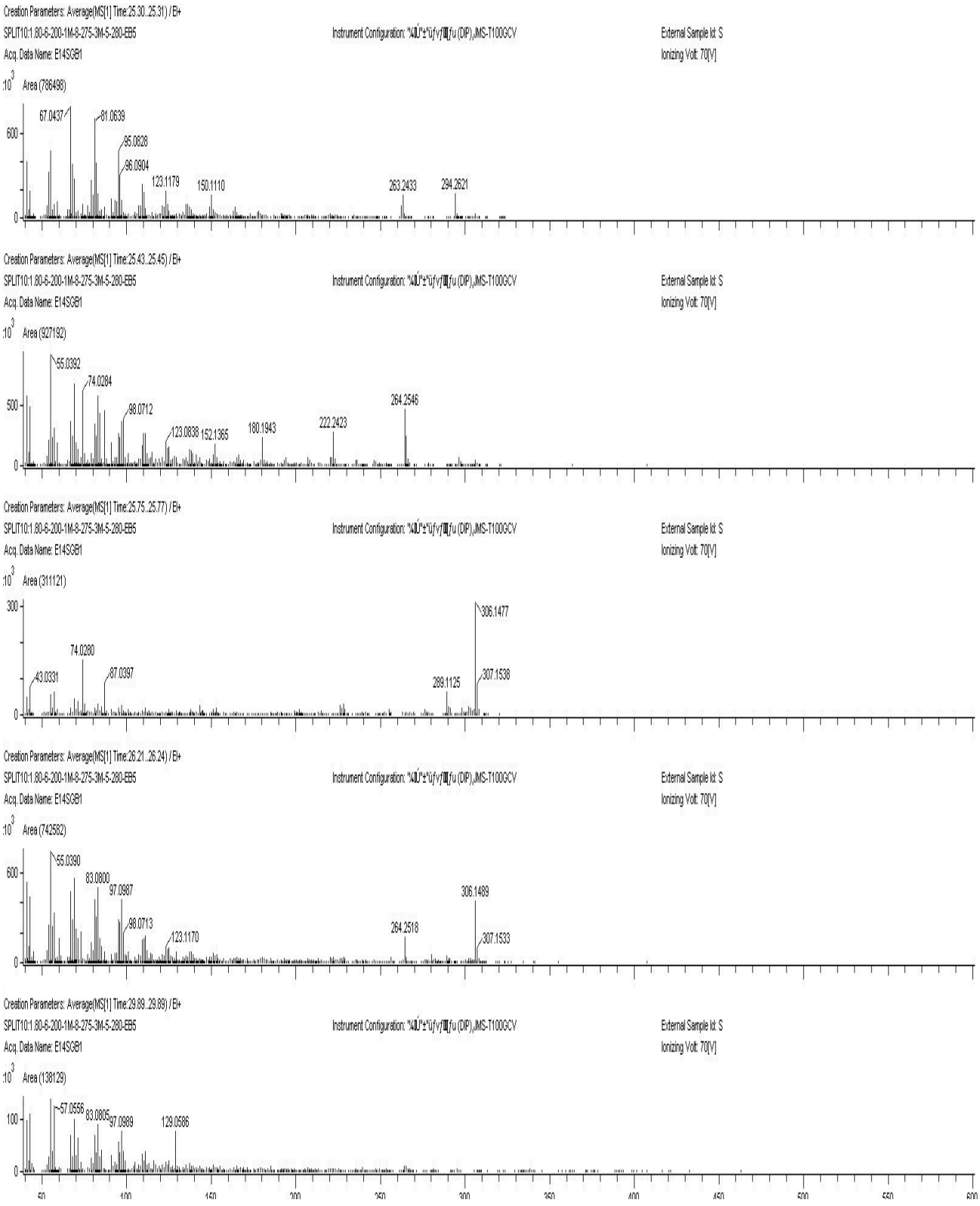
Resorcinoln-Butyl laurate

Fragmentation patterns of identified compounds



Chromatogram of *Colebrookeaoppositifolia* stem in acetone extract

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External Sample Id: S
Acq. Data Name: E14SGB1
Ionizing Volt: 70[V]
:10^3 Area (786498)
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95.0828
96.0904
123.1179
150.1110
263.2433
294.2621
Creation Parameters: Average(MS[1] Time:25.43..25.45) / EI+
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External Sample Id: S
Acq. Data Name: E14SGB1
Ionizing Volt: 70[V]
:10^3 Area (927192)
55.0392
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98.0712
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152.1365
180.1943
222.2423
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External Sample Id: S
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67.0397
289.1125
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External Sample Id: S
Acq. Data Name: E14SGB1
Ionizing Volt: 70[V]
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External Sample Id: S
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Ionizing Volt: 70[V]
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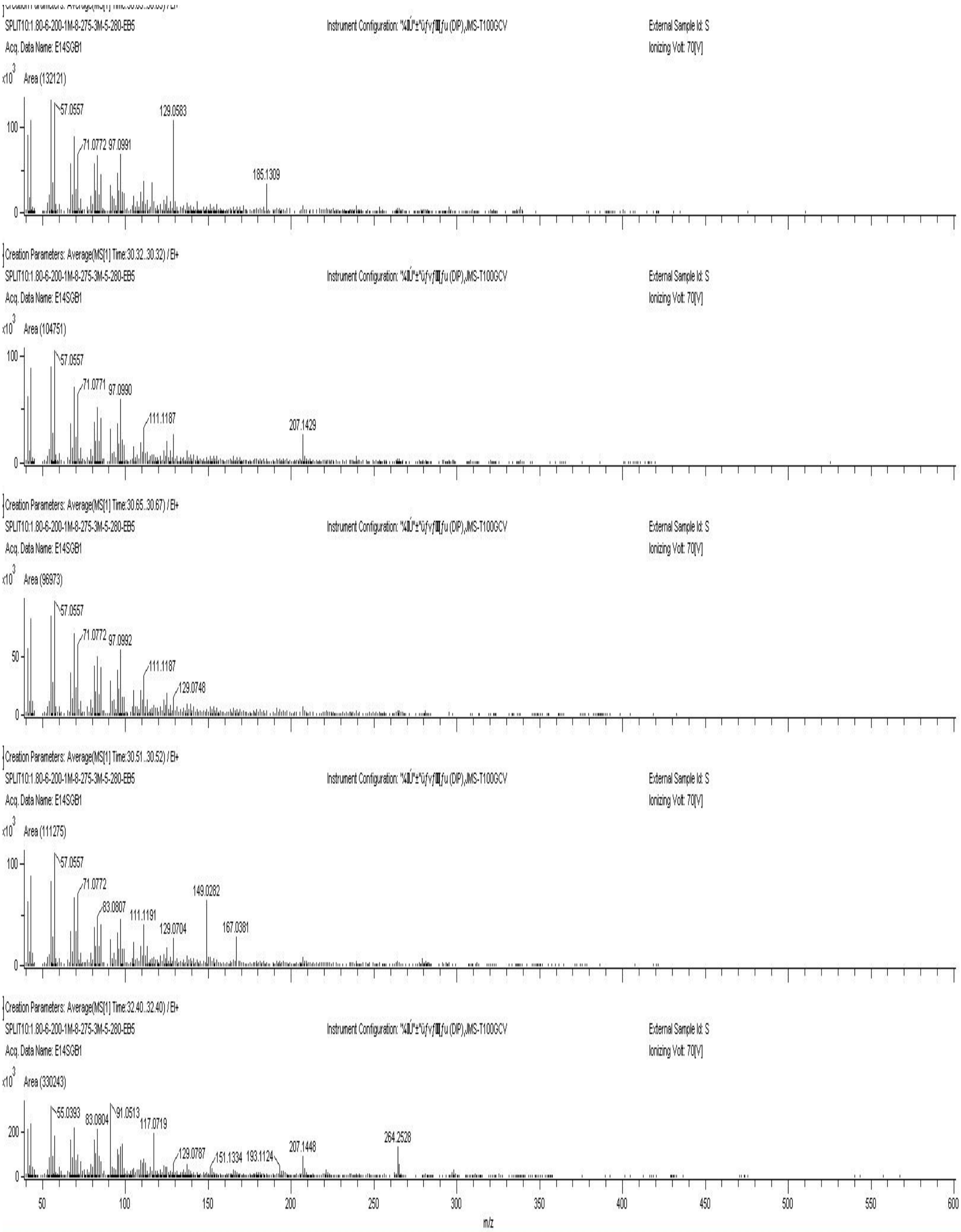
83.0805
97.0989
129.0586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x10^3 Area (132121)
57.0557
129.0583
71.0772 97.0991
185.1309
Creation Parameters: Average(MS[1] Time:30.32..30.32) / EI+
x10^3 Area (104751)
57.0557
71.0771 97.0990
111.1187
207.1429
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71.0772 97.0992
111.1187
129.0748
Creation Parameters: Average(MS[1] Time:30.51..30.52) / EI+
x10^3 Area (111275)
57.0557
71.0772
83.0807
111.1191
149.0282
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167.0381
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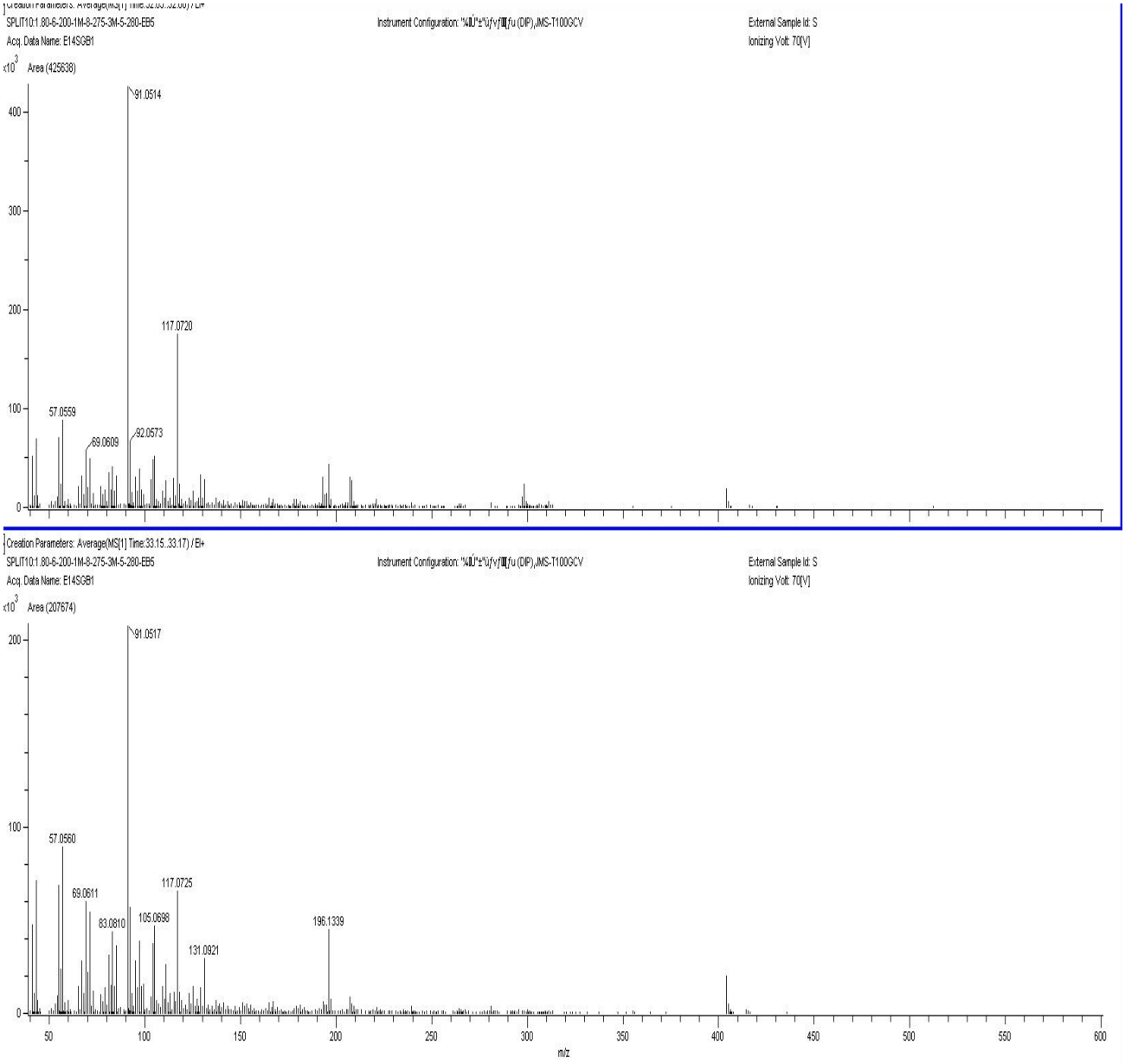
129.0787 151.1334 193.1124 207.1448
264.2528
m/z



Mass-Spectra *Colebrookeaoppositifolia*stem in acetone extract

Result and Discussion

GC-MS analysis of stem of *Colebrookeaoppositifolia* in acetone extract revealedvarious compounds. These compoundswere confirmed on the basis of base peak and mass peak and compared with NIST mass spectrum. The percentage of various compounds was calculated by the use of gas chromatogram and mass spectra. Stem contain Resorcinol (0.48%), B-Ionone (9.66%), Butyl laurate (2.41%) and Octanenitrile (20.25%).

Resorcinol does not appear to occur naturally in the Free State. It is used for topical acne treatments at 2% or less concentration (Lander *et al.*, 1945). In most of the hospitals resorcinol paste applied directly to the skin for chronic acne.**B-Ionone** (9.66%) is aroma compounds found in a variety of essential oils, including rose oil. B-Ionone is a significant contributor to the aroma of roses, it is an important fragrance chemical used in perfume. The combination of α-ionone and β-ionone is characteristic of the scent of violets and used with other components in perfumery and flavouring to recreate their scent (Baldermann*et al.*, 2010).Butyl butyratealso called butyl butanoate,is an organic compound that is an ester formed by the condensation of butyric acid and n-butanol. It is a clear, colorless liquid that is insoluble in water, but miscible with ethanol and diethyl ether. Like other volatile esters, butyl butyrate has a pleasant aroma. It is used in the flavour industry to create sweet fruity flavours that are similar to that of pineapple. It occurs naturally in many kinds of fruit including apple, banana, berries, pear, plum and strawberry (CINF 2018)

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Assessment of Physico-chemical Properties of Farmland Soil From Different Village of Umarkhed, Dist. Yavatmal (Maharashtra) India

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Abstracts

Soil is a main source of nutrients needed to plants for growth.Soil provides structural stability for plants and retains and relinquishes water and the nutrients necessary for plant growth.Soil analysis provides information which is important for maximizing nutrient use efficiency and agricultural productivity. Soil properties that are sensitive to change in the management can be used as indicator. In the present study it was preferred to analyse the nutrients contain in soil sample of UmarkhedTahsil. The five samples were collected from different sites of the study area of UmarkhedTahsilin December 2021. The analysis of soil was carried out for the study of various parameters like Nitrogen, Potassium, Phosphorous, Magnesium, Calcium, Moisture, pH, EC, &Organic Carbon.

The study revealed that all the five samples of selected area of UmarkhedTahsilare medium to high in mineral content. The pH of the soilsamples were on slightly alkaline side, ranged from 7.80 to 8.21 but within the limit of 6.5-8.5 which is optimum for crops. OC contentall the samples were of medium rating ranged from 0.32% to 0.47%. Available nitrogen ranged from 559 kg/ha to 710kg/ha; available phosphorous ranged from 18.96 kg/ha to 36.12 kg/ha. Potassium ranged from 340 kg/ha to 589 kg/ha and twosamples were rich in potassium.

***Key words**: UmarkhedTahsil, Soil quality, Micronutrients, Physico-chemical parameters.*

Introduction

Soilis main and fundamental component of agricultural activityso that it is important and necessary to understand the basicneeds of soil.Soil productivity encompasses soil fertility plus the inherent and management-related factors affecting plant growth and development.The productivity of soil is mainly depending upon physico-chemical properties and nutrient content in it. Soil provide medium for many of the ecological processes that improve water and air quality and that promote plant growth. The physic chemical properties ofsoil play an important role in activities of microorganism in soil.Soil filters water, decomposes waste, stores heat and exchanges gases and hence has great bearing on environmental balance.The quality and health of soil is important for both agricultural sustainability and environmental quality which connected to the plant, animal and human health.

Soil analysis is well recognized as a sound scientific tool to assess the status of available micronutrients in soils and their relationship with various physico-chemical properties Considerable research work has been done regarding the study of Nutrients and Physico-Chemical assessment of various types of soil in Maharashtra as well as in India have been attempted by several investigators[3,4,5]. Khadake P.A. reportedsoil analysis and its environmental impact on Nanded city of Maharashtra State [6].

The status of micronutrients in soils district Bhimber and their relationship with various physico-chemical properties were investigated by WajahatNazif,et.al[7].It is a real time to carry out the physico chemical analysis of soil because as with the increasing use of chemical fertilizer to the soil, it is difficult to control the adverse effect of the chemical fertilizer to the soil, land, animal and the human being.[1,2]Soil fertility and productivity are the key pillars for food production and soil quality is of equal significance in the background of soil degradation caused by many factors.Soil is a naturally occurring porous medium that supports thegrowth of plant and roots by retaining air, heat, water andnutrients and provides mechanical support to the plant.[12] Factors that affect the availability of soil nutrients include leaching. Soil erosion, soil pH, denitrification , volatilization, nitrogen immobilization and crop nutrient uptake. Crop growth is influenced by aerial and soil environment.

Suitable environment is necessary for better germination, growth and yield of crops. The soil is a complex organization being made up of some six constituents' namely inorganic matter, organic matter, soil organisms, soil moisture, soil solution and soil air. Roughly, the soil contains 50-60%mineral matter, 25-35% water, 15-25% air and little percentage of organic matter.[11]The higher nutrient availability is favorable when soil has higher water holding capacity, proper aeration and less soil strength or mechanical resistance. The six elements nitrogen, phosphorous, potassium, magnesium, calcium and sulphurwhich are required in large quantities are labeled as macronutrients. Most of the soils supply enough calcium, magnesium and sulphurhence thesoil scientists called these elements as secondary nutrient elements. The other three elements nitrogen, phosphorous and potassium are called as primary nutrients and are not usually available in large amounts which is enough for best growth and therefore are added through fertilization.It is well known fact that the periodical analysis of soil provides the up-to date information about the nature and the composition of the

soil.Considerable research work has been done in Maharashtra as well as in India, regarding the study of Nutrients and Physico-Chemical assessment of various types of soil,A.A.Patil[8], R.P.Ganorkar[9],R.P.Ganorkar.[10]Therefore, the present work was undertaken for the study of impact of physic chemical properties of soil on soil quality and its productivity.

Material And Methods

Study Area

Soil sample iscollected from five different village ofUmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravatiDivision. Moderate rain fall in this region and well known for cotton,soya bean, Tur, SugerCaneand other rabi crops. The sources of water for this area is Penganga river, well water and tube wellwater.

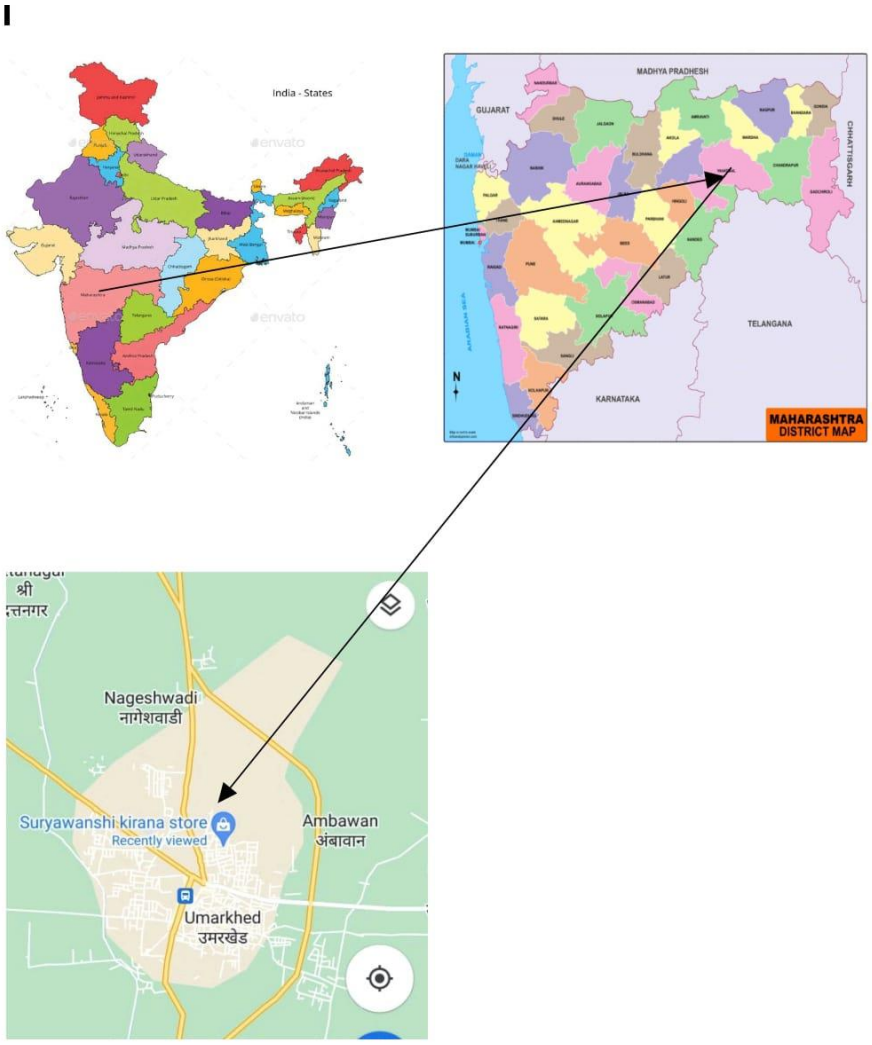


Figure1:-Location map of Study area UmarkhedTahasil District Yavatmal.

Sample Collection

Five samples were collected from the study area (farmer's field) in the month of December2021. Soil samples were collected randomly at 5 to 15 cm depths with five plots, in well sterilized polythene pouches. Soil sample were collected from following Village fields-

Sample-1 collected from VidulVillage.
Sample-2 collected from PophaliVillage.
Sample-3 collected from DahagaonVillage.
Sample-4 collected from Marlegaon.Village.
Sample-5 collected from Chili Village.

Physicochemical Analysis Of Soil Samples

The soil sample were Collected and dried for about 24hrs.Grinded more finely.Methods use for estimation of various parameters is as fallows, like Determination of pH by Digital pH Meter, EC by Conductometer, OC, Ca, N,P,by Titration Method, Determination of Mg was done by EDTA Titration Method.Determination of Potassium (K) by FlamePhotometry.

Result And Discussion

Color of Soil

The soil sample S1, S2, S3 and S4 were Black and S5 Faint Black in color.

pH

The range of pH is found in between 7.80 – 8.21. The sampleS1,S3 and S5 are slightly alkaline sample as compare toS2 and S4 soil sample which is in medium alkaline nature.

Organic Carbon

Organic carbon were recorded in the range of 0.32-0.47 %.The soil sample S2,S4, has high percentage of organic carbon. Sample S1,S5 have moderateandsample S3 has less organic carbon.

Nitrogen

Nitrogen content in the soil ranged from 710-559 kg/hector. The sample S3 & S5 has highnitrogen content as compared to other sample.

Phosphorous

The amount of Phosphorous content in the soil sample ranged between 18.96- 36.12 kg/hector. The soil sample S1 hasmore and soil sample S2 has very low phosphorous content.

Potassium

Potassium content in the soil sample ranged between 340 – 589kg/hector. The soil sampleS1havemore potassium content as compared to other samples.

Magnesium

The Magnesium content in the soil sample ranged from 8.75 – 11.45 %. It is seen in sequenceS1<S5<S3<S4<S2.

Electric Conductance

The Electric Conductance values varies from 0.090 – 0.242ms. It is seen that soil sample S2 have more value ofElectric Conductance as compared to other sample.

Calcium

The Calcium content in soil sample ranges from 49.10 – 60.90 %.It is seen in sequence S5<S3<S1<S2<S4.

Sodium

The Calcium content in soil sample ranges from 7.65 – 8.21 %.It is seen in sequence S5<S4<S2<S3<S1.

W.H.C.

The water holding capacity was observed in the sequence S5<S4<S2<S3<S1.

Calcium Carbonate

The Calcium Carbonate content in soil samples ranges from 6.02-8.35 %.It is seen that soil sample S1have more amount of Calcium Carbonate as compared to other soil samples.It is seen in sequence S2<S4<S5<S3<S1.

Density

The density of soil samples ranges from 1.45-1.63 %.It is seen that soil sample S2 &S4 have more density as compared to other soil samples.It is seen in sequence S4<S1<S3<S4<S2.

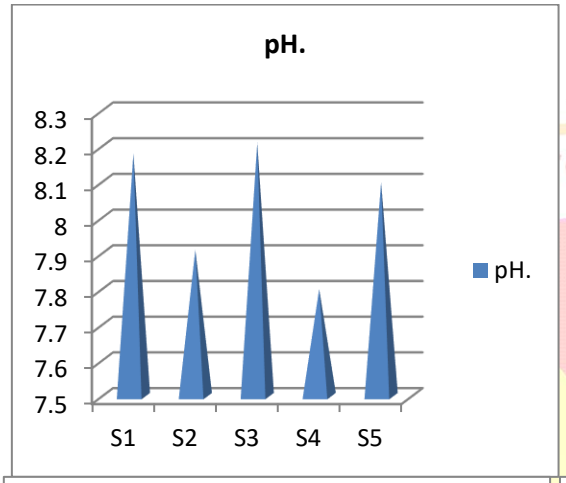
Conclusion

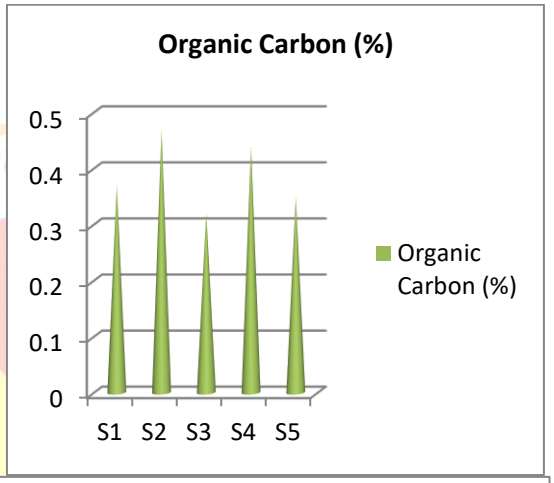
The physico chemical analysis of soil provides necessary information to set the target of nutrient application. The soil samples are slightly alkaline and the pH is in S4<S2<S5<S1<S3 order hence the Suggestion to use of compost manure.All the soil sample is low to modaret in organic carbone. In the soil sample S1 and S2 the Potassium is high as compare to other sample.

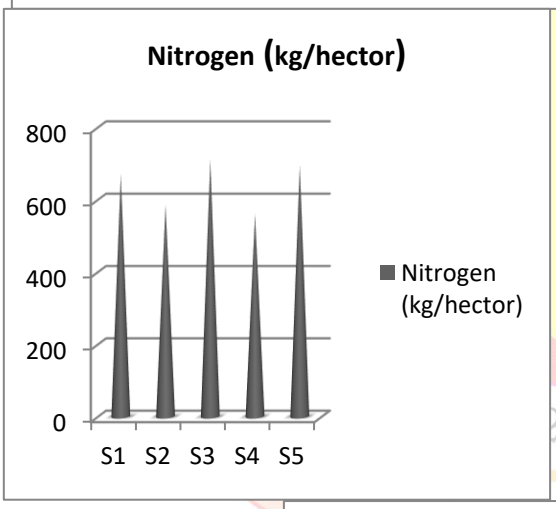
Table 1 :Physico chemicals parameters of soil samples

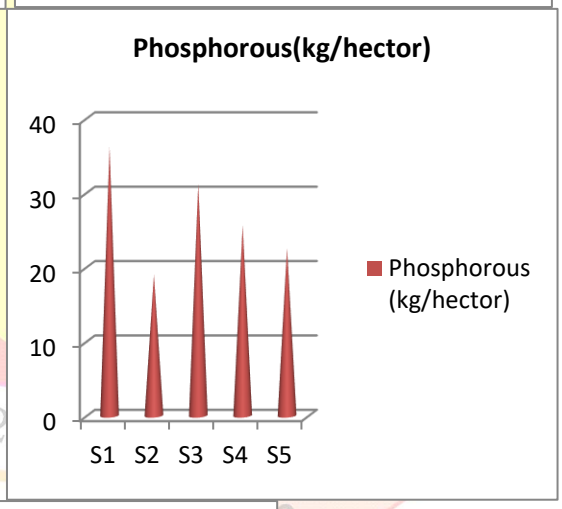
S. No.	Parameters	S1	S2	S3	S4	S5
1	Color	Black	Black	Black	Black	**Faint Black**
2	pH.	8.18	7.91	8.21	7.80	**8.1**

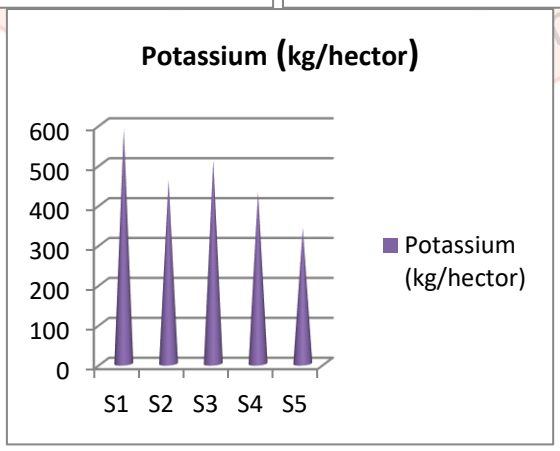
3	Electro Conductance(ms)	0.096	0.132	0.090	0.242	**0.112**
4	Organic Carbon (%)	0.37	0.47	0.32	0.44	**0.35**
5	Nitrogen (kg/hector)	670	585	710	559	**695**
6	Phosphorous(kg/hector)	36.12	18.96	31.20	25.60	**22.54**
7	Potassium (kg/hector)	589	460	510	430	**340**
8	Magnesium (%)	8.75	11.45	9.15	10.30	**9.10**
9	Calcium (%)	54.91	59.08	52.90	60.90	**49.06**
10	Sodium(%)	8.21	7.91	8.15	7.83	**7.65**
11	CaCo3(%)	8.35	6.02	8.26	6.35	**6.90**
12	M.W.H.C.	52.90	45.5	49.0	43.6	**42.50**
13	**Density**	**1.51**	**1.63**	**1.55**	**1.61**	**1.45**











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An Assessment of Water Sample for its Physico-Chemical Parameters of Umarkhed Tahsil, District Yavatmal (MH)

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Abstracts

Study of physico chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.The Physico-Chemical parameter like pH, EC, TDS, Alkalinity, Mg&Ca have been analyzed.

The range of pH of water sample was found that 7.5-8.6.The range of EC was 354-642.TDS of tap water was law as compare to hand pump &Borewell water. Alkalinity varies between 135-565.Concentretion of Mg was found slight high in borewell water and Concentration of Ca was found in an average range.

***Key words**:Physico-chemical parameters, Tap water, Hand Pump, Borewell Umarkhed Tahashil.*

Introduction

Water is one of the most important and abundant compounds of the ecosystem.Groundwater is an important source of drinking water supply throughout the world[1-2] Urbanization and the unregulated growth of the population have altered the surface and sub-surface terrains of the many areas. Changes in local topography and drainage system directly affect both quality and quantity of the ground water. Groundwater quality depends on the quality of recharged water, atmospheric precipitation, inland surface water and sub-surface geochemical processes.[3]

As per WHO, any change in the physical, chemical and biological properties of water that has a harmful effect on living things is termed as water pollution. Rapid growth of population, urbanization and industrialization exerts pressure on water resources and unregulated or illegal discharge of effluents results in water pollution.The quality of water is characterized by a range of physical, chemical and biological parameters, which arise from a variety of natural and human influences.[4-7]

The quality of ground water depends on various chemical constituents and their concentration, So Study of physico-chemical parameter of water is very important to get exact idea about the quality of water and we can compare results of different physico-chemical parameter values with standard values and show present status of water.

Material And Methods

Study Area

The Six Water sample were collected in January month. The S1 and S2 sample were collected from tap water, S3 and S4 sample from hand pump and S5,S6 fromBorewell in UmarkhedTahsil in Yavatmal District of Maharashtra State, India; which is shown in Fig.-1. It belongs to Vidarbha RegionAmravati Division, The sources of drinking water for this area is Municipal tube water system,Bore well water, well water,and dam water.

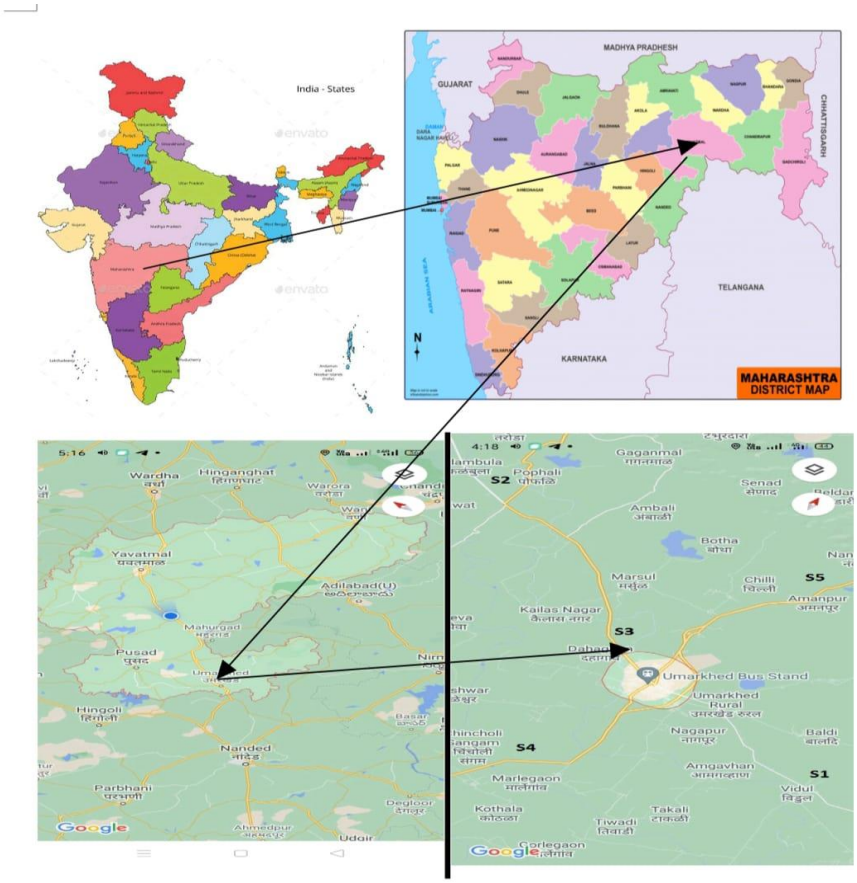


Figure1:-Map of Study area Umarkhed Tehsil

Sample Collection

Six samples were collected randomly from the study areaUmarkhedTahsil in Yavatmal District of Maharashtra State, India in the month of January 2022. Water sample ware collected in sterilized plastic bottle. Water sample were collected from following Source-

Sample-1 collected from Tap Water.
Sample-2 collected from Tap Water.
Sample-3 collected from Hand Pump.
Sample-4 collected from Hand Pump
Sample-5 collected from Bore well
Sample-6 collected from Bore well

Physicochemical Analysis of Water Samples

The Water sample ware collected in sterilized plastic bottle.Methods use for estimation of various parameters is as fallows, like Determination of, pH by Digital pH Meter, EC by Conductometer, TDS by TDS meter,Alkalinity , Mg and Ca, by Titration Method.

Result And Discussion

pH

The rangee of pH is found in between 7.5 – 8.140. The sample S4,S6 are slightly alkaline sample as compare toS1,S2,S3,S5 soil sample which is in medium alkaline nature.

Electric Conductance

Electric Conductivity were recorded in the range of 345 – 642 The watersample S5,S6 show high EC as compare to other sample.

TDS

TDS were recorded in the range of 220-660 The TDS was found that in water sample S1,S2 low as compare to other and it is seen in the sequence S2<S1<S5<S3<S4<S5.

Alkalinity

Alkalinity ware recorded in the range of 135-565. The water sample S1 and S2Showlow alkalinity it is seen in the sequence S2<S1<S6<S5<S3<S4

Magnesium

Magnesium content in the Water sample rangedbetween 10 – 35. The Water sampleS1has low and S4 hasmore concentration of Mg as compared to other samples.

Calcium

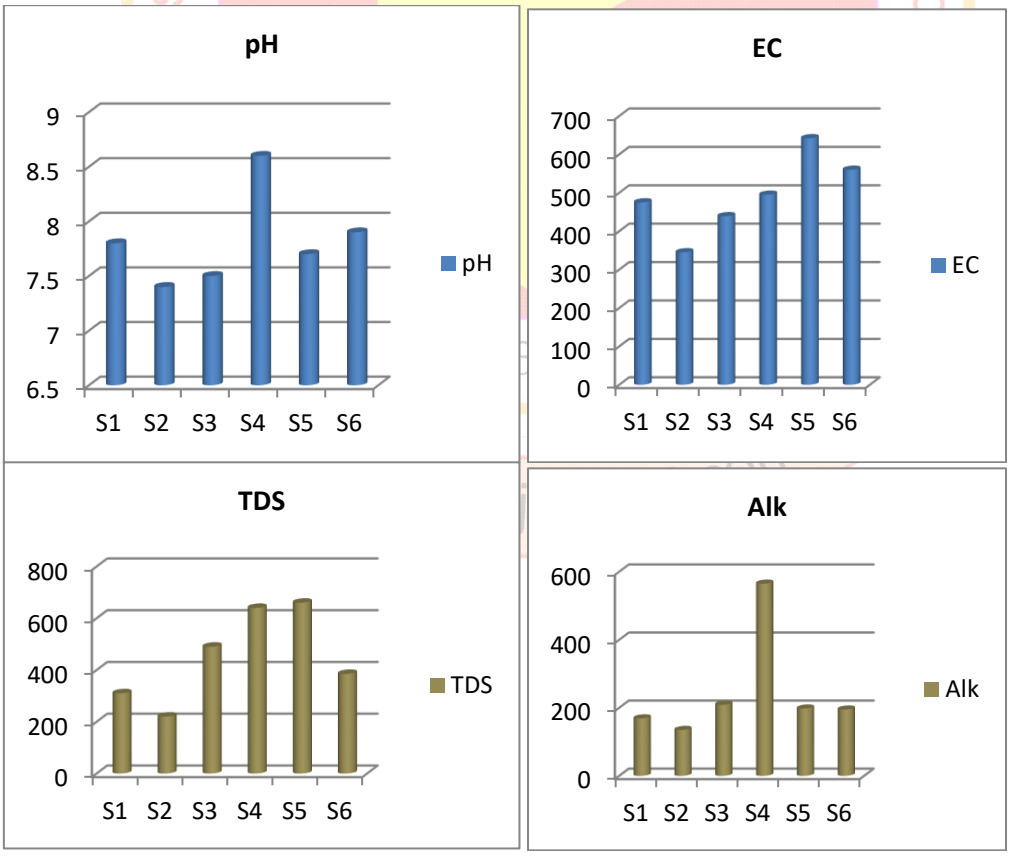
Calcium content in the Water sample ranged between 35 – 64. The Water sample S3 has low and S4 has more concentration of Ca as compared to other samples.

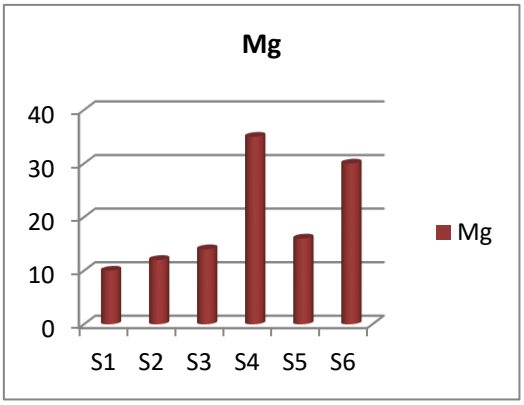
Conclusion

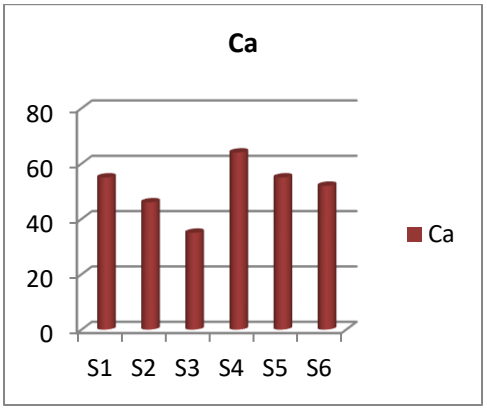
The physico chemical analysis of Water provides necessary information about quality of drinking water which gave idea to set the target of water treatment. The water samples are slightly alkalineand the pH is in S2<S3<S5<S1<S6<S4 order hence do not require special treatment to control pH.TDS of water is the most important properties to measure the quality of water and affected by other parameter like Hardness, EC, Alkalinity of water sample.

Table 1 :Physico chemical parameters of Water samples

Sample	S1	S2	S3	S4	S5	S6
pH	7.8	7.4	7.5	8.6	7.7	**7.9**
EC	475	345	439	495	642	**560**
TDS	310	220	490	640	660	**385**
Alk	169	135	209	565	198	**195**
Mg	10	12	14	35	16	**30**
Ca	**55**	**46**	**35**	**64**	**55**	**52**







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Induced frequency of chlorophyll chimeras in M_1 generation of kidney bean

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Abstract

Healthy and dwell dried seeds of kidney bean (Phaseolus vulgaris L.) were treated with various doses of chemical mutagens EMS and SA. The treated seeds were sown to raise the M_1 generation following randomized block design. The M_1 generation was screened for various chlorophyll chimeras. The plants carrying chlorophyll chimeras were counted and frequency of chlorophyll chimeras was determined.

Key Words: *Kidney bean, EMS, SA, chlorophyll chimeras*

Introduction

Kidney bean botanically described as *Phaseolus vulgaris* L. It is also called as haricot bean, common bean and navy bean (Singh, 1999; Pandey 2003). It comprises a good source of protein and also contains large quantities of complex carbohydrates, fibers and isoflavonoids (Anderson *et al.*, 1999). Mutagenesis is simple, relatively cheap to perform, applicable to all plant species and equally usable on small and large scale and therefore used to induce genetic variability in a great number of crops (Swaminathan 1995; Siddiqui and Khan, 1999). The objective of present studies was to study the effect of Ethyl methanesulphonate and Sodium azide on induction of chlorophyll chimeras in M_1 generation of kidney bean.

Materials And Methods

Healthy and uniform seeds of kidney bean variety HPR-35 were surface sterilized with 0.1% mercuric chloride solution for about one minute and washed thoroughly with distilled water. The seeds were presoaked in distilled water for 6 hours. Then seeds were later immersed in the mutagenic solution for 5 hours and treatment was given with intermittent shaking. All the treatments were given at room temperature of 25±2 °C. Seeds soaked in distilled water for 13 hours served as control. The different concentrations used for chemical mutagenic treatment were 0.05%, 0.10% and 0.15% for Ethyl methanesulphonate and 0.01%, 0.015% and 0.02% in case of Sodium azide. Immediately after the completion of treatment, the seeds were washed thoroughly under running tap water to remove excess of mutagens. Later on treated seeds were post soaked in distilled water for 2 hours. The post soaked seeds were dried in folds of filter paper. 360 seeds were used for each treatment, 60 seeds from each treatment were kept on moist blotting paper in petriplates to record germination percentage. Remaining 300 seeds of each treatment were sown in the field following randomized block design (RBD) with three replications each. M_1 generation was thoroughly screened for induced chlorophyll chimeras. Plants carrying chlorophyll chimeras were counted. Frequency of chlorophyll chimeras was determined.

Results And Discussion

Different types of chlorophyll chimeras were observed in mutagenic population. The chlorophyll chimeras could be detected in all the treatments. The different types of chlorophyll chimeras observed were *xantha* (yellow), *chlorina* (yellow green) and *viridis* (dull green). Among all concentrations the highest frequency of the various types of concentration the highest chlorophyll chimeras was observed in 0.15% concentration. And very least number of chlorophyll chimeras could be recorded in 0.10% concentration.

In present investigation three types of chlorophyll chimeras were noted sin M_1 generation of kidney bean after mutagenic treatments. Frequency of such chlorophyll chimeras was more at higher concentration. Motto *et al.*, (1975) also reported chlorophyll chimeras in kidney bean after EMS treatments. According to Gaul (1958) differential response of the embryonic cells to mutagen causes chimerism.

Table-1: Effect of mutagens on frequency of plants carrying chlorophyll chimeras in M_1 generation of kidney bean variety HPR 35.

Sr. No.	Treatment	Frequency of plants carrying chlorophyll chimeras (%)	± SE
1	**Control**	-----	-----
2	**0.05%**	8.00	3.0
3	**0.10%**	05.00	2.8
4	**0.15%**	16.00	0.3

Conclusion

Both the mutagens EMS and SA were effective in inducing chlorophyll chimeras in kidney bean at all concentration treatments with varied frequencies.

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Comparative Study On Total Dissolved Solids (Tds) Of Groundwater Of Arni Town, District-Yavatmal (Ms) India For Period Of 2 Year During Covid-19 Pandemic

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Abstract-

Water is life. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation. Total Dissolved Solids, also known as TDS, are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Total dissolved solids (TDS) are a measure of the combined total of organic and inorganic substances contained in a liquid. This includes anything present in water other than the pure H_2O molecules. These solids are primarily minerals, salts, and organic matter that can be a general indicator of water quality. Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water. In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Keyword- *total dissolved solids, groundwater, variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India, period of 2 year during covid-19 pandemic.*

Introduction-

Water is colourless, odourless and transparent substance. Water is the important, precious and indispensable natural resources of the earth, covering approximately three-forth of the earth surface. Water is life. Water is an essential element of human being. Approximately 60-65% of human body is composed of water (1). Groundwater has excellent natural quality, usually free from pathogens, color and turbidity and can be consume directly without treatment. It does not require large storage, treatment and distribution system, can be frequently developed incrementally at point near water demand. Generally, groundwater is mostly chemically and microbiologically non-polluted so it is safe for drinking and cooking in addition to agriculture or industrial use. Groundwater is used to irrigate around two fifth of India's total agricultural land. Groundwater is considered as purest and majorly available source of water. It is used to fulfill 50% urban and 80% ruler water demand in India besides irrigation (2).

Total Dissolved Solids, also known as TDS are inorganic compounds that are found in water such as salts, heavy metals and some traces of organic compounds that are dissolve in water. Excluding the organic matters that are sometimes naturally present in water and the environment, some of these compounds or substances can be essential in life. But, it can be harmful when taken more than the desired amount needed by the body. The total dissolved solids present in water are one of the leading causes of turbidity and sediments in drinking water. When left unfiltered, total dissolved solids can be the cause of various diseases.

Arni is a town (Taluka) with (Administrative Division) & Tahsil in Yavatmal district of Maharashtra State in India. It is situated on the banks of the Arunavati River. It Connected with National Highway-361. Nearest Railway Station is a Dhamangaon which is located 90 km approximately & Nearest Airport is a Dr. Babasaheb Ambedkar International Airport, Nagpur is around 187 km from Arni. Location of Arni in Maharashtra, India Coordinates: 20°07′40″N 77°55′39″E. In Arni town, main source of drinking water is groundwater. As groundwater is prominently used to fulfill domestic demands hence quality of groundwater must be checked time to time in order to supply safe drinking water (3).

In this paper, one attempt has been made to study of variation in total dissolved solids of water of Arni Town, District-Yavatmal (MS) India over a period of 2 year during covid-19 pandemic.

Methodology – Water samples were collected from different location of Arni town during investigation period of June 2020 to May 2021. Sample is collected in polyethylene bottle. Within 10 minute total hardness is measured. For measurement of hardness of the sample, used Tds meter whose details are as follows:

Brand	: HM
Model Number	: AP-1
Type	: Digital
Range	: 0-5000 ppm
Temperature Range	: -5+50 degree C degree C
Accuracy	: +-2%
Battery Life	: 1000
Power Features	

Power Requirement : 3v

Dimensions
Width : 3 cm
Height : 15 cm
Weight : 0.1 kg
Manufacturer : HM DIGITAL PVT LTD SOUTH KOREA
Importer : HM DIGITAL INDIA PVT LTD DELHI

Source-www.Flipkart.com

For the study purpose, we had selected six different groundwater sources of Arni. Water samples are collected every month and Tds is measured with the help of digital Tds meter. Following table shows details of the water sample source:

Sr. No.	Sample	Area of sample	Groundwater source	Depth
1.	Sample 1	Madhav Nagar	Borewell	125 ft
2.	Sample 2	Old Tahsil Area	Borewell	100 ft
3.	Sample 3	Datta Nagar	Borewell	125 ft
4.	Sample 4	Mathura Nagar	Borewell	110 ft
5.	Sample 5	Sambhaji Nagar	Borewell	150 ft
6.	Sample 6	Swami Samarth Nagar	Borewell	200 ft

Following table shows Tds of different samples under study-

Sr. No.	Month	Sample 1 TDS (in ppm)	Sample 2 TDS(in ppm)	Sample 3 TDS (in ppm)	Sample 4 TDS (in ppm)	Sample 5 TDS (in ppm)	Sample 6 TDS (in ppm)
1	March 2019	565	833	681	503	484	363
	June 2020	545	803	621	453	444	343
2	April 2019	568	890	658	536	580	380
	July 2020	535	800	566	485	526	406
3	May 2019	555	790	690	594	520	394
	August 2020	511	721	620	522	499	394
4	June 2019	634	750	620	520	603	406
	September 2020	604	720	598	499	600	410
5	July 2019	675	843	540	497	637	396
	October 2020	500	705	510	506	605	346
6	August 2019	605	867	530	457	702	384
	November 2020	611	854	524	455	600	400
7	September 2019	535	830	526	502	664	419
	December 2020	505	730	476	456	624	401
8	October 2019	528	750	495	535	634	399
	January 2021	508	700	455	505	604	319
9	November 2019	528	651	510	504	558	409
	February 2021	508	601	500	458	498	380
10	December 2019	480	608	504	507	512	320
	March 2021	508	600	413	503	495	312
11	January 2020	402	605	470	498	375	377
	April 2021	431	522	355	500	446	301
12	February 2020	407	600	431	436	325	309
	May 2021	400	565	421	411	380	396

According to World Health Organization (WHO) and Bureau of Indian Standard some parameter are as follows:

Sr. No.	Water quality parameter	Bureau of Indian Standard (IS-10500:1994)	WHO International Standard (1983)
1.	pH	6.5-8.5	7.0-8.5
2.	Total Dissolved solids (ppm)	500-2000	500
3.	Total hardness (ppm)	300-600	100

TDS- The mineral constituents dissolved in water constitute total dissolved solids. The concentration of dissolved solids in natural water is usually <500 ppm while water with more than 500 ppm is undesirable for drinking and industrial use. It is reported that TDS value of 500 ppm is desirable limit and 2000 ppm is the maximum permissible limit and that water containing more than 500 ppm of TDS causes gastrointestinal irrigation (4). High value of TDS influences taste, hardness and corrosive property of water (5, 6). Drinking water should contain sufficient minerals to keep you healthy and should not contain excess minerals that become overloaded in the body. In this article, we will provide details about the acceptable minimum and maximum TDS (Total dissolved solids) Limits for drinking water.

Variation in hardness and minimum, maximum hardness of sample over a period of 2 year during covid-19 pandemic are summarized in the following table:

Sr. No.	Sample	Maximum TDS		Minimum TDS		TDS Range (in ppm)	Variation in TDS (Max.-Min)		Average TDS variation Range in ppm	
		Before Covid-19	In Covid-19	Before Covid-19	In Covid-19		Before Covid-19	In Covid-19		
1.	Sample 1	675	611	402	400	400-675	63	2	9-78	2-78
2.	Sample 2	890	854	600	522	522-890	36	78		
3.	Sample 3	690	621	431	355	355-690	69	77		
4.	Sample 4	594	522	436	411	411-594	72	25		
5.	Sample 5	702	624	325	380	325-702	78	55		
6.	Sample 6	419	410	309	301	301-419	9	8		

Conclusion-

From the variation of hardness table over a period of 2 year during covid-19 pandemic it is observed that the minimum TDS of groundwater Arni city is 301 ppm and maximum is 890 ppm. In period of covid-19 pandemic Tds is found to be decreases by 100-200 ppm. Average TDS variation Range of groundwater arni is found to be same. These samples Tds range have acceptable value according to Bureau of Indian Standard (IS-10500:1994) which has range 500-2000 ppm. Sample which has value below 500 ppm which has acceptable value according to WHO International Standard (1983). TDS range of groundwater in Arni city is found to be acceptable and fair over a period of 2 year during covid-19 pandemic.

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Assesment of Plastic pollution awareness and impact of Plastic Pollution on Environment among peoples

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Abstract-

Plastic pollution has become one of the biggest environmental issues. Understanding the knowledge and attitudes of peoples about plastic pollution and its impact on Environment is very important to battle against plastic pollution. This study set out to investigate knowledge and attitudes towards plastic pollution awareness. This was a mixed study approach, where both qualitative and quantitative data were derived. Data were collected using a questionnaire asking about participants' plastic pollution knowledge, behaviors, and opinions about plastic usage. Data collected from group discussion and interviews gives idea about peoples knowledge about environmental impact of Plastic pollution and plastic waste management. The majority of participants understood how harmful plastic pollution is to the environment. Our results revealed that participants' knowledge and awareness were at high levels about plastic pollution. The most common current actions toward reduction in plastic pollution reuse, reduce, recycle, educate and replacement of plastic with sustainable alternatives

Keywords- Plastic pollution, awareness, plastic waste management, reuse, recycling of Plastic.

Introduction

Plastic waste arises from our homes and offices to dustbins, landfills and bodies of water, causing contamination. Plastic pollution is the accumulation of plastic objects and particles in the Earth's environment that adversely affects humans, wildlife and their habitat Plastics come in a variety of shapes and sizes, and they are commonly used in our everyday lives. Today, it's difficult to find a substance that isn't made of plastic. Plastics are inexpensive, simple to manufacture, and extremely durable and very adaptable for different uses. Due to these qualities of plasic manufacturers choose to use plastic over other materials.

There are three major forms of plastic that contribute to plastic pollution: micro-, macro-, and mega-plastics. Plastic pollution has also greatly negatively affected our environment. "The pollution is significant and widespread, with plastic debris found on even the most remote areas. Plastic pollution on land poses a threat to the plants and animals – including humans who are based on the land. Plastic pollution has several negative effects on our climate, but the three most important are air pollution, water pollution, ocean pollution, land pollution and food pollution.

For the sake of health and the environment, it is important to properly dispose of such plastic waste and to reduce its widespread use.

Need of present study

Plastic pollution is a major global issue aries from last few decades. Plastic pollution really requires a global and comprehensive solution . There is need to rethink about production, usage and plastic waste management system. Increasing awareness about plastic pollution is important in todays situation. Many peoples are not much aware about the Plastic pollution and Plastic pollution management. So present study is the attempt to find out awareness of peoples towards Plastic pollution and Plastic waste management and impacts of plastic pollution on environment..

Objectives of research

To find the knowledge of peoples about Plastic Pollution.
To find the knowledge of peoples about impact of Plastic Pollution on environment.
To find the peoples attitude towards Plastic waste management.

Material and method:-

The purpose of present paper was to study Plastic Pollution and Plastic waste management awareness among peoples. For this random sample of 100 peoples of different sex, different age group and different educational qualification were selected. The area which is selected to study Plastic Pollution awareness is mainly restricted to Pandharkawada dist Yavatmal Maharashtra. This was a mix study approch. Collection of data was done through self developed questioner, group discussion and interviews of different age group peoples. Both qualitative and quantitative data was colected. Self developed questioner is mainly consist of questions about knowledge of peoples about use of plastic, Plastic Pollution, impact of Plastic Pollution on environment and peoples attitude towards Plastic waste management. Raw data is collected and after processing

data final conclusions are drawn. Questioner consist of questions having answers in rating scale and yes/no type questions.

Results and discussion-

Demographic Details of Respondents.

The demographic details regarding age, gender, highest level of education were collected from the respondents and they are as given below

Table 1

Age Group	No. of respondres	Percentage
18-28	67	67 %
29-38	14	14 %
39-48	13	13 %
49-58	06	06 %
Male	56	56 %
Female	44	44 %
Education of the respondents		
Below Graduation	11	11 %
Graduation or pursuing graduation	73	73 %
Post Graduation and above	16	16 %

In present study 94 % of study participants responded plastics causes the pollution to environment. 0 % responders respond that plastic will not cause pollution and 6 % responded that they don't know about plastic causing pollution to environment.

Table 2

According to responders the main source of plastic pollution are

Food Wrappers & Containers	**26 %**
Bottle & Container Caps	22 %
Plastic Bags	20 %
Plastic cups and Plates	11 %
Takeout Containers	09 %
Straws and Stirrers	05 %
Toys	04 %
other	03 %

Table 3

Number of participant aware about different types of pollution caused by Plastic waste are as follows

Air Pollution	**92 %**
Water Pollution	84 %
Soil Pollution	73 %
Marine Water Pollution	39 %
E Pollution	32 %

85 % participants responded burning of plastic will cause lung problem and 15 % were not aware about that. Among the study participants 73 % participants replied plastic can cause cancer, and 27 % were not aware about that. 64 % participants answered plastic using in food package will cause health problem and 10 % are not agreed with packing of food in plastic causing any health hazards. 26 % were not aware about packing of food in plastic causing any health hazards.

Number of participant responded to following options to control Plastic Pollution

Table 4

Recycle when possible	**43 %**
Use alternative packaging	07 %
Avoid single-use plastics	21 %
Find reusable options	11 %
Carry own cloth bag to market	18 %

From group discussion and interviews of responders following information is collected

Responders are aware about following impacts of Plastic Pollution such as Plastic Pollution disturbs the natural ecosystem, it disturbs the food chain, it affects the water supply. Plastic Pollution can be harmful to human health, It is harmful to animals and Clearing areas of plastic waste is difficult and expensive. From study it is observed that many responders have no clear idea about plastic waste management and recycling of plastic.

Findings –

From the study following major findings are obtained about Plastic Pouution

- Many responders were well known about plastic pollution and its impact on Environment.
- Awareness about Plastic waste management yet not properly developed among the responders.
- They are unknown about proper Plastic waste management and recycling of Plastic waste.
- As compared to air , water and soil pollution caused by Plastic, many responders are unknown about the impact of Plastic pollution on marine pollution and E pollution.
- Responders are familiar to adverse health effect of pastic on human health.
- Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic.

Conclusion -

Present paper highlights the plastic pollution and its impact on Environment among 100 peoples of different sex, different age group. It focus on Present condition of plastic pollution awareness, From the findings which are obtained about plastic pollution and its impact on Environment it is observed that Many responders were well known about plastic pollution and its impact on Environment. Many Responders are well known about Reduce and Reuse of Plastic abut the are not much aware about recycling of pastic. Peoples are unknown to many environmental consequences of plastic pollution. So there is a need of proper education to make aware peoples about plastic pollution and its impact on Environment. Reduce , Reuse, Recycle and Educate are the best ways to control the plastic polltion.

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Study of Water Quality Parameters of Pimpalkhuti Dam in TalukaRalegaon, District-Yavatmal

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Abstract:

Water resources are essential and equally important for natural eco system and human development. All eco system on earth depends on the water. Fresh water is finite, critical, renewable, vulnerable the resource on the earth plays as important role in living environment without its life is impossible. Thepresent study is focus on the determination of Physico- chemical parameter such as hardness, chlorides, alkalinity, DO, BOD, COD, temperature, pH, TDS, phosphate, and sulphate of water sample. Where analyzed for periods of twelve months from 1st February 2021 to 31st January 2022. All parameter where within the permissible limits. The result indicates that the corresponding dam is non-polluted and can be used for irrigation, fishculture, and domestic purpose.

***Keywords**: Physico- chemical parameters, permissible limits, living environment.*

Introduction:

Water is most indispensable requirements for all living organism. Unsafe drinking water is one of the main concerns in developing countries. In order to deal with this problem, physico- chemical parameters were determined in order to identify the contamination problems and suggest appropriate solution. The good quality of water is essential for living organism. The quality of water can be assessed by studying its physical and chemical characteristic. Because of vast population[1] highly used fertilizers[2], pesticides, insecticides, and negligence of human being [3], the quality of water is being deteriorated day by day. Regarding the quality of drinking water, microbiological contamination is primary concern of developing countries[4]. In addition, inorganic contaminants[5], concerning both health and aesthetic aspect can be present in the water. Fluoride and arsenic are a great health problem worldwide [6,7].The natural aquatic resources are causing heavy and varied pollution in aquatic environment leading to water quality and depletion of aquatic Biota. It is there for necessary that the quality of drinking water should be checked at regular time interval because due to use of contaminated drinking water. In present study includes the analysis of water quality in terms of physico- chemical parameters of Pimpalkhutidam talukaralegaon district,Yavatmal (Maharashtra). The dam water is basically used for Domestic, Agriculture purpose, Fisheries activity and Various Animal water drinking purpose. In Yavatmal region still now several researchers have done study on physicochemical parameters of various water resources [8, 9, 10].

Materials and Methods:

Surface water sample were collected from pimpalkhutidam. Water sample from all site were collected in sterile glass bottles in the morning Hours between 9 to 11 am, regularly for every month, brought to the laboratory, processed within 1-3 hrs for the estimation of various physico- chemical parameters like water temperature, pH, and Total Dissolved Solids were recorded at the time of sample collection by using Thermometer, pocket Digital pH meter and pocket Digital TDS meter. Transparency was measured with the help of Secchi Disc. While other parameters such as DO, Free CO_2, Hardness, Chlorides, Alkanity, Phosphate and Nitrate were estimated in the laboratory.

Result and Discussion: The monthly variation in physico-chemical parameters are represented in following table

Months	Temperature ^{0}C	TDS	pH	Turbidity NTU	Total Hardness mg/l
January	24	722	7.8	9.40	81.0
February	24.5	701	8.1	11.90	90.5
March	27	648	8.3	11.93	160
April	27	645	8.3	11.92	160
May	27.5	652	8.4	11.02	157
June	25	958	8.0	10.5	150
July	25.5	965	7.3	1.35	73

August	25	961	7.2	2.3	84
September	25.5	940	7.1	2.2	100
October	24.5	810	7.2	0.5	67
November	23.5	760	7.5	1.45	106
December	23.5	743	7.6	1.90	83

Table No. 2

Months	DO	Free Co_2 mg/l	Chloride	Alkalinity	Transparency Cm
January	8.90	0.0	42.32	118.25	14.3
February	9.10	0.0	33.08	122.50	6.9
March	12.32	0.0	42.06	182.50	6.8
April	15.5	0.0	55.08	160.25	6.6
May	15.4	3.5	55.59	205	6.7
June	12.08	7.6	41.18	169.0	9.4
July	10.02	8.4	43.32	153.25	60.1
August	9.08	7.3	48.59	191.0	61.4
September	9.15	21.0	37.12	192.0	57.2
October	7.96	15.7	41.09	173.25	92.0
November	6.55	25.3	43.57	150.50	92.4
December	6.40	25.3	47.61	141.25	66.25

Water Temperature:

Water temperature can exert great control over aquatic communities. Temperature of water may not be as important in pure water, but in polluted water, temperature can have profound effects on dissolved oxygen (DO) and biological oxygen demand (BOD). The fluctuation in dam water temperature usually depends on the season and sampling time. In this present study of the water temperature ranges from 23.5 ^{0}C to 27.5^{0}C. The maximum (27.5 ^{0}C) temperature was recorded in the month of May (summer) and minimum (23.5 ^{0}C) in the month of December (winter). It shows that higher temperature in summer and relatively lowers in winter. Similar study has done at Kapileshwar Dam AshtiDist- Wardha [11], observed that water temperature was high during summer season due to low water level, and clear atmosphere.

Total Dissolved Solid (TDS): The TDS in water consist of inorganic salts of calcium, magnesium, sodium etc. Small amount of organic matter and dissolved material present in the water. In this study TDS fluctuate from 645 ppm to 965 ppm. The maximum value of TDS was found to be 965 ppm in the month of July. It is due to heavy rainfall in rainy season and the minimum value of TDS 645 ppm was recorded in the month of April. Similar result reported by IoryueIjah Silas et al [12]

pH: The pH is an indicator of the existence of biological life. The pH of dam water was found to alkaline character throughout the study period. Were most of the water samples collected in different months of the year, tested in the present study were found to be in permissible range of pH value recommended by several health and pollution control organization eg. WHO, (the permissible value of pH is 6.5 to 8.5). The maximum pH value (8.4) was recorded in the month of May (summer season) and minimum pH value (7.1) was recorded in the month of September. pH of water directly affect the biochemical and chemical reaction as well as pH of water is increased by reducing the percentage of $Co_2$and biocarbonate which is happened due to photosynthetic activities. Apart from above some other factors such as air and temperature bring about changes the pH of water. K. Bheemappa et al [13] reported that the maximum value of pH was found in pre- monsoon season.

Turbidity: Turbidity may be due to the organic or inorganic constituents. The turbidity of water fluctuates from 0.5 NTU to 11.93 NTU during the year. The maximum values (11.93 NTU) was recorded in month of March

(summer) it is mainly due to the decrease in the water level and suspended particulate matter and minimum value of turbidity (0.5 NTU) was founded in the month of October.

Total Hardness: The amount of dissolved salts of calcium and magnesium in the water is generally known as hardness of water. Hardness of water is an important consideration to determining the suitability of water for industrial and domestic uses. The value of the hardness fluctuates from 67 mg/l to 160 mg/l. the maximum value (160 mg/l) was recorded in the month of March to April (summer) and minimum value (67 mg/l) in the month of October. Similar result were reported by H. V. Vyas and V. A. Sawant [14]

Dissolve oxygen (DO): Thedissolved oxygen content is essential for aquatic life. Its deficiency directly affects the ecosystem of dam or river low dissolved oxygen (less than 2 mg/l) would indicate poor water quality. The value of DO is generally average from 6.40 mg/l to 15.5 mg/l.

The maximum values of DO (15.5 mg/l) was recorded in month of April (summer) and minimum values of DO (6.40 mg/l) was recorded in month of December (winter).

Free CO_2: The value of free CO_2 ranges from 0.0 mg/l to 25.3 mg/l. The maximum value (25.3 mg/l) was found in the month of November to December (winter) and minimum value (0.0 mg/l) was found in the month of January to April.

Chloride: The value of chloride ranges from 33.08 mg/l to 55.59 mg/l. The maximum value (55.59 mg/l) was found to be in the month of May (summer) and the minimum value (33.08 mg/l) in the month of February.

Alkalinity: Due to increase in the percentage of bicarbonates in the month of March to May (summer) alkalinity was found to be maximum. Total alkalinity ranges from 118.25 mg/l to 205 mg/l. The highest value of alkalinity (205 mg/l) was recorded in the month of May (summer) and lowest value of alkalinity (118.25 mg/l) in the month of January (winter).

Transparency: Transparency of water fluctuates from 6.6 cm to 92.4 cm. The maximum water transparency 92.4 cm was recorded in the month of November (winter) and minimum 6.6 cm in the month of April (summer).Similar result were reported by Rachel M. Pilla et al [15]

Conclusion:

The thermal decomposition of the complexes is not simple and involves different stage decomposition. It is assumed that dehydration of the complexes containing water occurs within an active reaction interface. The compensation effect of thermal decomposition of the complexes indicating the change of sample mass on the estimated values of activation energy. The structural changes of all complexes have marked effect on the sensitivity and sensitivity varies with organisms.

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Study of Some Chemical Parameters of Water From Shahanoor Dam.

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Abstract-
Water is the most important or vital factor for the existence of all living organisms. Reservoirs are also the main sources of drinking water supply. Man has used water bodies as most convenient and cheapest refuse disposal system for domestic and industrial waste which leads to pollution. So its necessary to know chemical parameter of the water. In the present investigation chemical parameters of water from shahanoor dam was studied to assess the quality of water for, irrigation, fishing, industrial processing and so on. In the present study an attempt has been made to detect the Ph, Alkalinity and Acidity , Conductivity, Dissolved Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride etc. water samples were collected per season from Shahanoor dam. Samples were analysed regularly for 3 years in the laboratory from Jan. 2011 to Dec. 2013. The observations were recorded. The pH turbidity were recorded at the site. All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards. This means chemical status of the dam is suitable for biodiversity of life. It showed that there are some, physical, chemical and biological processes which self-purify the dam.
Keywords- Shahanoor dam, Chemical Parameters, Oxygen, Carbon-di-oxide, Hardness, Calcium, Phosphate, Nitrate, Fluoride.

Introduction-

Human activities have the great impact on the environment, ecosystems, and economical sensitive areas. Medudhula. T. *et. al*. (2012). Environmental monitoring studies provided the information about any damage to the ecosystem. Harney, N. V., et. al. (2013). It assesses how affected ecosystems changes over time and thus determine the best means of prevention. Hulyal, S.B. (2011),

Environmental monitoring describes methods and processes to monitor the quality of the environment. It provides information about changes in structure and function of ecosystems which can be used in environmental protection or management, as well as in many circumstances in which human activities carry a risk of harmful effects on the natural environment. Ahangar I. A. *et. al*. (2012). From ancient time, civilizations depend on fresh water bodies like lakes, reservoirs, rivers and wetlands. Fresh water is essential not only to sustain human life but also to support the activities that form the basis for thriving economies. At the same time water resources are essential to human societies and the activities of these societies can pollute and degrade water resources. Barot C. , et. al. (2014). Water has unique property of dissolving large amount of substances in it. (Choudhari, 1995) This property of water brings about changes in its physical as well as chemical properties and ultimately the pollution. (Kaushik and Saksena 1999) It has long been recognized that regular monitoring of the physical, chemical and biological parameters characterizing water quality in river, lakes and reservoirs used for water supply is essential for protecting public health and assuring the long term reliability of these substances. (Banerjee, K., *et. al.* (2006).

Freshwater becomes a critical natural resource due to number of reasons . India receives about 1400-1800 mm of rainfall annually. It is estimated that the 85% of water is used for agriculture ,10% for industries and 5% for domestic use. Analysis conducted in 1982 revealed that about 70% of all available water in our country is polluted. (Chandrashekhar and Kodarkar, 1996) Dams are the major part of freshwater resources. A dam is manmade reservoir have been constructed for irrigational needs ,drinking purposes ,industrial and domestic use etc. Gopalkrishna, M.H. (2011).

Shahanoor dam selected in the present study is situated at a site nearly 10 km towards North-West from Achalpur Tahsil and 85 km from Amravati. It is build up on the Shahanoor river. It is an earthen dam with 6.9 km length and is situated in the midst of Satpuda hills.

Aquatic pollution thus brought about by human activities causing alteration in the chemical properties of water. APHA (1998). Water get polluted due to the discharge of chemical water pollutants such as mercury from mining activity, certain nitrogen compounds used in agriculture and chlorinated organic compounds arising from sewage water treatment plants. (Richardson *et al.* 2007) There for evaluation of physico-chemical parameters of water is essential to assess the quality of water for, irrigation, fishing, industrial processing and so on. (Rajgopal *et al.*,2010)

Chemical Paramaters -

Ph, Alkalinity and Acidity -

Alkalinity, acidity and buffering capacity are the important characteristics of water. pH is defined as the intensity of acidic or basic characters of a solution. pH of water affects its suitability for biota and also influence chemical reactions. Bade, B. B., *et. al.* (2009)**.** The largest variety of freshwater aquatic organisms prefer a pH range between 6.5 to 8.0.

- **Conductivity :**

Conductivity is a measure of a solution such as water of lake, dam or stream to pass an electric current. This is an indicator of dissolved electrocytes ions in the water.

- **Dissolved Oxygen :**

The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep the proper balance of various populations thus making the water body healthy.

- **Carbon-di-oxide :**

Free carbon-di-oxide in the waters accumulates duo to microbial activity and respiration. This impart the acidity to the water because of the formation of carbonic acid. In an aquatic ecosystem sources of CO2 are commonly respiration and decomposition.

- **Hardness :**

Hardness is the property of water which prevents the lather formation with soap and increases the boiling point of waters. The major cautions imparting hardness are calcium and magnesium. Ecologically temporary hardness plays a key role in buffering capacity and this has a great effect on biotic diversity and biomass in an ecosystem

- **Calcium :**

Calcium is one of the most abundant elements found in the natural water. It is an important ion in imparting the hardness to the waters. At high pH much of its quantity get precipited as caco3.

- **Phosphate :**

The phosphates is generally considered as the critical nutrient for the growth of algae in water. The enrichment of this nutrient leads to the process of eutrophication. The most important sources of phosphates are discharge of detergents and agricultural run-off.

- **Nitrate :**

Like phosphorus nitrate is also one of the critical nutrient for the growth of algae and helps accelerating the eutrophication. Domestic sewage, natural run-off and agricultural wastes are the important sources of it. The determination of nitrate in drinking water is of prime importance because of the disease methamoglobonebia caused by its excessive presence.

- **Fluoride :**

Fluoride originates from weathering of fluoride containing minerals and enters surface waters from run-off and ground waters. Significant sources of fluoride are found in coke, glass and ceramics, electronics, pesticides, and fertilizer manucturing, steel and aluminium processing and electroplating industries.

Material And Methods

Description of the study area :

- **Shahanoor Dam :**

Shahanoor dam selected for the present study is situated near Anjangaon Surji, Amravati district, state of Maharashtra, India. This dam was constructed as a part of irrigation projects by the Government of Maharashtra in the year 1990. It is an earthfill dam built using soil and stones with a capacity of 45 MCUM on the Shahanoor river.

The dam is located in the hill ranges of Satpuda. Human activities like washing of clothes and vehicles, bathing are rare as the dam is far away from the adjoining villages. Water from the dam is used for irrigation and hydroelectricity. The net irrigation area is 7455 hectors. Water from the dam is supplied for drinking for 156 villages and 2 towns in Anjangaon Surji, Daryapur, and Bhatkuli Talukas of Amravati district.

Morphometry of the catchment area :

Shahanoor dam is located at latitude 21.15’21” and longitude 77.19’30”. The total catchment area of the dam site is 53.74 sq. miles (139.187Km^2). All the catchment area is through hill ranges of Satpuda and lies in Maharashtra state only. The length of the dam is 795 meters and height of the dam is 56.45 meters. An ogee type waste weir of 57 meter length having 4 radial gates on the left

bank saddle. The live storage capacity of the reservoir is 46.04 Km^3 and gross storage capacity is 47.85 km^3.

The drainage area receives rainfall 781.81 mm mainly from the southeast monsoon from June to October. The monsoon precipitation generally commences in the 2nd week of June and continues throughout the year. The soil in the area varies from grayish black to deep black.

chemical Analysis :

Water samples were collected once per season in well labeled, polythene sampling bottles which were tightly stoppered and brought to the laboratory for analysis.

pH - The determination of pH is important due to its effect on chemical and biological properties of liquids. On field pH was recorded with the help of standard pH paper strips. The paper was dipped in a sample water and colour developed was compared with standard colour code given. In the laboratory pH was recorded with the help of pH meter.

- **Free Carbon dioxide : (Titration Method)**

Free CO_2 was determined by titrating the sample using a strong alkali to pH 8.3. At this pH all the free CO_2 is converted into bicarbonates.

- **Total Hardness : (EDTA Method)**

Hardness is generally caused by the calcium and magnesium ions present in water. Hard water is unsuitable for cooking, washing and bathing.

- **Calcium : (EDTA method)**

Calcium is the major cation present in natural waters, its main source being leaching rocks in the catchment. Its concentration restricts water use while it is an important component in the exoskeleton of Arthropod and shells in Molluscs.

- **Chlorides : (Argenometric Method)**

Natural water normally has a low chloride content.

- **Total Phosphates : (Photometric method)**

The presence of phosphates in water is due to detergents, fertilizers.

- **Nitrates : (Phenoldisulphonic acid method)**

Nitrate is normally the most common form of combined inorganic nitrogen in aquatic system.

- **Fluoride : (SPADANS Method)**

Fluorides have dual significance in water supplies. High concentration causes dental fluoris and lower concentration (< 0.8 mg/l) causes dental caries. A fluoride concentration of approximately 0.1 mg/l is recommended. They are frequently found in certain industrial processes resulting in fluoride rich waste waters. It was calculated by SPADANS method.

- **Dissolved Oxygen : (Winkler's Method)**

Oxygen dissolved in water is very important parameter in water analysis as it is an indicator of the physical, chemical and biological activity. Generally high DO is found in the ecosystem which is free from pollution, while its values are negligible in case of polluted water due to the presence of NH_3, H_2S, Nitrites etc.

- **Bicarbonates (HCO_3) :**

Bicarbonates imparts the alkalinity to the natural waters. In natural waters CO_2 is responsible for alkalinity.

- **Magnesium : (EDTA Method)**

Magnesium is dominant cation in natural water which added in the ecosystem by the leaching of rocks in the catchment. Potable water got an unpleasant taste due to the high concentration of Mg.

RESULT

In the present study, seasonal variation of the physico-chemical paramaters of Shahanoor dam for the period of Jan. 2017 to Dec 2019 were studied. Water samples were analysed for 3 years at regular interval and the obtained data is presented in tables.

pH :

pH plays important role in the life of aquatic animals. During the present study pH ranges obtained were between 7.12 to 7.52 in 2017. In the year 2018 pH was highest 7.26 during monsoon and minimum during winter. In 2019, it was maximum 7.65 in monsoon and minimum 7.09 in winter. Seasonal variation in pH shows that it was maximum during monsoon followed by summer and winter for the successive two years 2018 and 2019. (Table 2-3)

Dissolved Oxygen :

Dissolved oxygen is the most important parameter of the aquatic ecosystem which can directly affect the survival and distribution of aquatic organisms.

In the present study, dissolved oxygen (mg/l) in water from dam varies from 6.81 to 9.07 mg/l. The maximum value 9.07 was recorded during winter and minimum value 7.8 recorded during summer in the year 2017. In the winter season of the year 2018 and 2019 it was maximum (8.72,9.07) respectively. But was minimum in the summer of 2018 and monsoon of 2019. (Table 2-3)

Free carbon-oxide :

In an aquatic ecosystems free CO_2 is essential for the photosynthetic activities. Free CO_2 of the water from Shahanoor dam varies from 0 to 0.51. The free CO_2 was absent during summer and monsoon season in the 2017. In winter of 2017, it was recorded 0.51mg/l. (Table 1) Again it was totally absent during summer in 2018 and during monsoon and winter in 2019. Its values were 0.51 during winter in 2017, 0.12 and 0.19 mg/l during during monsoon and winter in 2018 and 0.13 during summer of the year 2019. (Table 2-3)

Total Hardness :

Hardness of water is mainly imported by alkaline earth metallic cations mainly calcium and magnesium present in it.

Total hardness of Shahanoor dam was determined seasonally during the present study. The range of total hardness was found between 68 to 152 mg/l. Total hardness was found to be more (150, 152) during winter, followed by summer (132, 150) and minimum during the monsoon(88,188) respectively in the year 2017 and 2018 . While in 2019 total hardness was more than 148 mg/l in summer followed by monsoon and minimum during winter.

Total Alkalinity :

Total alkalinity of Shahanoor dam was found to vary in different seasons. The minimum and maximum values were noted as 24 mg/l and 150 mg/l respectively. In the year 2017 it showed highest 44 mg alkalinity in summer and lowest 32 mg/l in monsoon. Similar seasonal variation was found in the year 2018 and 2019 i. e. highest alkalinity during summer (52, 64mg/l) and lowest during monsoon (24,36) respectively (Table 2-3)

Bicarbonates :

The carbon-di-oxide that is dissolved by naturally circulating water appears a21s carbonates and bicarbonate ions. Seasonal variation was recorded in bicarbonate of the dam water throughout the study period. Bicarbonate values were maximum 40 mg/l during monsoon and minimum 26 mg/l during summer, for the year 2017. (Table 1) In 2018, 2019 higher carbonate occurred in monsoon 51, 65 and 29, 35 mg/l during winter season and moderate in summer. (Table 2-3)

Chlorides :

Chloride concentration from the studied dam ranged between 10 to 18 mg/l. The maximum chloride values were found to be 13, 14, and 18 mg/l found in monsoon season of the year 2017, 2018, and 2019 respectively. While the minimum value in the winter season of the year 2011 and 2013 was found to be 10 mg/l. The seasonal trend throughout the study was maximum in monsoon season. (Table 1-2-3)

Calcium :

Calcium is an important ion which impart hardness to the water. Calcium ion concentration in the water of the Shahanoor dam varied from 9mg/l to 30mg/l during the study period 2017 to 2018. Calcium values recorded were more in the monsoon season, followed by summer and winter seasons. (Table 1-2-3)

Magnesium :

Magnesium is an important cation which gives hardness to the water. High value of magnesium 15mg/l was found in summer season, while low value i.e. 9 mg/l was found in winter season in the year 2017. Similar pattern of seasonal variation was found in 2018 and 2019 i.e. maximum Mg in summer and minimum in winter season. Data of the study is presented in tables (Table 1-2-3)

Nitrates :

Nitrate content of the water from the Shahanoor dam was studied for the period 2017 to 2019. The nitrate content ws found to be maximum 5.17 mg/l during monsoon season and minimum 2.14 mg/l. in summer season. The nitrate value 2.68 mg/l and 7 mg/l were during winter season respectively. (Table 1-2) During the year 2017 and 2018, the nitrate values were found to increase from that of 2019, as recorded as 11.4 mg/l and 15.16 mg/l during summer season.

Phosphates :

Phosphates of Shahanoor dam was calculated seasonally during the present investigation period. Phosphate values were recorded as 0.03 mg/l during summer, 0.05 mg/l during monsoon season and 0.06 mg/l during winter season in the year 2017. In the year 2018, 0.06 mg/l during summer, 0.01 mg/l during monsoon season and 0.03 in winter season. (Table 1-2-3)

Fluoride :

The Fluoride values of Shahanoor dam were recorded as 0.20 mg/l and 0.11 mg/l in the monsoon and winter season of 2017 respectively. It was absent during the summer. 0.16mg/l,0.20mg/l and 0.07mg/l fluoride was found respectively during summer, monsoon and winter season in 2018. In the year 2019, 0.163mg/l, 0.112mg/l and 0.07mg/l fluoride were found during summer, monsoon and winter season respectively. All the data is presented in the table (Table 1-2-3)

Table 1
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2017 – DEC 2017

Sr. No.	Parameters	anges	Seasons		
			Summer	Monsoon	Winter
1.	pH	7.4 - 8.1	7.14 ± 0.15	7.16 ± 0.27	**7.52 ± 0.19**
2.	Dissolved Oxygen (mg/l)	5.30 - 9.00	6.81 ± 1.7	7.40 ± 1.11	**8.90 ± 0.5**
3.	Carbon dioxide (mg/l)	0 – 0.60	-	-	**0.51 ± 0.7**
4.	Total Hardness (mg/l)	120 - 155	132 ± 10.62	88 ± 5.12	**150 ± 9.36**
5.	Total Alkalinity (mg/l)	30 – 45	44.66 ± 4.1	32.19 ± 1.16	**36.71 ± 5.6**
6.	Total dissolved Solids (mg/l)	155 - 195	162 ± 9	180 ± 8.1	**168 ± 6.1**
7.	Bicarbonate (mg/l)	2.02 - 45.6	26 ± 5.8	40.08 ± 1.42	**32.21 ± 4.3**
8.	Chlorides (mg/l)	9.5 - 16.2	11.03 ± 1.02	13.16 ± 2.03	**10.47 ± 1.07**
9.	Calcium (mg/l)	11.6 - 35.09	18.09 ± 4.69	25.13 ± 3.1	**14.1 ± 5.49**
10.	Magnesium (mg/l)	7.06 - 18.65	15.01 ± 3.30	1.5 ± 1.69	**9 ± 5**
11.	Nitrates (mg/l)	1.67 - 13.5	11.14 ± 0.42	9.5 ± 0.16	**2.68 ± 0.54**
12.	Phosphates (mg/l)	0.01 - 0.08	0.03 ± 0.01	0.05 ± 0.03	**0.06 ± 0.01**
13.	**Fluoride (mg/l)**	**0.08 - 0.25**	---	**0.20 ± 0.01**	**0.01 ± 0.02**

Table 2
Seasonal Variation And Mean ± Se Of Chemical Parameters Of Shahanoor Dam.
JAN 2018 - DEC 2018

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
	pH	7.1 - 7.9	7.25 0.31	7.26 ± 0.26	**7.6 ± 0.39**
	Dissolved Oxygen (mg/l)	4.6 - 11.2	7.54 ± 2.09	8.09 ± 1.01	**$8.^{1/2}$ ± 2.2**
	Carbon dioxide (mg/l)	0.09 - 0.25	-	0.12 ± 0.01	**0.19 ± 0.05**
	Total Hardness (mg/l)	95 - 146	150 ± 5.8	118.05 ± 72	**152 ± 8.7**
	Total Alkalinity (mg/l)	20.55	52 ± 5.7	24 ± 2.4	**39 ± 4.17**
	Total Dissolved Solids (mg/l)	250 - 420	240 ± 10.1	404 ± 14.6	**243 ± 6.9**
	Bicarbonate (mg/l)	33.6 - 52.8	39.2 ± 2	51.8 ± 0.23	**29.9 ± 3.07**
	Chlorides (mg/l)	9.6 - 175	11 ± 1.6	14 ± 3	**12 ± 1.27**
	Calcium (mg/l)	18.8 - 36.5	19 ± 3.8	30 ± 6.5	**17 ± 1.18**
	Magnesium (mg/l)	4.6 - 18.90	13 ± 4.4	9 ± 2.9	**8.5 ± 3.5**
	Nitrates (mg/l)	4.9 - 17.01	15.16 ± 1.4	8.20 ± 0.89	**7 ± 2.1**
	Phosphates (mg/l)	0.01 - 0.09	0.06 ± 0.02	0.01 ± 0.02	**0.03 ± 0.01**
	Fluoride (mg/l)	**0.03 - 0.30**	**0.16 ± 0.03**	**0.20 ± 0.04**	--

TABLE 3
Seasonal Variation And Mean ± Se Of Physico-Chemical Parameters Of Shahanoor Dam.
JAN 2019 - DEC 2019

Sr. No.	Parameters	Ranges	Seasons		
			Summer	Monsoon	Winter
1.	pH	6.86 - 7.95	7.20 ± 0.35	7.65 ± 0.13	**7.09 ± 0.67**
2.	Dissolved Oxygen (mg/l)	6.8 - 13.6	8.8 ± 2.3	9.2 ± 0.34	**9.07 ± 3.93**
3.	Carbon dioxide (mg/l)	0.00 - 0.15	0.13 ± 0.01	-	-
4.	Total Hardness (mg/l)	67.13 - 53.2	148 ± 4.2	114 ± 8.65	**6.8 ± 0.13**
5.	Total Alkalinity (mg/l)	122 - 157	64 ± 10.59	36 ± 11.04	**56 ± 3**
6.	Total dissolved Solids (mg/l)	154.8 - 465.7	163 ± 8.8	163 ± 4.07	**216 ± 6.6**
7.	Bicarbonate (mg/l)	34.19 - 77.71	49 ± 3.05	65 ± 4.77	**35 ± 0.18**
8.	Chlorides (mg/l)	27.7 - 20.6	12 ± 0.094	18 ± 1.9	**10 ± 2.6**
9.	Calcium (mg/l)	7.4 - 26.5	20 ± 21	23 ± 3.4	**9 ± 2.4**
10.	Magnesium (mg/l)	8.00 - 24.09	19 ± 4.46	17 ± 1.89	**9 ± 1.01**
11.	Nitrates (mg/l)	0.26 - 5.92	2.14 ± 1.87	5.17 - 0.22	**3.03 ± 2.9**
12.	Phosphates (mg/l)	0.06 - 0.20	0.5 ± 0.5	0.09 ± 0.002	**0.12 ± 0.20**
13.	**Fluoride (mg/l)**	**0.04 - 164.9**	**0.163 ± 0.09**	**0.112 ± 0.06**	**0.07 ± 0.03**

Summary And Conclusion

In the present study chemical parameters was investigated.

pH ranged between 7.6 to 7.65. pH was maximum during monsoon and minimum during winter for 2012 and 2013. For 2011 pH was highest during monsoon and lowest during summer season.

Dissolved oxygen (mg/l) was found more (9.07) in the winter season throughout the 3 years, but it was minimum during summer season of 2011 and 2012 and monsoon of the year 2013.

Free CO2 of Shahanoor dam varied from 00 to 0.51 mg/l. The free CO2 was absent from the Shahanoor water during summer season of 2011 and 2012. Again it was absent during monsoon of the year 2011 and 2013. In the winter of the year 2011 and 2012 CO2 was recorded 0.51 mg/l and 0.19 mg/l respectively and 0.12 mg/l during monsoon of 2012.

Total hardness was found to be more (150, 152) during winter and minimum during the monsoon (88, 118) respectively for the year 2011 and 2012.

Total alkalinity varied between 24 mg/l during monsoon of 2012 and 64 mg/l during summer of 2013. Seasonal trend for alkalinity of Shahanoor dam was maximum during summer and minimum during monsoon throughout the study years.

Total dissolved solid of the dam ranged from 162 mg/l to 404 mg/l, and showed maximum values during monsoon seasons for the three year study.

Bicarbonate values of studied water body was maximum (40) during summer and minimum (26) during monsoon of the study years.

Maximum chloride values were recorded during monsoon season throughout the study years.

Maximum calcium content of the Shahanoor dam were recorded in the monsoon seasons for the three study years and minimum in the winter season.

Magnesium values of the dam were recorded higher in summer and lower in winter season for the year 2012 and 2013.

Nitrates values for the year 2011 and 2012 was found to be more during summer season and less during winter season.

Phosphate content of the Shahanoor dam varied between 0.03 mg/l and 0.06 mg/l maximum phosphate values recorded during winter season.

Fluoride values of Shahanoor dam was found to very between 0.07 and 0.163mg/l.

Conclusion :

From the present investigation of the dam following conclusions were drawn.

All the chemical parameters of the dam are within permissible limit of World Health Organization (WHO) standards.

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Aurone : Synthesis of Active Compound And Experimental Study In Physical Aspects.

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Abstract:

Aurones, constitute a subclass of naturally occurring compounds which are structurally isomeric to flavones, biogenetically related to chalcones, and are responsible for imparting beautiful yellow colors to some of the flower petals[1-4].Recent investigations have shown that these compounds have potent and promising biological activities, in some cases even more potent than chalcones and flavones[5-7] .

This paper aims to study physical properties with experimental data such as density, refractive index and viscosity of Aurone.

Keywords:Aurone,Density.Viscocity,Refractive index etc.

Introduction:

Actually,to date, the chemical structures of more than 100 different aurones have been identified, characterized by distinctive hydroxylated, methoxylated, and glycosylated substitution patterns. Moreover, their effective potential to predict viable therapeutic uses has begun to be unveiled[8-11] .Therefore, they represent a worth deepening class of natural compounds intended to provide bioactive compounds in the near future.

The first examples of aurones were characterized in 1940 in Asteraceae[12],the family of sunflowers, which synthesize the most common 4-deoxy-derivatives of the family including sulfuretin , maritimetin , leptosidin and their corresponding glycosides. The species *variabilis* and *sulphureus* mainly express sulfuretin and its glycosylated counterparts in leaves and petals. In the *bidens* species, maritimetin has been isolated while, in the genus Coreopsis, compounds such as sulfuretin, maritimetin, but also leptosidin may be found.

The chalcone are accessed through synthesis by the Claisen-Schmidt reaction of 2-hydroxyacetophenone and benzaldehyde or their derivatives in the presence of aqueous NaOH, KOH or Ba(OH)2[12-16].This chalcone further cyclized in various solvent to get desired substituted aurone . Aurone provides intense yellow pigmentation to some fruits and flowers [17].Aurones are found in flowers of Scrophulariaceae and Compositae family. However, they are also found in leaves, barks, seeds and woods of various plants. Aurone derivatives show various range of pharmacological activities such as antiviral, antifungal, antioxidant, anticarcinogen, antidiabetes[18,19].

Experimental

I.Synthesis :

Substituted Aurone have been synthesized by cyclization of substituted chalcone in presence of various solvents and their general structures were confirmed by IR, 1H NMR and mass spectral data. Table 1,Table 2, and Table 3 shows the various physical parameters of synthesized Aurone.

II.Physicochemical studies:

The synthesized Aurone was recrystallized from DMF. The solvent A.DMF and B.DMSO were used for the physicochemical studies.

III.Density and Refractive index:

Abbe refractometer was used to determine the refractive index of all the solutions. Table 1 shows the refractive index of synthesized Aurone at various temperatures and various concentrations.

Results and Discussions:

I. Refractive Index of synthesized Aurone:

Table 1 : shows the dynamic values of refractive index.

Concentrations	R.I. in solvent A	R.I. in Solvent B
0.05	1.492	1.553
0.04	1.485	1.541
0.03	1.469	1.534
0.02	1.458	1.531
0.01	1.453	1.529

II. Density and Viscosityof synthesized Chalcone:

The table below shows the dynamic experimental values of density (ρ), and viscosity (η), at different temperature and different concentrations.

Table:2 (Temperature: 303.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1410	1.2754	0.9779	0.8510
0.04	1.1406	1.2601	0.9772	0.8478
0.03	1.1403	1.2522	0.9768	0.8398
0.02	1.1401	1.2497	0.9766	0.8257
0.01	1.1398	1.2453	0.9764	0.8201

Table:3 (Temperature: 313.15 K)

Conc.	Solvent A Density(ρ) ($g.cm^{-3}$)	Solvent A Viscosity Centipoise	Solvent B Density(ρ) ($g.cm^{-3}$)	Solvent B Viscosity Centipoise
0.05	1.1352	1.2455	0.9557	0.8212
0.04	1.1349	1.2398	0.9553	0.8191
0.03	1.1345	1.2342	0.9550	0.8129
0.02	1.1341	1.2292	0.9541	0.8087
0.01	1.1340	1.2231	0.9538	0.8002

Conclusions:

From above experimental values it is concluded that densities,viscosities and refractive index of solution are changes by changing temperatures and by changing the solvent due to solute-solvent interaction.

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Studies on Assessment of Physico-chemical Parameters of Drinking Water in Schools of Akola District

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Abstract:
Water is essential in every stage of life for any living organism. The quality of water is of vital concern for mankind since it is directly linked with human welfare. The water resources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, this study is focused on analysis of physico-chemical parameters of water is essential for all living organisms.
Keywords: Water, Hardness, pH, COD, BOD, Chloride, Conductance, Acidity, Alkanality etc.

Introduction

Water:

Water is the most abundant compound on Earth's surface, covering about 70 percent of the planet. In nature, water exists in liquid, solid, and gaseous states. It is in dynamic equilibrium between the liquid and gas states at standard temperature and pressure. At room temperature, it is a tasteless and odorless liquid, nearly colorless with a hint of blue. Many substances dissolve in water and it is commonly referred to as the universal solvent. Because of this, water in nature and in use is rarely pure and some of its properties may vary slightly from those of the pure substance [1]. However, there are also many compounds that are essentially, if not completely, insoluble in water. Water is the only common substance found naturally in all three common states of matter and it is essential for all life on Earth. Water usually makes up 55% to 78% of the human body [2].

Clean, fresh drinking water is essential to human and other lifeforms. Access to safe drinking water has improved steadily and substantially over the last decades in almost every part of the world. However, some observers have estimated that by 2025 more than half of the world population will be facing water-based vulnerability. A recent report (November 2009) suggests that by 2030, in some developing regions of the world, water demand will exceed supply by 50%[3,4].

Forms of water:

Like many substances, water can take numerous forms that are broadly categorized by phase. The liquid phase is the most common among water's phases (within the Earth's atmosphere and surface) and is the form that is generally denoted by the word "water." The solid phase of water is known as ice and commonly takes the structure of hard, amalgamated crystals, such as ice cubes, or loosely accumulated granular crystals, like snow[5]. The gaseous phase of water is known as water vapour (or steam), and is characterized by water assuming the configuration of a transparent cloud. (Note that visible steam and clouds are, in fact, water in the liquid form as minute droplets suspended in the air.) The fourth state of water, that of a supercritical fluid, is much less common than the other three and only rarely occurs in nature, in extremely uninhabitable conditions. When water achieves a specific critical temperature and a specific critical pressure (647°K and 22.064°MPa), liquid and gas phase merge to one homogeneous fluid phase, with properties of both gas and liquid.

Contamination of Water :

Water is a chemical substance with the chemical formula H_2O. Its molecule contains one oxygen and two hydrogen atoms connected by covalent bonds. Water is often co-exists on Earth with its solid state ice, and gaseous state, water vapour or steam. According to researchers, water covers 70.9% of the earth's surface, and is vital for all known forms of life. On Earth, it is found mostly in oceans and other large water bodies, with 1.6% of water below ground in aquifers and 0.001% in the air as vapour, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Research also claims that oceans hold 97% of surface water, glaciers and polar ice caps 2.4%, and other land surface water such as rivers, lakes and ponds 0.6%. A very small amount of the Earth's water is contained within biological bodies and manufactured products. Water on earth moves continually through a cycle of evaporation or transpiration (evapotranspiration), precipitation, and runoff, usually reaching the sea. Over land, evaporation and transpiration contribute to the precipitation over land.

Drinking water is never pure. Water naturally contains minerals and microorganisms from the rocks, soil, and air with which it comes in contact. Human activities can add many more substances to water. But drinking water does not need to be pure to be safe. In fact, some dissolved minerals in water can be beneficial to health. For example, the National Research Council (National Academy of Sciences) states that drinking water containing dissolved calcium and magnesium generally contributes a small amount toward calcium and magnesium human dietary needs. Fluoride, either naturally occurring or added to the water supply, can help protect against tooth decay. Whether or not drinking water is safe will depend on which substances are present and in what amounts.

Water Is Essential to Life:

Water is second to oxygen as being essential for life. People can survive days, weeks, or even longer without food, but only about four days without water. The average adult consumes and excretes two or more quarts of water each day. Some of this water is supplied through foods but most is consumed through beverages. It is generally recommended that adults consume 6 to 8 cups (48 to 64 ounces) of liquids daily. Some beverages, such as coffee, tea, soda with caffeine, and alcohol are diuretic and increase urine excretion. These beverages, if consumed in large quantities, can upset the body water balance [6].

Water is essential in every stage of life for any living organism. The quality of wateris of vital concern for mankind since it is directly linked with human welfare. The waterresources now days as consequences of population explosion coupled with industrialization, urbanization and green revolution. Water related diseases have remained a major concern in much of the developing world. The World Health Organization (WHO) estimated in the 2000 assessment that there are four billion cases of diarrhea each year in addition to millions of other cases of illness associated with the lack, of access to clean water. Therefore, analysis of physico-chemical parameters of water is essential for all living organisms [7].

Sources of water Supply:

Water resources are of critical importance to both natural ecosystem and human development. It is essential for agriculture, industry and human existence. The healthy aquatic ecosystem is depended on the physico-chemical and biological characteristics. The quality of water in any ecosystem provides significant information about the available resources for supporting life in that ecosystem. Good quality of water resources depends on a large number of physicochemical parameters and biological characteristics [8].

To asses that monitoring of these parameters is essential to identify magnitude and source of any pollution load

Sources of fresh water

a) Surface water

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapo-transpiration.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow[9,10].

Nevertheless, over the long term the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here; however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution [11,12].

b) Under river flow

Throughout the course of a river, the total volume of water transported downstream will often be a combination of the visible free water flow together with a substantial contribution flowing through sub-surface rocks and gravels that underlie the river and its floodplain called the hyporheic zone [13].

c) Ground water

Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water").

The natural input to sub-surface water is seepage from surface water. The natural outputs from sub-surface water are springs and seepage to the oceans[14].

d) Desalination

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination.

e) Frozen water

The Himalayas, which are often called "The Roof of the World", contain some of the most extensive and rough high altitude areas on Earth as well as the greatest area of glaciers and permafrost outside of the poles. Ten of Asia's largest rivers flow from there and more than a billion people's livelihoods depend on them [15].

Material And Methods: In proper Akola district, numbers of different schools are there such as primary schools, high schools, Junior colleges, convents etc. The drinking water samples were collected from different schools. The various physico-chemical parameters of these samples were assessed.

Ten such samples were collected from following schools

Table 1 : Names of schools from which water samples were collected.

Sr. No.	Names of Schools from which samples collected	Area
1	Shri. Shivaji Vidyalaya, Akola	Deshmukh Peth, Akola
2.	Jubilee English Convent, Akola	Ramdas Peth, Akola
3	Savitribai Phule Kanya School, Akola	Santoshi Manta Mandir, Akola
4	New English School, Akola	Ramdas Peth, Akola
5	B. R. High School, Akola	New Bus Stand, Akola
6	Jagruti Vidyalaya, Akola	Ranpise Nagar, Akola
7	Aadarsh Vidyalaya, Akola	Aadarsh Colony, Akola
8	D. R. Patil Vidyalaya, Akola	Sahakar Nagar, Akola
9	Jyoti Vidyalaya, Akola	Azad Colony, Akola
10	Swami Vivekanand Vidyalaya, Akola	Gurukul Nagar, Akola

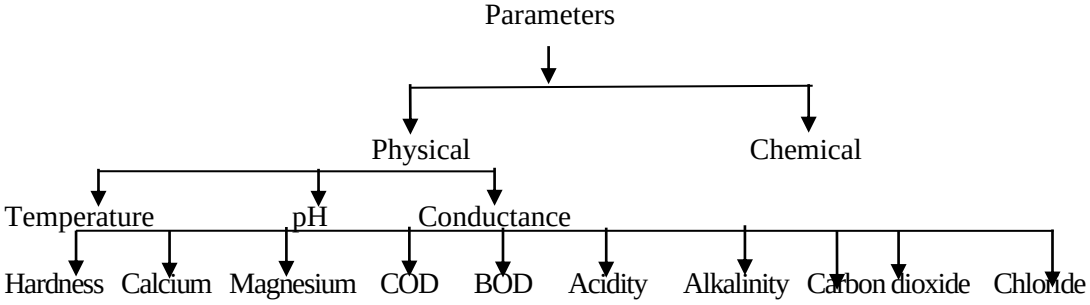
The water samples were collected from handpump, cement tank, plastic tank (PVC), Rajans from ten different schools. Drinking water samples collected in 250 ml sterilized glass bottle.

The standards (Maximum permissible limits) of physico-chemical parameters for drinking water as recommended by World Health Organization (WHO) are given in following table.

Sr. No.	Physico-chemical parameters	Limits
1	Colour	--
2	Odour	--
3	Taste	--
4	Temperature	10 – 15.6°C
5	Conductance	300 – 600 mg/lit.
6	Hardness	300 mg/lit.
7	Chloride	Not to exceed 600 mg/lit
8	Calcium	75 – 100 mg/lit.
9	Magnesium	50 – 150 mg/lit.
10	Alkalinity	200 mg/lit.
11	Acidity	--
12	Free CO_2	--
13	COD	Not to exceed 250 mg/lit.
14	BOD	Not more than 8 mg/lit.
15.	pH	6.5 – 8.5

Analysis of Water

Following are the parameters which are to be analyzed for the water samples.



Physical Analysis

1) Temperature

In wastewater various chemical reactions occur. The rate of chemical reactions increases with increasing temperature provided the higher temperature does not affect the reactant or catalyst. The temperature was recorded with the help of thermometer.

2) pH

pH of different sample was measured by pH meter. This measurement provides a very quick and easy obtain appraisal of the acid base equilibrium in an ecological system. It indicates the acidic and basic character of samples.

As per the standards set by Indian Council of Medical Research (ICMR, 1975), Drinking Water Protection Act (USA, 1973) p^H should be within 6-8.0 units. The standards set by other agencies are 6.5 – 8.5 units.

Importance of pH measurement

It may be evident from the forgoing discussion that pH of unpolluted natural waters occur within a narrow range of values and major deviations from that range caused by natural or anthropogenic sources, may have very strong impact of the aquatic ecosystems[16]. Physical, chemical and biological processes associated with water supply and sanitary engineering are also strongly pH dependent. Besides practically every analytical procedure associated with aquatic ecology and water pollution studies requires determination of pH.

pH Measurement

Connect the calomel and glass electrodes to the pH meter. Clean the electrodes with distilled water and dry it. Dip the electrodes in the 4.00 pH buffer solution. Adjust the temperature knob. Push the p^H button of function switch panel. Adjust the display to 4.00 p^H with calibration knob. Now pH meter is thus calibrated.

Wash the electrode, dry it and put in the solution whose pH is to be determined. Take the reading of pH.

3) Conductance

Electrical conductance is the ability of a substance to conduct the electric current. In water, it is the property caused by the presence of various ionic species.

The term specific conductance is also used in place of electrical conductivity, but it is an absolute term. The unit of conductivity measurement is Siemens. The older unit mhos/cm is now rarely used.

Importance of Conductivity Measurement

1. Conductivity is used to estimate total dissolved solids in water/wastewater.
2. It is useful in the rapid assessment of the salinity of water.
3. It is useful to assess the degree of mineralization of distilled and deionised water.
4. It is useful in checking the performance of water deionized and other ion-exchange resins.
5. It is useful to determine the amount of ionic reagent needed in certain precipitation and neutralization reactions and to determine end points in titrimetry.

4) COD

The amount of chemical oxidation required converting organic matter in water and wastewater to carbon dioxide in water and waste water is called as Chemical Oxygen Demand (COD). This test involves measuring the amount of oxidizing agent such as permanganate i.e. consumed when the organic matter in a water sample is oxidized completely to carbon dioxide. Organic matter in a sample also can be reacted directly with oxygen at a high temperature produce carbon dioxide. Too much organic matter addition to the lentic and lotic systems increases the levels of COD and changes the composition of oxygen requiring organisms. Variation in the organic matter in turn. Changes COD levels show diversity in the autotrophic and heterophic populations and decreases the productivity status. The energy budgets of the aquatic bodies also directly related to the levels of chemical oxidation in prescribed periods.

Procedure

50 ml of wastewater sample was taken and a mixture of added 10 ml of $KMnO_4$ and 10 ml H_2SO_4, H_2O was added into in to it then it was incubated for 4 hours, a few crystals of KI was added which turned the entire solution to yellow colour. After addition of few drops of starch indicator to above prepared solution until it turns colorless. Simultaneously distilled water bland was prepared and analyzed COD[12] (mg/L) using the formula.

$$COD(mg/L) = \frac{8\,xCx\,(B-A)}{Sx\,1000}$$

Where,

C = Concentration of titrant (N/80)

A = Volume of titrant used for blank (ml)

B = Volume of titrant used for sample (ml)
S = Volume of water sample taken (ml)

5) Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is the measure of the degraded organic material present in a water sample, and can be defined as the amount of oxygen required by the microorganisms in stabilizing the biologically degradable organic matter under aerobic condition. Hence, BOD approximates the amount of oxidizable organic matter present in the solution and the BOD value can be used as a measure of waste strength. It is highly important to know the amount of organic matter present in the waste treatment system and that the quantity of oxygen required for its stabilization.

It can be determined by BOD bottles after five days.

BOD = (Do – Ds) x Dilution factor mg/lit.

6) Alkalinity

Reagents

A. Hydrochloric acid, 0.1 N
B. Methyl orange indicator, 0.05%
C. Phenolphthalein indicator
D. Sodium carbonate 0.1 N.

Procedure

1. Take 100 ml of sample in a conical flask and add 2 drops of phenolphthalein indicator.
2. If the solution remains colourless, PA = 0, and total alkalinity is determined as described in step 4.
3. If the colour changes to pink after addition of phenolphthalein titrate it with 0.1 N HCl until the colour disappears at end point. This is phenolphthalein alkalinity (PA).
4. Now add 2-3 drops of methyl orange to the same sample and continue the titration further, until the yellow colour changes to pink at end point. This a total alkalinity (TA).

Calculation

$$PA\ as\ CaCO_3, mg/L = \frac{(A \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

$$TA\ as\ CaCO_3, mg/L = \frac{(B \times Normality) of HCl \times 1000 \times 50}{ml\ of sample}$$

Where,

A = ml of HCl used with only phenolphthalein
B = ml of total HCl used with phenolphthalein and methyl orange
PA = phenolphthalein alkalinity
TA = Total alkalinity

7) Acidity

Reagents

A. Sodium hydroxide, 0.05 N
B. Methyl orange indicator
C. Phenolphthalein indicator

Procedure

1. Take 100 ml of colourless sample in a conical flask and add 2-3 drops of methyl orange indicator.
2. If the solution turns yellow, the methyl orange acidity is absent. In case the content turn pink, titrate it with 0.05 NaOH. At the end point colour changes from pink to yellow.
3. Now add few drops of phenolphthalein indicator to the same sample and titrate further with NaOH until the content turn to pink.

Calculation

$$Methyl\ orange\ acidity\ mg/L\ as\ CaCO_3 = \frac{A \times Nof NaOH \times 1000 \times 50}{ml\ of sample}$$

$$Phenolphthalein\ acidity\ mg/L\ as\ CaCO_3 = \frac{B \times Nof NaOH \times 1000 \times 50}{ml\ of sample}$$

Where,

A = Volume of NaOH used with methyl orange in titrating the sample to pH 3.7
B = Volume of NaOH used with phenolphthalein in titrating the sample to pH 3.7 to pH 8.3

8) Carbon Dioxide

Reagents

A. Sodium hydroxide, 0.05 N
B. Phenolphthalein indicator

Procedure

1. Take 100 ml of sample in a conical flask and add few drops of phenolphthalein indicator.
2. If the solution turns pink, free CO_2 is absent. If the sample remains colourless, titrate it against 0.05 N NaOH. At the end point pink colour appears.

Calculation

$$Free\ CO_2\ mg/L\ = \frac{(ml \times N)\ of\ NaOH \times 1000 \times 44}{ml\ of sample}$$

9) Chloride

Reagents

A. Silver nitrate, 0.02 N
B. Potassium chromate, 5%

Procedure

1. Take 50 ml of sample in a conical flask and add 2 ml of K_2CrO_4 solution..
2. Titrate the contents against 0.02 N $AgNO_3$ until a persistent red tinge appears.

Calculation

$$Chloride\ mg/L\ = \frac{(ml \times N)\ AgNO_3 \times 1000 \times 35.5}{ml\ of sample}$$

9) Hardness

Reagents

A. EDTA solution, 0.01 N
B. Buffer solution
C. Ferrochrome Black T (Solo chrome Black T) indicator
D. Sodium sulphide solution.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher calcium takes a smaller volume and dilute to 50 ml.
2. Add 1 ml of buffer solution.
3. If the sample is having higher amounts of heavy metals add 1 ml of Na_2S solution.
4. Add 100-200 mg of Eriochrome Black T indicator, the solution turns wine red.
5. Titrate the contents against EDTA solutions; at the end point colour changes from wine red to blue.

Calculation

$$Hardness\ as\ mg/L\ CaCO_3\ = \frac{ml\ EDTA\ used \times 35.5}{ml\ of sample}$$

10) Calcium

Reagents

A. EDTA solution, 0.01 M
B. Sodium hydroxide, 1 N
C. Murexide indicator.

Procedure

1. Take 50 ml of sample in a conical flask. If sample is having higher alkalinity, use smaller volumes diluted to 50 ml.
2. Add 2.0 ml of NaOH solution in the sample.
3. Add 100-200 mg of murexide indicator a pink colour develops.
4. Titrate against EDTA solutions until the pink colour changes to purple. For better judgement of end point, compare the purple colour with the distilled water blank end point.

Calculation

$$Calcium, mg/L\ = \frac{x \times 400}{ml\ of sample}$$

Where,

x = Volume of EDTA used.

11) Magnesium

Reagents

A. EDTA solution, 0.01 M
B. Buffer solution
C. Eriochrome Black T indicator

Procedure

1. Find out the volume of EDTA used in calcium determination.

Calculation

$$Mg^{++}, mg/L = \frac{y - x \times 400.8}{Volume\ of\ sample\ x\ 1.645}$$

Where,
y = EDTA used in hardness determination.
x = EDTA used in calcium determination for the same volume of the sample

OBSERVATIONS AND RESULTS

Observations

Water analysis Report

Table 1 : Quality Index of Drinking water of different schools in Akola district

Sr. No.	Samples ID	pH	Temp.	Colour	Odour	Taste
1	1	6.92	23°C	Clear	Odourless	Tasteless
2	2	6.77	24°C	Clear	Odourless	Tasteless
3	3	6.86	25°C	Clear	Odourless	Tasteless
4	4	7.00	23°C	Clear	Odourless	Tasteless
5	5	7.22	24°C	Clear	Odourless	Tasteless
6	6	7.33	25°C	Clear	Odourless	Tasteless
7	7	7.21	23°C	Clear	Odourless	Tasteless
8	8	7.23	24°C	Clear	Odourless	Tasteless
9	9	7.21	24°C	Clear	Odourless	Tasteless
10	10	7.37	23°C	Clear	Odourless	Tasteless

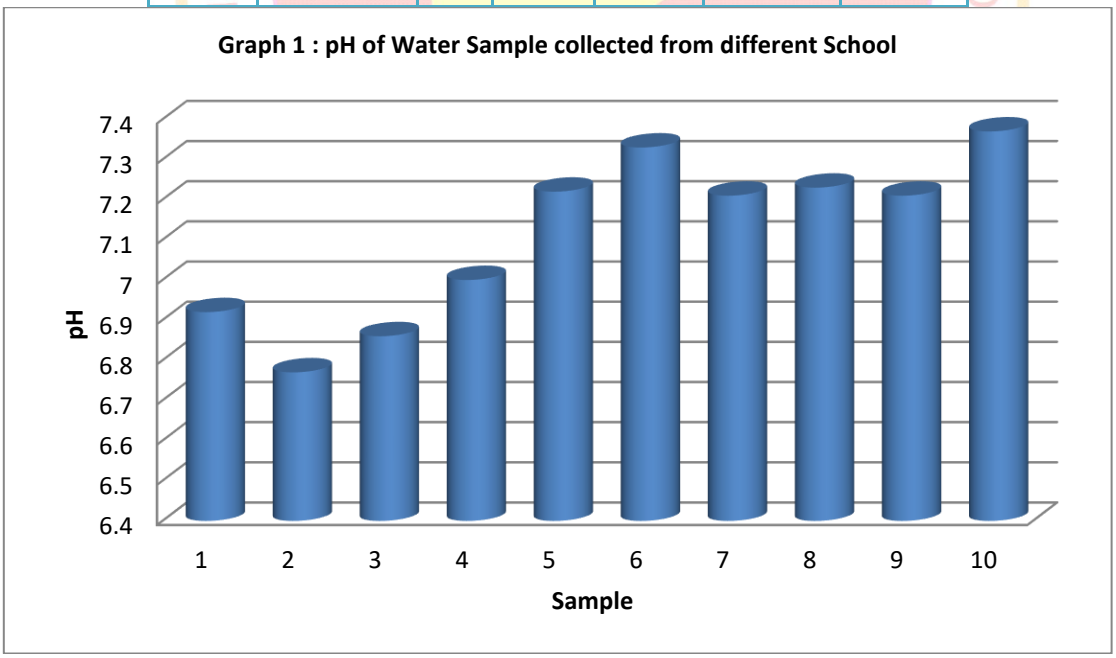


Table 2 : Conductance of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Conductance mg/l
1	1	415
2	2	310
3	3	310
4	4	425
5	5	305

6	6	417
7	7	610
8	8	306
9	9	504
10	10	425
11.	Standard by WHO	300-600

Graph 2 :- Conductance of Drinking water of different schools in Akola district

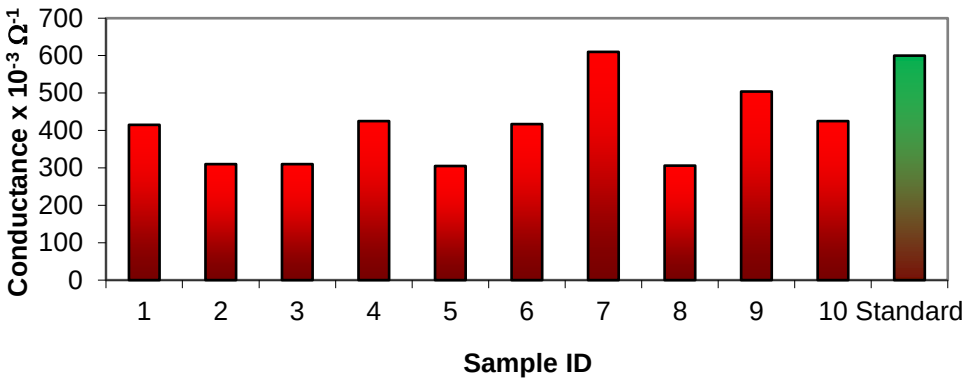


Table 3 : Hardness of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Hardness ppm
1	1	304
2	2	380
3	3	684
4	4	516.8
5	5	684
6	6	668.8
7	7	760
8	8	212.8
9	9	349.6
10	10	212.8
11	Standard by WHO	300

Graph 3 :- Hardness of Drinking water of different schools in Akola district

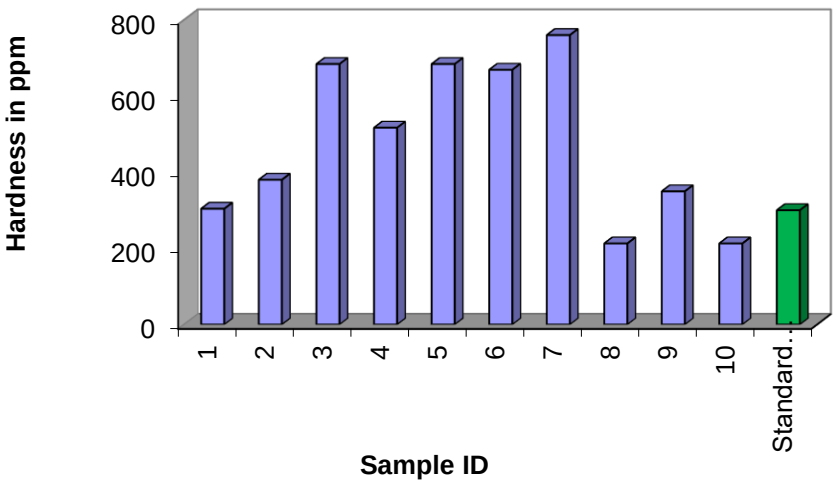


Table 4 : Calcium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Calcium ppm
1	1	45.6
2	2	136.8
3	3	121.6
4	4	106.4
5	5	152
6	6	152
7	7	167.2
8	8	60.8
9	9	30.4
10	10	15.2
11	Standard by WHO	75 – 100

Graph 4 : Calcium of Drinking water of different schools in Akola district

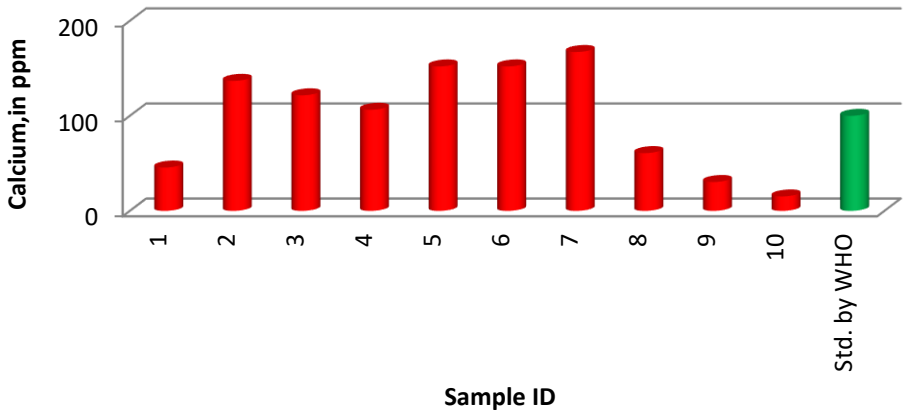


Table 5 :Magnesium of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Magnesium ppm
1	1	258.4
2	2	243.2
3	3	562.4
4	4	410.4
5	5	532
6	6	516.8
7	7	592.8
8	8	152
9	9	319.2
10	10	197.6
11	Standard by WHO	50 – 150

Graph 5 :- Magnesium of Drinking water of different schools in Akola district

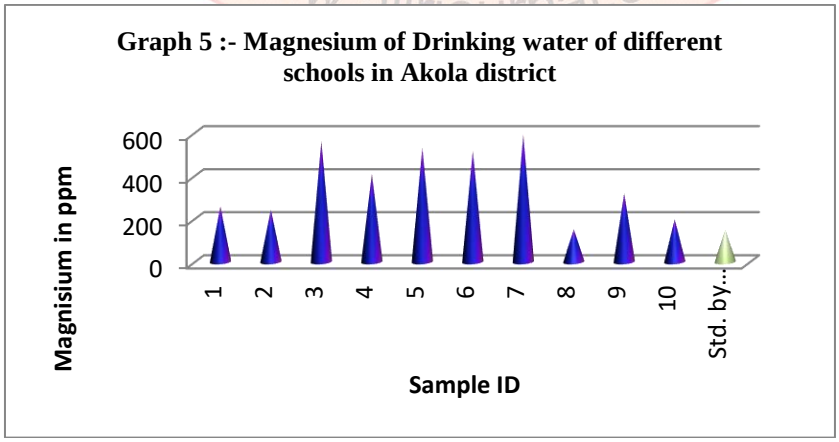


Table 6 : Chloride of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Chloride mg/l
1	1	183.18
2	2	140.438
3	3	134.332
4	4	702.19
5	5	106.855
6	6	100.749
7	7	131.279
8	8	146.544
9	9	732.72
10	10	427.42
11	Standard by WHO	Not to exceed 600

Graph 6 : Chloride of Drinking water of different schools in Akola district

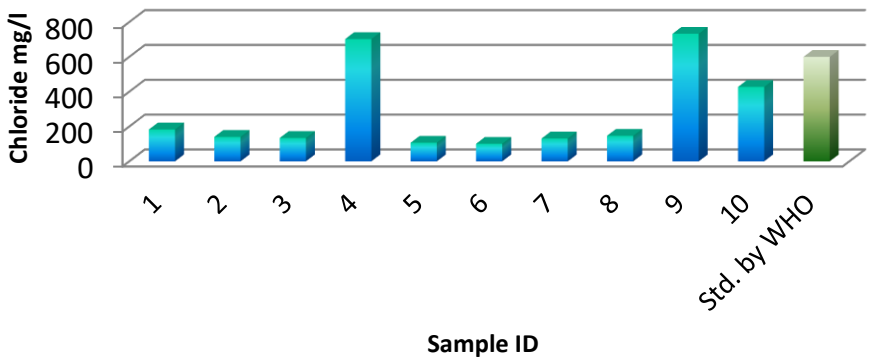


Table 7 : Alkalinity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Alkalinity mg/l
1	1	300
2	2	400
3	3	350
4	4	350
5	5	500
6	6	650
7	7	1000
8	8	400
9	9	250
10	10	200
11	Standard by WHO	200

Graph 7 : Alkalinity of Drinking water of different schools in Akola district

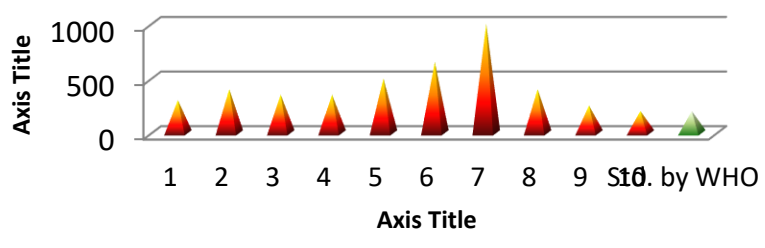


Table 8 : Acidity of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Acidity mg/l
1	1	50
2	2	125
3	3	175
4	4	125
5	5	150
6	6	225
7	7	250
8	8	100
9	9	75
10	10	50

Graph 8 : Acidity of Drinking water of different schools in Akola district

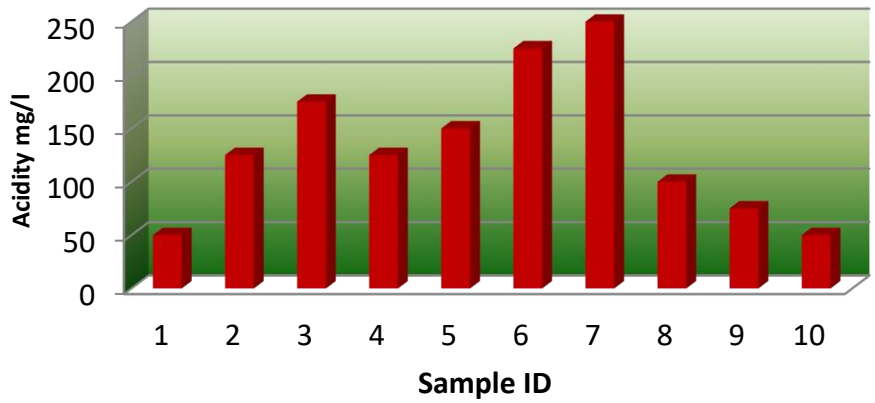


Table 9: Free CO_2 of Drinking water of different schools in Akola district

Sr. No.	Samples ID	Free CO_2 mg/l
1	1	110
2	2	44
3	3	22
4	4	44
5	5	44
6	6	44
7	7	66
8	8	22
9	9	22
10	10	44

Graph 9 : Free CO_2 of Drinking water of different schools in Akola district

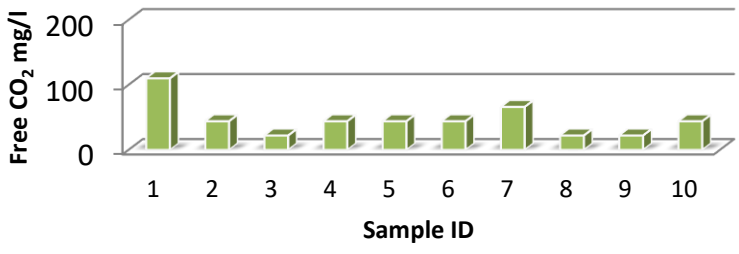
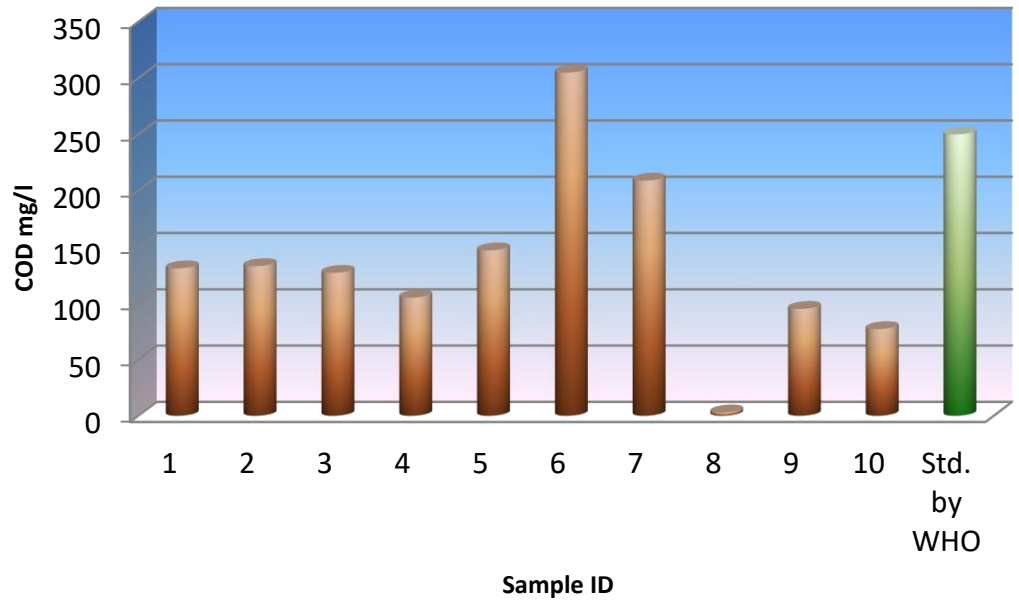


Table 9: COD of Drinking water of different schools in Akola district

Sr. No.	Samples ID	COD mg/l
1	1	131
2	2	133
3	3	127
4	4	105
5	5	147
6	6	305
7	7	209
8	8	3
9	9	95
10	10	77
11	Standard by WHO	Not to exceed 250

Graph 9 : COD of Drinking water of different schools in Akola district



CONCLUSION AND SUGGESTION

Conclusion

1) The study shows that better class and reasonably better quality water should provided at school and maintain its hygienic condition properly.
2) Storage of drinking water in Rajan and Drum was highly contaminated due to its direct contacts of hands and fingers.
3) The study also indicates that daily washing of storage means least coliform count. So we have low contamination in water.
4) The study shows that poor hygienic condition, improper method of storage, improper handling of drinking water makes drinking water more contaminated.
5) Hazen (1998) studied on drinking water and diarrhea diseases due to *E. coli* and reported that, prevention of fecal, contamination prevents water born outbreaks.

Suggestions

1) It is important to maintain the hygienic conditions of children's health.
2) Personal hygiene conditions
   a) Students should wash hands properly before drinking the water.
   b) Regular washing of water tanks/storages in schools.
   c) Water tanks/Rajan should be placed at the hygienic conditions.

d) Good quality purifier should be used in school.
e) Children should be guided serve drinking water properly from water storage (rajan, etc)
f) Children should aware about hygienic conditions related to drinking water.

3) Prevention from water born diseases
a) Regular checkout the pipeline leakage of water supply.
b) Water chlorination is the best and ultimate method of purification. Because chlorine reduces the germ and bacterial growth from water. Ferrous ions, magnesium ions and hydrogen sulphide from water oxidized by chlorine and it reduces the taste and odor from water.
c) Keep surrounding clean and animals away from the sources of water.

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Synthesis And Antimicrobial Activity Of 3, 5, 7 Trisubstituted -1, 2, 4-Triazolo-[3, 4-*B*] Benzothiazoles

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Abstract

4-Methoxy acetanilide on treatment with bromine in acetic acid, followed by hydrolysis with dil. HCl/NaOH solution, yielded 2-bromo-4-Methoxy aniline (1) which on treatment with sodium thiocyanate in acetic acid afforded 2-amino-4-bromo-6-Methoxy benzothiazole (2). Compound (2) in ethylene glycol was heated at 150 ^{0}C with 80% hydrazine hydrate to get 4-bromo-6-Methoxy-2-hydrazino benzothiazole (3). This hydrazino compound (3) on heating with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde/ 2-hydroxybenzaldehyde /4-hydroy benzaldehyde /4-dimethyl aminobenzaldehyde to obtain corresponding hydrazones (4a-4f). [4-bromo 2(substituted phenyl)-6-methoxy benzothiazolyl hydrazone]. These hydrazones (4a-4f) in unhydrous benzene independently were refluxed on water bath for three hours with Attenburrow's MnO_2[14] to obtain corresponding 3-substituted phenyl- 5-bromo-7-methoxy-1 ,2, 3-triazolo benzothiazoles (5a-5f). All these newly synthesized compounds were screened for antimicrobial activity against E.Coli (Gram –ve), B. subtilis (Gram +ve), E. Carotovara and xanthomonas citri using Ampicillin, Streptomycin and penicillin as a standard for comparison.

***Key Words** : Hydrazone, triazolobenzothiazole, biological screening*

Introduction:

1,2,4-triazole and their derivatives are important class of organic compounds with diverse agriculture, industrial and biological activities[1-3], including antimicrobial[4-5] anti-convulsant[6-7] and antiinflamatory[8]. Similarly benzothiazoles are known to posses different activities such as anticancer[9],anthelmintic activity[10], antitubercular activity[11].

A survey of literature reveals such fused substituted tricyclic triazoles are prepared by different methods[12 13] but little work is carried out on bromo methoxy derivative of such fused tricyclic triazoles. Hence it was thought worthwhile to synthesize 5-bromo-7-methoxy as a substituent on benzene moiety in the 1,2,4-triazolo-[3,4-*b*]-benzothiazole system by following series of reactions and study the chemistry and biological activity of these compounds.

As the first step, 2-bromo 4-methoxy aniline (1) was prepared by treating 4-methoxy acetanilide with bromine in acetic acid, followed by hydrolysis with dil. HCl / NaOH solution.To the solution of sodium thiocynate in glacial acetic acid, 2-bromo-4- methoxyyl aniline (2) was added .The mixture was stirred well and bromine in glacial acetic acid was added drop by drop action maintaining the temp. below 5 ^{0}C. The obtained residue filtered, dissolved in hot water and neutralized by 20% alkali. The obtained product 2-amino-4-bromo-6-methoxy benzothiazole (2) was recrystlised by using ethanol.

On the basis of elemental analysis and spectral data the obtained product (2) has assigned the structure 2-amino-4-bromo-6-methoxy benzothiazole. The I.R. spectrum showed absorption bands at 3440 cm^{-1} and 3340 cm^{-1} due to asymmetric and symmetric stretching of -NH_2 group respectively. The PMR spectrum exhibited singlet at δ 3.4 due to -OCH_3, broad peak of δ 6.0 due to -NH_2 protons and two singlets in the region δ 7.0 - 7.5 due to two Ar-H protons. The mass spectrum reveals molecular ion peaks at 260 (M+2, 98%) and 258 (M^+, 100%). It also confirmed the presence of one bromine atom.

2-Amino-4-bromo-6-methoxy benzothiazole (2) in ethylene glycol as solvent was heated with 80% hydrazine hydratehydrochloride for three hours by using oil bath and maintaing temp. at 150°C to 160°C to get 4-bromo-6-methoxy-2-hydrazino benzothiazole (3). The I.R. spectrum of compound (3) showed absorption bands at 3320 cm^{-1} and 3203 cm^{-1} due to -NH_2 asymmetric and symmetric stretching respectively. The mass spectrum exhibits molecular ion peaks of equal intensity at 275 (M+2) and 273(M^+) which also confirming the formation of product with one bromine atom.

Compound (3) in ethanol was heated with 2-hydroxy-3-methoxy-benzaldehyde/4-methoxy benzaldehyde/4-hydroy-3-methoxy benzaldehyde /2-hydroxybenzaldehyde/4-hydroxybenzaldehyde /4-dimethyl aminobenzaldehyde sperately on water to obtain corresponding hydrazones (4a-4f). The I.R. spectra of hydrazones showed stretching absorption bands in the region 3450-3100 cm^{-1} due to –N-H stretching. The presence of broad singlet in their PMR spectra in the region δ 2.5 to δ 4.5 confirmed the presence of -NH proton. The mass spectrum of the compound (4a) shows molecular peak at 377 (M^+.) which corresponds to molecular weight of the compound.

These hydrazones (4a- 4f) in benzene were refluxed on water bath for three hours with Attenburrow's MnO_2[1] independently to obtain 3-(2'-hydroxy-3'-methoxy phenyl/4'-methoxy phenyl / 4'-hydroxy-3'-methoxy phenyl /2'-hydroxy phenyl/ 4'-hydroxy phenyl /4'-dimethyl amino phenyl-5-bromo-7-methoxy-1,2,4-triaz-

olo[3,4-*b*]-benzo- thiazoles respectively (5a-5f). The I. R. spectra of these triazolo benzothiazoles observed the absence of strong bands in the region 3450cm^{-1} - 3100 cm^{-1} due to -NH stretching , however the absence of broad singlet in PMR spectra of these triazolo benzothiazole in the region δ 2.5 - δ 4.5 confirms the formation of cyclised products.

The mass spectrum of compound (5f) exhibits molecular peak at 403 which corresponds to its molecular weight. It confirms the formation of 5-bromo-3-(4'- dimethyl amino phenyl)-7-methoxy 1,2,4-triazolo-[3,4-*b*]-benzothiazole products

Experimental:

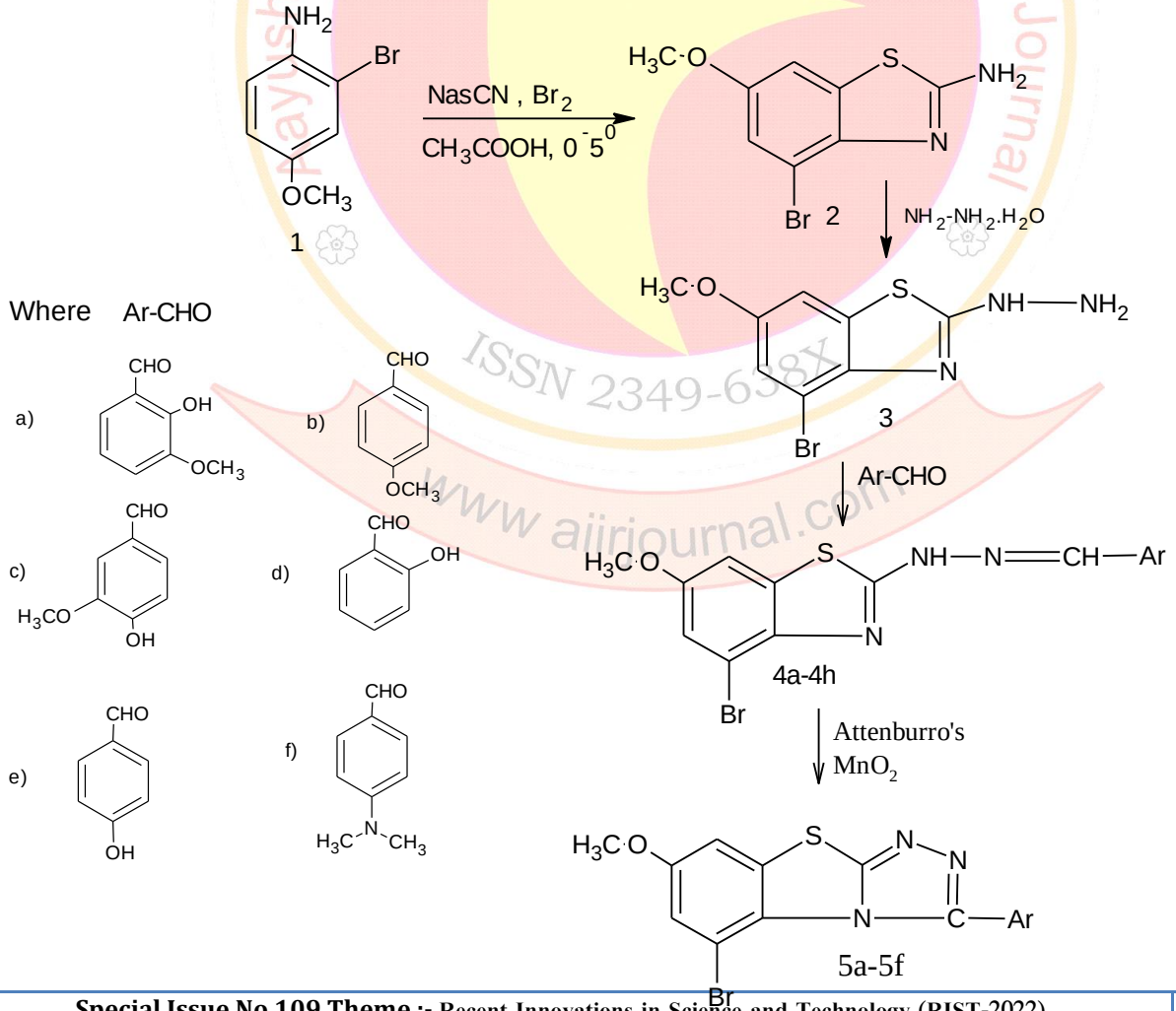
Melting points were determined in open capillaries and are uncorrected. Infrared spectra were recorded in Nujol / potassium bromide pellets on Bomen MB 104FT infrared spectrophotometer. ^{1}HNMR spectra were obtained on a Gemini 200 Mz specrtometer with TMS as an internal standard and mass spectra on FT VG-7070H mass spectrometer using the GI technique at 70 ev. Elemental analysis was carried out on a Heraeus CHN-O Rapid analyser. Purity of the compound was checked by TLC.

Synthesis of 2-Amino-4-bromo-6-methoxy benzothiazole (2)

2-Bromo-4-methoxy aniline (10.8 gm, 0.1 M) and sodium thiocynate (8 gm, 0.1 M) were dissolved in glacial acetic acid (75 ml). The solution was cooled in freezing mixture. Bromine (16 gm, 5 ml, 0.1 M) in glacial acetic acid (20 ml) was added with stirring and maintaining temperature below 25°C. The mixture was allowed to stand for overnight at room temp. The resulting hydrobromide was dissolved in hot water and neutralized with 20 % NaOH to obtain base. The amine thus obtained was filtered, washed with water and recrystallized in aq. alcohol to get the product 6.5 gm.

(60 %), M.P 160 °C., IR (KBr): 3440 cm^{-1} (Asymmetric stretching of -NH_2), 3340 cm^{-1}(N-H Symmetrical stretching of -NH_2), 3052cm^{-1} (Ar-H stretching), 1630 cm^{-1} (-C=N stretching), 1325 cm^{-1} (Ar–C-O stretching), ^{1}HNMR ($CDCl_3$) : δ 3.4 (singlet, 3H, CH_3) due to -OCH_3, δ 6.0 (broad, 2H, NH_2), δ 7.0-7.5 (two singlet, 2H, Ar-H), m/z 230 (M+2, 98 %), 228 (M^+,100%),

Scheme-1



4-Bromo-2-hydrazino -6-methoxy-benzothiazole (3)

Hydrazine hydrate (80%, 9 ml) was taken in a round bottom flsk, cooled the solution to 5°C and added conc. HCl (6 ml) in dropwise fashion with constant stirring. The flask was kept at room temperature for half an hour. 2-amino-4-bromo-6-methoxy benzothiazole (6 gm) and ethylene glycol (24 ml) was added in portions. The contents of the flask were heated at 150 °C to 160 °C on an oil bath for three hours and then cooled. The obtained product, 4-bromo-6-methoxy-2-hydrazino benzothiazole was filtered, washed with cold water and crystallized from ethyl alcohol to give 3.6 gm (62%), M. P. 172°C, IR (KBr) : 3320 cm^{-1} (asymmetric N-H stretching of $–NH_2$), 3203 cm^{-1} (symmetric N-H stretching of $–NH_2$) m/z: 275 (M+2), 273 (M^+)

General procedure for Synthesis of hydrazone of 2-hydrazino-4-bromo -6-methoxy benzothiazole and substituted aromatic aldehyde (4a-af)

2-hydrazino-4bromo-6-methoxy benzothiazole (0.01 M) and aromatic substituted aldehyde is suspended in ethanol seperatly.the mixture of these suspended solution was refluxed on water bath for three hours. The reaction mixture was cooled and obtained solid filtered by using vaccume pump. The obtained product washed with ethyl alcohol and recrystallised from hot benzene.

4a. 2.5 gm , M. P. : 150 °C, IR(KBr) : 3185 cm-1 (-OH Stretch), 3160 (N-H) stretch), 1584 (C= N Stretch), 1290, (C-N Stretch),

4b. : Yield : 2.4 gm, M. P. : 130 °C. IR (KBr) : 3200 cm^{-1} (-OCH_3 Stretch), 3167 cm^{-1} (N-HStretch), NMR shows 3.4 Singlet due to OCH_3 group.

4c. : Yield : 2.6 gm , M. P. : 115 °C. IR (KBr):3180 cm-1 (-OH Stretch), 3174 cm-1 (N-H Stretch).

4d. : Yield : 2.5 gm, M. P. : 140 °C. I.R. (KBr) : 3389 (N-H stretching) 3053 (= C-H stretch in aromatic ring), 1541 (C=N stretch), 1290 (C-N stretch),

4e. Yield : 2.5 gm , M. P. 182 °C, IR (KBr):3423 cm-1 (O-H) stretching), 3209 cm-1 (N-Hstretching),.

4f. Yield : 2 gm , M. P. : 138 °C, IR (KBr) :, 3200 cm-1 (N-H stretching),

General procedure for synthesis of 3-Substituted-5-bromo-7-methoxy 1,2,4 triazolo [3,4-b]-benzothiazole. (5a-5f)

4-Bromo-2-substituted -6-methoxy benzothiazolyl hydrazone (0.002 M) was taken in dry benzene (50 ml). To this was added Attenbarrow's active manganese dioxide[1] (2.0 gm, 0.016 M) and the mixture was refluxed on water bath for three hours. Contents were poured on hot condition in petridish, benzene solvent was removed by evaporation. Obtained solid product was recrystallized from hot ethanol,

All compound (5a-5f) shows absence of N-H streatching in IR specrum, which confirms the formation of cyclised product. Compound 5a shows absorption signal at 3200 cm^{-1} due to O-H streatching while it is absent in compound 5b and 5f because absence of O-H substituent on aromatic ring.

Table : 1

Sr. No.	Compound	Molecular formula	Molecular formula Weight	Yied In gm	M. P In ^{0} C.
1	5a	$C_{16}H_{12}BrN_3O_3S$	406	1.2	183
2	5b	$C_{16}H_{11}BrN_3O_2S$	390	1.3	170
3	5c	$C_{16}H_{12}BrN_3O_3S$	406	1.5	102
4	5d	$C_{15}H_9BrN_3O_2S$	376	1.0	182
5	5e	$C_{15}H_9BrN_3O_2S$	376	1.2	118
6	5f	$C_{17}H_{14}BrN_4OS$	403	1.4	103

Antimicrobial screening: Result and discussion:

Table-2: Evaluation of antimicrobial activity of 3-substituted 5-bromo 7-methoxy 1,2,4 triazolo [3,4,-b] benzothiazole.

Sr. No.	Comp.	Antimicrobial activity (zone of inhibition)			
		E.coli	***Erwinia cartovora***	***Bacillus subtilis***	***Xanthomo-nas. citri***
1	5a	+++	+++	++	++
2	5b	++	+++	+++	++
3	5c	++	++	+++	+
4	5d	+	-	-	+
5	5e	+	+	+	+
6	**5f**	+++	+++	++	++

The compounds (5a-5f) were tested for their antimicrobial activity by cup plate agar diffusion method against *E.coli* (Gram –ve) *B.subtilis* (Gram +ve), *E. carotovara* and *Xanthomonas citri* using ampicillin, streptomycin. and penicillin as a standard for comparison. The antibacterial screening data of the compounds is presented in table No.1. Dimethyl sulphoxide was used as a control (solvent). Compound 5a and 5f is active against *E. coli* and *E. carotovara* species while 5c compound is more active against *Bacillus subtilis* species. compound 5b active against *Bacillus subtilis* and *E. carotovara* species. Compound 5d and 5e are inactive against all four species tested.

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Role Of Physicochemical Properties in Drugs

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Abstract

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. In pharmacology, a drug is a chemical substance typically of known structure, which when administered to a living organism produce a biological effects. Pharmaceutical drugs also called a Medicine. Medicine which is a chemical substance used to treat, cure, prevent or diagnose a disease to promote well. The drugs were obtained through extraction from Medicinal Plants. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product, the effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules. The present paper is based on the literature survey on the Physiochemical properties of drugs studied by various scientists. Physical properties of drugs are responsible for its action. The drug react extra cellular according to simple chemical reactions like neutralization, chelating, oxidation, etc.

Keywords*: solubility, Pharmaceutical, properties, drugs etc*

Introduction:

Physical properties, solvation properties related to interactions with different media, properties or molecular attributes that define intrinsic chemical reactivity. A drug is a chemical substance that interacts with proteins in the body to affect a physiological function. This is the general idea behind all medicine. Once these substances are absorbed into the systemic circulation they bind with certain proteins changes the functioning of the cell slightly.

Physical and chemical properties of substances are very important in identifying and studying chemical compounds. Physical properties are different from chemical properties of a substance. The main difference between physical and chemical properties is that physical properties can be observed without changing the chemical composition of a substance whereas chemical properties can be observed by changing the chemical composition of a substance [1]. The physical characteristics impact the passage of a drug molecule from the administered dose to the site of action, profoundly influencing its pharmacokinetics and pharmacology [1]. Chemical properties are properties that can be measured by changing the chemical composition of a substance. The chemical composition of a substance is like the identity of that substance

Why to study Physicochemical Properties of Drugs?

A complete knowledge of the relevant therapeutic and physicochemical properties of the drug is required to determine the proper formulation and delivery method of a drug. Avdeef A. etal [2]discuss that in addition to providing a basic understanding of the importance of solubility and stability to drug delivery, methods to enhance solubility and physical and chemical stability are described. They also focus on the processes required for the proper drug formulation. Since most drugs are administered in the solid state, the formulation process for tablets is described in detail. They also discuss on some basic drug delivery methods, with an emphasis on the physicochemical properties that impact those methods [2]. For Example: The various Physicochemical properties of the drug that affect drug dissolution and its rate are solubility, particle size, polymorphism, salt form, pseudo polymorphism, complexation, wettability, etc. Pharmaceutical formulation is the multistep process where the active drug is mixed with all other components by considering the factors of particle size, polymorphism, pH, and solubility and becomes the final beneficial medicinal product. Pharmaceutical drugs are usually categorized into drug classes. A group of drugs will share a similar chemical structure, or have the same mechanism of action, the same related mode of action or target the same illness or related illnesses [3]. The Anatomical Therapeutic Chemical Classification System (ATC), the most widely used drug classification system, assigns drugs a unique ATC code, which is an alphanumeric code that assigns it to specific drug classes within the ATC system [4].

Principle of drug action:

Goldstein A. etal [5] focus on the appearance of a text which is almost completely devoted to the theory of drug action, and in fact covers no particular drug in a systematic fashion, emphasizes the remarkable growth of pharmacology as a science. At a molecular level and in an orderly manner it dissects and demonstrates the logic by which man has attained the ability to control living processes of all types by the use of chemicals

How do Physicochemical Properties affect Drugs Absorption?

Avdeef A. etal [2] studied on solubility and permeability are considered as the major physicochemical factor that affect the rate and extent of oral drug absorption, moreover

other physicochemical properties always show their effects to drug absorption via affecting solubility and permeability [6].

Factors affecting on drugs solubility:

a) Drug solubility & dissolution rate b) Particle size & effective surface area c) Polymorphism & amorphism d) Pseudopolymorphism (hydrates/solvates) e) Salt form of the drug f) Lipophilicity of the drug (pH- Partition-hypothesis) g) pKa of drug & gastrointestinal pH h) Drug stability

Kerns EH. etal [7] focused on all drugs can be administered via number of routes Bolus is the administration of the medication, drug and other compound that is given to raise its concentration in blood to an effective level. Inhaled as an aerosol, vape, inhaler or dry powder. Injection as a solution, suspension or emulsion. Orally as a liquid or a solid, that is absorbed through the intestines. Sublingually, diffusing into the bloodthrough tissues under the tongue. Rectally as a suppository, that is absorbed by the rectum or colon [8].

Physicochemical properties of drugs

The ability of a chemical compound to elicit a pharmacological/ therapeutic effect is related to the influence of various physical and chemical properties of the chemical substances on the bio molecules that is interacted with. Physical properties of drugs are responsible for its action. Chemical properties of drug react extra cellularly according to simple chemical reactions like neutralization, chelation, oxidation, etc.

Types of physicochemical properties of drugs

A. Solubility
B. Partition co-efficient
C. Hydrogen bond
D. Chelation / Complexation
E. Ionization of drugs
F. Surface activity
G. Protein Binding

Solubility:

C. D. Rangel-Yagui. Etal[8] studied on the solubility of the substance at a given temperature. Solubility depends on the nature of solute and solvent as well as temperature, pH of pressure. The solubility of drug may be expressed in terms of its affinity or repulsion for either an aqueous or organic solvent [9]. Kerns EH. and C. D. Rangel-Yagui [8] focused on Solubility is based on the highest-dose strength of an immediate release product. A drug is considered highly soluble when the highest dose strength is soluble in 250 mL or less of aqueous media over the pH range of 1 to 7.5. Solubility improvement techniques can be categorized in to physical modification, chemical modifications of the drug substance, and other techniques. Physical Modifications includes Particle size reduction like micronization and nanosuspension, modification of the crystal habit like polymorphs, amorphous form and cocrystallization, drug dispersion in carriers like eutectic mixtures, solid dispersions, solid solutions and cryogenic techniques. Chemical Modifications includes Change of pH, use of buffer, complexation, and salt formation.

Partition co-efficient

Leo A. etal [10] explained on the chemical and pharmaceutical sciences, both phases usually are solvents. Most commonly, one of the solvents is water, while the second is hydrophobic, such as 1-octanol. Hence the partition coefficient measures how hydrophilic or hydrophobic a chemical substance. Partition coefficients are useful in estimating the distribution of drugs within the body. Hydrophobic drugs with high octanol-water partition coefficients are mainly distributed to hydrophobic areas such as lipid bi layers of cells. Hydrophilic drugs are found primarily in aqueous regions such as blood serum. Edwards MP, etal [11] studied on drug's distribution coefficient and how easily the drug can reach its intended target in the body, how strong an effect it will have once it reaches its target, and how long it will remain in the body in an active form. Log P is an octanol -water Partition co-efficient and measure the degree of hydrophobicity playing vital role in drug absorbtion.

Hydrogen Bond:

Edwards MP, etal [11] studied on the hydrogen bond which is a special dipole – dipole interaction between the hydrogen atom in a polar bond such as N-H, O-H or F-H and electronegative atom O, N, F atom. Dipoles result from unequal sharing of electrons between atoms within a covalent bond. These are weak are capable of forming hydrogen bonding is also soluble in water [1]. A number of motifs, several of which are clearly underutilized in drug discovery are analyzed in more detail by comparing small molecules and protein ligand X-ray structure. The effects on physiochemical properties, sets of closely related structures with and without the ability to form intra molecular hydrogen bonds were designed, synthesized and characterized with respect to membrane permeability, water solubility and lipophilicity [9].

Chelation / Complexation:

Drug complexation can lead abeneficial properties such as enhanced aqueous solubility and stability. In some instances, complexation also can lead to poor solubility or decreases absorption of drug in the body. For some drugs, complexation with certain hydrophilic compounds can enhance excretion.

Ionization of drugs:

Allen R. I., etal studied on the drugs are either weak acids or bases and can exist in either ionized or unionized state. Ionization = Protonation and deprotonation resulting in charge molecules. The ionization of the drug depend its pKa and pH. As the majority of drugs are weak acid and base of the dissociation constant in each case helps in understanding the ionic form a molecule will take across a range of pH values. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affect pharmacokinetic (PK) characteristics such as absorption, distribution, metabolism and excretion. The association between pKa and PK has also resulted in the requirement for pKa values to be measured for regulatory compliance. Allen R. I., etal [12] focused on the rate of drug adsorption is directly proportional to the concentration of the drug at absorbable form but not the concentration of the drug at the adsorption site. Ionization form imparts good water solubility to the drug which is required of binding of drug and receptor interaction. Unionized form helps the drug to cross the cell membrane **[12]**.

Surface Activity:

Surfactant is defined as a material that can reduce the surface tension of water at very low concentration. Surface active agents affect the drug adsorption which depends on:

- The chemical nature of surfactant
- Its concentration
- Its affect on biological membrane and the micelle formation.

In lower concentration of surfactant enhanced the rate of adsorption because amphiphiles reduces the surface tension and better adsorption. In higher concentration of surfactant reduced the rate of adsorption

Protein Binding:

Haupt V. J, etal [13] explained on the reversible binding of protein with non specific and non functional site on the body protein without showing any biological effect is called as protein binding. Protein + Drug⇌Protein – drug complex. Depending on the whether the drug is a weak or strong acid, base or neutral, it can be bind to single blood proteins to multiple proteins. The most significant protein involved in the binding of drug is albumin, which comprises more than half of blood proteins. The degree of protein binding can greatly affect the pharmacokinetics of drugs acid drugs such as non steroidal anti-inflammatory drugs (NSAIDs) tend to bind predominantly to albumin. Albumin is the most abundant plasma protein and it is critical to maintaining the colloidal entotic pressure in the vascular system. As a negative acute phase protein, albumin concentration decreases during inflammation. Other proteins, including corticosteroid binding globulin are important for binding of some specific drugs but are less important in overall drug protein binding. There is equilibrium between free and bound drug, just like the relationship of ionized and non ionized drug molecule. Protein binding is most clinically significant for antimicrobial therapy. Changes in protein binding caused by drug interactions are assumed to instantaneously change free drug concentrations and have been frequently cited as a cause of adverse drug reaction.

Conclusion:

From literature survey it is concluded that study of physiochemical properties are to be studied before the drugs are provided in market. The physicochemical properties of compounds that determine their interaction with transport proteins and the enzymes involved in drug clearance. Lipophilicity is an important physicochemical property resulting in interaction and, in particular, inhibition of both transport proteins and enzymes. Solubility is one of the important parameters to achieve desired concentration of drug in systematic circulation for achieving required pharmacological response. Partition Coefficient is useful in estimating the distribution of drugs within the body. The partition coefficient measures how hydrophilic or hydrophobic a chemical substance is one of the solvent is water while the second is hydrophobic, such as 1- octanol. Hydrogen bonding plays a crucial role in determining the specificity of ligand binding. Hydrogen bonding holds complementary strands of DNA together, and they are responsible for determining the three dimensional structure of folded proteins including enzymes and antibodies Chelation therapy is the preferred medical treatment for reducing the toxic effects of metals. Complexation is an extensively used technique in the pharmaceutical field to improve solubility of several pharmaceutical ingredients and subsequently the

bioavailability of poorly water soluble drugs. Ionized drugs are not absorbed as efficiently as unionized drugs. A drug that is a weak acid will be adsorbed primarily in acidic environment, whereas, a drug that is a weak base will be absorbed in the alkaline environment of small intestines. The action of surface activity in drug as a liquid membrane hypothesis of drug action for surface active drugs. Protein binding can influence the drugs biological half life. The bound portion may act as a reservoir or depot from which the drug is slowly released as the unbound form. The pKa of a drug influences lipophilicity, solubility, protein binding and permeability which in turn directly affects pharmacokinetic characteristics such as absorption, distribution, metabolism and excretion (ADNE)[1-5]. The modern drug discovery involves the identification of screening hits, medicinal chemistry and optimization of those hits to increase the affinity, selectivity, efficacy and oral bioavailability. The effect of a drug in the human body is mediated by specific interactions of the drug molecule with biological macromolecules, led scientists to the conclusion that individual chemicals are required for the biological activity of the drug.

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Green Chemistry,Nanotechnology,Environmental Chemistry and Synthetic Organic Chemistry.

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Abstract:-

Nano material are important in many diverse areas,from basic research to various application in Electronics,biochemical sensors catalysis energy.Bridge between homogeneous & Heterogeneous catalysis.Close to Homogeneous catalyst.Microwave assisted Nano catalysis in aqueous medium,in last fews years, Microwave assisted chemistry has blossomed in to a matured and useful Technique for a variety of applications. In India, agriculture plays an important role for development in food production. In our country, agriculture are depends on the monsoons which is not sufficient source of water. So the irrigation is used in agriculture field. In Irrigation system, depending upon the soil type, water is provided to plant. In this paper, automatic irrigation system based on GSM module is studied. The developed system is a machine based system, which automates the irrigation of land by combining various software and hardware approaches together to find exact field information and to provide instant across the field. This involves some sensors, LCD display, buzzer, artificial lights and GSM.Here we are using sensors to monitor the field condition. Those are Temperature, humidity, soil moisture, and fire and light sensors. All these devices are connected to the microcontroller.GSM is used for communication purpose only

Key words:- *Nanoparticles synthesis, icrobial synthesis, Phytonanotechnology, UV–visible spectroscopy.*

Introduction:-

Green chemistry is also known as environmentally benign chemistry or sustainable chemistry ,Paul Anastas and John Warner, who defined green chemistry as the design of chemical products and processes that reduce or eliminate the use and generation of hazardous substances.Chemical developments also bring new environmental problems and harmful unexpected side effects, which result in the need for 'greener' chemical products. Green chemistry looks at pollution prevention on the molecular scale and is an extremely important area of Chemistry due to the importance of Chemistry in our world today and the implications it can show on our environment. The Green Chemistry program supports the invention of more environmentally friendly chemical processes which reduce or even eliminate the generation of hazardous substances. Anastas and Warner formulated the twelve principles of green chemistry in 1998. These serve as guidelines for chemists seeking to lower the ecological footprint of the chemicals they produce and the processes by which such chemicals are made.The invention, design and application of chemical products and processes to reduce or to eliminate the use and generation of hazardous substances.

Green Chemistry Is About

- Waste Minimisation at Source
- Use of Catalysts in place of Reagents
- Using Non-Toxic Reagents
- Use of Renewable Resources
- Improved Atom Efficiency
- Use of Solvent Free or Recyclable Environmentally Benign Solvent systems

Principles Of Green Chemistry

1. **Prevention of Waste or by-products**
   It is better to prevent waste than to treat or clean up waste after it is formed
2. **Atom Economy**:-
   Atom economy (atom efficiency) describes the conversion efficiency of a chemical process in terms of all atoms involved (desired products produced).

$$Atom\ Economy = \frac{Mol.\ weight\ of\ Desired\ product}{Mol.\ weight\ of\ all\ reactants} \times 100$$

3. Minimization of hazardous products

Wherever practicable, synthetic methods should be designed to use and generate substances that possess little or no toxicity to people or the environment.

4. Designing Safer Chemicals

Chemical products should be designed to effect their desired function while minimising their toxicity

5. Safer Solvents & Auxiliaries

"The use of auxiliary substances (e.g. solvents, separation agents, etc.) should be made unnecessary wherever possible, and innocuous when used"

6. Design for Energy Efficiency

Energy requirements of chemical processes should be recognized for their environmental and economic impacts and should be minimized. If possible, synthetic methods should be conducted at ambient temperature and pressure. Developing the alternatives for energy generation (photovoltaic, hydrogen, fuel cells, bio based fuels, etc.) as well as continue the path toward energy efficiency with catalysis and product design at the forefront.

7. Use of Renewable Feedstock

"A raw material or feedstock should be renewable rather than depleting whenever technically and economically practicable."

8. Reduce Derivatives

Unnecessary derivatization (use of blocking groups, protection/de-protection, and temporary modification of physical/chemical processes) should be minimized or avoided if possible, because such steps require additional reagents and can generate waste. More derivatives involve ,Additional Reagents ,Generate more waste products More Time ,Higher Cost of Products .Hence, it requires to reduce derivatives.

9. Catalysis

Catalytic reagents (as selective as possible) are superior to stoichiometric reagents. e.g. Toluene can be exclusively converted into p-xylene (avoiding o-xylene & m-xylene) by shape selective zeolite catalyst.

10. Designing of degradable products

Chemical products should be designed so that at the end of their function they break down into innocuous degradation products and do not persist in the environment.

11. New Analytical Methods

"Analytical methodologies need to be further developed to allow for real-time, in-process monitoring and control prior to the formation of hazardous substances."

12. Safer Chemicals For Accident Prevention

"Analytical Substances and the form of a substance used in a chemical process should be chosen to minimise the potential for chemical accidents, including releases, explosions, and fires."

Microwave assisted Reaction: An approach to green Chemistry

Microwave assisted organic synthesis is defined as the preparation of desired organic compound from available starting material via some procedure involving microwave irradiation. As it is less hazardous it is a potential tool of green chemistry. Microwave Synthesis opens up new opportunities to the synthetic chemist in the form of new reaction that are not possible by conventional heating. It is an enabling technology for accelerating drug discovery and development processes.

Nanoparticles

Nanoparticles are particles which lie in dimensions between 1-100 nm. Nano derived from the Greek word Nanos which means dwarf or extremely small It can be used as a prefix for any unit to mean a billionth of that unit. For example, nanoseconds (billionth of a second), nanometer (billionth of a meter), nanoliter (billionth of a liter). They consist of micro molecular materials in which the active ingredients (drug or biologically active material) is dissolved, entrapped, encapsulated, adsorbed or attached

Methods For Synthesis Of Nano Particles

Physical method; time and energy consuming, synthesis at high temperature, and pressure.

Chemical method; simple, inexpensive, and low temperature, use of toxic reducing and stabilizing agents make it harmful.

Green method; Easy, efficient and eco-friendly. eliminates the use of toxic chemicals, consume less energy and produce safer products and by products.

Major Limitation Of Microbial Synthesis

Microbial synthesis is of course readily scalable, environmentally benign and compatible with the use of the product for medical applications, but production of microorganisms is often more expensive than the production of plant extracts.

Techniques For Synthesis Of Nano Particles

The methods for making nanoparticles can generally involve either a “top down” approach or a “bottom up” approach

Phytonanotechnology

Phytonanotechnology is actually the synthesis of Nano particles using fresh plants or plant extracts. Plant derived nanoparticles produced by readily available plant materials. The nontoxic nature of plants are suitable for fulfilling the high demand for nanoparticles with applications in the biomedical and environmental areas.Recently, successfully synthesized gold and silver nanoparticles using the leaf and root extract from the medicinal herbal plant Panax ginseng. Additionally, various plant parts, including leaves, fruits, stems, roots, and their extracts, have been used for the synthesis of metal nanoparticles. It has been proposed that proteins, amino acids, organic acid, vitamins, as well as secondary metabolites, such as flavonoids, alkaloids, polyphenols, terpenoids, heterocyclic compounds, and polysaccharides, have significant roles in metal salt reduction and, furthermore, act as capping and stabilizing agents for synthesized nanoparticles.

Phytochemical Screening

It refers to the extraction, screening and identification of the medicinally active substances found in plants. Some of the bioactive substances that can be derived from plants are flavonoids, alkaloids, carotenoids, tannin, antioxidants and phenolic compounds. Color changes or precipitation formation is the indication of presence of these phytochemicals.

Preparation Of Plant Extract For Phytochemical Screening

Take Fresh plant. An ethanol extract of sample can be prepared by milling 50 gram of the desired part of plant in an electric blinder. Then mixed paste of plant with 200 ml ethanol in conical flask by shaking it with hand and placed for three days or by mixing it with magnetic stirrer. Now filter the Ethanoic extract of plant. Placed the filtrate on rotary evaporator at 60 degree centigrade to remove ethanol. The extract will be concentrated by placing it on water bath at 75 degree centigrade. Now the sample is prepared for the phytochemical screening.

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Future aspects of 5G Technology in India- A Review

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Abstract

5G is the fifth-generation digital cellular network which will completely revolutionize digital cellular technology. We have seen from the past several years that how digital cellular network technology changed from 1G to 4G. This technology was widely accepted and spread in our country in a short span of time. As due to increasing dependency on technology we need much more high-speed internet with high data download capacity and low latency. In the future we will see how machine to machine communication, unman machine with artificial intelligence will change our way of life. Already we are using 4G cellular networks which are not enough with growing demand due to vast changing technology. In India very soon department of telecommunication will roll out auction of spectrum for 5G digital cellular network which is likely to be start in the beginning of 2022. Many private players like Reliance Jio, Bharti Artel and Vodafone Idea is ready to provide 5G network. Although department of telecommunication is all ready to go for 5G. But many users still unaware about 5G technologies. It is because due to increasing technology over the years we have seen lot of changes in nature and its effect ultimately on the human body. Hence, there is a palpable sense of fear among users related to its effect on health. This current paper provides comprehensive study of 5G technology, its implementation and myths related to health.

Keywords: 5G, 4G, Frequency, Millimeter wave, Radiation.

Introduction

5G is the fifth-generation digital cellular technology which is having capability of providing high speed internet connectivity, high downloading data with low latency. Although 4G is widely used in our country but it needs to update due to vast increasing and developing technology. It is believed that around 2025 there will be more than 5.7 billion mobile users around the world and 5 billion internet users [1]. We have seen from the last several years how there is an increasing dependence on technology. Today for anything we need internet through cell phones from calling taxi to order meal as well as using GPS for searching location. In the last decade there has been a tremendous increase of internet users. According to recent data there are 4.72 billion people around the world use the internet in April 2021, that's more than 60 percent of the world's total population. Internet users are currently growing at an annual rate of 7.6 percent. The average global internet user spends almost 7 hours online each day [2].

In India the number of smartphone users was estimated to reach over 760 million in 2021 [3]. This figure is growing day by day due to the majority of mobile users are going towards digital. Mostly youngsters are using digital payment option from paying bills for electricity to ordering meals and also for shopping. During covid-19 pandemic lockdown 2020-21 internet usage increased by 60%. From students to employees everyone was using the internet for working at home and to spend some time. This will not stop here we will see in future how our dependency will enhance on internet. Everything will be control by internet through Artificial intelligence such as driver less cars, house appliances, security cameras, smartwatches and machine to machine communication, like a high-speed vehicle on road or highway will communicate with another car on highway and provide safer journey. It will not only save our time but also avoid accidents. Another most significant aspect is its use within the medical field now a days we've seen how this pandemic realized the importance of doctors. Many countries don't have proper medical facility with specialized doctors. This pandemic emphasized the requirement of more specialized doctors. Available statistics show that, as of 2020 over 55% of WHO Member States report back to have but 20 medical doctors per 10000 populations (almost 40 countries within the WHO African region). Medical experts are distributed unevenly across the world. Countries with very cheap relative need have the best numbers of physicians, while those with the greatest burden of disease must manage with a far smaller health workforce. The African Region suffers quite 22% of the world burden of disease but has access to only 3% of medical examiners and less than 1% of the world's financial resources [4].

Even in our country position is additionally not good many remote areas don't have specialized doctors. Most of the specialized doctors are working in cities, only a few doctors are working in rural areas but most of them are not specialized. In such cases patients have to visit a nearby city hospital. The doctor to population ratio in India is 1:1456 against the WHO recommendation of 1:1000 [5]. To solve this problem either we've got to extend no of qualified doctors which isn't possible in less time like current situation of pandemic or we have to

use technology like 5G. Within which 5G digital network allow telemedicine service through which doctors can treat patients at remote area and do surgery from anywhere any time without delaying in time [6]. 5G technology isn't only useful for consumers but also very essential for our growing economy. Due to pandemic 2020-2021 government of India suffered huge loss of revenue. India's growth fell to 3.1 percent within the fourth quarter of the financial year 2020, as per the Ministry of Statistics [7]. The 140 million people lost employment during this lockdown, and others got salaries cut. During the primary phase of lockdown, the Indian economy was expected to lose $4.5 billion on a daily basis [8]. But 5G technologies may well be a game changer it can create lot of revenue to government of India and large no of jobs especially in private sector. Department of Telecommunications (DoT) is expected to auction spectrum for 5G in next year 2022, it delayed because of pandemic. Many companies like Jio, Bharti Airtel, Vodafone, BSNL and MTNL is geared up to go for 5G networks. It is estimated that 5G will deliver $150 billion in additional GDP for India [1].

On the other hand, there are some misconceptions related to 5G technology among the general public. The misperception is related to health, some believe that 5G cellular technology will create lot of radiation due to which it will cause to health. As radiofrequency EMFs at sufficiently high-power levels can adversely affect health. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) published Guidelines in 1998 for human exposure to time-varying EMFs up to 300 GHz, including the radiofrequency EMF spectrum. This commission is regulating 5G network frequency to make sure safety to individual and environment. During this pandemic also some were believed that the second wave of coronavirus has been caused by testing of 5G technology. The ministry of communication issued an announcement they said that there's no relationship between coronavirus and testing of 5G network. They urged public not to believe on such fake news [9]. The study of 5G digital cellular network technology in this paper is to analyse its future aspects on Indian consumers.

Comprehensive information about 5 G technologies

Wireless communication and transmission of data is possible by the use of Radio frequency (RF) waves. It is the electromagnetic wave frequencies that lie in the range extending from around 3 kHz to 300 GHz in the electromagnetic spectrum. We are using this radio frequency from navigation of ship to satellite communication. Some frequency is reversed only for government agencies such as space and research or defence forces in countries. In wireless communication our journey starts from the analog world and now we come to the digital world. The first generation mobile communication start from 1G it had provided bandwidth 2.4 Kbps with frequency 30 KHz, 2G had provided bandwidth 64 Kbps with frequency 1.8 GHz, 3G had provided bandwidth 100 kbps-2 Mbps speed with frequency 2 GHz and 4G currently provided 100 Mbps-1 Gbps speed with frequency 8 GHz and is based on LTE (Long term evolution) Technology [10]. LTE developed by 3Gpp (Third generation partnership project). It was used to speed up the device like cell phone, tablet, Wi-Fi etc. We can observe that how bandwidth and frequency had increased from 1G to 4G with increasing technology and its uses. Following table-1 shows the development in technology [11].

Generation	Year of development	Technology	Frequency	Bandwidth
1G	1982	AMPS, NMT, TACS	30KHz	2Kbps
2G	1992	GSM	1.8 GHz	14.4-64 Kbps
3G	2001	CDMA	1.6-2 GHz	2Mbps
4G	2012	LTE, WiMAX	2 - 8 GHz	2Mbps to 1Gbps

Table-1 (Development of network from 1G to 4G)

5G is the fifth-generation digital cellular technology which will use higher Radio frequency of electromagnetic spectrum for high speed internet, high data downloading with low latency. 5G is technology designed to meet the requirements of IMT-2020 set by the International Telecommunication Union (ITU-R).

IMT-2020 (5G) is meant to supply way more enhanced capabilities than those provided by IMT Advanced (4G). Compare to 4G network its speed will 10 times higher. 5G will provide data speed 1 GB/sec and peak data speed will be 2-20 GB/sec. 5G will provide 1 milli second low latency which is far lesser than 4G having 100 milli second. 5G network uses higher frequency range from electromagnetic spectrum called as millimeter wave (mm Wave). Millimeter waves have a shorter range than microwaves, this millimeter wave is completely new for transmission of signal or data. But due to the use of higher frequency of millimeter wave it

affects the range of network. Hence, 5G network service area is divided into small geographical areas called cells. Small cells are low powered cellular radio access nodes in which it has a range of 10 meters to a few kilometers. These small cells are connected to macro cells or large tower to receive and emit signal See. 5G technology used Multiple bitstreams technique to transmitted data simultaneously. A technique called as beamforming, in which the base station computer will continuously calculate the best route for radio waves to reach each wireless device and will organize multiple antennas to work together as phased arrays to create beams of millimeter waves to reach the device.[13] [14].

To increase its capacity 5G used Massive MIMO (multiple input and multiple output) technique in which large number of antennas employed in transmitter and receiver. Each antenna is individually-controlled and will embed radio transceiver components. All 5G devices in a cell are connected to the internet and telephone network by radio waves through a local antenna in a cell. For wide 5G network service, it operates on three frequency bands-Low, Medium and High. Spectrum requirement for 5G network lies around three key frequencies ranges: Sub-1 GHz, 1-6 GHz and above 6 GHz. The selection of spectrum among these ranges will depend upon the capacity and coverage requirement of the region [17]. Low-band 5G uses the identical frequency range to 4G cell phones, 600–850 MHz, giving download speeds a little higher than 4G: 30–250 megabits per second (Mbit/s).[12] Low-band cell towers have a range and coverage area just like 4G towers. Mid-band 5G uses microwaves frequency from 2.5–3.7 GHz, allowing speeds of 100–900 Mbit/s, with each cell tower providing service up to many kilometers in radius. High-band 5G uses frequencies of 25–39 GHz, near the underside of the millimeter wave band. Since millimeter waves (mm Wave or mm W) have a more limited range, it requires many small cells.[15] Hence, millimeter signal waves could be impeded or blocked by materials in walls or windows [16]. Hence, 5G network service is planning to deploy cells only in dense urban environments and areas where crowds of people congregate like sports stadiums and convention centres. By deploying small cells, operators are able to support significantly higher capacity in dense areas, as well as improve coverage in areas where building blockage otherwise reduces the signal strength. Since 5G capabilities rely on hyper dense network, small cells are going to be required to be deployed at every 200-250 meters on many varieties of infrastructure like electric utility poles, street light poles, bus stands, roof tops, traditional cell towers, etc. [17]. The industry standards group 3GPP chose the 5G NR (New Radio) standard along with LTE as their proposal for submission to the IMT-2020 standard [18][19]. 5G NR include lower frequencies (FR1), below 6 GHz, and higher frequencies (FR2), above 24 GHz.

World position at 5G Technology

South Korea was the first country to adopted 5G network at her own country on a large scale. Swedish telecoms giant Ericsson predicted that 5G internet will cover up to 65% of the world's population by the end of 2025.[20] Also, it plans to invest 1 billion reals ($238.30 million) in Brazil to add a new assembly line dedicated to fifth-generation technology (5G) for its Latin American operations.[21].

India's preparation in the direction of 5G

A 5G High Level Forum (5G HLF) was founded by the Union Government of India in September 2017 to articulate the vision for 5G in India and to recommend policy initiatives & action plans. In August 2018 (5G HLF) released a report ''Making India 5G ready'' suggesting measures within the area of Spectrum Policy, Regulatory Policy, Education and Awareness Promotion Program, Application & Use Case Labs, Development of Application Layer Standards, Major Trials and Technology Demonstration and Participation in International Standards. The Government has launched a program titled 'Building an End-to-End 5G Test Bed' to advance innovation and research in 5G. The program envisages close collaboration between universities and small technology companies. The goal of the program is to make proof-of-concept 5G prototypes that are broadly compliant with the 3GPP standards [17]. On the standards front, the Low Mobility Large Cell (LMLC) use case accepted in the International Mobile Telecommunications-2020 (IMT-2020) requirements. Low Mobility Large Cell (LMLC) is a standard use to provide better coverage of internet in rural areas and other places of country. The base station in rural areas will cover up to 6 km range. According to 5G High Level Forum due to 5G roll out there will be an economic advantage of USD 1 trillion on India by 2035.

The National Digital Communication Policy-2018 (NDCP-2018), released on 26th September 2018 with the target of fulfil the information and communication needs of citizens and enterprises through the establishment of a ubiquitous, resilient, secure, accessible and affordable Digital Communications Infrastructure and Services; within the process, support India's transition to a digitally empowered economy and society. The three mission of NDCP are as following: -

1. Connect India- To push Broadband for All as a tool for socio-economic development, while ensuring service quality and environmental sustainability.
2. Propel India- To harness the facility of emerging digital technologies, including 5G, AI, IoT, Cloud and Big Data to enable provision of future ready products and services; and to catalyse the fourth industrial revolution (Industry 4.0) by promoting Investments, Innovation and IPR.
3. Secure India- To secure the interests of citizens and safeguard the digital sovereignty of India with paying attention on ensuring individual autonomy and selection, data ownership, privacy and security; while recognizing data as an important economic resource.

To support the digital economy and achieving objectives of National Digital Communication Policy there is a need of implementing 5G technology as early as possible. Department of Telecommunication (DoT) most probably in the beginning of 2022 will allow companies to conduct 5G trials and DoT wish to implement 5G technology in urban as well as rural areas. Dot will provide spectrum to companies like Reliance Jio, Bharti Airtel, Vodaphone idea and MTNL for a period of six months to conduct trials of 5G network across the country. Many cities like Delhi, Mumbai, Kolkata, Bangalore, Hyderabad and some part of Gujarat are companies first choice for conducting 5G trials. DoT also allowed Nokia, Samsung, Ericsson and C-DOT [22]. Companies got permission for the frequency 700 MHz, 3.3-3.6 GHz and 24.25-28.5 GHz to conduct trials. The base price for purchasing bandwidth per hertz is 492 crores (Source-media).

Effect of Radiation from 5G tower on Health

In India, there has always been a public concern on possible adverse health effects from the Electro-Magnetic Field (EMF) Radiation from mobile towers. Due to this people oppose the erection of telecom towers on rooftops of houses and in densely populated areas. For clearing the misunderstanding of public on mobile towers emissions, DoT in May 2017, launched Tarang Sanchar. It is a web portal for Information sharing on Mobile Towers and EMF Emission Compliances [12].

The ICNIRP issued some guidelines on Limiting Exposure to Electromagnetic Field are for the protection of humans exposed to radiofrequency electromagnetic fields (RF) within the range 100 kHz to 300 GHz. The rules cover many applications like 5G technologies, Wi-Fi, Bluetooth, mobile phones, and base stations. The rules periodically revised and updated as advances are made in the relevant scientific knowledge [23]. There is no any current evidence to confirm the existence of any health consequences from exposure to low level electromagnetic field [4]

EMF Radiation Norms in India

Department of Telecommunications have prescribed stricter precautionary norms for exposure limit for the Radio Frequency Field (Base Station Emissions) which is 1/10th of the present limits prescribed by ICNIRP and recommended by WHO [24]. The present limits/levels for antennae (Base Station) EMF emissions for general public exposure are detail below

Frequency Range	E-Field Strength (Volt/Meter (V/m))	H-Field Strength (Amp/Meter (A/m))	Power Density (Watt/Sq.Meter (W/Sq.m))
400MHz to 2000MHz	0.434f ½	0.0011f ½	f/2000
2 GHz to 300GHz	19.29	0.05	1

In addition to norms for mobile towers, government of India also released precautionary guidelines for mobile users [25].

1. Keep distance-hold the cell phones faraway from body to the extent possible.

2. Use a headset (wired or Bluetooth) to keep the handset off from your head.
3. Do not press the phone handset against your head. Radio frequency (RF) energy is inversely proportional to the square of the distance from the source.
4. Limit the length of mobile calls.
5. Use text as compared to voice wherever possible.
6. If the radio signal is weak, a mobile phone will increase its transmission power. Find a strong signal and avoid movement, use your phone where reception is good.
7. Let the call connect before putting the handset on your ear or start speaking and listening-A mobile phone first make the communication at higher power and then reduces power to an adequate level. More power is radiated during call connecting time.
8. If you have an option, use a landline (wired) phone. Not a mobile phone.
9. People having active medical implant should preferably keep the cell phone a minimum of 15 cm faraway from the implant.
10. While purchasing a mobile handset check the SAR value of the mobile phone.

Conclusion

As telecom sector is growing tremendously from last several years. Today, India is amongst top three of largest and one of the fastest growing telecom markets in the world. Also, India is very large country and installation of such 5G base stations or network will only be in certain small areas, not everywhere in country at least for some years. Hence, there is a need of large investment in telecom sector to achieve goal of digital India such smart cities, complete digital transaction etc. Adopting 5G technology will also benefit to our economy. According to various reports increase in 10% penetration of mobile broadband leads to more than 1% increase in GDP of country. Public safety is one of the important issues in our country and govt of India must convince to public and make sure that there are no any adverse health effects.

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An overview of study of basics of Artificial Intelligence (AI)

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Abstract

According to McKinsey, AI has the potential to create 600 billion dollars of value in retail bring 50 per cent more incremental value in banking compared with other analytics techniques. In transport and logistics, the potential revenue jump is 89% more. AI automates redundant jobs allowing a worker to focus on the high level, value-added tasks.

Introduction to AI

The new technology Artificial intelligence that can augment human intelligence, amplify human capabilities, and provide actionable insights that drive better outcomes for employees, customers, partners, and communities.[1]

Nowadays, AI is used in almost all industries, giving a technological edge to all companies integrating AI at scale. If an AI uses for its value purpose, it can automate mundane and repetitive tasks, allowing the sales representative to focus on relationship building, lead nurturing, etc. If a company XYZ provides a conversation intelligence service.[2] Each time a Sales Representative makes a phone call, the machine records, transcribes and analyzes the chat. The VP can use AI analytics and recommendation to formulate a winning strategy.
In a nutshell, AI provides cutting-edge technology to deal with complex data that a human being cannot handle. When AI is implemented at scale, it leads to cost reduction and revenue increase.

History of Artificial Intelligence

Artificial Intelligence is a buzzword today, although this term is not new. In 1956, avant-garde experts from different backgrounds decided to organize a summer research project on AI. Four bright minds led the project; John McCarthy (Dartmouth College), Marvin Minsky (Harvard University), Nathaniel Rochester (IBM), and Claude Shannon (Bell Telephone Laboratories).[3]
Here, is tabulated history of Artificial Intelligence:

Innovation	Year
Karel Čapek plays named "Rossum's Universal Robots, the first use of the word "robot" in English.	1923
Foundations for neural networks laid.	1943
Isaac Asimov, a Columbia University alumni, use the term Robotics.	1945
John McCarthy first used the term Artificial Intelligence. Demonstration of the first running AI program at Carnegie Mellon University.	1956
Danny Bobrow's dissertation at MIT showed how computers could understand natural language.	1964
Scientists at Stanford Research Institute Developed Shakey. A robot equipped with locomotion and problem-solving.	1969
The world's first computer-controlled autonomous vehicle, Stanford Cart, was built.	1979
Significant demonstrations in machine learning	1990
The Deep Blue Chess Program beat the then world chess champion, Garry Kasparov.	1997
Interactive robot pets have become commercially available. MIT displays Kismet, a robot with a face that expresses emotions.	2000
AI came into the Business world in the year 2006. Companies like Facebook, Netflix, Twitter started using AI.	2006
Google has launched an Android app feature called "Google now", which provides the user with a prediction.	2012
The "Project Debater" from IBM debated complex topics with two master debaters and performed exceptionally well.	2018

Subsystems of Artificial Intelligence

Here, are some important Subsystems of Artificial Intelligence:

Machine Learning: Machine learning is the art of studying algorithms that learn from examples and experiences. Machine learning is based on the idea that some patterns in the data were identified and used for future predictions. The difference from hardcoding rules is that the machine learns to find such rules.

Deep Learning: Deep learning is a sub-field of machine learning. Deep learning does not mean the machine learns more in-depth knowledge; it uses different layers to learn from the data. The depth of the model is represented by the number of layers in the model. For instance, the Google LeNet model for image recognition counts 22 layers.[4]

Natural Language Processing: A neural network is a group of connected I/O units where each connection has a weight associated with its computer programs. It helps you to build predictive models from large databases. This model builds upon the human nervous system. You can use this model to conduct image understanding, human learning, computer speech, etc.[5]

Expert Systems: An expert system is an interactive and reliable computer-based decision-making system that uses facts and heuristics to solve complex decision-making problems. It is also considered at the highest level of human intelligence. The main goal of an expert system is to solve the most complex issues in a specific domain.

Fuzzy Logic: Fuzzy Logic is defined as a many-valued logic form that may have truth values of variables in any real number between 0 and 1. It is the handle concept of partial truth. In real life, we may encounter a situation where we can't decide whether the statement is true or false.[6]

Types of Artificial Intelligence

There are three main types of artificial intelligence: rule-based, decision tree, and neural networks.

- Narrow AI is a type of AI that helps you perform a dedicated task with intelligence.
- General AI is a type of AI intelligence that can perform any intellectual task efficiently like a human.
- Rule-based AI is based on a set of pre-determined rules that are applied to an input data set. The system then produces a corresponding output.
- Decision tree AI is similar to rule-based AI in that it uses sets of pre-determined rules to make decisions. However, the decision tree also allows for branching and looping to consider different options.
- Super AI is a type of AI that allows computers to understand human language and respond in a natural way.
- Robot intelligence is a type of AI that allows robots to have complex cognitive abilities, including reasoning, planning, and learning.

How AI is different from Machine Learning?

The terms machine learning and artificial intelligence are often used interchangeably, but they don't mean the same thing. Most of our Smartphone, daily device or even the internet uses Artificial Intelligence. Very often, AI and machine learning are used interchangeably by big companies that want to announce their latest innovation. However, Machine learning and AI are different in some ways.[7]

AI- artificial intelligence- is the science of training machines to perform human tasks. The term was invented in the 1950s when scientists began exploring how computers could solve problems on their own.

Artificial Intelligence is a computer that is given human-like properties. Take our brain; it works effortlessly and seamlessly to calculate the world around us. Artificial Intelligence is the concept that a computer can do the same. It can be said that AI is a large science that mimics human aptitudes.

Machine learning is a distinct subset of AI that trains a machine to learn. Machine learning models look for patterns in data and try to conclude. In a nutshell, the machine does not need to be explicitly programmed by people. The programmers give some examples, and the computer is going to learn what to do from those samples.[8]

Machine Learning (ML)

When we talk about machine learning, we're referring to a specific technique that allows a computer to "learn" from examples without having been explicitly programmed with step-by-step instructions. Currently, machine learning algorithms are geared toward answering a single type of question well. For that reason, machine

learning algorithms are at the forefront of efforts to diagnose diseases, predict stock market trends, and recommend music.

Artificial Intelligence (AI)

Artificial intelligence is an umbrella term that refers to efforts to teach computers to perform complex tasks and behave in ways that give the appearance of human agency. Often they do this work by taking cues from the environment they're embedded in. AI includes everything from robots who play chess to chatbots that can respond to customer support questions to self-driving cars that can intelligently navigate real-world traffic.

AI can be composed of algorithms. An **algorithm** is a process or set of rules that a computer can execute. AI algorithms can learn from **data**. They can recognize patterns from the data provided to generate rules or guidelines to follow. Examples of data include historical inputs and outputs (for example, input: all email; output: which emails are spam) or mappings of A to B (for example, a word in English mapped to its equivalent in Spanish). When you have trained an algorithm with training data, you have a **model**. The data used to train a model is called a **training dataset**. The data used to test how well a model is performing is call **test dataset**. Both training datasets and test datasets consist of data with input and expected output.[9] You should evaluate a model with a different but equivalent set of data, the test dataset, to test if it is actually doing what you intended.

Bias Challenges in AI

So far, we've discussed the broad ethical implications of developing technology. Now, let's turn our attention to AI. AI poses unique challenges when it comes to bias and making fair decisions.

Opacity

We don't always know why a model is making a specific prediction. Frank Pasquale, author of *The Black Box Society*, describes this lack of transparency as the black box phenomenon. While companies that create AI can explain the processes behind their systems, it's harder for them to tell what's happening in real time and in what order, including where bias can be present in the model.[10]

Speed, Scale, and Access to Large Datasets

AI systems are trained to optimize for particular outcomes. AI picks up bias in the training data and uses it to model for future predictions. Because it's difficult if not impossible to know why a model makes the prediction that it does, it's hard to pinpoint how the model is biased. When models make predictions based on biased data, there can be major, damaging consequences.

Machine learning techniques have improved since 1979. But it's even more important now, as techniques become more opaque, that these tools are created inclusively and transparently. Otherwise, entrenched biases can unintentionally restrict access to educational and economic opportunities for certain people. AI is not magic; it learns based on the data you give it. If your dataset is biased, your models will amplify that bias.

Developers, designers, researchers, product managers, writers—everyone involved in the creation of AI systems—should make sure not to perpetuate harmful societal biases. (As we see in the next module, not every bias is necessarily harmful.) Teams need to work together from the beginning to build ethics into their AI products, and conduct research to understand the social context of their product. This can involve interviewing not only potential users of the system, but people whose lives are impacted by the decisions the system makes. We discuss what that looks like later in this module.

Why is AI booming now?

Now in this Artificial Intelligence testing tutorial, let's learn why AI is booming now. Let's understand by the below diagram.

A neural network has been out since the nineties with the seminal paper of Yann LeCun. However, it started to become famous around the year 2012. Explained by three critical factors for its popularity are:

1. Hardware
2. Data
3. Algorithm

Machine learning is an experimental field, meaning it needs data to test new ideas or approaches. With the boom of the internet, data became more easily accessible. Besides, giant companies like NVIDIA and AMD have developed high-performance graphics chips for the gaming market.

Hardware

In the last twenty years, the CPU's power has exploded, allowing the user to train a small deep-learning model on any laptop. However, you need a more powerful machine to process a deep-learning model for computer vision or deep learning. Thanks to the investment of NVIDIA and AMD, new generations of GPU (graphical processing unit) are available. These chips allow parallel computations, and the machine can separate the computations over several GPUs to speed up the calculations.[1-3]

For instance, with an NVIDIA TITAN X, it takes two days to train a model called ImageNet against weeks for a traditional CPU. Besides, big companies use clusters of GPU to train deep learning models with the NVIDIA Tesla K80 because it helps to reduce the data center cost and provide better performances.[4]

Data

Deep learning is the structure of the model, and the data is the fluid to make it alive. Data powers artificial intelligence. Without data, nothing can be done. The latest Technologies have pushed the boundaries of data storage, and it is easier than ever to store a high amount of data in a data center.

Internet revolution makes data collection and distribution available to feed machine learning algorithms. If you are familiar with Flicker, Instagram or any other app with images, you can guess their AI potential. There are millions of pictures with tags available on these websites. Those pictures can train a neural network model to recognize an object on the picture without the need to collect and label the data manually.

Artificial intelligence combined with data is the new gold. Data is a unique competitive advantage that no firm should neglect, and AI provides the best answers from your data. When all the firms can have the same technologies, the one with data will have a competitive advantage. To give an idea, the world creates about 2.2 exabytes, or 2.2 billion gigabytes, every day.[7]

A company needs exceptionally diverse data sources to find the patterns and learn in a substantial volume.

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An IoT Enabled Colorimetric Technique Based Soil Fertility Detection System

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Abstract:

Agriculture is a wide economic sector and plays a vital role within the overall economic development of the nation. Technological advancements in the sector of agriculture can ascertain to enhance the ability and quality of assured farming activities. Bad quality crop production is often because of either unnecessary use of fertilizer or insufficient addition of fertilizer. The intend of our developed system is to detect the N(nitrogen), P(phosphorus) and K(potassium) contents of soil and based on the result, farmers will used the necessary fertilizers as per need. For this we proposed IoT enabled colorimetric techniques based soil fertility detection system. Based on a color sensor (TCS 3200) as a soil fertility detection sensor, microcontroller (Arduino Nano V3) and Esp8266 Wi-Fi module for transferring data to cloud.

Keywords: Color Sensor, Soil Fertility, NPK nutrients, ESP8266, Internet of things, Arduino.

I. Introduction:

Agriculture is the only source for crop production. Soil is a valuable resource in agriculture. The physical and chemical conditions of soil play a most important role in the crop production cycle. In addition to this farmers can also add organic or inorganic nutrients to the soil in a precise proportion. Thus soil fertility detection plays a major role for better crop growth as well as yield [1]. Continuous cropping without enough measurement of soil nutrients may lead decrease in soil fertility and yield. Soil nutrient identification is greatly required for proper plant growth and effective fertilization [2], [3]. Farmer's follows traditional techniques still today which commonly make used of approximations i.e. unbalance feeding of fertilizer without knowing the actual necessity of nutrient to a specific crop, results in low productivity [4]. In order to improve the farm meadow, the fertility of soil is an important factor in increasing the crop production. The soil fertility is, amount of nutrients content available in the soil. There are 17 nutrients available in the soil classified into two classes namely macronutrients and micronutrients. Nitrogen (N), Phosphorous (P), Potassium (K) are some of the main macronutrients, which usually required in large quantity in the soil and zinc, copper, iron, boron are some examples of micronutrients which required in comparatively small amounts. The quantity of macronutrients defines the soil fertility [5]. Depending upon the deficiency of a particular nutrient for a particular crop in a given region the amount of fertilizer is determined. Thus the quantity of fertilizer to be used depends upon the soil fertility, crop to be grown and type of soil [6].

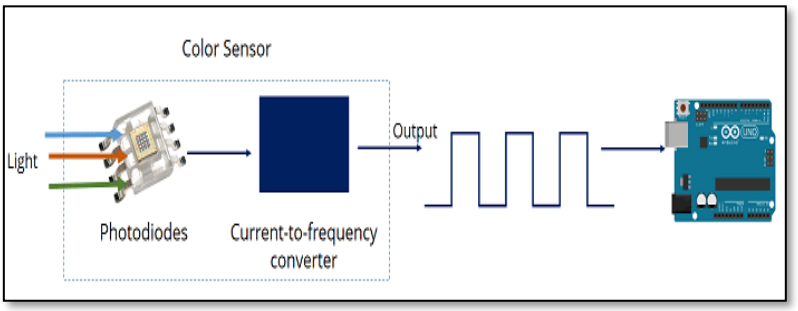
The general soil testing is take place in laboratories which are maximum available at district level also it take a considerable time to generates the results. Hence this process is time consuming and costly too [7]. Moreover the overall soil fertility changes with change in weather conditions. Thus a system required which will detect the soil nutrients in real time.

This system is based on colorimetric technique. In this, color sensor is used as a soil nutrient sensor, an aqueous solution of soil under test has been added different reagents which will eventually change its color depending on the concentration of the present micro nutrients values. Light emitted from a color detecting sensor will fall on the solution and the reflected light is received by color detecting sensor will convert the (R, G, B) values to electrical signals. Further using the threshold values which were earlier saved in the database of the microcontroller helps to detect the levels of micronutrients present in the soil sample.

II. Methodology

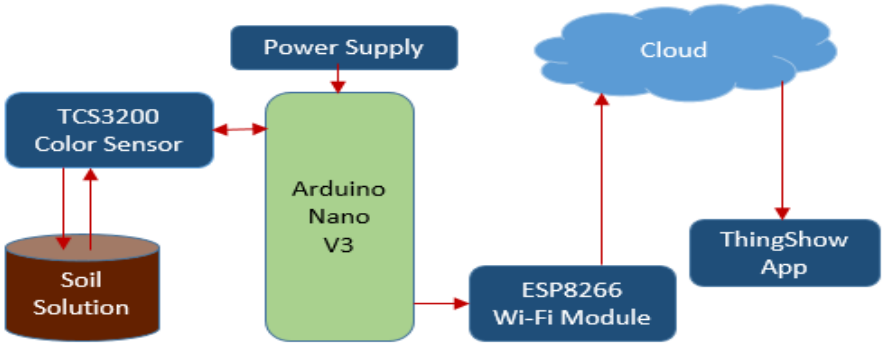
As we discuss the above said issue to resolve we design, Colorimetric Technique Based Soil Fertility Detection System. In this system, the color sensor works by illuminating white light on soil aqueous solution sample and measure the intensity of reflected light with the help of 8x8 photo-diode chip available in TCS3200

sensor. The microcontroller helps to uphold the intensity of light which is falling on soil sample, also helps to store the resultant values to cloud with the help of ESP8266 Wi-Fi module.



System Block Diagram

To detect the presence of nutrients in the soil by using colorimetric technique. First we make the aqueous solutions with the help of different chemicals regents. Then using color sensor we detects the nutrients present in the soil.



A. **SYSTEM REQUIREMENT**

Arduino Nano V3:

Arduino NANO V3 is the open source tiniest Embedded Development board launched by Arduino based on Atmega328 SMD Package Microcontroller. Also, is a Surface stand Breadboard Friendly board integrated with Mini USB Port.

Specifications:-

- Operating Voltage: 5 V
- Digital I/O Pins: 14, Analog Input Pins: 08
- DC Current per I/O Pin: 40 mA
- Flash Memory: 32 KB

Color Sensor TCS3200:

The TCS3200, Color Sensor programmable color light-to-frequency converters that comes with silicon photodiodes and a current-to-frequency converter on a single CMOS IC. The output is a square wave and frequency directly proportional to light intensity. [8]

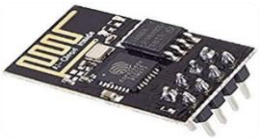
The colors of the visible light spectrum

Color	Wavelength interval	Frequency interval
Red	~ 700–635 nm	~ 430–480 THz
Orange	~ 635–590 nm	~ 480–510 THz
Yellow	~ 590–560 nm	~ 510–540 THz
Green	~ 560–520 nm	~ 540–580 THz
Cyan	~ 520–490 nm	~ 580–610 THz
Blue	~ 490–450 nm	~ 610–670 THz
Violet or Purple	~ 450–400 nm	~ 670–750 THz

Table 1. Pin values for activation of Photodiode filters. [8]

S2	S3	PHOTODIODE TYPE
L	L	Red
L	H	Blue
H	L	Clear (No Filter)
H	H	Green

ESP8266 Wi-Fi Module:

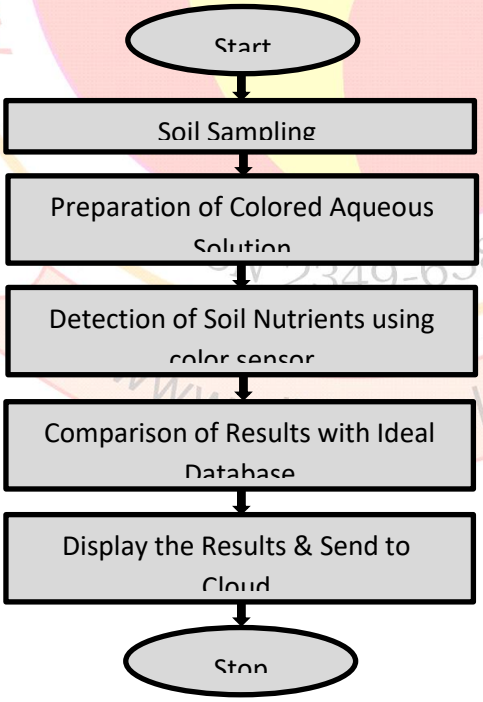


The ESP8266 is a low-cost Wi-Fi module, have built-in TCP/IP networking software, and microcontroller capability. Each ESP8266 module comes pre-programmed with an AT command can be change its baud rate by calibrating it with the help of AT commands.

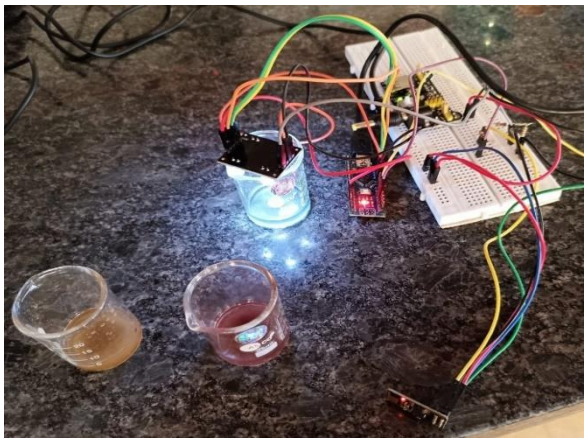
B.**Making Of Aqueous Solutions**

The aqueous solution is made with the help of soil testing kit with standard procedure.

C. WORKING FLOW CHART:



D.CIRCUIT DESIGN

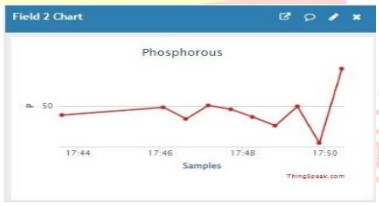


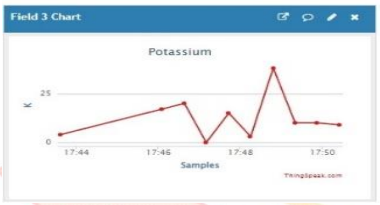
III.Results & Discussion

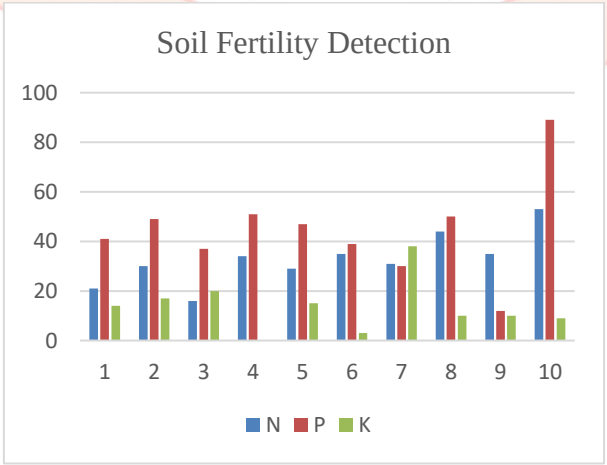
Table 2. Threshold color intensity values. [6]

Nutri.	Low	Medium	High
N	$x < 15$	$15 < x \leq 20$	$20 < x \leq 25$
P	$16 < x \leq 20$	$20 < x \leq 35$	$35 < x \leq 50$
K	$20 < x \leq 25$	$25 < x \leq 40$	$50 < x \leq 60$

By taking all adaptive measures we have used 2cm fixed distance between sensor & solution and we get sample results as below.







The above bar graph shows the different samples we have tested from different areas & found NPK values are changes from one area to another area.

Also the threshold color intensity values for N, P, K contents in the soil are described in Table 2. Which provides the scope of color intensity values in form of low, medium and high for N, P, K.

IV.Conclusions

This research concludes that, we have successfully developed a real time IoT enabled soil fertility detection system. This research will definitely reduce the farmer's time as well as money for soil fertility testing. Also help them to decide amount of fertilizers to be added in the soil according to the real time availability of the nutrients like N, P and K in the soil.

V.Future Scope

By extending this research can be possible to predict suitable crops according the nutrients are available in the soil. Also an atmospheric parameters effect can be observed on soil fertility. Therefore, the farmers can take necessity action towards their crop yield.

VI.Acknowledgement

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A Comparative Analysis on Energy Conservation in Wireless Sensor Networks Using NLP, Naive Bayes, and SVM Classifications

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Abstract:

A fundamental goal in the design of wireless sensor networks (WSNs) is to optimize their lifetime. Designers can use intelligent energy management models to help them reach this goal. These models strive to minimize the number of sensors used to report atmospheric measurements and, as a result, achieve improved energy economy while retaining the appropriate level of measurement precision. We compare three intelligent models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM) classifiers in this research. For the identical WSNs Lifetime Extension Factor, simulation results prove that Linear-SVM selects sensors that yield higher energy efficiency than MLP and Naive Bayes.

A wireless sensor network (WSN) is a network of sensor nodes that are linked together. These sensors are low-cost, tiny devices with limited functionality. In a typical setting, every node in a sensor network must continuously monitor and gather information such as temperature, sound, and humidity, as well as physical conditions like pressure, vibration, motion, and light. Sensors may collaborate based on the circumstances to meet the sensor network's purpose of performing specific jobs. Furthermore, the information gathered is extremely significant. Because of the vast number of sensors placed, they are interconnected depending upon the nature of the analyzed measures. This paper analyses three smart models based on Naive Bayes, Multilayer Perceptrons (MLP), and Support Vector Machine (SVM)

1. Introduction

Well-known algorithms in the area of machine learning, neural networks, and artificial intelligence include Naive Bayes, Multilayer Perceptron (MLP), and Support Vector Machine (SVM). For starts, MLP can successfully conduct the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's intricacy [7]. In the realm of data mining, SVM is also viewed as a very powerful algorithm.

It's been used successfully in a number of scientific applications [9]networks, for example. artificial intelligence, etc. MLP can, for starters, do the following tasks. A successful classifying operation [7, 8]. On the other hand MLP neural network training, on the other hand, is difficult due to the the structure's complexity [7]. In the area of data mining, SVM is also viewed as a very powerful algorithm.It's been used in a variety of scientific applications [9]networks, for example. artificial intelligence, etc. For beginnings, MLP can meet all the requirements of the classification operation [7, 8]. MLP neural network training, on the other hand, is difficult due to its structure's complexity [7]. In the realm of data mining, SVM is also regarded as a very powerful algorithm. It's been used successfully in a variety of research application.

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Despite the significance of machine learning algorithms for WSN applications [5], there has been little consideration paid to offering comparative studies between different algorithms, particularly when it comes to WSN energy management. Additionally, there have been little contributions to identifying an effective intelligent energy management paradigm for these networks. Except for the one we disclosed in our prior study [11], there is no previous work that supports the usage of a certain intelligent algorithm compared to others for WSNs [10]. We present an intelligent and efficient energy management model for WSNs leveraging MLP rather than Naive Bayes in that paper. MLP and Naive Bayes were compared in order to see how well they performed in terms of performance.

In comparison to Naive Bayes, MLP demonstrates a considerable improvement in selection accuracy when given the same Lifetime Extension Factor. Due to its complexity and the updating process in the sequence of weights, MLP takes longer to train the network. As a result, sensor nodes may use a little more energy during the deployment phase.

Considering the significance of machine learning techniques for WSN applications [5], comparison investigations between these methods have received little attention. Especially as it pertains to WSN energy management. .Furthermore, there have been little contributions to specify a model for intelligent energy management that is appropriate for these interconnections There hasn't been anything like this before, as far as we know.

work that serves to reinforce the application of a particular clever algorithm except for the one we have, comparable to others for WSNs [10]. A paradigm for effective and efficient energy management Instead of Naive Bayes, WSNs use MLP. A comparison is possible to correlate MLP and Naive Bayes, a study was conducted.MLP achieves a higher Lifetime Extension Factor when given the same Lifetime Extension

Bayesian naivety. MLP, on the other hand, takes longer to train.Due to its complexity and the updating procedure in the network a set of weights As a result, sensor nodes may use energy.

First, relying on intelligent machine learning models and algorithms, we have provided a detailed state-of-the-art associated energy management in WSNs. Second, we used three real labeled evaluation metrics to conduct a thorough comparison of three clever neural network classifiers. Third, using a confusion matrix, the effectiveness of these three intelligent classifiers is evaluated. Finally, an intelligent paradigm for enhancing the energy in WSNs has been proposed. We used statistical ranking and selection strategies to address this model not only at the classification level, but also at the processing level. These two strategies, as well as the use of Linear-SVM as an intelligent classifier, are crucial in the development of the model.

The largest Contributions of this work is arranged as follows. Preliminaries are presented in Section 2: which examines the latest advances in the field of intelligent models for energy management in WSNs. The context of the classification methods employed in this study, particularly Naive Bayes, MLP, and SVM, is presented in Section 3.

2. Related Work

In order to achieve energy efficiency of WSNs, several sophisticated models have been developed. Thiemjarus et al. [17] suggested a sensor selection algorithm that can aid in discovering the network's optimum number of sensor nodes. The number of sensors can be reduced without degrading the decision-making process, and the network's lifetime can be enhanced. For sensor selection, the Bayesian strategy was chosen, as this filtering method aids in the detection of the best sensors in the network. A classifier was also employed, which was the Self-Organising Map (SOM). The authors of [18] developed a selection technique for optimizing WSN energy use. Sensors were ranked from most to least important in their scheme, considering the importance of their utilization in WSNs. Thereafter, the Naive Bayes classification approach was utilized to classify the data. This method was put to the test on three well-known real-world sensor datasets. The analysis indicated that as more sensors are employed, more energy is spent, and the sensor network's lifetime is shortened. The lifetime of the sensor network can be prolonged if the sensors are ranked, as the selection algorithm is used first, pursued mostly by intelligent classifier. This is due to the fact that the number of sensors used is limited. Similarly, [19] suggested a method to reduce energy use while extending the sensor network's lifetime. This would be focused on a feature/sensor selection that reduces the number of utilised sensors to the minimum level. It does, however, use a different selection technique by using K-Nearest Neighbor (KNN) method.

The segmentation problem is considered as a classification problem in [20], with clusters being constructed using Least Squares.SVM (LS-SVM) using a hybrid kernel (a blend of SVM and LS-SVM)Kernels with polynomial and Radial Basis Function (RBF) functions. Results demonstrated that combining LS-SVM with hybrid clustering was effective.

When compared to LS-SVM with a single input, kernel produced better results.Kernel was visible in the situation of a multiclass system. In the clustering problem, there is a classification challenge.

CDLSVM, a clustering-based distributed Linear-SVM methodology that varies from previous parallel SVM algorithms in its ability to obtain a global optimal classifier, was developed. The results suggest that the proposed method is effective for large-scale WSNs since it minimizes data interchange and energy usage.

Forero et al. [22] addressed distributed classification by creating techniques for training SVM in a distributed architectural environment where communication between nodes via a centralised processing unit is banned. The distributed forms of operation demonstrated how energy might be preserved.

The DFP-SVM (Distributed Fix Partition SVM) and the WDFP-SVM (Weighted Distributed Fix Part SVM) are two energy-efficient distributed learning techniques for WSN.SVM [23, 24] has been proposed. The aim was to develop an expert in the field.

SVM in a distributed and efficient manner. As a result, it is better. On the test data, classification results were reached with Compared to the standard SVM, it uses the least amount of energy. Several classification techniques based on SVM have recently been proposed. For example, Rajasegarar et al. [25] proposed a Centered Hyperellipsoidal Support Vector Machine (CE-SVM) and a distributed Quarter-Sphere Support Vector Machine to address the problem of anomaly identification in WSNs (QS-SVM). Using four datasets that correlated to wireless sensor datasets, a comparison study using CESVM and QS-SVM was performed. For the evaluation, four datasets were used: GDI, Ionosphere, Banana, and Synth.

In addition, three distinct kernel functions were considered: RBF, polynomial, and linear. When compared to QSSVM, the results showed that CESVM used to have a higher detection accuracy. Zhang et al. [26] introduced two online outlier identification and distribution strategies for WSNs, the key contribution of which is to build livestream intelligent classifying techniques in order to find outliers in the typical behaviour of sensor data in real time. The hyperellipsoid one-class SVM is used in the proposed intelligent approaches. EOOD (ellipsoidal SVM-based online outlier detection) and EOOD (ellipsoidal SVM-based adaptive outlier detection) are the two approaches (EAOD). In order to detect abnormalities in a WSN, both EOOD and EAOD evaluate the correlation between sensor data features. The simulation results suggest that EAOD has a higher detection accuracy than other methods.

Dutta and Terhorst [27] proposed a multisensor fusion and integration strategy based on artificial intelligence. To solve the challenge, the researchers focused on the categorization level of the embedded sensor fusion system.

Most frequent sensor flaws and problems Intelligent people in particular.For aggregate soil moisture estimation, classification approaches are used.To get optimal outcomes, cosmic ray sensors were introduced.Estimations that are fault-tolerant Four classifiers were used in this study.Adaptive Neuro-Fuzzy Inference System was examined. (ANFIS), Probabilistic Neural Network (PNN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis Network (RBN), Radial Basis The RBF network and the Multilayer Perceptron constitute two types of networks (MLP) network

Experiments were conducted on three datasets, and the results demonstrated that ANFIS exceeds all other classifiers in terms of correct classification percentages. To detect intervals of food intake, Sazonov and Fontana [14] designed a sensor system, as well as signal processing and pattern recognition approaches. The analysis and classification of jaw movements was used in this investigation.

The researchers have chosen the most relevant aspects, which represented sensor signals, using the forward selection method.

The SVM was also employed as the chewing detecting classification technique. Furthermore, the linear kernel activation function was applied (Linear-SVM). The experts were able to attain a high mean accuracy of 80.98 percent for that application by implementing an intelligent classifier.

Furthermore, the linear kernel is the easiest of all the kernel functions for SVM, according to Karatzoglou et al. [28]. Linear-SVM also outperforms other machine learning classifiers, according to Ham et al. [29]. This classifier is now receiving greater attention because to its superior classification accuracy when compared to other machine learning classifiers. As a result, this efficient classifier has been used in a number of applications. A moving human motion detection system was proposed by Yun and Song [30].

Pyroelectric Infrared (PIR) sensors and intelligence classification techniques were used to build the system. The data for this investigation was acquired by recording PIR sensor signals while a person was walking. The dataset's size and memory cost were lowered by extracting and choosing identifiable features from it. In addition, Bayes Net, C4.5, decision table, KNN algorithm, Naive Bayes, MLP, and SVM were employed as intelligent classification methods.

The Linear-SVM was considered for SVM because its kernel needed less computing time than other kernels. Experiments on decreased feature sets indicated that Linear-SVM is the most efficient classifier for this application.

3. Preliminaries

This section gives a quick overview of the classification methods employed in this investigation, as well as the datasets used in the experiment.

3.1 Algorithms for Classification. Below is a brief description of the categorization algorithms employed in this study..

3.1.1 Naive Bayes Classifier. Naive Bayes is a well-known type of classifier that is based on the application of Bayes' theorem with strong independence assumptions. It is considered to be a simple probabilistic classifier that computes conditional class probabilities and then predicts the most probable class [31]. In other words, it will assign a class for an object based on the values of the descriptive attribute probability model.

3.1.2 Multilayer Perception is a type of perceptron that has multiple layers (MLP). MLP is composed of a large number of highly densely interconnected that work together to solve a specific problem. With a feed-forward information flow, it is organised in layers. Signals flow progressively through the several layers from the input to the output layer in the main topology of an MLP network.

3.1.3 Intermediate layers exist between the input and output levels. Because they are not noticeable at the input or output, they are also known as hidden layers. Each unit is used to determine the difference between a weights vector and the vector given by the previous layer's outputs. A transfer function, also known as activation, is applied to the result to produce the input for the following layer.

The following are the main steps in an MLP network's training phase: First, given a dataset's input pattern X, this pattern is forward to all the MLP's output.

second, the network is examined and the desired output is compared; third, the network is evaluated and the desired output is compared.the signal of mismatch between the network's output and the The network is notified of the desired response; and Finally, modifications to synaptic weights are performed [34].

This technique is continued for each subsequent input vector until all of the input vectors have been processed.The network is used to pass on training patterns.Support Vector Machine (SVM) 3.1.3 (SVM). The dataset is segmented into two classes by SVM, which is separated by a linear border between the normal and attack classes that maximises the margin. SVM seeks out the hyperplane with the greatest distance between it and the closest positive and negative samples [35, 36]. The basic construction of an SVM network is similar to that of a regular RBF network, except that the kernel activating function is used instead of the exponential activating function (which is commonly Gaussian). A polynomial kernel, Gaussian radial basis kernel, or two - layered feed-forward neural network kernel can all be used to activate the kernel.

3.2 The three datasets used in this study are briefly described in this section.

3.2.1. Ionosphere.The ionosphere dataset was gathered using radar in Goose Bay, Labrador. Radar signals are divided into two categories: good and bad. The data that reveal indications of some form of construction in the ionosphere are good data. Those returns that do not let transmission signals to penetrate over the ionosphere are considered bad [18]. There are 34 readings and 351 records in this collection.

3.2.2. Forest CoverType is a type of forest cover. At the University of Colorado, the Forest CoverType dataset was created. It's made to estimate the type of forest cover in unknown areas. It's been used in a series of data stream classification studies. There are 581, 012 occurrences and 54 attributes in this dataset [18, 37]. It is regarded as one of the most extensive datasets. Because of restricted memory capacity, the number of features in our sample was reduced to 25000.

Sensor Discrimination (section 3.2.3). This set of data contains 12 numerical values for samples of an unknown chemical.

There are three classifications in this labelled dataset: group A, group B, and false alarm [38]. The receiver node is used to establish which class an unknown sample belongs to after receiving 12 numerical values.

To put it another way, the receiver should say whether this unknown sample belongs in group A or group B. Whenever the sample does not fall into either of the first two groups, it is termed false alarm. There are 12 readings and 2211 records in this collection.

4.Proposed Methodology:

The classification algorithm is used to develop an intelligent neural network architecture for efficient energy management in WSNs in this paper. The selection sensor algorithm used in [18] is utilized in our work. The Ionosphere, Forest CoverType, and Sensor Discrimination datasets were utilised to assess the performance of the three intelligent algorithms in terms of classification accuracy in this work. Furthermore, for all completed experiments, 30% of the dataset is used for training data, with the remaining 70% used for testing. By establishing the shared and common parameters, we can give a fair comparison between the three classifiers, namely Naive Bayes, MLP, and Linear-SVM..

The Lifetime Extension Component is calculated as follows:

LEC=Total Sensor node/Number of sensor consumed

Two key actions were taken in [11] in order to reduce energy usage and increase the lifespan factor. The following are the two steps:

(1) The most prominent sensor nodes in WSNs were chosen after ranking them from most to least important in terms of utilisation, and

(2) Naive Bayes and MLP classification methods were used to classify them. It is important to note that in our research, we introduce an intelligent model for efficient energy management in WSNs utilising a classification approach based on SVM with linear kernel, which would be a polynomial kernel with exponent 1.

The following are the four parts of our proposed method:

(1) Preprocessing
(2) Processing:
  (a) Ranking:
  (i) Determine the feature/relevance sensor's level.
  (ii) Sort the items in ascending order.
(3) Machine Learning
(4) Evaluation of performance

Sensor Discrimination, ionosphere, and Forest CoverType The input dataset must be cleaned and formatted before moving on to the preprocessing stage. In the processing block, On the chosen dataset, two functions are applied. The The first is the Rank function, which ranks the features/sensors in order of importance. The significance level computation process as well as the sorting process are two consecutive procedures included in this function. The independent significance features test is a built-in procedure in MATLAB [39] that is used to calculate the significance level of a feature/sensor. This approach is known as the independent significance features test, according to Weiss and Indurkhya [40]. (IndFeat).

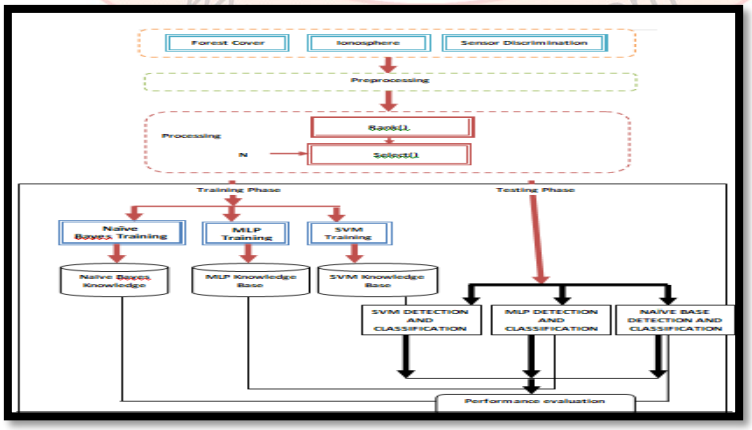

Figure: Structure of Proposed System

This method is commonly used in artificial intelligence engineering applications to quickly detect and remove poor features. To put it another way, the number of inputs that must be considered during the selection procedure will be drastically reduced. As a result, it can be utilised as a preliminary step in the selection process. Furthermore, it cuts down on the amount of time it takes to complete the final selection procedure. The sorting process, on the other hand, sorts the output of the level of significance calculation operations in descending order.

The Rank function returns an array of features/sensors that are organized from most significant to least significant. The Rank function's job is to figure out how significant each feature/sensor is. Then it sorts them in descending order, with the most key features or sensors at the top and the least important at the bottom.

On the Sensor Discrimination dataset, Figure 2 illustrates an example of the output while calculating the significant level procedure and sorting process. The diagram shows how the Ranking function's processes will be carried out in a sequential order. The Select function is then used to choose the first N features/sensors. If N = 10, for example, this method will return the numbers of the first 10 features/sensors.
Similarly, if N = 20, the first 20 features/sensors' numbers are returned, and so on.

The machine learning block is the fourth block, which applies the specified classifier (Naive Bayes, MLP, or Linear-SVM) to the N features/sensors.

Two steps are done in this block: the first is the training or learning phase, which allows the intelligent system to construct the appropriate knowledge base. The intelligent system picks up on existing relationships/correlations in the built environment.

Table 1: Experimental parameters Simply

Factor	Value
%Testing	65%
%Training	35%
Learning rate for MLP	0.35
Number of epochs for MLP	600
Number of hidden layers for MLP	1
Number of hidden neurons for MLP	(# selected sensors + # classes)/2
Kernel for SVM	Linear kernel (polynomial kernel with exponent being 1)

expressed, the training phase is a process of the intelligent system evolving to provide the optimum possible response in the testing phase. The testing phase involves putting the proposed system to the test with test datasets. This phase's output data demonstrate the system's performance and efficacy in terms of classification and computational speed.

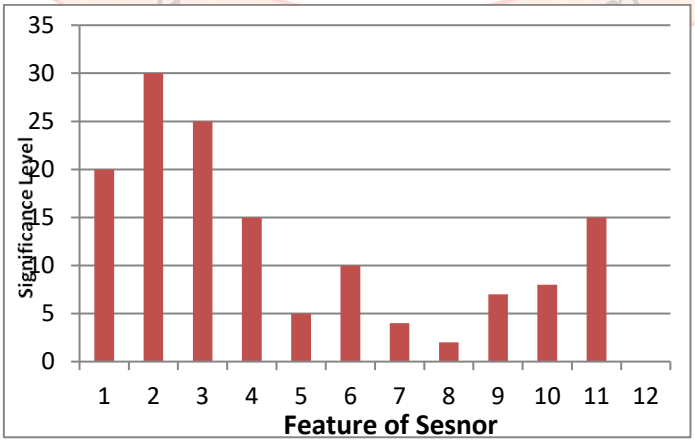

Figure:1 The result of the significance process calculation

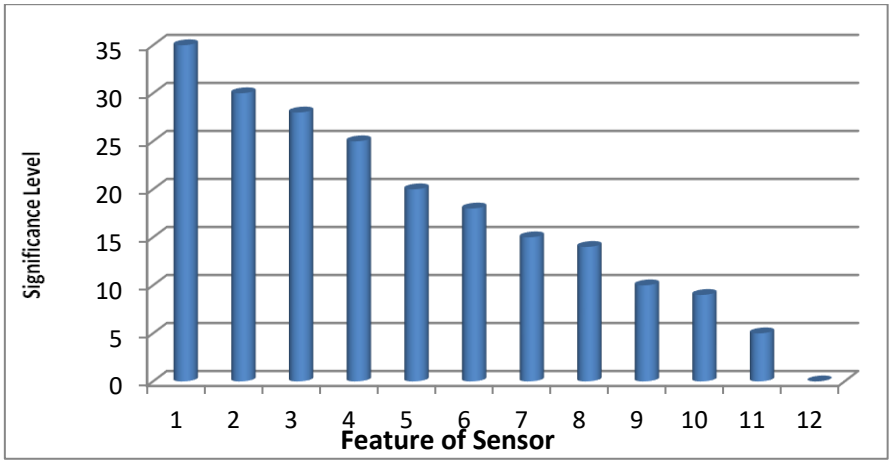

Figure:2 The result of a descending order sorting method

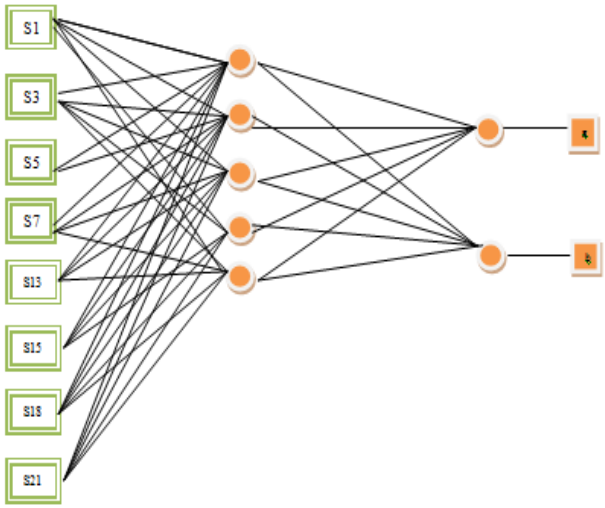

Figure 3: Experiment 1, NN structure for the selection of 10

5. Hands-on Experience:

The Ionosphere dataset, which is a radar dataset collected from 34 widely different sensor nodes, was used in this experiment. The selection algorithm presented in [18] was applied in MATLAB. This algorithm (shown in Figure 3) prioritized the sensors according to the importance of their data.

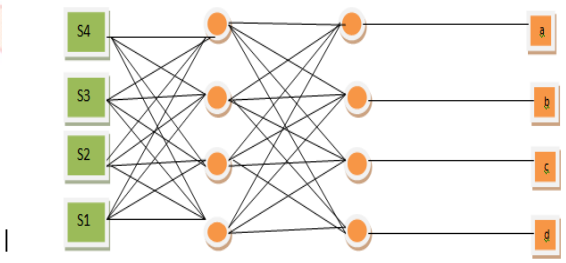

Figure 4: Experiment 3, NN structure for the selection of 4

The Forest CoverType dataset, which was created at the University of Colorado, was used in this experiment. The Forest CoverType of unknown regions, which has 581,012 records and 54 incoming values, can be predicted by studying the received data from the sensors.

6. Results Discussion

The confusion matrix [30, 42] is used to assess the performance of the three intelligent classification algorithms.

False positive (FP), true positive (TP), false negative (FN), and true negative (TN) are the four possible outcomes [42, 43], where (1) FP occurs when the actual class of test sample is negative and is classified incorrectly as positive; (2) TN occurs when the actual class of test sample is negative and is classified correctly as negative; (3) FN occurs when the actual class of test sample is positive and is classified incorrectly as negative; and (4) TP occurs when the actual class of test sample is positive

7. Conclusions

An intelligent model for efficient energy management in WSNs is presented in this paper. It examines the differences between Naive Bayes, MLP, and Linear-SVM. The goal is to figure out which intelligent categorization model is best for efficient energy management in WSNs. Different tests were run on three benchmarking datasets in order to evaluate the performance of the three classifiers.

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Hip Implant by Cluster Analysis of Anthropometry Parameters of Femur

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Abstract:

Background and Objective: A range of research told that there is extensive variations in the sizes and shapes of femur bone across different ethnic groups and geographical locations, thus particular bone-implant fit is challenging to achieve. Prosthesis of mismatched sized can caused serious problems for patients. Thus aim of the study was to design standard hip implant based on anatomical parameter of respective population. Materials and Methods: Eleven osteological parameter of femoral prosthesis of 125 patient (67 male and 59 female) were evaluated, these eleven parameter were grouped to obtain scatter diagram. Then cluster analysis in SPSS software V25 was carried out by using slink clustering method. Results: After studying scatter diagram it was found that 15% population had irregular anatomy then rest of population. So, remaining data put under cluster analysis gives 8 (4 for men and 4 for women) sets of standard anatomical parameter for designing hip implant. Conclusion: These eight standard hip implant satisfy 85% population of Vidarbha region.

Index Terms *- Hip implant, standard anatomical parameter, femoral prosthesis, mismatched sized, cluster analysis, Slink method, osteological parameter.*

I. Introduction

Importance of hip geometry has been well defined in previous studies1-5. Due to wide variation in anatomy of femoral prosthesis, it is difficult to achieve precise bone implant fit. Asians have a smaller distal femur size than that of the western population6,7. But maximum artificial femoral prosthesis are standardize and manufacture in European and North American region8 and currently available western orthopaedic implants do not match the dimensions of the proximal femoral of Indian population. The usage of these over-sized and unsuitable implant affect outcome of the surgery reported with problems such as stress shielding, micro-motion and loosening9-12. This standard hip implant were not useful for population of Vidarbha region because they were not based on anthropometry of respective population13.

The variations in dimensions may need to be considered when designing the appropriate implant14. To eliminate mismatch between femur and implant and to attain suitable fitment, it was necessary to design a few standard implant based on shape and size of proximal femur of respective population. So, objective of the study was to design standard hip implant based on anatomical parameter of Vidarbha region population.

II. Materials And Methods

Present study was carried out since 2014 in Vidarbha region central part of India. An eleven anatomical parameter of femur were identified from X-ray image of 125 patients, in the age group of 50-70 years. Out of total patients 67 were male and 58 were female. Each X-ray image of 125 patients was processed in DICOM Viewer 4.2.1 software. By means of linear and angular measure tool in software all anatomical parameter of femur were measured. The exact position of each anatomical parameter from where its value was measured shown in Fig. 1 and the measured value of each anatomical parameter designated by alphabets in Fig. 1 exposed in Fig. 2. Following were the anatomical measurements used for study:

C Femoral head diameter (FHD): Diameter of femoral head in frontal plane

C Femoral neck diameter (FND): Diameter of femoral neck in frontal plane

C Horizontal offset (HO): The horizontal distance between the centre of the femoral head and the shaft axis in frontal plane.

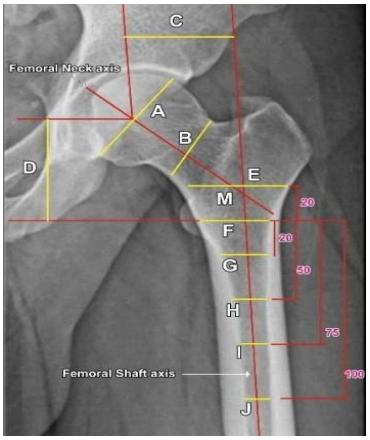

Fig. 1: Anatomical parameter on femur

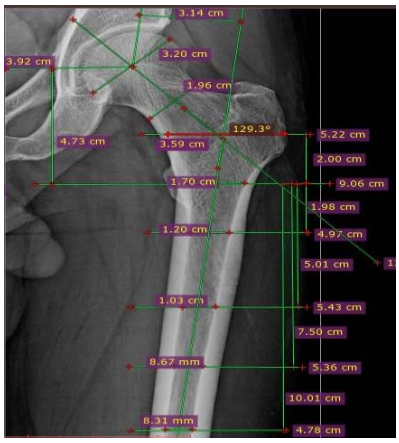

Fig. 2: Measured value of anatomical parameter on femur

C Vertical offset (VO): The vertical distance between the center of the femoral head and the middle of lesser trochanter level
C Canal width (CW): The CW 20 mm above from lesser trochanter at E in frontal plane of femur
C Canal width (CW): The CW in frontal plane, passing through the middle of the lesser trochanter
C Canal width (CW): The CW 20 mm below from lesser trochanter at G in frontal plane of femur
C Canal width (CW): The CW 50 mm below from lesser trochanter at H in frontal plane of femur
C Canal width (CW): The CW 75 mm below from lesser trochanter at H in frontal plane of femur
C Canal width (CW): The CW 100 mm below from lesser trochanter at J in frontal plane of femur
C Neck-shaft angle (NSA): The angle between the shaft axis and the neck axis

III. Grouping of anatomical parameter: The measured value of anatomical parameter of femur were divided into three groups for prosthesis designing purpose (i) A, B, E, F and G were important for deciding Anterior-Posterior cross section of prosthesis (ii) H, I, J, used for determine distal length and (iii) C, D and M for orientation of neck of the prosthesis.

IV. Finding out dissimilar set of object: Aimed at finding dissimilar set of data a standard deviation of each parameter was calculated and on the basis of standard deviation scatter diagram of each parameter was plot. After examining scatter diagram it was found that some set point were not in range because anatomical parameters of some patients were irregular i.e., there anatomy not in range with rest of patients and they requisite customized hip implant. Such patients were omitted and remaining patient was used for cluster analysis.

V. Cluster analysis: Romesburg defined cluster analysis is mathematical method, can be used to find out which objects in a set are similar. Cluster analysis has an endless list of user because classification (which object in set are similar and dissimilar) are essential building blocks in field of research. Cluster analysis carried out using following six steps: (1) Obtain data matrix, (2) Standardize data matrix, (3) Calculate resemblance matrix, (4) Implement clustering method, (5) Reposition data and resemblance matrix and (6) Compute cophenetic correlation coefficient. In existing study IBM SPSS Statistic software (Version 25) was used to execute hierarchical clustering with slink clustering method for four cluster and standard deviation ranging from -1 to 1. A slink clustering method calculate closest members of two cluster. After completing cluster analysis in SPSS software input data was split on basis of fourth cluster.

Results

The database of the measured values of each anatomical parameters for first 10 patients out of 125 patients were presented in Table 1. To find out dissimilar data base total 22 scatter diagram was obtained, few of them given below in Fig. 3 as a sample. After analyzing scatter diagram it was found that 15% patients (In male category 12 patients out of 67 patients and 7 patients out of 59 patients from female) had abnormal anatomy. These patients were omitted and listed in Table 2.Remaining 85% database of patient was used for

cluster analysis. After completing cluster analysis in SPSS software forecast values of each parameter were summarized in Table 3. Total 8 (4 Male and 4 Female) sets of standard anatomical parameters provide standard sizes hip implant designs, which was found suitable for Vidarbha region population. In this study conventional X-ray technique has been used for understanding the femur bone geometry. The outcome of current study make available eight set of standard anatomical parameter for hip implant design which satisfy maximum population of Vidarbha region. Equally they achieve proper fitment because they were standardize on anthropometry of respective population and reduces chance of revision surgery. It also reduces operating time and achieve successful positioning in hip joint.

Discussion

Surgeon who perform hip replacement surgeries must depend on implant manufacture to provide proper implants

Parameters	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	H (mm)	I (mm)	J (mm)	M (deg)
1	51.1	34.3	47.0	66.4	52.4	32.1	19.6	13.2	11.5	11.5	**131.3**
2	51.6	39.5	51.8	61.8	51.1	31.1	20.4	14.3	13.4	12.9	**120.3**
3	43.7	27.7	46.6	59.0	47.7	30.7	19.8	15.7	15.1	12.0	**125.7**
4	44.7	31.9	43.5	70.3	41.3	27.8	18.8	15.0	14.4	10.5	**134.9**
	40.5	27.1	37.8	48.9	44.4	25.1	18.0	14.0	3.6	11.5	**124.2**
	49.6	29.6	47.6	59.6	51.2	29.6	19.2	14.3	13.6	12.3	**123.5**
	49.3	36.2	34.9	54.6	49.2	30.7	20.6	12.7	11.6	10.4	**141.8**
	51.2	34.1	37.8	53.2	50.5	32.4	22.1	15.7	14.4	13.3	**124.3**
	53.8	35.1	44.4	55.0	60.0	33.7	19.4	15.3	14.9	12.2	**124.0**
	45.4	**28.3**	**40.1**	**41.8**	**51.0**	**34.4**	**23.4**	**18.3**	**15.0**	**14.9**	**132.0**

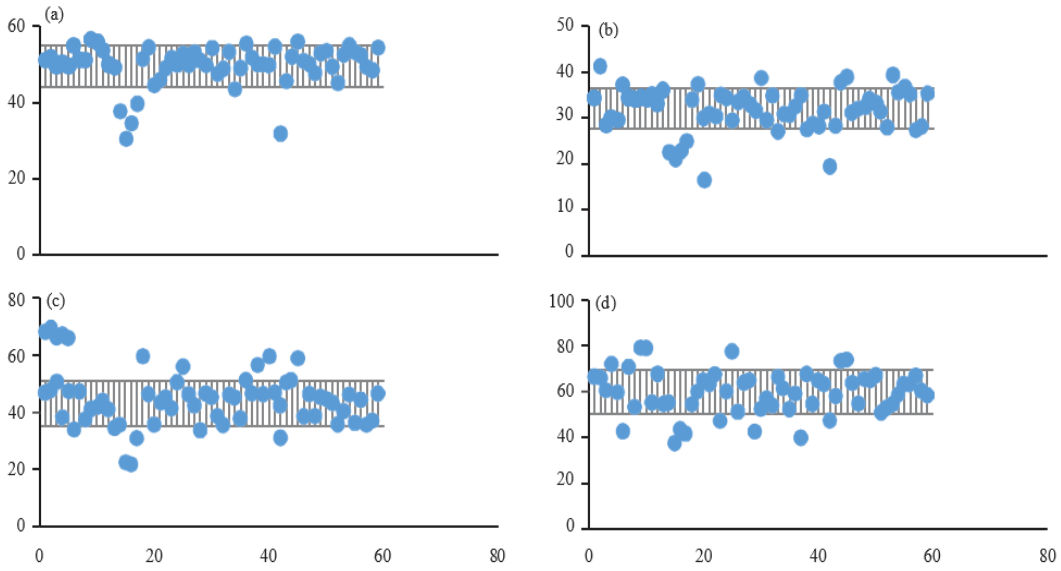

Fig. 3(a-d): Dissimiam of measured anatomical parameter as per, (a) Femoral head diameter, (b) Femoral neck diameter, (c) Horizontal offset and (d) Vertical offset.

Table 2: Irregular anatomical parameter of femur Patients having irregular anatomical parameters

	Male												Female						
AP	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
A (mm)		58	58	38	31	35	40	32	59					40	53	53			**34**
B (mm)	37			23	21	23	25	20	39					23	34	33	23	32	
C (mm)	34				23	22	31	31	59				46	30		33			**30**
D (mm)	43	79	79		38	44	41	47	74	40			37		66	64		43	**37**
E (mm)	37	56		36	35	38	40	36		57		57		34	37		54		
F (mm)	18	40	40	22	17		21	17			42	42		21			36	39	**22**
G (mm)	11	29	29		8	15	14	12		30	32	27		15			28	32	**15**
H (mm)	11	20	19	11	6	9	10	10		20	28	21		12			20	22	**10**
I (mm)		17		10	5	7	9	9		18	25	19		11			17	22	**9**
J (mm)				9	6	7	9	8		18	25			9.5				20	**7**
M (deg)	118					142			117				118			141			

Table 3: Anatomical parameter for designing standard implant

		Male				Female			
AP	N	1	2	3	4	1	2	3	**4**
A (mm)	106	55.7	49.5	47.1	53.4	51.0	45.7	43.1	**48.4**
B (mm)	106	36.5	34.0	31.8	35.2	29.1	27.7	26.0	**26.9**
C (mm)	106	50.2	43.6	40.6	47.6	43.9	41.5	39.6	**43.1**
D (mm)	106	70.3	61.2	56.7	65.8	59.9	57.2	52.7	**54.9**
E (mm)	106	51.0	47.4	43.4	54.4	58.3	54.1	44.6	**49.8**
F (mm)	106	32.3	30.3	27.8	34.8	38.1	35.3	29.0	**32.4**
G (mm)	106	22.3	21.2	19.4	23.4	26.5	24.3	20.2	**22.3**
H (mm)	106	16.2	15.1	13.8	16.9	19.8	18.9	15.1	**17.4**
I (mm)	106	14.3	13.3	12.2	15.2	17.2	16.4	13.1	**14.8**
J (mm)	106	12.3	11.5	10.5	13.2	14.8	12.1	11.4	**13.6**
M (deg)	**106**	**141.0**	**126.0**	**120.0**	**133.0**	**135.5**	**130.5**	**120.0**	**125.0**

Sized but there were limitation in design of implant. The proposed approach for standardize a hip implant was simplest and quite accurate. The proposed implant improve longer term outcome and clinical functionality for Vidarbha region population by reducing loosening rate and complication rate. There was inconsistency in measurement parameter. Thus it was challenging to attain specific bone implant fit. Statistical analysis showed no significant differences between left and right femora but significant differences were found between male and female subjects8,16. Also, the neck shaft angle varies17 from 125-132E. It was noted that Nigerians were taller than average Indians so their femoral heads were bigger than that of Indians18. The femoral neck diameter and neck shaft angle for Hong Kong Chinese population were small when compared with their western counterpart19. The undersized and overhanging hip implant could lead to replace soft tissue and patella20. Improper choice of implant could create serious problem for patient in long period21,22. There is a deficiency of literature relating to the effect of improperly sized implants on patient outcome.

However, forecast result are based on measured anthropometric data, it is some time subject to variation by the system utilized. This study will help medical practitioner in particular and common population in general.

Significance Statement

It was disclosed that the current finding (eight standard hip implant) can provide suitable fitment to the majority of the population. It is innovative step and more purposeful to prevent general complications like prosthetic loosening and dislocation. While a small percentage of population will always be requiring the customized prosthesis for exact fitment. The current outcome will also assist and enhance facts of hip region for the clinicians or thopaedicians and radiologists.

Conclusion

To validate the need of designing a hip implant based on particular location, an effort has been made for collection of data (Anatomical Parameter) of vidhrabha region population and scatter diagram is formed on basis of standard deviation. After examine a scatter diagram it found that 15% population had irregular shape of hip prosthesis. Cluster analysis was carried out on remaining dataset, which offered 8 set of standard anatomical parameter, on this basis 8 standard hip implant could design for population of the study region. These 8 set of standard hip implant serve 85% of population.

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Technical Review on Educational Data Mining

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Abstract-

Importance of education is to develop good society in terms of cultural, social and economic. Educational data mining (EDM) is a new area for knowledge discovering from large amount of educational data. Researchers from the glob are trying to search the outline and elements which give betterment of education. This paper shows the review of data present in the world and methodology used for collecting and clearing them before applying data mining techniques. It represents different techniques used by different research for educational data mining. It gives kind of result for selecting proper technique for proper data mining in educational data.

Keywords: Educational Data Mining, Dropout, Data Mining, Decision Trees

1. Introduction

Education has different meaning as per the situation. Education is very broad term for considering individual. Basically it is a character appearance of a single person known as education. The education reflected from the society of different persons who represent their culture. In education sector the schools, colleges and universities and so on represent education. The newly education system which will be implemented from 2022-2023 by the Indian government for focusing the aim regarding education system by 2040 with equitable access to the highest-quality education for all learners regardless of social or economic background [1]. The system divides the education parts such as Fundamental, Preparatory, Middle, Secondary and Higher education. Education gives the development of the persons or society. It gives good impact on the society and the nation. The development may be attitudes, modern values and economic growth of a person by education due to which equality and social justice is occurring.

Data is important for any sector. We are living around the data, now a days we are using World Wide Web (WWW), Whatsapp, Facebook etc. which having lot of important data around us. The person tries to find out the meaningful data from the huge data by applying knowledge discovery from data or KDD process. Data mining technique can be applied for meaningful data [2]. In educational field, Data Mining is used to understanding of learning process of students. Educational Data Mining (EDM) is growing area for data mining to better understand students [3].

2. Layout For Drop-Out Learner

Different scholars have used different model or layout for drop out learner. The architecture [4] used is based on ETL process. The abbreviation of ETL is Extract, Transform and Load.

It is business oriented system in which author study the operational system to support business. The model [5][6] which predicting students result at school level which are failure. It involved the stages Data collection, Preprocessing, Data mining and Interpretation. Early student success prediction is also layout by the authors by showing the model [7].

Layout of primary involvement of elements, database creation, processing and output of educational data using Data Mining is as follows in Fig. 1.

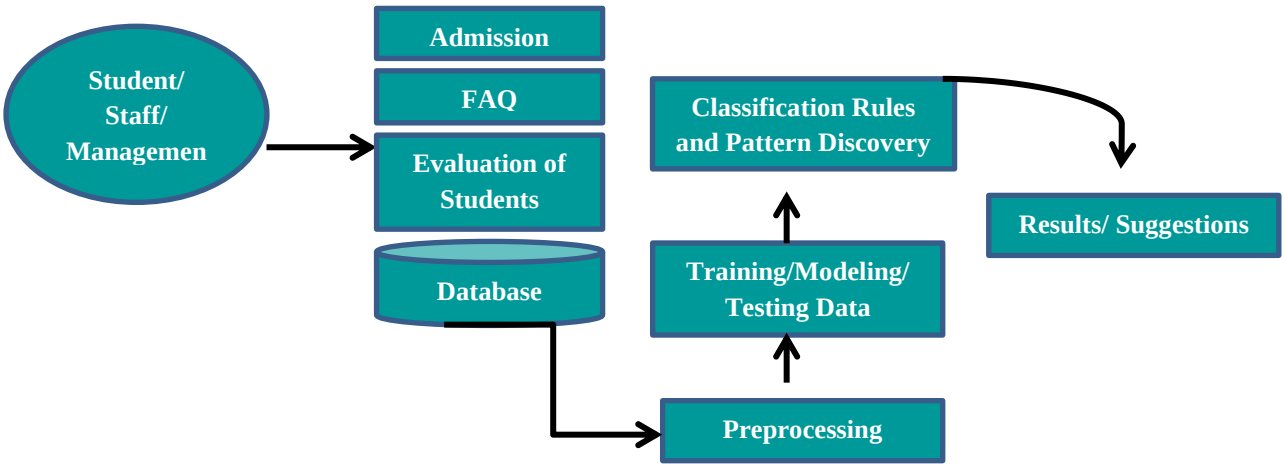

Fig. 1. Educational System Layout

i. Data-Variable-Users

To predict probability of drop out student or performance of student from educational institutional data from different sources are compulsory. Researcher focuses on outcome in particular course such as information system in open polytechnic based on admission data [7]. By using white box data mining technique, researcher predicts student failure in school level [6]. In this study the highly imbalance data is focuses and the students which are on high risk will be detecting so that they can be early guided. The aim [4] study the variables that responsible for the drop out as well as to develop a model of predication which identifying drop out students.

The questionnaire supplied to the three university students for two continuous years from which data is collected [8]. The EDM models and results of the project carried out from the Thailand University. The aim of research is to predicting student performance and dropout based on characteristics before admission, admission details and initial exam performance in the university. Objective of the research is to reduce the number of features, remove irrelevant, redundant data and reduce the size of data set for feature selection algorithm [9]. The less educational qualification [10] decreases possibility of getting good employment in the company or private sectors. Thus dropout students identify as early as possible.

ii. Preprocessing

Pre-processing of data is one of the important steps in data mining process. Generally incomplete, noisy and inconsistent data are received from various sources such as web and social media [2]. The Quality decisions will be taken on quality data. The WEKA software is used to remove noisy data i.e. data cleaning techniques. [11][12][13]. Cleaning process in which missing values will be fill out using data approach. Before applying mining technique the preprocesses data work is done by the researcher [14][15]. Data cleaning and transformation process were manually done by replacing missing values with the standard values.

iii. Data Mining Techniques

Decision Trees, Genetic Algorithm, Artificial Intelligence, Neural Networks, Classification, Clustering, Regression, Association Rules, Nearest Neighbor method etc. are the algorithms and techniques used for knowledge discovery from databases [16]. These techniques are used for Educational Data Mining purpose also. Algorithm [6] are used for feature selection dataset, number of algorithms are applied for features ranking higher in multiple algorithms. 15 important features are selected from original 77 features. Some of the authors also use WEKA for performing out data mining techniques. Association rule mining is used to identify causes of student dropout [11][16].

The researcher [17] constructed a CHAID prediction system in which 7-class response variable by using predictive variable to obtained feature selection technique. In this simple linear regression technique was used to construct a regression model.

The researcher [9] applies feature selection before applying data mining techniques. Researcher uses filter model, hybrid model and wrapper models for features selection. Different studies [18] focus mainly on feature selection like investigating the familiar subset features with little cardinality for gaining good predictive performance with techniques of data mining and calculating better subsets with different cardinality. The basic steps namely subset generation, subset evaluation, stopping criterion and validation are used for feature selection procedure in early days.

3. Conclusion

The major problem for a research is unavailability of global dataset. Various techniques will be applicable for preprocessing of noisy data. Every day Data mining techniques are perform their performance nicely with the EDM and now a days different dimensional and not properly arrange data can also properly arrange. The survey of this paper show that educational data mining is even a large field for research in the education sector which uses more techniques to mining the educational data as well as to plan or develop new education effective for the educator and nation.

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Artificial Intelligence Using Neural Network Based D. S. S. For Iris Detection

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Abstract:-

Neural network-based decision support system, is used for persons identification from IRIS recognition. In this case DECISION SUPPORT SYSTEM (D.S.S.) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration using MLP, RBF, SVM. The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partition will varied gradually. In each of neural network configuration. The variable parameter test and train by neural solution software.

Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to identify person iris image.

Keywords: *Iris recognition, neural network-based decision support system, Classify accuracy. MLP ,RBF, SVM*

Introduction:-

Today's E-Security are in critical need of finding accurate, Secure and cost-effective alternatives to passwords and personal identification numbers as financial losses increase dramatically year over year from computer-based fraud such as computer hacking and identity theft. Biometric solutions address these fundamental problems, because an individual Biometric data is unique and cannot be transferred Biometric is automated methods of identifying a person or verifying the identity of a person based on physiological or behavioral characteristic.

For Example, of physiological char. Include hand, finger image and facial characteristic and iris recognition behavioral char. Are trends which can be learn or acquired dynamic signature verification, speaker verification and key stroke dynamic are example of behavioral char. Biometrics system uses a hardware to capture the Biometric information and software to maintain and manage the system in general, the system translates these Biometric profile known as template that templates is stored in a data base the Biometric system then compares this templates to the new image created every time a user accesses system then compares this templates to the new image created every time a user accesses the system for an enterprise Biometric provides value into two ways Biometric adds a unique identification to network authentication, one that is extremely difficult to duplicate smart cards and token also provides a unique identifier but an Biometric has an advantage over these devices a user cannot lose or forget his or her finger print, retina or voice the practical application for Biometric are diverse and expanding and range from healthcare to govt, financial services, transportation and public safety and justice. Such application are on line identification for E-commerce access control of a certain building or restricted area, offline personal identification, financial automated teller machine (ATM), online ticket purchase etc.

Feature Extraction

In order to provide an accurate recognition of an individuals, the most discriminating information present in an iris pattern has been extracted. Only the significant features of the iris have been encoded so that comparison between templates is done. the feature extraction stages.

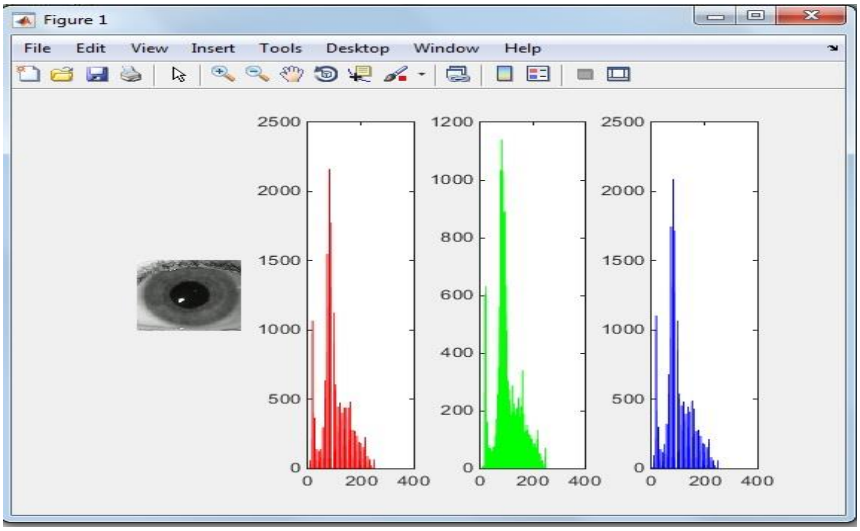


Fig , Histogram of Iris

Problem Formulation :- In this paper preliminary part of the work is given .
Neural network based decision support system, is used for persons identification from IRIS recognition.In this case the D.S.S. (DECISION SUPORT SYSTEM) will work as a classifier estimate non linear and complex decision boundaries between different classes. The neural network configuration to be used for this research work are as

1) Multilayer Perceptron (MLP)
2) Radial based function network (RBF)
3) Self Organizing map (SOM)
4) Support Vector Machine.

The various parameter of neural network will be varied carefully in order to obtained the optimal configuration in view of minimum mean square error and maximum classification accuracy and simplicity of neural network model, the available data set ratio of these partitions will varied gradually. For e.g. 70% training, 20% testing, 10% cross validation and various possible combination like permutation and combination like this will be form. The order of testing and training will be swapped for reverse tagging. The different data partitioning ensures that the trained neural network s not dependent on any specific data partition to produce the best results and the learning is almost independent of data is essential. In each of the neural network configuration. The variable parameters are as Hidden layer, Number of neurons in each hidden layer, Transfer function of neurons output layer, Learning rule or training algorithm to be used such as standard back propagation algorithm, conjugate gradient algorithm, delta algorithm and quick propagation , Number of cluster Centers, Learning rate and value of step size and momentum. All possible Variable parameter of neural network will be varied systematically until the most optimal configuration is reached, where mean square error on the training, testing and cross-validation data set is the lowest regardless of data partitions and classification accuracy for cross validation and testing data set will approach 100% ideally. Finally an optimal neural network based D.S.S. will be designed in each category of neural network and then shall be overall comparison among different neural network configuration. In this case of decision support system confusion matrix and classify accuracy are important to Identify person iris image. In this case mean square error is not very important digestive parameter, it is only used to control and monitor learning algorithm and training of neural network, neural network is trained on the different data partition and it is tested on a separate data partition that was never presented to neural network, while training. This is done for proper generalization and true learning.

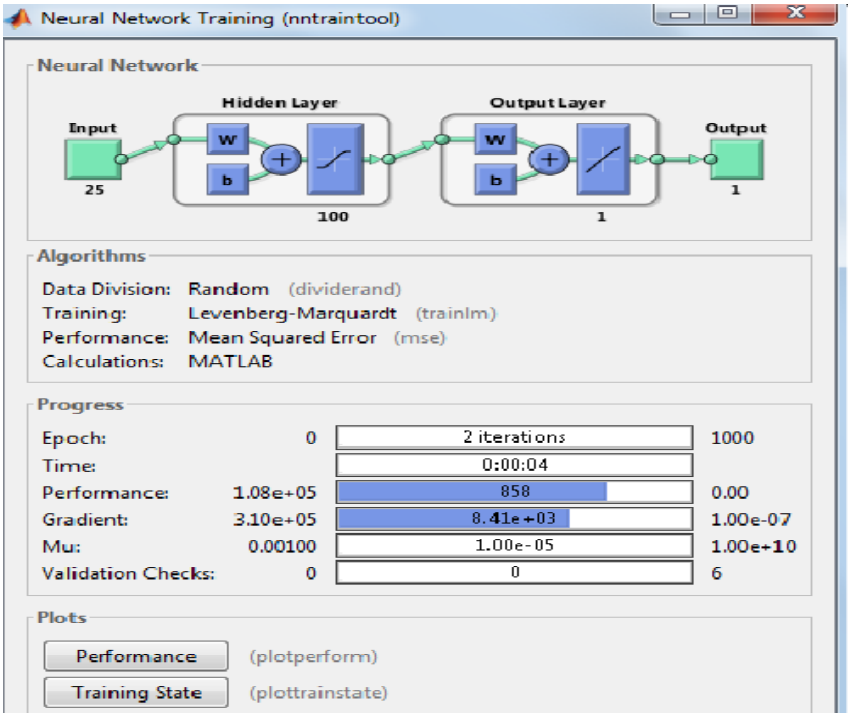
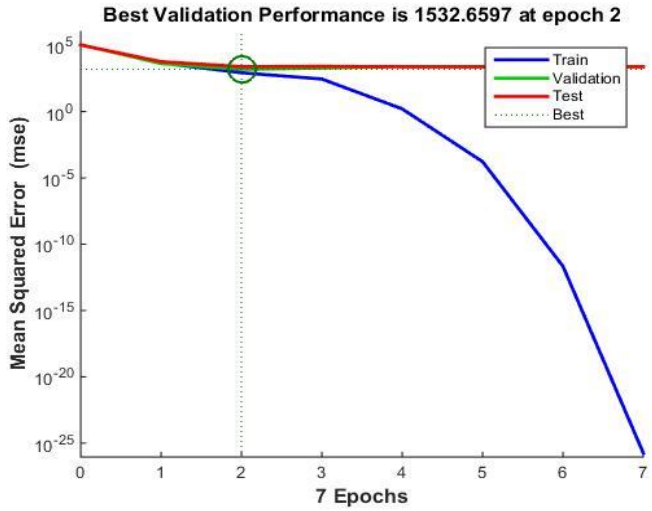


Fig. neural network training

If the train button is pressed on the menu the neural network traing (nntraintool) would be activated from the neural network toolbox. The result of train network is shown in fig 4.1

In this figure the neural network algorithm would be displayed with 25 input two layers with weight and bias .Hiden layer are 100 and one output layer. According to the present result of training system the epoch is 2 iteration for 1000 epochs. Running time is 0.004 hours .The performance is 858 for 1.08e+05 target. The gradient is 8.41e+03 for 1.00e-07 and validation check is 0 for 6 must be displayed on the command window.

According to the fig 4.1 the neural network training system has been accomplished and known by the user neural network toolbox is very useful to simulation of this right iris recognition .



The result is found by the algorithm and we can get the number of epochs used and which epoch gives the best result as shown in fig 4.2.As shown in fig 4.2 a plot fo epochs MSE has been plotted .The epochs gets the best validation performance at epoch no. 2 . The MSEW is the lowest at this point and hereafter no significant changes takes place and no further decrease takes place. Hence this is the best validation performance is 1532.6597 at epoch

Conclusion:-

In this the iris preprocessing steps that includes iris localization, normalization and enhancement and then applied to the small singular program on MATLAB. Software converts that image into the numerical data.

Numerical data then applied to the Neural solution and then trained the Network and classify the images using multilayer perception (MLP), Radial based function Network (PDF) and the images and gives the accuracy of that images. In this work, Iris recognition system based on neural networks base decision support system is used for persons identification from iris images. Multilayer perceptron network is one of the best techniques to identify Iris images of a person.

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Competency Development and Mapping of An Engineering Graduates Employability Skills

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Abstract:

Hiring fresh engineering graduates for Industry has become a crucial task for the industry as well as for the agencies. At the commencement of employment, graduate engineer training is essential, additional training is both time consuming and costly for the industry. Industry work on three main elements man machine and money. Among these three the main element of industry is man i.e., humans. The existing economic globalization demands novel methods to workforce management. Nowadays industry is in need of high skilled workforce, thus the skilled graduates demand is increasing day by day, and low skilled employees demand is increasing and is on declining side. Multi-tasking role are expected by the employees to be performed. More agility is required, proactive, self-disciplined, organized, Creative etc. are the recruiters from the upcoming graduates. The practice of determining critical competencies for a company is called skill mapping or competency mapping. Competency mapping is a growing HR approach that focuses on the characteristics that are necessary for job success and matches them to the skills of the current workforce. Its is expected by the academicians and the Engineering institutes to focus more towards the competency development and mapping of engineering graduate. It can be achieved by imparting various technical and non-technical trainings, providing internship opportunities, conducting workshops, Seminars etc.

Keywords: *Competency mapping, Skill, Employability, Globalization, Gap, Graduates, Engineering.*

Introduction:

Process of identifying key competencies of employees for an organization is termed as Competency mapping of skill mapping. Competency mapping is an evolving HR practice focusing on factors required for success at any job and matching it with skills of workforce available.[1] It Involves various skills which are related and expected to be performed in the job. It reveals the working capabilities, ingenious, adaptability, stress handling capacity, forecasting skills, problem solving abilities, decision making sills and many more. This analysis helps the industry and the perspective candidate to compare suitability of engineer for the respective job. Its also help in reducing the training or the on-job training cost of the industry. More reliable workforce can be developed for future. In order to remain in alive and active in today's competitive environment, every industry is striving for maximum efficiency and effectiveness. Industry is divided into two categories: production and service. They are making every effort to make their system more efficient. All of their strategies and approaches for increasing the performance and efficiency of their operations point to one fundamental factor: "Skill and Competency." As a result, firms that want to improve their performance turn to skills and competencies as a key area. Every sector, particularly those in manufacturing, places a premium on ability and competency.[2] Individuals must have convenient capacities in order to be 'employable.' Employers frequently describe a set of abilities that they expect from an employee, in addition to solid technical understanding and subject knowledge. It's like Team working, Problem solving, Self-management, Knowledge of the business, Literacy and numeracy relevant to the post, ICT knowledge, Good interactive and communication skills, Ability to use own initiative but also to follow instructions and Leadership skills where necessary are some skills needed.[3]

Importance of Competency Mapping:

Using a competency map to drill down to the specific skills, knowledge, abilities, and behaviors required for the job is beneficial. Competency mapping has the advantage of establishing criteria for employee training and development that are especially matched to our company's needs. It involves exploring the skills which are required for particular job position and role while performing duty. The goal of applying competency mapping is to ensure the organization's competitiveness, efficiency, and effectiveness[4]. These ability marking necessities serve as the indicator for employees. Employees' performance assessment forms are properly filled out depending on their degree of talents, which qualifies them for a certain function in the organization. Human resource department is responsible for analyzing the strengths and weaknesses of personnel after they have been assigned based on their competency.[5] The finest organizations always coming up with new methods to interact with their employees on a personal level. Building a more personal relationship with employees is becoming increasingly popular among the greatest places to work. It increases the productivity at workplace, reduces the work pressure, increases the quality of work, workplace environment[6]. Competency mapping has the advantage of establishing criteria for staff training and development that are precisely matched to your company's requirements[7]. It is a rapid and effective process that concentrates on and analyses how workers operate, and it normally takes one or two days to complete. Making a competence map can help you drill down to the specific skills, knowledge, abilities, and behaviors needed for each unit of work[7]. The competence map becomes a very helpful and practical tool for enterprises because of this approach.

Advantage of Competency Mapping for Industry:

- Increased Productivity
- Better workplace environment
- Increased Job Retention
- Better achievement of goal
- Sense of Responsibility

Figure 1 Advantage of Competency Mapping for Industry:

Advantage of Competency Mapping for Employee:

- Performance Excellence
- Improves clarity in work
- Job Satisfaction
- Better appraisal
- Better understanding of Job Role

Figure 2 Advantage of Competency Mapping for Industry

Competency Mapping & Development

Boyatzis(1980) – "A capacity that exists in a person that leads to behavior that meets the job demands within parameters of organizational environment, and that, in turn brings about desired results".[8] Unless the industry is not ready for competency mapping, it would become very difficult to get a better achievement at the workplace. competency mapping is also one of the leading concepts which is accepted worldwide[9]. It has shown

a tremendous increase in the qualitative approach towards achieving the Vision and Mission of any organization. It also gets in line with the organization goal as well as with the individual Goal. it is giving a wider spectrum for a better career enhancement and performance appraisal.[10] A capacity to recognize, interpret, and apply emotional information about oneself that leads to or causes successful or exceptional performance is an emotional intelligence skill[11]. The capacity to notice, analyses, and apply emotional information about others that leads to or causes successful or superior performance is referred to as social intelligence[12]. An intellectual intelligence competence is the dimensions to think critically about and evaluate information and circumstances in a way that leads to or causes successful or exceptional performance.

Figure 3 Competency Mapping & Development

HR Planning: Human resource planning (HRP) it is an incessant progression of disciplined scheduling ahead to ensure that an organization's most important asset—quality employees—is utilized to its full latent. Human resource planning certifies that personnel and occupations are a good match, while preventing manpower shortages or surpluses.

Competencies can be developed

One of the main recompenses of the ability or behavioural tactic to talent is that we reach an area of human talent that may be developed later in life. Although our understanding of skills has grown, one of the most noteworthy advances made in the prior years[13].

- an ageing and increasingly diversified workforce requiring greater employer support to remain productive at work
- increasing levels of chronic disease in the general population
- rising costs of ill-health in the workplace associated with increased absenteeism and reduced performance
- external societal pressures such as growing expectations that employers will promote wellness programmes as a duty of corporate social responsibility[14]
- a need for employers to distinguish their offerings to attract recruits in an increasingly competitive labor market
- attempts by government to reduce public health expenditure

Government is also planning to increase the presence of for universities in a global ranking our country is planning to have almost more than 20 universities and the list of top 200 universities of world. It will definitely attract the focus of top Global recruiters towards India. As when the Global recruiters come out for recruitment they especially focus on the top universities of the world If these top universities are being targeted for the Global recruitment it is a mandatory to make and raise a standard of university to this top level which will ultimately increase the growth[11].

Employability Skill development for Competency Mapping.

Employability skills are those skills which are required by and fresh graduate to start their company in organisation. These are the skills which will help the graduate to attend his or her first employment of their life[15]. Employers for the recruiters are always in search of such skills which are beyond your experience and qualification. When it comes to experience and qualification it has certain limitations because you cannot learn the things beyond your qualification and beyond your expectation it is expected by industry. Employability skill

is something which comes between your qualification and expectations it is more over incline toward the self-initiative, or self-learning, for proactiveness of an individual to learn new skills which will help them for a smooth working at workplace[16]. As your education and your qualification along with your experience will only make you eligible for the recruitment process of any organisation based on your qualification and education you will be able to appear in the recruitment process of an organisation but once you have not cleared the organisation recruitment process you want to be able to get a selection. The selection of a candidate in any recruitment process is purely based on the employability skill which acquired and which is shown to the employer during the screening process[17]. In general company is always ready to train the fresh graduates on the required skills. Skills may vary from organisation to organisation and sector 2 sector. They always are in search for such candidates who initially purchase certain soft skill interpersonal skills before hiring because once they identify that you already possess certain skills which are expected by the recruiter it will help them to train the graduate[18]. On the other hand, the fresh graduates who is not having any of the above-mentioned skills it is very difficult and it is very harder for the industry to train such a graduate on a required skill. Soft skill for employability skills is also considered as the building blocks for your future they will help you to get an acquaint yourself with better career and the candidate having a good command on soft skill definitely will get more opportunities in the state as compared to any other candidate. There are many different employability skills some among them are most important are in the areas of as mentioned below[19]:

- Creating a good Repo with co-workers: it is very important whenever you are working in an organisation you have to create a good rapport with your co-workers. having a good tune with your co-workers will definitely help you to create healthier and more supported work environment.
- Being more trustworthy and independent: following the deadlines and fulfilling the given task in a given set of time definitely makes you more Independent and dependable in organisation. it reflects that the said employee is more reliable when it comes to following the deadlines.
- Proactiveness: proactiveness is an attribute which is expected from every employee nowadays. organizations now are in search of such candidates those who to apply their own logic and skills to get the job done in the set time. employers don't want such candidate who always wait for someone else to instruct them and get the work done from them[20].

Apart from this some of the most important employability skills which are expected in a job market are listed below:

- ✓ Communication skill
- ✓ Emotional intelligence
- ✓ Aptitude skills
- ✓ Team building
- ✓ Negotiation skill
- ✓ Persuasion Skill
- ✓ Influencing skill
- ✓ Conflict Resolution Skill
- ✓ Mediation skill
- ✓ Problem Solving Skills
- ✓ Decision making Skills Etc

Conclusion:

Competency Mapping is a need of hour. Regular assessments and mapping of engineering graduates must be practiced. As a result, skills are a crucial aspect of an individual's personality that should be examined in order to assess their potential. To do so, we'll need to use competence mapping, which is a useful method for identifying an employee's work and behavioural abilities. Various employability skills listed above can be considered as a quality parameter for reference check. All the stake holders of the industry including Employer, Employee and Academician must take initiatives. These initiatives will surely help towards building and developing of knowledge economy for the nation.

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Introduction to the Quantum Computing: A Comparative Study with Classical Computing

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Abstract:

The flow of electrons is referred to as electricity. Because electrons can transport themselves to the other side of a blocked passage through a process called quantum tunnelling, transistors cannot be utilized as switches as their size shrinks to the size of a few atoms. Quantum mechanics is a field of physics that investigates the physical universe at the atomic level. At this level, particles behave differently than in the classical universe, taking on multiple states at once and interacting with particles that are thousands of miles away. Superposition and entanglement are examples of the phenomena. At the crossroads of mathematics, computer science, and physics, quantum computing is a novel and interesting field. It is concerned with the use of quantum physics to improve compute performance. Quantum computing is a novel type of computing that is based on quantum mechanics and interacts with a probabilistic and unpredictable physical reality. Because quantum mechanics is a more general model of physics than classical mechanics, it leads to a more generic model of computing, quantum computing, which has the ability to tackle challenges that classical computing cannot.

Keywords: *Computers, Classical computation, Quantum computing, Bits and Qubits, Quantum computing challenges*

Introduction:

Today's developments in computing are resulting in powerful tiny integrated circuits. The capacity of a chip doubles every two years, according to Moore's law. As we go closer to 10 nm, strange things happen with the electrons, revealing quantum nature, and the laws of classical physics are no longer respected at such scales. As a result, either new semiconductor devices must be developed that can sidestep quantum nature or quantum nature must be embraced. Scientists are currently opting to embrace quantum nature, i.e., to use quantum mechanics principles to develop innovative computers known as quantum computers [1-4].

Any type of calculation that contains both arithmetical and non-arithmetical processes and follows a well-defined paradigm (e.g. an algorithm) is referred to as computation. Computers are mechanical or electronic machines that do computations [1-5]. In today's world, most personal computers calculate 64 bits of data at a time. A 64-qubit quantum computer would be 2 to the 64th power quicker or 18 billion billion times faster. (It's worth noting that billion billion is correct). We wanted to explore the fundamental concepts of computation, how they are achieved using transistors in classical computing, the speed limitations of classical computing, the difference between classical and quantum computing, and the introduction and challenges of quantum computing to a general audience in this paper.

Computation: (Classical approach)

Binary computing is also known as classical computing. Information is stored in the form of classical bits, which are logically represented by either a 0 (OFF) or a 1 (ON) in this traditional approach to computing. It's analogous to turning on an ON or OFF a light switch. All current computers are built around the transistor. We regard this event to represent the 1(ON) when the transistor allows the current to travel through it, and we consider this activity to represent the 0 (OFF) when the transistor blocks the current from passing through it. We can manipulate the state of a bit in traditional computers by employing various combinations of transistors connected to each other. They're known as logic gates. In classical computing, we know that logic gates can perform logical operations. AND, OR, NOT, NAND, NOR, and other logic gates are examples. Transistors are small semiconductor devices that are used to amplify and also switch electric or electronic signals. They were used to manufacture integrated circuits on a piece of silicon (IC). In traditional computers, the number of transistors has a 1:1 connection with power. As a result, in order to enhance computation power, the number of transistors must be raised while the size of the chip must be reduced [2-6].

Limit of Classical computation:

Computers are getting smaller and faster day by day because electronic components are getting smaller and smaller. But this process is about to meet its physical limit.

Gordon Moore, the co-founder of Intel, discovered in 1965 that the number of transistors on a silicon microprocessor chip had doubled every year since its discovery, while the prices had been cut in half. Moore's Law is the name given to this phenomenon. Moore's Law is significant because it indicates that computers are becoming smaller and more powerful with time.

This leads to the concept of creating the tiniest computer by shrinking the circuit down to the size of an atom. Due to the "Quantum tunnelling" phenomenon, an electron can cross the barrier and appear on the other side when the size is lowered at the atomic level. As a result, these circuits will be unable to function as switches. It demonstrates that beyond 5–7 nanometres, the size of the circuits in a traditional computer has hit its limit. As a result, the power of classical computing can only be increased up to a limit [3-5].

Quantum computing: (An introduction)

Quantum computing is a sort of computer that uses the collective properties of quantum states to accomplish calculations, such as qubits, superposition, interference, and entanglement. The devices that perform quantum computations are known as quantum computers. A quantum computer is a machine that performs calculations based on the laws of quantum mechanics, which is the behaviour of particles at the sub-atomic level. Unlike traditional classical computers, which utilize binary bits 0 and 1 independently to store and manipulate the information, they use their own quantum bits, also known as 'Qubits,' to store and manipulate data. The computers using such type of computing are known as ‘Quantum Computers'. Circuits using transistors, logic gates, and Integrated Circuits are not possible in such small computers. As a result, it uses subatomic particles such as atoms, electrons, photons, and ions as bits, together with their spins and states of information. They can be stacked on top of one other to create new combinations. As a result, they may execute in parallel and efficiently use memory, making them more powerful. Quantum computing is the only model that can challenge the Church-Turing thesis, allowing quantum computers to dominate classical computers exponentially faster in speed [7-12].

Quantum Bits (Qubits): Representation of Data

A qubit, or quantum bit, is the fundamental unit of quantum information in quantum computing. The quantum bit can represent 0, 1, or both at the same time. A quantum bit can exist in superposition, which means that it can exist in multiple states at once. A single atom is used to represent a bit of data, and it can be in one of two states: |0> and |1>.

Qubits includes

- An atom in an excited or ground state.
- Polarisation of a single photon, in which the two states are vertical polarisation and horizontal polarisation.
- Spin of the electron, in which the two levels are spin up and spin down.

A linear superposition of a qubit's two orthonormal basis states can be used to represent its general quantum state in quantum mechanics (or basis vectors). |0> and |1> are the most common symbols for these vectors. They are pronounced "ket 0" and "ket 1," respectively, and are written in the traditional Dirac or "bra–ket" notation. The computational basis, which consists of the two orthonormal basis states {|0>,|1>}, is said to cover the two-dimensional linear vector (Hilbert) space of the qubit. In 2^n-dimensional Hilbert space, ‘n’ qubits are represented by a superposition state vector [7-12].

Qubits have unique qualities that enable them to solve complex problems considerably more quickly than traditional bits. Superposition is one of these qualities, which states that a qubit can store a combination of "0" and "1" at the same time. It refers to a quantum system's ability to exist in several states at the same time. A quantum bit can be in superposition, meaning it can be in multiple states at the same time [7-12].

Entanglement is a quantum particle-to-quantum particle correlation that is extremely strong. Quantum systems' ability to display correlations between states within a superposition is known as entanglement. Consider two qubits, each of which is in the state |0> + |1> (a superposition of the 0 and 1). We can entangle the two qubits so that one qubit's measurement is always correlated with the other qubit's measurement [7-12].

Comparison between Quantum computing and classical computing:

Classical Computing	Quantum Computing
1) Conventional computing is based on the classical phenomenon of electrical circuits being in a single state at a given time, either on or off.	1) Quantum computing is based on the phenomenon of Quantum Mechanics, such as superposition and entanglement, the phenomenon where it is possible to be in more than one state at a time.
2) Information storage is bit based on voltage or charge etc.	2) Information storage is Quantum bit based on direction of an electron spin.
3) Classical computers use binary codes i.e. bits 0 or 1 to represent information.	3) Quantum computers use Qubits i.e. 0, 1 and both of them simultaneously.
4) No restrictions exist on copying or measuring signals.	4) Severe restrictions exist on copying and measuring signals.
5) Power increases in a 1:1 relationship with number of transistors.	5) Power increases exponentially in proportion to number of qubits.
6) Can operate at room temperature.	6) Requires ultra-cold environment.
7) It has low error rates.	7) It has high error rates.
8) Circuit behaviour is governed by classical physics.	8) The circuit behaviour is governed by quantum physics or quantum mechanics.
9) Well suited for everyday processing.	9) Well suited for tasks like optimization problems, data analysis, simulation, etc.
10) Information processing is carried out by logic gates e.g. NOT, AND, OR etc.	10) Information processing is carried out by Quantum logic gates. E.g. Hadamard, controlled-NOT, Pauli's X, etc.
11) It is large scale integrated multi-purpose computer.	11) It is high speed parallel computer based on quantum mechanics.
12) CMOS transistors are the basic building blocks of conventional computers.	12) Superconducting Quantum Interference Device or SQUID or Quantum Transistors are the basic building blocks of quantum computers.
13) Logic gates are not reversible.	13) Quantum logic gates are reversible.

Advantages of Quantum computing:

1) **They can tackle complex problems-** Quantum computers, according to researchers, will be able to solve complex mathematical problems that ordinary computers are unable to accomplish in a reasonable amount of time.
2) **They are quick-** In the end, quantum computers may be able to provide processing power on a scale that ordinary computers may never be able to equal. Google, for example, claimed in 2019 that it could perform a calculation in approximately 200 seconds that would take a traditional supercomputer 10,000 years to complete.
3) **Computer power beyond imagination-** It provides computing power capable of processing massive volumes of data (2.5 Exabyte per day, equivalent to 5 million laptops) generated all over the world and extracting meaning from it.
4) **Lower power consumption-** Due to the teleportation phenomena known as 'quantum tunnelling,' it can work in parallel and consume less electricity, reducing power consumption by 100 to 1000 times.
5) **Greatest for simulation-** Quantum computers are the best for simulating data. Many algorithms have been developed to simulate diverse phenomena such as weather forecasts, chemical simulations, and so on.
6) **Medicine creation-** These computers are more effective in the medical industry. They have the ability to detect ailments and formulate drug formulas. These computers can be used to diagnose and test a variety of ailments in scientific laboratories.
7) **High privacy-** These computers have strong encryption capabilities and are adept at cryptography. The security of quantum computers cannot be breached. China just launched a satellite that employs quantum computing, claiming that the satellite cannot be hacked.

8) **Employed in the manufacture of radar missiles-** Quantum computing is also used in the manufacture of radar missiles. This technique can help increase the accuracy of radar weapons.
9) **Used in artificial intelligence-** These computers are excellent at artificial intelligence. They can make more precise judgements than regular computers. These computers will allow scientists to do more effective study.
10) **Machine learning-** Machine learning techniques are an excellent way to apply quantum computing. Users can write less code and rely on machine learning to improve results.
11) **No overheating-** It can handle complex problems without overheating since the quantum system is kept cold up to 0.2 Kelvin for stability.
12) **Optimization-** It can quickly handle problems like determining the optimum route and scheduling trains and aircraft. It would also be capable of processing 1 trillion chess moves per second. Quantum computers will be able to break even the most secure and impenetrable encryption systems. It would, however, create hack-proof alternatives.
13) **Industrial revolution-** It has the potential to revolutionise industries ranging from pharmaceuticals to petroleum. It will be able to develop new medications. Financial institutions' marketing algorithms can be enhanced. Artificial intelligence can be improved in the near future.

Quantum Computing's Drawbacks: (Challenges)

1) **Low security and high mistake rate**- the systems are not very secure, and there is always a threat. Furthermore, the mistake rate is extremely high and must be reduced.
2) **The security of the present Internet of Things (IoT) might fall down** due to quantum computer advancements. Databases of government and commercial large corporations, banks, and defence systems can all be hacked using cryptographic techniques. Given these factors, quantum computers have the potential to be disastrous for humanity's future. ***Considering these facts, quantum computers can be terrible for our future.***
3) Secure communication or any type of internet transaction could be cracked, with the data being misused or resold.
4) Today's quantum computers are mostly prototypes that are still huge, difficult, and costly. At the same time, they continue to have a number of issues that their developers have yet to fully resolve.
5) The Quantum Computer will function as a separate device and will not be able to completely replace traditional computers. Because classical computers are superior at certain tasks to quantum computers, such as email, excel, and so on.
6) It has not yet been fully conceived, as only portions of it are being executed and people are still imagining how it will look.
7) Qubits are unable to disregard noise in their native state. As a result, the quantum system is more prone to errors. It has a problem with decoherence. The most difficult problem is figuring out how to deal with any unwanted deviations or noise in quantum computers.
8) It is extremely delicate and prone to errors. Subatomic particles such as atoms and electrons are affected by all kinds of vibrations. Noise, malfunctions, and even failures are conceivable as a result. It causes "Decoherence," or the loss of quantum coherence.
9) **Algorithm creation-** For each type of calculation, a separate algorithm must be written. Quantum computers cannot function in the same way as traditional computers; they require specific algorithms to complete jobs in their environment.
10) **The low temperature required-** Because the processing in these computers is done at a very deep level, a temperature of minus 460 degrees F is required. This is the universe's coldest temperature, and maintaining it is extremely difficult.
11) **Software development-** In addition to hardware, further software development is necessary to construct.

Applications of Quantum computing:

1) **Healthcare sector:**
   a) Research
   b) Diagnostics
   c) Treatment
   d) Drug Design & Development
   e) Full-speed DNA sequencing and analysis
   f) Developing the ideal decision-making aid
   g) Improving imaging solutions
   h) Creating the safest medical data systems ever

2) Cryptography & Cybersecurity

Due to the increasing number of cyber-attacks that occur daily around the world, the online security environment has become rather vulnerable. Quantum computing, along with machine learning, can aid in the development of various strategies to combat these cyber-threats. Quantum computing can also aid in the development of encryption systems, commonly known as quantum cryptography.

3) Finance and Banking:

a) High-frequency automated trading
b) Fraud detection
c) Big data analytics
d) Business optimization, including risk management and compliance
e) Risk profiling, trading optimization, and targeting and prediction.

4) Weather Forecasting:

Currently, typical computers take longer to analyse weather conditions than the weather itself. However, a quantum computer's capacity to crunch large volumes of data quickly and accurately. Meteorologists will be able to develop and analyse more precise climate models with quantum computers, which will provide more insight into climate change and strategies to mitigate it.

5) Machine Learning and Artificial Intelligence

Quantum computing could bring up new possibilities in artificial intelligence, which frequently includes the combinatoric processing of enormous amounts of data to produce better predictions and choices (think facial recognition or fraud detection). Quantum machine learning is an emerging topic of research that identifies ways that quantum algorithms can speed up AI.

6) Automotive sector
7) Energy
8) Advanced Manufacturing
9) Computational chemistry
10) Entertainment and Quantum gaming industry
11) Logistics optimisation
12) Traffic optimisation
13) Industry specific applications
14) Biotechnological development
15) Defence and security sector
16) Various engineering fields applications

And may there be many more.....

Conclusion:

Quantum computing will spawn a slew of new technical applications, opening up new commercial opportunities and assisting in the resolution of some of the world's most pressing problems. Quantum theory's previously unexplored effects can now be employed as a resource in technologies with far-reaching applications, such as secure communication networks, ultra-precise sensors, pharmacological studies of chemical reactions, innovative materials, and fundamentally new computing paradigms. Governments and organizations all around the world, including Google, Microsoft, Intel, Toshiba, and IBM, have been investing heavily in order to realize this potential in recent years. Despite tremendous advances, quantum computing has a number of hurdles, including the difficulty of manufacturing a large-scale quantum computer, the development of novel quantum algorithms, and the cost of construction. Quantum computers have the potential to transform computation by allowing for the solution of previously unsolvable problems. While no quantum computer has yet been developed to perform calculations that a classical computer cannot, significant progress is being made.

Quantum computing encompasses a wide range of concepts, including quantum physics, superconductivity, nanotechnology, and others. Each of them is a complex field that is still in its early stages of development. As a result, creating a physical system that follows the principles of all of these professions is a

monumental task. Quantum computing has enormous potential, allowing us to achieve things that were previously thought to be unachievable with traditional computers.

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Sports Results Prediction Using Supervised Learning

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Abstract-

Different Machine Learning techniques are used to predict the score and outcome of various sports. We have analyzed different model design hypotheses to assess our model's performance which helped us choose the best algorithm to predict the winner of the match. The main algorithm used is logistic regression however, for collating, Support VectorMachine (SVM) and Naïve Bayes has been used.

Predictive analysis has enforced the prediction of success rate of each team depending on the statistics of previous matches or tournaments which would help others to see where they stand andwho their competitors are. Sports managers are striving to model appropriate strategies that can work well for assessing the opponent's potential in a match. The challenge of predicting sports results is based on several parameters and it differs from sport to sport. So, it is important to consider all the essential ones in order to increase the accuracy rather than just focusing on the score to predict the outcome. Also, this area has always been something interesting for sports fanatics, magazine makers and others who are interested in approximating the odds of a game in advance. This system would aid in easy generation of results, display of ranking and regulating the selection of the tournament dates.

Keywords- Logistic regression, Support Vector Machine (SVM), Predictive Analysis

I. Introduction

A system for predicting the results of various sports matches that are based on previous results ofthe team's performance and conduct. We also strive to find accurate probabilities for a home win,a draw, or an away win for each match.

A particularly important element of Data Science in sports like football and cricket is the ability to evaluate a team's performance in games and use that information to attempt to predict the resultof future games based on this data. Outcomes from sports matches can be difficult to predict, withsurprises often popping up. Football is an interesting example as matches have fixed length. It alsopossesses a single type of scoring event: goals that can happen an infinite amount of times duringa match, and which are all worth 1 point. The possible outcomes for a team taking part in a footballmatch are win, lose or draw. Similarly, in cricket, the possible outcomes are same as football. Butthere are many parameters for consideration like teams, runs per over, overall runs, run rate etc. Normally, predictions are done based on goals or runs for respective sport and it can therefore seem quite straightforward to predict the outcome of a game. Traditional predictive methods havesimply used match results to evaluate team performance and build statistical models to predict theresults of future games. For instance, a team with many scoring opportunities could be unlucky and convert none of their opportunities into goals or runs, whereas a team with a single scoring opportunity could score a point. This makes match results an imperfect measure of a team's performance and therefore an incomplete metric on which to predict future results.

Our primary goal is to create a model that predicts outcome of a sports match with sufficient accuracy. This accuracy can be determined by attaining 70% precision when predicting results of the match. More specifically, every match consists of characteristics of the players and thematch and based on these features our algorithms predict the outcome. The outcome is, for example in tennis where zero bit (0) corresponds to a win for Player 1 and one bit (1) a win for Player 2. No draw is possible here. In sports where a draw is possible, other representationsare necessary. In contrast to tennis, a draw is possible in football and cricket, and we have shroud both the scenarios.

Proposed System:

Deliberating the existing system, we have come up with the idea of using multiple classification and regression techniques namely Logistic Regression, SVM, Naïve Bayes, etc and with the helpof few technologies like Weka to anticipate the results. We have considered the factors like scores,home and away team (for any sport), strategies used, time, location (city and country) etc. Using such methods, we have compared as to which

algorithm gives efficient results. As we used previous data sets to train it, the methods would help us easily identify trends and patterns as it understands behavior and historical data. There is no human intervention(automation) in this approach. There is continuous improvement as the algorithm learns to make more accurate predictions faster. It can also handle multi-dimensional and multi-variety of data, and they can dothis in dynamic and uncertain environment. Our research will hopefully be informative and use tothose performing future research in this application area.

Challenges

The following are several challenges on the path to achieving the objectives:

- Data availability & quality.
  Finding a public database of the sports data with the necessary statistical depth to generate expected goals metrics is an essential part of the project. However, the leading sports data providers do not make their information publicly available. We did scour various public databasesto find one that is suitable for us to use. The alternative approach in the case where we do not finda suitable database would be to find websites displaying the required data and using web scrapingtechniques to create our own usable database.
- Research and understanding of prediction landscape.
  In order to design our models and test different hypotheses, we undertook a thorough backgroundresearch of prediction techniques and develop a mathematical understanding of various Machine Learning algorithms that have been used for our predictions.
- Testing different models and parameters.
  An important challenge has been to make the model training and testing tasks as quick and easy as possible, in order to test and compare different models. A robust pipeline will have to be builtto enable us to find the best possible models.

II. Literature Survey

Machine learning (ML) is one of the intelligent methodologies that have shown promising resultsin the domains of classification and prediction. One of the expanding areas necessitating good predictive accuracy is sport prediction, due to the large monetary amounts involved in betting. In addition, club managers and owners are striving for classification models so that they can understand and formulate strategies needed to win matches. These models are based on numerousfactors involved in the games, such as the results of historical matches, player performance indicators, and opposition information.

One of the common machine learning tasks, which involves predicting a target variable in previously unseen data, is classification. The aim of classification is to predict a target variable (class) by building a classification model based on a training dataset, and then utilizing that modelto predict the value of the class of test data. This type of data processing is called supervised learning since the data processing phase is guided toward the class variable while building the model. Some common applications for classification include loan approval, medical diagnoses, email filtering, among others. Sport prediction is usually treated as a classification problem, with one class (win, lose, or draw) to be predicted.

In sport prediction, large number of features can be collected including the historical performanceof the teams, results of matches, and data on players, to help different stakeholders understand theodds of winning or losing forthcoming matches. The decision of which team is likely to win is important because of the financial assets involved in the betting process; thus bookmakers, fans, and potential bidders are all interested in approximating the odds of a game in advance. Once a predicted result for the match is obtained, an additional problem is to then decide whether to bet on the match, given the bookmaker's odds. In addition, sport managers are striving to model appropriate strategies that can work well for assessing the potential opponent in a match. Therefore, the challenge of predicting sport results is something that has long been of interest to different stakeholders, including the media. The increasing amount of data related to sports that is now electronically (and often publicly) available, has meant that there has been an increasing interest in developing intelligent models and prediction systems to forecast the results of matches.

In this proposal, a critical survey of the literature on ML for sport result prediction, focusing on the use of Logistic Regression for the given problem is provided. Several studies have used many otherapproaches but using classification model and comparing them with other efficient algorithms likeBayesian networks, K Means, Support Vector Machine, Generalized boosted models(GBM) etc helped us in providing which is the best way to achieve the predicted outcome in order to derive highly accurate classification models in other domain.

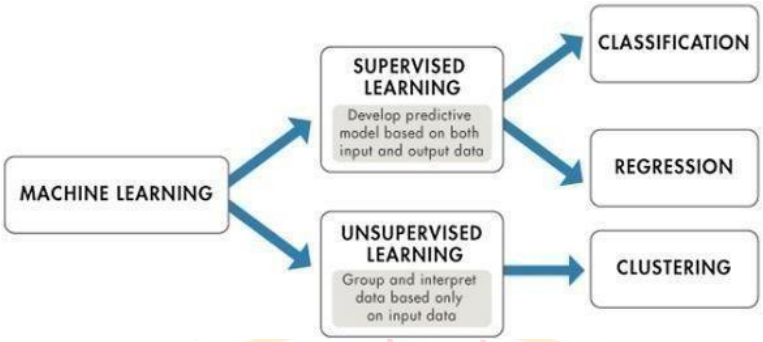


Fig1: Machine learning Algorithms: The above diagram shows different algorithms insupervised learning and unsupervised learning.

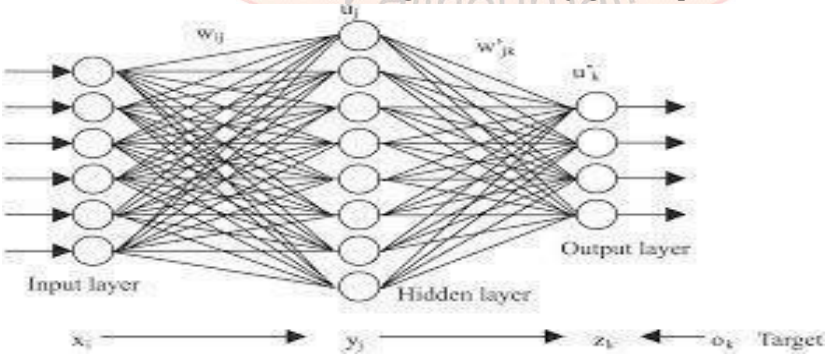
Existing Solutions

This paper's objective by authors Li Yan-Xia, Li Lin, Wang Qiang is to improve the managementlevels of college sports work in the new era, that will proportionally affect the party's education policy, if it is extensively implemented. It also strives to improve the scientific level of college sports management work to achieve maximum operation by providing a useful reference.

Design and development of this system allows us to enter the world of office automation. In the system described above; it is composed of seven modules: sports teaching, physical fitness tests, sports competitions, extra-curricular sports activities, files management, professional team training, venues and equipment management, etc.

Rory P.Bunker and Fadi Thabtah have developed via ANN i.e., Artificial neural networks recentlywhich showed good results. They have used unsupervised learning methods as well to distinguishbetween good and poor teams.

Artificial Neural Networks (ANNs) are perhaps the most applied approach among ML mechanisms to the sport result prediction problem. An ANN usually contains interconnected components (neurons) that transform a set of inputs into a desired output. The power of ANN comes from the non-linearity of the hidden neurons in adjusting weights that contribute to the finaldecision. ANN output often relies on input features and other components associated with the network, such as these weights. Weights associated with interconnected components are continuously changing to accomplish high levels of predictive accuracy. These changes are performed by the ANN algorithm to fulfil the desired model's accuracy given earlier by the user.An appealing feature of ANNs is that they are quite flexible in terms of how the class variable is defined whether it is probability of victory or whether two classes are used with home goals and away goals represented in the two various classes.



(Fig: 2.2.1) Artificial Neural Networks: The above diagram represents a simple artificial neural network with one hidden layer.

Data from the first eight rounds of the competition and five features were used, consisting of yardsgained, rushing yards gained, turnover margin, time of possession, and betting line odds. Unsupervised methods based on clustering were used to distinguish between good and poor teams.An ANN with backward propagation (BP) was then used.

Purucker achieved 61% accuracy compared with 72% accuracy of the domain experts. The BP algorithm was found to be the most effective approach. A limitation of this study is that only a relatively small number of features were used.

Kahn extended the work of Purucker and achieved greater accuracy, performing slightly better than experts in the NFL who were making predictions on the same games. Data on208 matches inthe 2003 season were collected. The features that were used were total yardage differential, rushingyardage differential, turnover differential, away team indicator and home team indicator. There were two classes: away team outcome and home team outcome – a value of1 indicating that the team lost the match, and a value of +1 indicating that the team won the match. The problem was treated as a classification problem. The first 192matches were used as the training data set, and the remaining rounds (week 14 and 15) were used as the test set. Through testing, a network structure of 10-3-2 was found to be optimal. Accuracy of75% was achieved across the week 14 and 15 matches. The results were compared to the predictions of eight sports casters fromESPN.com. Across the same matches, the domain experts predicted an average of 63% of matches correctly.

Related Work Classified by Sport

FOOTBALL

Football is perhaps the World's pre-eminent sport, so it is not surprising that there has been a substantial amount of research on football prediction. Among all sports, football prediction is oneof the most widely and deeply researched area. We thus survey prediction related researches for football, a representative of the sports as our target domain, and categorize them into a few groups. These studies mostly deal with mathematical/statistical models or methods but there are a few researches based on machine learning techniques.

Statistical analysis has been done on football prediction. Many researchers suggested their own models or processes to analyze the results of football matches. They usually showed that their methods represent the results of football matches well. Many models and methods, like Poisson regression models, a logistic regression model using seed positions, and an updating process for the intra-match winning probability, were used to analyze the results of football matches. Most ofthese works also give some predictions as well, but they are more focused on statistical analysis of the results of football matches. The technique was based on a Poisson regression model but wascomplicated by the data structure and the dynamic nature of teams' performances.

The author study multiple techniques in data mining and result prediction to devise a good modelfor predicting matches. They use these major models: GBM (Generalized Boosted Models) and NB (Naive Bayes).

II. Naive Bayes

For Bayesian networks, we handle the uncertainty and formulize the sports strategies using a rule-based reasoner, but at the same time the strategies of a team or a player can be represented by crisplogic rule through which highly scholastic results are obtained.

All these studies relied on previous match results that is win/draw/lose or scores as training data and forecasted the results of a league or tournament matches. The expert NB also relied on information about the playing status of key players and on home ground advantage.

Their results of football prediction using FC Barcelona in 2008- 2009 they split their data set intonon psychological factors such as record of 5 previous matches weather conditions, results for or against team, players mean age, number of key players injured, mean number of goals scored in home and away fixtures.

III.GBM

Using GBM they attain 60% accuracy on an average, while the other models weren't accurate. Tofurther improve the results, more data and statistics can be considered such as opponent's team overall form in that season. Head to Head results and info about each team previous games.

They proposed a logistic regression model in 2016 Barclay's premier league match results with anaccuracy of 40.5. This was developed using4 significant variables: Home defines, home offense, away offense, away defense. The only limitation is only, one team was taken into consideration for predicting the outcomes. The author presents an approach to estimate football match results with neural networks, initially they classified the match into different categories using learning vector quaternization.

Neural Network has been used to determine the strength contrast between two opponents. They used specific Back propagation networks on data that have been designed according to classifyingresult.

We proposed a model to predict outcomes of football matches in English premier league. We trainthe final dataset on various machine learning classifiers and compare the performances of each classifiers and choose the one which yields the best results. We could bring in sentiment analysisand features such as individual player and team performance metrics, studying the trending hashtags on Twitter on match day to further enhance the accuracy of the model.

Statistical analysis forms one of the major strands on football predictions, they generally aim to show that their models or methods represent the results of football matches well; they should fit well. Many models and methods such as Poisson Regression Model, Logistic Regression Model using seed positions were used to analyze and interpret the results. Some of the works in this areatook more statistical approaches in predicting football matches. They use littleknowledge/information and are heavily based on pure statistical models, such as an ordered probity model and Poisson models.

A critical analysis of the literature in machine learning focusing on the application of artificial neural networks is done through this paper. In doing so, we identify the various data sources, learning methodologies, appropriate means of model evaluation and finally the specific challengesof predicting sports results. This is also one of the expanding areas which provide us a good predictive accuracy due to the large monetary amounts involved in betting and gambling.

CRICKET

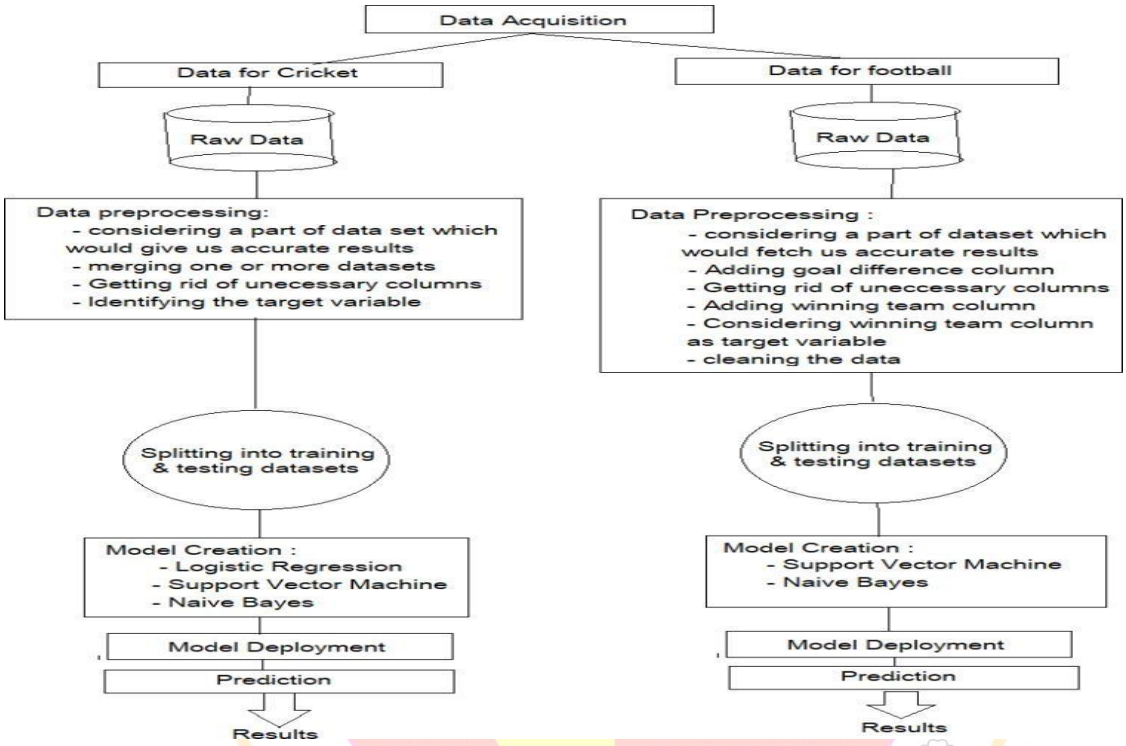
In literature, Duckworth and Louis proposed a solution called DL method to reset targets in rain interrupted matches which was adopted in the international cricket council 1998. It also consists of players performances, optimal batting order, strength of the opponent team and the performanceof their batsmen and bowlers. Various factors affecting the game, including home team advantage,day and night effect, toss etc. uses Bayesian classifier to predict the outcome of the match. We have modern classification techniques- Naive Bayes, Random Forest, Support Vector Machines.

Linear regression and nearest neighboring clustering algorithms conducted a comparative study based on their outcomes and performances. They take both the historical data and instantaneous state of the match while the game is in progress. A separate model for each team is prepared in which each team is analyzed. Random Forest is an ensemble method used for classification, regression and other tasks that operate by constructing many decision trees during training phase in classification, the output is the class which is the mode of the classes predicted by the individualtress. While in regression, mean prediction of individual trees is given as final output. This has anadvantage of correcting the flaw of decision trees which tend to overfit the training set with respectto every other team. The reason behind this is to avoid any duplicate data entry.

III Design Of The Proposed System

System Design (Block Diagram)

We explain the general design of our model and how we attacked the problem, providing a few flowcharts to help simplify the representation. Once the input dataset has been pre- processed, it is split into two features sets; one feature set that concerns features related to thehome ground and another one for the away team features. Once the dataset is split, a numberof different learning algorithms are applied on the two feature sets to derive predictive models for the match result. These models are then compared to seek the one that can be utilized for forecasting upcoming match results.



Data Set Description

- **Football**

We have considered 4 datasets, to predict the FIFA 2018 Tournament match results. Theyare, namely: Fifa_rankings, World Cup 2018 Dataset, Fixtures and the Results datasets. Wehave obtained them from Kaggle, which has an abundant amount of data and resources, and played a huge part in achieving our goal.

i. **Fifa_rankings**: This dataset contains all available FIFA men's international soccerrankings and includes 211 teams. It includes features like the position, team name and the points scored by each team and has a size of 4.23KB with 3 columns and 211 rows.

ii. **World Cup 2018 Dataset**: This is the dataset that contains the history of all previous matches, scores and titles of all participating teams to help us predict whowill qualify and predict who will win. It also has all the participating teams, and thematch schedule with orders of the matches. The dataset contains 32 entries, each team will have 3 matches in the group stage, so each match is mentioned vs whom,the history between those 2 teams with wins minus losses. It has a size of 3KB.

iii. **Fixtures**: This dataset has all the individual match locations, the home team and away team names, the date the match took place and which group they belong to. Ithas 6 columns and 64 rows, amounting to a size of 1MB.

iv. **Results**: This dataset includes 38,903 results of international football matches starting from the very first official match in 1972 up to 2019, totaling up to 2.63MB.The features exists are date, home_team, away_team, home_score, away_score, tournament, city, country, and the matches range from FIFA World Cup to FIFI Wild Cup to regular friendly matches.

Cricket

In the case of cricket, we have reviewed three datasets, to predict the IPL 2016 match results. They are, namely: Matches, Deliveries, and Results. Like football datasets, we haveobtained them from Kaggle.

i. **Matches:** This dataset describes features like city, date, team1, team2, toss_winner, toss_decision, result, winner, win_by_runs, win_by_wickets, venue, and the umpires. It contains 636 rows and 15 columns having a total size of 114 KB.

ii. **Deliveries:** This particular dataset has the innings, batting and bowling team, overs, balls, batsman, bowler, the various kinds of runs scored, and the players dismissed.It has more than 1.5Lakh records with 20 columns and a size of 15MB.

Description of modules

Steps followed to obtain the results are.

i. Importing packages
ii. Loading the dataset
iii. Performing data exploratory analysis for semifinal
iv. Training and Testing the dataset
v. Prediction based on criteria

IV Results

Detailed report of the result going for semifinals

Brazil and Portugal
Winner: Brazil
Probability of Brazil winning:0.348
Probability of Draw: 0.262
Probability of Portugal winning: 0.191

Germany and Argentina
Winner: Germany
Probability of Draw:0.243
Probability of Argentina winning: 0.242
Detailed report of the result going for semifinals
Germany and Brazil
Winner: Germany
Probability of Germany winning: 0.200
Probability of Draw: 0.280
Probability of Brazil winning: 0.519
The winner is predicted as Germany using support vector machine (SVM)

V Conclusion And Future Scope

In this report, we presented a sports data mining approach to predict the winners of various games. Instead of using the traditional approach of comparing the statistics of the two competing teams and projecting the outcome, our approach predicts the outcomes based on the historical results of games. The competing teams are compared to other teams and game results are pulled from thosesimilar teams and used in predicting their winning probability.

In the future, this project can be extended by taking player's statistics for more accurate analysis on the algorithms we have worked on and we can also use many other algorithms and approachesto improve the

accuracy of the prediction like Naive Bayes algorithm with principle component analysis, artificial neural networks, and many other algorithms. We can also improve the performance of the current implementation related to both, feature creation and model training aswell as the prediction. In terms of future addition to the project, this project could be implementedas a web application and the same strategy for predicting the results can be used for other sports as well. In coming years, E-sports will be the biggest sports around, hence, predictions play a major role to keep the audience engaged.

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Compressing and de-noising of Biomedical Signals

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Abstract

Compressing and de-noising signals of ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) is important in signal processing. Several steps are involved to process biomedical signals, among which the first step related to pre-processing, in which a noisy signal is processed for generating noise-free signal, which can be utilized for further operations. This work gives a detailed understanding of de-noising techniques those have been used. These techniques utilize the benefits of artificial neural networks (ANN), adaptive filtering, Remez Exchange Algorithm and finite impulse response (FIR) filtering. These techniques have been implemented for de-noising of biosignals, individually as well as combining with other techniques, for better results. The application of the method to simulated and biomedical signals shows its potential.
Keywords : Biomedical signals, anolog, digital, FIR Filters, Remez Exchange Algorithm

1 Introduction:

Biomedical instrumentation is the branch of Medical Sciences where the medical instruments are to be studied. Biomedical instruments are used to record, analyze & process the biomedical signals. Biomedical signals are extracting the information from biological systems like brain, muscles or heart etc, under investigation. The extracting information may be so simple to note the pulse rate of a person from wrist or so complex like analyzing the information from heart by using ECG. There are various sources for extracting signals from the biological system [1-2].

They are:

i. Bioelectric signal:- ECG (Electrocardiograph), EEG (Electroencephalograph), GSR (Galvanic skin response), EOG (Electrooculography) and EMG (Electromyograph) are the bioelectric signals. These signals are generated from the nerve cells or muscle cells. These signals are collecting from the cell membrane potential which may be excited under certain conditions to generate an action potential.

ii. Bioacoustic Signals:- Lung sounds, heart sounds, bowel sounds, and joint sounds are the bioacoustic signals generated from the human body in easy and noninvasive way during its working.

iii. Biochemical Signals:- Neurotransmitters are the chemical messengers from the body that control and regulate the body. These signals are extracted from the chemical measurement of living tissues & samples which are taken from living being.

iv. Biomechanical Signals:- This signals are extracted from some mechanical function of the biological system. The flow of blood & pressure signals, all types of motion & displacement signals are the example of the biomechanical signals.

v. Biomagnetic Signals:- MMG (Mechanomyogram) or MEG (Magneto-encephalogram) are the examples of biomechanical signals which are observed from the surface of muscles when it is contracted. Biomagnetic signals are obtained from the magnetic field produced by electrical currents occurred naturally in the brain of the living things.

vi. Bio-optical Signals:- Bio optical signals can observe either naturally or the signals may be introduced to measure a biological parameter with an external light medium.

vii. Bio-impedance Signals:- An electrical impedance signal can be obtained due to the changes in blood volume or blood resistivity from human being.

The biomedical signals are extracted from the biomedical instruments. Therefore it is useful to study of biomedical instruments.

2. Significance of Biomedical Signals

Biomedical signals are the collection of electrical signals acquired from any organ. This signal is normally a function of time. It may be in terms of its amplitude, frequency and phase. The analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of

patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently, extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies, improving detection techniques to reduce noise, and to acquire accurate biosignals [3-4].

3. Sources of errors and significance of reduction of noise

Accurate measurement of biomedical signals depends on the properties of electrodes and its interaction with the skin, amplifier design and the conversion and subsequent storage of the biomedical signal from analog to digital form. Biomedical signals are influenced by electrical noise and some other factors.

3.1 Electrical noise and factors influencing biomedical signal:

The amplitude of biomedical signals is very small before being amplified. Biomedical signals collecting from any organ acquire noise while traveling through different tissues or blood vessels. Therefore it is important to understand the characteristics of the electrical noise. The electrical noise, which will be affected biomedical signals, can be categorized into the following types [5-6]:

i. Power line interference
ii. Base line drift
iii. Electrode contact noise
iv. Motion artifacts
v. Muscle contraction
vi. Instrumentation noise generated by electronic devices
vii. Electrosurgical noise

Power line interference and base line drift: This noise could be occurred due to stray effect of the alternating current and loose contact of the electrodes to the patient as well as faulty electrodes. This error can cause due to power line interference or not properly earthen measuring instruments and the patients. This noise is reduced by using notch filter [7].

Inherent noise in electronics equipment: This noise is induced by the electronics equipments and cannot be eliminated. But it can be reduced by using high quality electronic components.

Ambient noise: This type of noise is procreated by the electromagnetic radiation from the surfaces of our body. It is almost impossible to avoid this. The ambient noise may have the amplitude that is one to three orders of magnitude greater than the biomedical signal.

Motion artifact: There are two major sources of motion artifact:

1) The electrode contact with the surface of our body and
2) The cable of electrode.

Motion artifact can be reduced by properly designed set up of the electronic circuitry.

Inherent instability of signal: The amplitude of biomedical signal is random in nature. It is influenced by the firing rate of the motor units. In most of the situation, firing frequency region is of the order of 0 to 20 Hz. This class of noise is considered to be unwanted and therefore there is a need of removal of the noise [4].

Electrosurgical noise: Electrosurgical noise is procreated by different medical equipment present within the patient care environment at frequencies between 100 kHz and 1 MHz, lasting for about 1 to 10 seconds [8]. The electrosurgical noise completely destroys the ECG signal and is presented in large amplitude [5].

The specific requirement of biomedical amplifiers [9];

- ECG amplifier
  - Frequency range is about 0.05- 100Hz.
  - Safety and protection: leakage current below safety standard limit of 10 μA.
  - Electrical isolation from the power line and the (earth) ground.
  - Safety against high defibrillation voltages.

- EEG amplifier
  - Gain must deal with microvolt or lower levels of signals.
  - Components must have low thermal and electronic noise.
  - Other factors are similar to ECG.
- EMG amplifier
  - Slightly improved amplifier BW suffices.
  - Post-processing circuits are always needed (e.g. rectifier and integrator).
- EOG amplifier
  - High gain with very good low frequency or even DC response.
  - DC-drifting electrodes should be selected with great care.
  - Often active DC or drift cancellation or correction circuit may be necessary.

From the above background, it seems that the quality of biomedical signal can be improved by-

a) Design the instrumentation amplifier with increase in Signal to Noise ratio (SNR), high common mode rejection ratio (CMRR), low input referred noise voltage and low dc offset as well as very low power consumption.

b) The distortion of biomedical signal must be as small as possible by avoiding unnecessary filtering, notch filters and distortions of signal peaks.

4. Techniques used for reduction of noise

The amplitude of biomedical signals is very small. Therefore it is easily contaminated by noise. Due to noisy signal, there may be misleading of diagnosis and hence it is necessary to reduce noise from the original signals. Exclusive amplifiers designed with specific features and various filter circuits are used for reduction of noise from the biomedical signals.

Table 1.1: Electric potentials of biomedical signals **[9]**:

Biopotential	Frequency Range	Signal Amplitude	Electrode
Electrocardiogram (ECG)	0.05 - 100 Hz	1 - 5 mV	Surface
Electromyogram (EMG)	20 - 2000 Hz	0 - 10 mV	Surface, needle
Electroencephalogram (EEG)	0.5 - 40 Hz	0.001 - 0.01 mV	Surface
Electro-oculography (EOG)	DC -10 Hz	0.01 - 0.1 mV	Contact
Action potential of neurons	0 -10 KHz	50 - 90 mV	Glass pipette

4.1 Exclusive amplifiers:

The biomedical signals are extracted from organ of human beings and it is the input to the amplifier. This input consists of five components:

i. The desired biopotential,
ii. The undesired biopotential,
iii. A power line interference signal of 50 Hz (60 Hz in some countries) and its harmonics,
iv. Interference signals generated by the tissue/electrode interface, and
v. Noise.

Essential factors to be considered for measuring equipments [8]:

- High amplification
- High CMRR (High differential gain and low common mode gain)
- High input impedance
- Low Noise
- Stability against temperature and voltage fluctuations
- Electrical safety, isolation and defibrillation protection.

Therefore proper design of the amplifiers is the extensive task. Table 1.2 shows the biopotential amplifiers design consideration for various biomedical signals.

Table 1.2 Biopotential amplifiers design consideration [10].

Biopotential	Exclusive amplifier design consideration	Additional features desired
ECG	Moderate gain, Bandwidth, noise, CMRR, Input Impedance	Electrical safety, isolation, defibrillation protection
EEG	High gain, very low noise filtering	Safety, isolation, low electrode-skin resistance
EMG	Gain and bandwidth of Op-Amps	Post acquisition data processing
EOG	DC and low drift	Electrode-skin junction potential. Artifact reduction

Now many companies are used CMOS technology for designing of high performance amplifiers, which provides increase in gain and CMRR along with low power consumption [4]. Along with high performance amplifiers, various filter circuits are also used for reduction of unwanted signals or noise. These filter circuits are classified in number of ways:

i. Analog or digital Filters
ii. Passive or active filters
iii. Audio (AF) or radio frequency (RF) filters

4.2 Analog filters

Analog filters are designed to processed analog signals, while digital filters are processed analog signals using digital techniques. Op Amp based active filters are called analog filters. Passive filter uses passive elements such as resistors, capacitors and inductors, while active filter employs transistors or operational amplifiers in addition to the resistors and capacitors. RC filters are commonly used for low frequency signals or audio signals, whereas LC or crystal filters are used for high frequency signals or radio frequency signals. The crystal provides more stable operations at high frequency due to high value of figure of merit. In audio frequencies, inductors are not used because it is bulky, expensive and may dissipate more power. It also emits magnetic field [11].

Active filters offer the advantages over passive filters:

a) Gain and frequency adjustment: The operational amplifier is capable of providing desired gain. Therefore input signal is not attenuated. Frequency response of active filter is excellent.
b) No loading problem: The active filter uses Op Amp having high input resistance and low output resistance and therefore it does not cause any loading effect.
c) Cost: Usually active filter is more economical than the passive filter. Because the circuit uses Op Amp which is not expensive and the absence of inductor.

Although active filters are most widely used in communication system and signal processing. Active filters are more extensively used in telephone, radio, television, radar, space satellites and **biomedical instruments**. The most commonly used filters are;

i. Low pass filter
ii. High pass filter
iii. Band pass filter
iv. Band reject filter
v. All pass filter

4.3 Digital Filters

Digital filters are important class of Linear Time Invariant (LTI) digital signal processing (DSP) systems. It is designed to modify the frequency characteristics of the input signal x (n). Digital filters are extensively used because of certain advantages over Analog filters. Digital filters have the potential to achieve much better signal to noise ratio than Analog filters. Digital Filters have emerged as a strong option for removing noise, shaping spectrum and minimizing Inter-Symbol Interference (ISI) in communication architectures.

Digital Signal Processing (DSP) is used in video compression, digital set-top box, cable modems, digital versatile disk, portable video systems/computers, digital audio, multimedia and wireless communications, digital radio, digital still and network cameras, speech processing, transmission systems, radar imaging, acoustic beam formers, global positioning systems, and biomedical signal processing. The field of DSP is always been driven by the advances in DSP applications and in scaled Very-Large-Scale-Integrated (VLSI) technologies [12].
The design of digital filter involves five steps [13]:

i. Filter Specification
ii. Coefficient calculation
iii. Realization
iv. Analysis of Finite word length Effects
v. Implementations

Digital Signal Processing Systems (DSPS) relate input signals x (n) to the output y (n). The relationship between the output sequence of this system and may be represented by the operator as y (n) = F [x (n)]. The Fig. 1.1 shows Discrete-time signal representation.

Figure 1.1: Discrete-time signal representation.

4.4 FIR Filter [14];

FIR filter is a digital filter without feedback. The block diagram of FIR filter is shown in the Fig. 1.2. If x (n) is the input at n^{th} time, and $x\,(n-1)$ is the delayed input then the filter output $y\,(n) = x\,(n) + x\,(n-1)$,

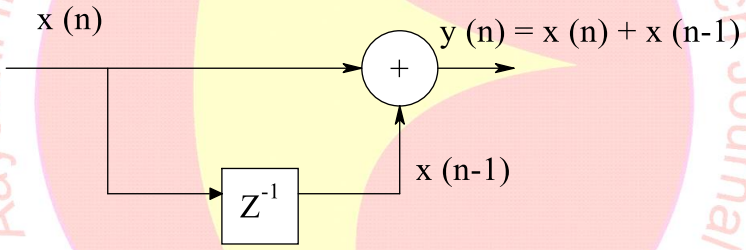

Figure 1.2: *A simple FIR filter*

The general transfer function of an FIR filter in the z transform is given by

$$H(z) = \sum_{l=0}^{M} b_l z^{-l} = H_0 z^{-M} \prod_{l=0}^{M} (z - z_l) \qquad (1)$$

A filter with the above transfer function will be always stable, i.e. an input of finite amplitude will lead to an output that is also finite. This can be inferred from the location of the poles in the z-plane (the two-dimensional plane formed by plotting the real part of z along the abscissa, and the imaginary part along the ordinate). The poles correspond to the points in the z-plane where the denominator of *H (z)* is zero; their counterparts are the zeros, where the numerator becomes zero. For the FIR filters, all poles are at the origin (z= 0), and the zeros are at the z_l in the equation above. When the poles of a transfer function are within the unit circle (i.e. $|z| < 1$), then filter is stable; this clearly stated that the case of FIR filters.
The advantage of FIR filters is that they can be designed to have linear phase. FIR filters have a linear phase response if and only if its impulse response is symmetric or anti-symmetric, that is $h\,(n) = \pm\, h\,(M - n)$. Such filters may introduce delay in the output signal with respect to corresponding input signal, but all frequencies are delayed by the same amount. These filters thus distort the features of the signal that are not linear in their phase-response.

FIR filters can be designed by using optimization packages or by using approximations to the ideal infinite-impulse responses by cutting the finite length using the different types of tapered windows. The main drawback of FIR filters is that in order to satisfy demanding specifications, FIR filters require a relatively high

number of multiplications, additions and storage elements or large memory space. This makes FIR filters potentially more expensive than IIR filters in applications where the arithmetic operations or storage elements are costly, or need to be limited in number. FIR filters has the benefit of achieving linear phase, this motivates the widespread use of it.

4.5 FIR Filter Designing Methods:

Basically FIR Filter has three methods of designing [15] :

i. Window Method
ii. Frequency Sampling Method
iii. Optimal Method (Remez Exchange Method)

4.5.1 Window Method:

The impulse response *h (k)* is related to the inverse Fourier transform of *H (ω)*. In this case, the pair of transformation is used which couples discrete time domain signals (sequence of samples) with a continuous spectral description.

Discrete Time Fourier Transformation is represented by the equation,

$$H(\omega) = \sum_{k=-\infty}^{\infty} h(k) e^{-j2\pi fTk} \qquad (2)$$

There are many types of window functions:

i. Kaiser Window
ii. Hamming Window
iii. Hanning Window
iv. Rectangular window
v. Blackmann window

By using Kaiser Window, it is quite possible to obtain separate control upon length or order of Filter. In Kaiser Window, there are two main parameters, the length of window and the shape parameter β. An important advantage of the window method is its Simplicity. It is simple to understand and simple to apply. It involves a minimum amount of computational efforts. The major disadvantage of it is its lack of flexibility.

The window method uses the Fourier series in conjunction with a class of functions known as window functions.

4.5.2 Frequency Sampling Method [15]**:**

When a desired frequency response has been specified, then the frequency-sampling method for FIR filter design is used which is the simplest and most direct technique. It consists of uniform sampling of the desired frequency response, and an inverse DFT technique is used to obtain the corresponding finite impulse response. But the results are not optimal because the response generally deviates from what is desired between the samples. When the desired frequency-response is under sampled then the resulting impulse response will be time aliased to some extent. It is important to evaluate the final impulse response by the use of a simulated DTFT (FFT with lots of zero padding) comparing to the originally desired frequency response.

4.5.3 Remez Exchange Algorithm [16]:

The Remez Exchange Algorithm is a standard method for filter designing. It minimizes the filter length and error between desired frequency response and actual frequency response. The Error function is defined as the difference between the ideal filter response and the practical filter response.

The magnitude of the error $|E(\omega)| = |W(\omega)[D(\omega) - P_c(\omega)]|$

Where

$D(\omega)$ is the ideal filter response or desired filter response,
$P_c(\omega)$ is the actual or practical filter response and (3)
$W(\omega)$ is the weight function.

The Remez algorithm is not a general linear programming approach, but it is very robust, converges very rapidly to the optimal solution, and is widely used.

Optimal Filter Design Method is used to design a filter, in which filter coefficients are adjusted again and again until a particular error is minimized. The various methods of optimal filter design are as follows:

i. Least square method.

ii. Equiripple method.
iii. Maximally flat.
iv. Generalized equiripple.
v. Constrained band equiripple.

5. Results and discussion

We started working with digital filter like FIR filter. We found that the source of noise doesn't have any fix band of interference, so we were planned for adaptive filtering algorithms. The algorithms differentiate in a way of updating the coefficient (h) of filter sample by sample inputs. After an extensive experimentation over the adaptive algorithms, it is observed that the performance of filters depend on the SNR values of input signal, μ value (Step size), number of taps and other factors. Finally, we choose Artificial Intelligent based filtering algorithms for dynamic solution. These techniques have only two processes- training and testing. Training process based on subset outcomes of adaptive filtering algorithm in initial stages, which may not require in later time even on change of source input as well, called trained filter / smart filter. Such intelligent filters give the freedom of selection of signal with different SNR values; also not bother about number of parameter settings which lead one more step towards the auto filter concept. The goal of our proposed work is to develop an algorithm which will use for removing noise excellently.

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Noise Reduction of Electromyography (EMG) signals by Artificial Neural Network (ANN) Technique

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Abstract

Electromyography (EMG) signals can be used for clinical/biomedical application and modern human computer interaction. EMG signals acquire noise while traveling through tissue, inherent noise in electronics equipment, ambient noise, and so forth. In this paper, it is shown that a Focused Artificial Neural Network ANN can elegantly solve to reduce the noise from EMG signal. It is seen that the performance of the proposed ANN clearly outperforms the best techniques. It is observed that ANN Filters work excellently as compared to adaptive filters and also observed that as the number of testing samples of biomedical signals.

Keywords: EMG, SNR, MSE, MATLAB, ANN

1 Introduction:

Biomedical signals are the collection of electrical signals and analysis of these signals is very important for researchers as well as for careful medical diagnosis. It is also essential for proper treatment of patients. If the signals are not properly diagnosed and analyzed, it will lead to wrong diagnosis and can be dangerous for the lives. Careful analysis of biomedical signals such as ECG, EMG, and EEG are very important for proper diagnosis of disease. These signals are noisy as well as artefacts which have to be removed for proper treatment of a patient. Presently,extensive efforts and research have been done in this area for developing better algorithms, upgrading existing methodologies,improving detection techniques to reduce noise, and to acquire accurate bio-signals [1-4].

The EMG signal is a biomedical signal that measures electrical currents generated in muscles during its contraction representing neuromuscular activities. The nervous system always controls the muscle contraction and relaxation. Hence, the EMG signal is a complicated signal, which is controlled by the nervous system and is dependent on the anatomical and physiological properties of muscles. EMG signal acquires noise while traveling through different tissues. The main reason for the interest in EMG signal analysis is in clinical diagnosis and biomedical applications. So far, research and extensive efforts have been made in the area, developing better algorithms, upgrading existing methodologies, and improving detection techniques to reduce noise and to acquire accurate EMG signals. Noise removal from noisy EMG signal is a filtering problem. Here the Neural Network model is trained to separate known noise from EMG signal. Neural Networks (NNs) have been efficiently used for nonlinear multivariable function approximation [5-7].

The main objective of our research work is to develop artificial intelligent model for reduction of noise from biomedical signal. This paper deals with intelligent removal of noise from the EMG signal using ANN-based Techniques.

2. Experimental : Performance measures by using following two factors**;**

i) Signal to Noise Ratio (SNR):

The output SNR (SNR_{out}), is calculated from power of the input signal x (n) and an noise signal e (n) and is given by,

$$SNR_{out} = 10 \ Log_{10} \left[\frac{\text{Signal Power}}{\text{Noise Power}} \right]$$

Where, SNR_{out} is the ratio of the two powers expressed in decibels.

ii) Mean Square Error (MSE)

The formula for the mean square error is given by,

$$MSE = \frac{1}{N} \sum_{i=1}^{N} \left(\hat{y}_i - y_i \right)^2$$

Where, N = number of samples in the set of data,

y_i = Actual network output, and

$\hat{y}_i$ = Desired network output.

2.1 Experimental Arrangement

i) Database Descriptions:

To design ANN Model, a sufficiently large amount of data is required for training and testing. We have collected standard data bases for biomedical signal from the https://physionet.org, http://www.emglab.net and etc.

ii) Software Specification Requirement: MATLAB:

MATLAB is very rich in command toolbox. Although MATLAB is intended primarily for numerical computing, an optional toolbox uses the MuPAD, symbolic engine, allowing access to symbolic computing capabilities. Matlab for designing artificial intelligent model. MATLAB has enormous Toolboxes. Out of which, we used Signal processing toolbox, Neural network toolbox, Fuzzy logic toolbox, Filter design toolbox, Curve fitting toolbox, and Data based toolbox for design the filters [8-9].

In this paper, we have simulated the MATLAB codes for the data conversion, adaptive filter algorithm, artificial intelligent ANN Model training and its testing.

iii) Software Implementation details:

The GUI has been constructed by using Matlab codes. Other set of codes have been used to run the various algorithms for noise removal in Matlab simulator. The main GUI contains four parts as shown in the following Fig. 1.1.

1] File input and its conversion
2] Adaptive filter algorithm and its Input parameter section
3] Output parameters section
4] Artificial intelligent noise removal section.

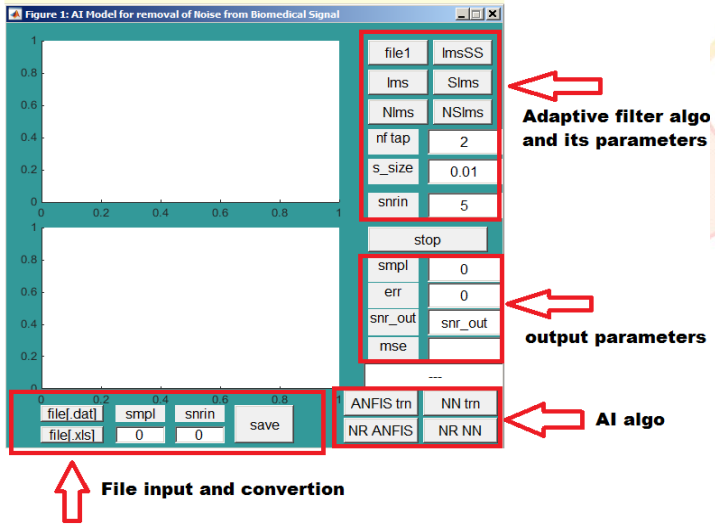


Figure 1.1: Artificial Intelligent Model for reduction of biomedical signal

2.2 Artificial intelligent noise removal algorithm: We have designed an artificial intelligent model for removal of noise from the biomedical signal by using Matlab coding on the basis of Sugeno architecture and run the

programme which creates graphical user interface. The Fig. 1.2 shows the block diagram of proposed artificial intelligent model.

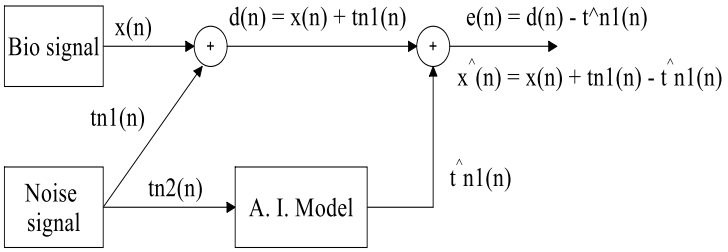


Figure 1.2: Block diagram of proposed A. I. Model

2.3 ANN based Noise Removal Algorithm:

Similar basic steps have been processed for training and weight storage of Neural Network Model as like an ANFIS. First we have trained the Neural Network by processing flowchart shown in Fig. 1.3 using 'allwe' file of relevant algorithm. Then processed the same steps used in ANFIS Model to save the weights, MF and MFT parameters. Once parameters have been saved then network was ready to test. Then we have tested neural network by performing steps as given in Flowchart of Fig. 1.4 on various biomedical signals.

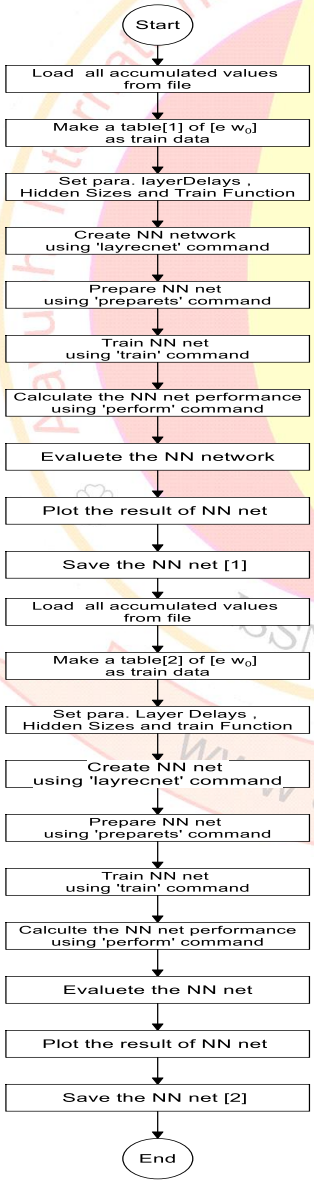


Fig.1.3: Flow chart of training of ANN Model

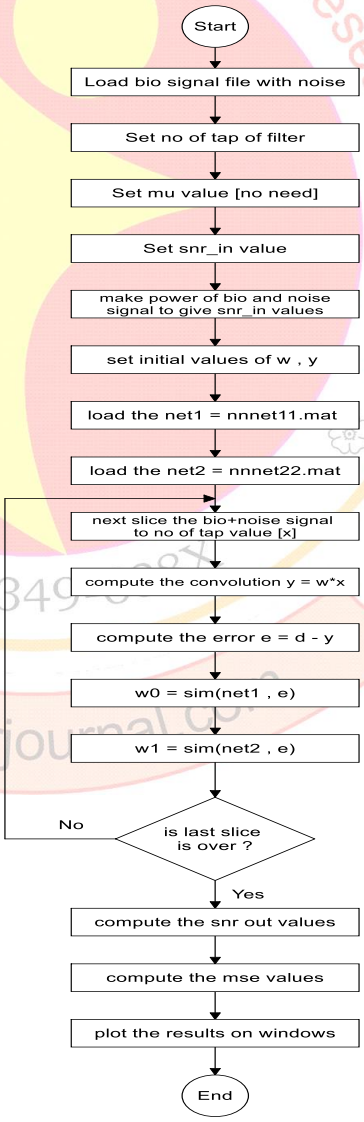


Fig.1.4: Flow chart of testing of ANN Model

2.4 Simulations

The major objective of this study was to investigate a noise removal filters. For this, simulations are carried out on EMG signals. The results are obtained on the output parameter section of MATLAB based GUI for removal of noise from biomedical signals [10-15].

We have taken various data-based files of EMG from cited resources given in database descriptions. First, we have converted these files into MATLAB format file that is .mat format for further processing and saved as .mat files.

Then we processed the adaptive filters on saved files. We have used LMS related algorithms namely LMS, Sign LMS, Sign LMS, Normalized LMS and Normalized LMS Sign for different step sizes, tap values and different SNR in values.

For the illustration of all these simulation process, in shortest way, we have taken the screen snap for LMS related algorithm mentioned above for ANN Model. After application of adaptive filtering process, we have gathered all needful data in the allwe_algo_name .mat file for the further training and testing of artificial intelligent algorithm such as noise removal Neural Network.

During the adaptive filtering, training and testing process, the all information regarding input parameters, output parameters and process status along with plots, etc. have available on the GUI panel. For ready outcome in notable way, we have summarized all the observations in tabular form.

The adaptive Filters based on LMS algorithms have been trained on ECG and EMG (Blue lines) signal (File name- 100.mat) of samples = 500. It is shown in Fig. 1.3

The various biomedical signals having sample size= 500: ECG and EMG (Blue lines) and biomedical signals with noise (Red lines) have been used for testing of Artificial intelligent and ANN model as shown in Fig. 1.4. a,b,c,d,. The performance parameters such as signal to noise ratio and MSE have been observed from GUI for various step sizes using different adaptive algorithms on ECG1 Signal as given in Table 1.1 and Table 1.2.

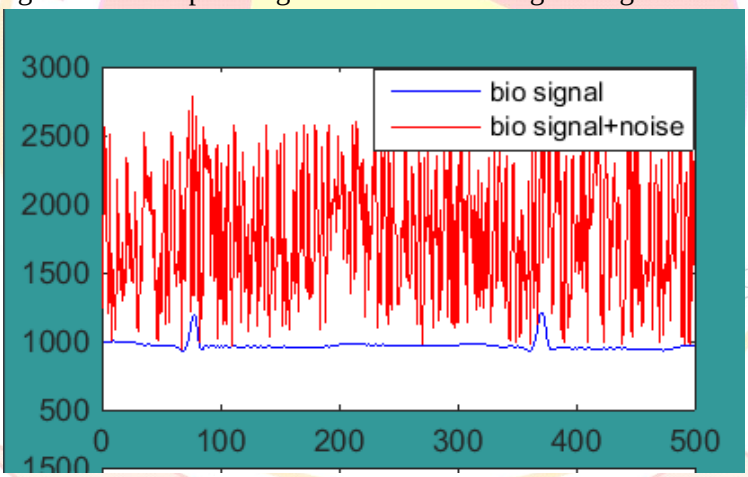
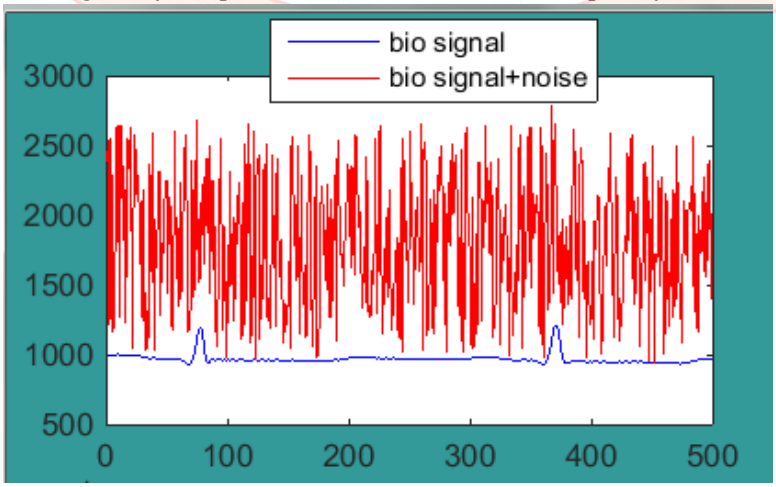


Figure 1.3: ECG signal of Samples= 500 used to train the adaptive filters LMS algorithms



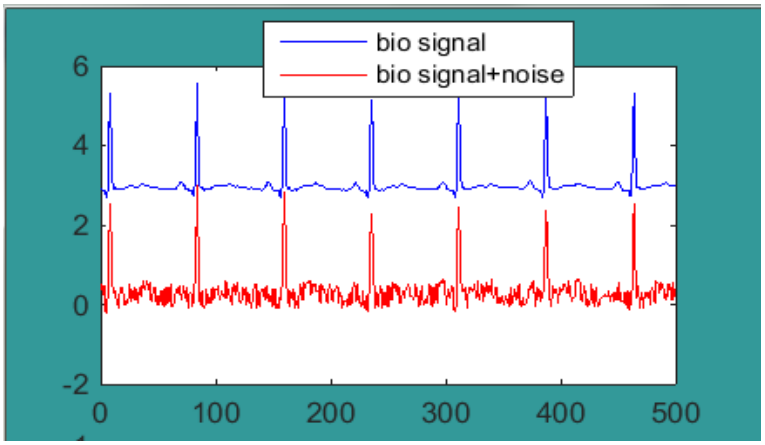


Figure 1.4 .a,b.: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

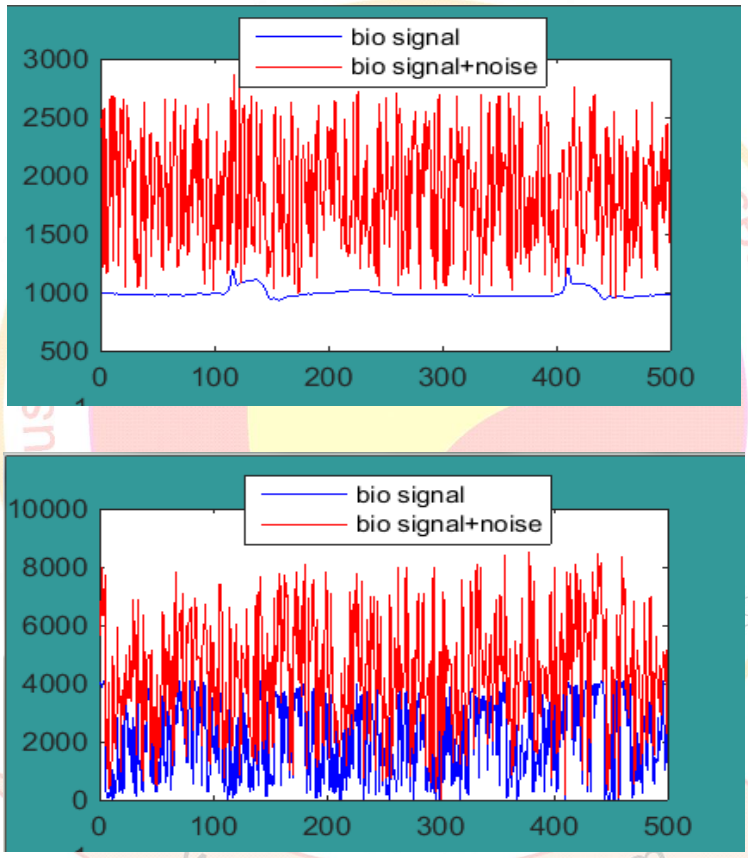


Figure 1.4.c,d: Blue line shows biomedical signals (ECGs and EMGs) and Red line shows biomedical signals with noise

Simulation Result for various Step under Adaptive Filters:

Table 1.1: Signal to noise ratio for various step sizes using different adaptive algorithms (on ECG1 Signal).

Step Size	SNR_out				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	-0.19906	26.7339	26.7339	7.97304	26.7338
1e-8	0.21109	26.7339	26.7339	24.324	26.7339
1e-9	1.23573	26.7339	26.7339	26.7018	26.7339
1e-10	10.2783	26.7339	26.7339	26.7336	26.7339
1e-11	24.5255	26.7339	26.7339	26.7339	26.7339

1e-12	26.7039	26.7339	26.7339	26.7339	26.7339
1e-13	26.7336	26.7339	26.7339	26.7339	26.7339
1e-14	26.7339	26.7339	26.7339	26.7339	26.7339
1e-15	26.7339	26.7339	26.7339	26.7339	26.7339

Table 1.2: Mean square error for various step sizes using different adaptive algorithms

Step Size	**MSE**				
	LMS	**NLMS**	**NSLMS**	**SLMS**	**SSLMS**
1e-7	977169	1980.05	1980.05	148854	1980.09
1e-8	889108	1980.05	1980.05	3448.79	1980.05
1e-9	702247	1980.05	1980.05	1994.74	1980.05
1e-10	87545	1980.05	1980.05	1980.20	1980.05
1e-11	3292.4	1980.05	1980.05	1980.05	1980.05
1e-12	1993.78	1980.05	1980.05	1980.05	1980.05
1e-13	1980.19	1980.05	1980.05	1980.05	1980.05
1e-14	1980.05	1980.05	1980.05	1980.05	1980.05
1e-15	1980.05	1980.05	1980.05	1980.05	1980.05

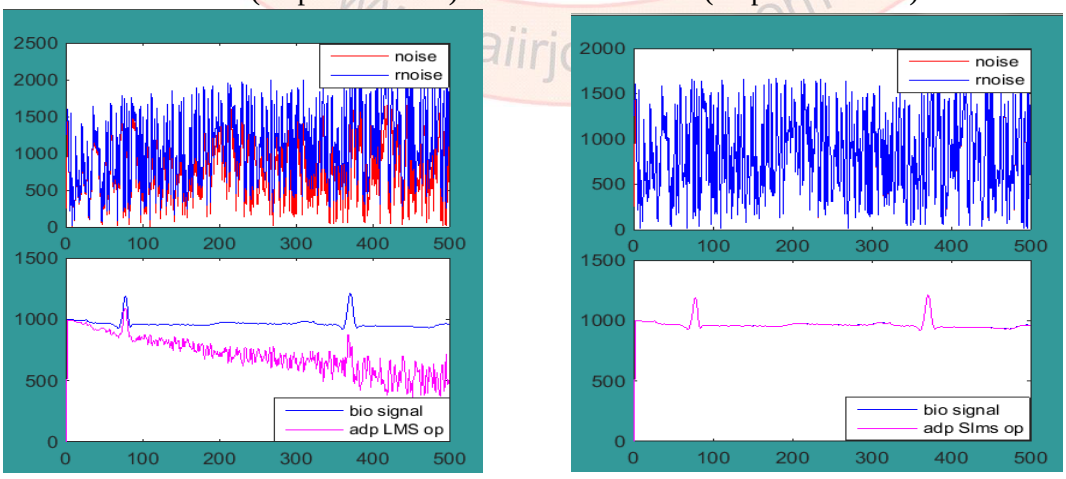
Table 1.1 shows that SNR_out for various step sizes on LMS related algorithms. From this, we have observed that NLMS and NSLMS performed better at step sizes from 1e-07 to 1e-15. But overall, all algorithms have good performance on step size 1e-10, which governs the rate of convergence and speed of tracking ability.
However, use of small step size is to ensure a small steady state error but it may decreases the convergence speed of the adaptive filter. However, increase in step size is to improve the convergence speed of the adaptive filter, but it might cause the adaptive filter to become unstable, so we have to select optimum value of step size [15,16]. The adaptive filter processed on LMS related algorithms using ECG 1 (100.mat file). The outcomes are depicted on GUI in Fig. 1.5.
Number of Samples used for Adaptive filters = 500.

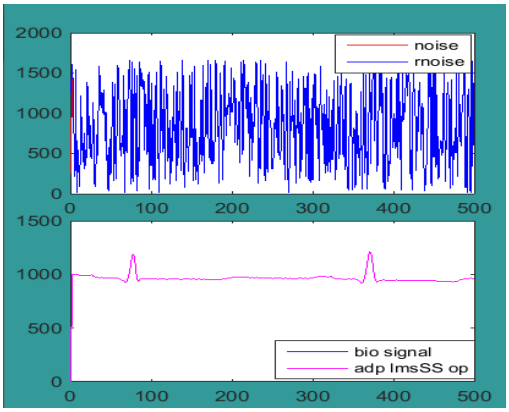
The Percent Root mean square Difference (PRD) indicates the reconstruction fidelity by point wise comparison with the original data. Another definition of error measure is called PRD and is given by:

$$PRD = \sqrt{\frac{\sum_{n=1}^{N}[x[n]-\hat{x}[n]]^2}{\sum_{n=1}^{N}[x[n]-\bar{x}]^2}} \times 100$$

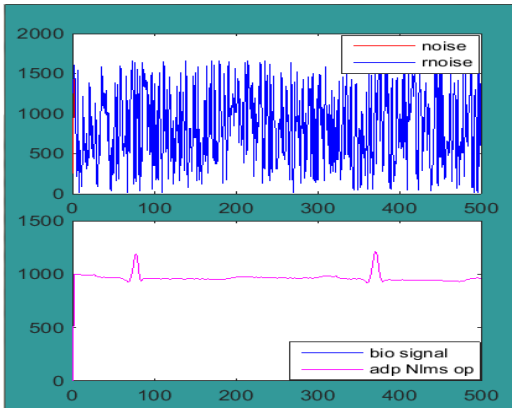
Where x[n] and x [n] are the original and reconstructed signals of length N, respectively and x is the average value of the signal. PRD provides a numerical measure of the residual root mean square (RMS) error and the observed value of prd_val = 0.0461 [10-11].

LMS (Step size=1e-10) SLMS (Step size= 1e-10)





SSLMS (Step size= 1e-10)



NLMS (Step size= 1e-10)

NSLMS (Step size= 1e-10)

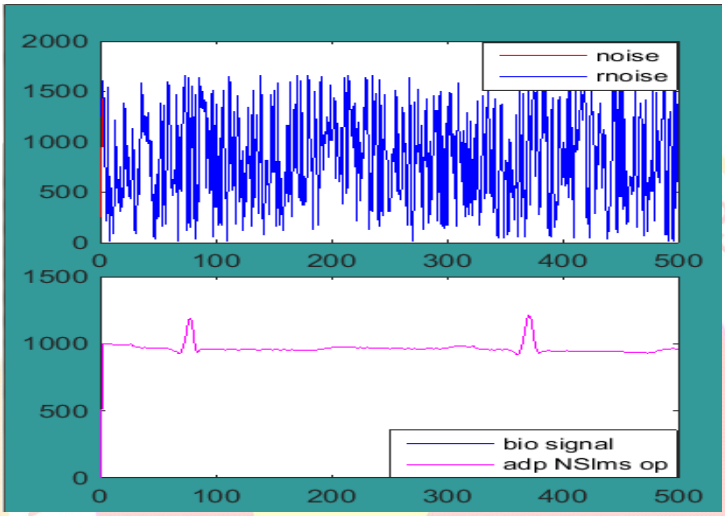


Figure1.5: Simulation Result of Adaptive Filters for the ECG 1 signal (LMS, Sign LMS, Sign Sign LMS, Normalized LMS & Normalized LMS Sign algorithms)

Table1.3: Report of Adaptive filters for various algorithms.(No. of Samples = 500)

Algorithm	**Parameters [μ =1e-10 and No. of Taps= 2]**		
	SNR in	SNR out	MSE
LMS	0	10.333	86450.1
SLMS	0	26.7336	1980.19
SSLMS	0	26.7339	1980.05
NLMS	0	26.7339	1980.05
NSLMS	0	26.7339	1980.05

From the Tables 1.1 and 1.2, we have to select proper value of step size which gives the good SNR out and minimum MSE. Thus we have preferred optimum value of step sizes which shows the best fit of straight line. Then we have developed adaptive filters for various LMS algorithms. The SNR out and MSE of various adaptive filters is shown in the Table 1.3.

3. Results and Discussion

The higher level of noise reduction is possible by performing adaptive noise cancellation techniques, otherwise this level of reduction of noise is difficult to achieve by using conventional filtering methods. As per the simulation results, it is observed that LMS algorithm has some limitations such as instability when the power

of input signal changes or the value of step size varies resulting in change of the rate of convergence. Thus SSLMS, NLMS and NSLMS algorithms are evolved from LMS algorithm to overcome the above-mentioned limitations. From the Table 1.1 and 1.2, it is inferred that the SSLMS, NLMS and NSLMS algorithm shows far greater stability with different step size. This combined with good convergence speed and relative computational simplicity. Thus, the SSLMS, NLMS and NSLMS algorithms are ideal for the real-time adaptive noise cancellation system. The amount of variation in non-stationary signals is difficult to control. LMS and SLMS have relatively poor performance for non-stationary as compared to SSLMS, NLMS and NSLMS and if we have to improve the performance of LMS and SLMS, the step size should have to reduce resulting in long convergence time. It is observed that ANN Filters works excellently as compared to adaptive filter and also observed that as the number of testing samples of biomedical signal (100.mat file) increases then the SNR value increases, while that of MSE decreases.

Thus, from the overall observations, we have concluded that the artificial intelligent networks ANN can be used to reduce noise from various biomedical signals intelligently. The SSLMS, NLMS and NSLMS are more precise and consistence as compared LMS and SLMS algorithms for wide range of step sizes [17-21].

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Adaptive Neural-Based Fuzzy Inference System (ANFIS) : A Survey

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Abstract

The main aim of this study is to develop a flow prediction method, based on the adaptive neural-based fuzzy inference system (ANFIS) coupled with stochastic hydrological models. In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model.

Keywords: ANFIS, Fuzzy Systems, Mamdani, Sugeno , Membership Function

Introduction: Fuzzy Systems

Fuzzy systems suggest a mathematical system that interprets the subjective human knowledge of the real time processes. This is a way to manipulate practical knowledge with some level of uncertainty. Fuzzy sets theory was introduced by Lofti Zadeh in 1965. The general architecture of a fuzzy system is depicted in Figure 1.1 The behavior of these systems is described by using a set of fuzzy rules such as *IF <premise> THEN <consequent>*. These system uses linguistics variables with symbolic terms. Each term represents a fuzzy set. The terms of the input space compose the fuzzy partition. The fuzzy system consists of three stages [1-4]:

1. The values of numerical inputs are mapped by a function according to a degree of compatibility of the respective fuzzy sets. This operation is called fuzzification.
2. The fuzzy system processes the rules in accordance with the firing strengths of the inputs.
3. The resultant fuzzy values are transformed again into numerical values. This operation is called defuzzification.

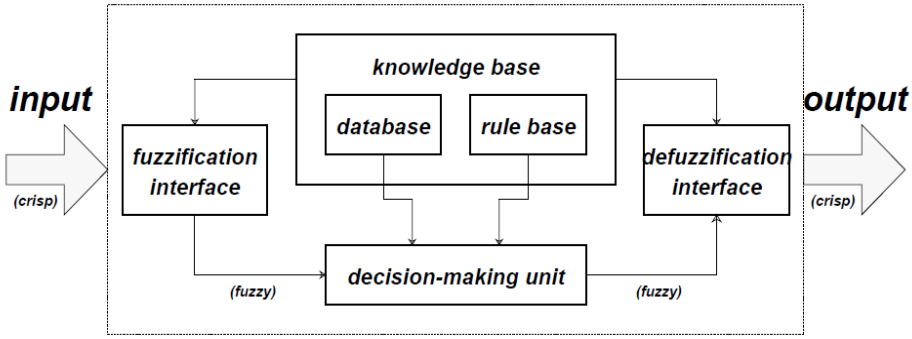

Figure1.1: Basic Components of Fuzzy System

In an FIS, the knowledge base is comprised of the fuzzy rule base and the database. The database contains the linguistic term sets considered in the linguistic rules and the MFs defining the semantics of the linguistic variables, and information about domains. The rule base contains a collection of linguistic rules that are joined by AND/OR operator. Expert can provide his knowledge in the form of linguistic rules *(Hao Yu et al.)*. The fuzzification process collects the inputs and then converts them into linguistic values or fuzzy sets. The decision logic which is called as fuzzy inference which generates output from the input, and finally the defuzzification process produces a crisp output for control action.

Interpretations of a certain rule or the rule base depend on the FIS model. The Mamdani and the Tagaki-Sugeno-Kang (TSK) or simply Sugeno model are two popular FISs. TheMamdani model is a non-additive fuzzy model that aggregates the output of fuzzy rules using the maximum operator, while the Sugeno model is an additive fuzzy model that aggregates the output of rules using the addition operator [1-4].

Mamdani inference model

Fuzzy variables are pasteurized by fuzzy logic rules with MIN and MAX operators. The fuzzy logic can be interpreted as the extended Boolean logic: for binary 0 and 1, the MIN and MAX operators, AND and OR

operators in Boolean logic, respectively. This has been depicted in the Table 1.1 and for fuzzy variables, the MIN and MAX operators [1-4].

Table 1.1: Binary Operations Using Boolean Logic and Fuzzy Logic

A	B	A AND B	MIN (A,B)	A OR B	MAX (A, B)
0	0	0	0	0	0
0	1	0	0	1	1
1	0	0	0	1	1
1	1	1	1	1	1

Table 1.2: Fuzzy Variables Operations Using Fuzzy Logic

A	B	MIN (A,B)	MAX (A, B)
0.3	0.5	0.3	0.5
0.3	0.7	0.3	0.7
0.6	0.4	0.4	0.6
0.6	0.8	0.6	0.8

In Mamdani model, let's assume that we have two fuzzy control rules:
R1: if *x* is *A1* and *y* is *B1* then *z* is *C1* and also
R2: if *x* is *A2* and *y* is *B2* then *z* is *C2*
Fact: *x* is *x0* and *y* is *y0*
Consequence: *z* is *C*
The inference procedure of the Mamdani model with the min (AND) and max (OR) operators and fuzzy inputs is shown in Figure 1.2.

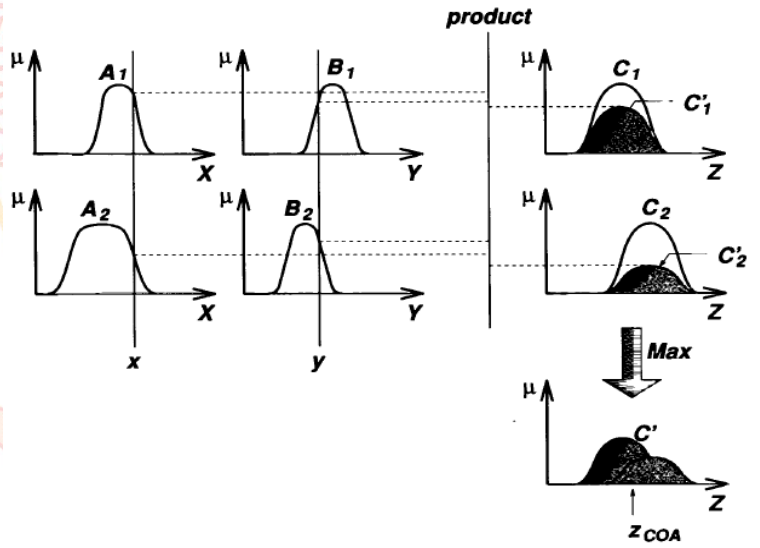

Figure 1.2: Mamdani Inference Model

The fuzzy implication is modeled by Mamdani's minimum operator and the sentence connective is also interpreted as propositions and defined by max operator[4].
The firing levels of the fuzzy rules denoted by α_i, i = 1, 2, are computed by
$\alpha_1 = A_1(x_0) \wedge B_1(y_0)$, $\alpha_2 = A_2(x_0) \wedge B_2(y_0)$
The individual rule outputs are obtained by
$C'_1(w) = (\alpha_1 \wedge C_1(w))$, $C'_2(w) = (\alpha_2 \wedge C_2(w))$
Then the overall system output is computed by the individual rule outputs

$C(w) = C'_1(w) \vee C'_2(w) = (\alpha_1 \wedge C_1(w)) \vee (\alpha_2 \wedge C_2(w))$

Finally, to obtain a deterministic control action, employ any defuzzification strategy. For the instance, defuzzified value of fuzzy set is defined as its fuzzy centroid:

$$Z_o = \frac{\int z\, C(z)\, dz}{\int C(z)\, dz}$$

The Mamdani Model consists of five layers as depicted in Fig. 1.3.

Details are given below*;*

Layer 1: Input layer

Layer 2: Input membership or fuzzification layer

- Neurons represent fuzzy sets used in the antecedents of fuzzy rules determine the membership degree of the input.
- Activation function: The membership function.

Layer 3: Fuzzy Rule Layer

- Each neuron corresponds to a single fuzzy rule.
- Conjunction of the rule antecedents: *product*
- Output: the firing strength of fuzzy rule R_i ,$\mu_{Ri} = \mu_{Aj} \times \mu_{Bk}$
- The weights in layer 3 and layer 4 : the normalized degree (certainty factors) of confidence of the corresponding fuzzy rules.

They are adjusted during training.

Layer 4: Output membership layer

- Disjunction of the outputs: $\mu_{C\,i} = \mu_{Rj} \oplus \mu_{Rj} = \sum \mu_{Rj}$*: sum.*
- The integrated firing strength of fuzzy rule neurons R_j and R_k.
- Activation function: The output membership function.

Layer 5: Defuzzification layer

- Each neuron represents a single output. (Ex.- Centroid Method).

Learning:

- A various learning algorithm may be applied: Back propagation.
- Adjustment of weights and modification of input/output membership functions.
- Sum-Product composition and centroid defuzzification was adopted; a corresponding ANFIS was constructed easily.
- Extra complexity with max-min composition – no better learning capability or approximation power.

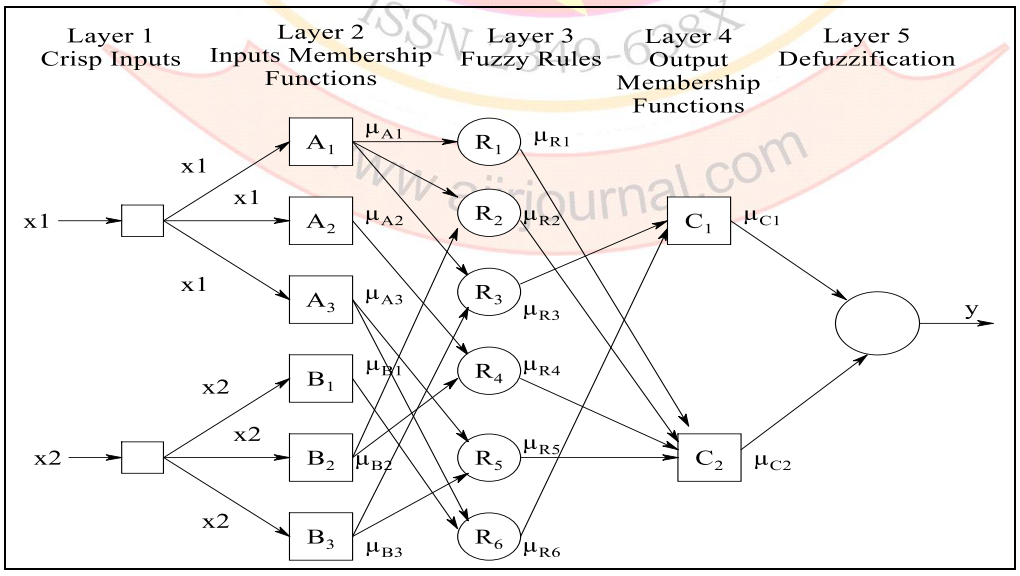

Figure1.3: Neuro Fuzzy Equivalent System

The Mamdani model offers a high semantic level and a good generalization capability. It contains fuzzy rules built from expert knowledge. However, FISs based only on expert knowledge may result in insufficient accuracy. For accurate numerical approximation, the Sugeno model can usually generate a better performance.

Sugeno inference model

However, TSK or Sugeno architecture is more popular than Mamdani architecture where the defuzzification layer was replaced by normalization and weighted average. The TSK architecture does not require MAX operators, but a weighted average is applied directly to regions selected by MIN operators. TSK architecture is actually very straightforward method, in which the output weights are proportional to the average function values at the selected regions by MIN operators. The TSK fuzzy system works as a lookup table. Sugeno and Takagi use the following architecture which is graphically represented in Figure 1.4.

R_1: if x is $A_1$and y is B_1then $z_1 = p_1x + q_1y + r_1$

R_2: if x is $A_2$and y is B_2then $z_2 = p_2x + q_2y + r_2$

Fact: x is $x_0$and y is y_0

Consequence: z

The firing levels of the fuzzy rules are computed by

$w_1 = A_1(x_0) \wedge B_1(y_0)$, $w_2 = A_2(x_0) \wedge B_2(y_0)$

Then the crisp control action is demonstrated as

$$Z_0 = \frac{w_1 z_1 + w_2 z_2}{w_1 + w_2}$$

If we have n rules in our rule-base system then the crisp control action is calculated as

$$Z_0 = \frac{\sum_{i=1}^{n} w_i z_i}{\sum_{i=1}^{n} w_i}$$

Where w_i denotes the firing level of the i^{th} rule, i= 1, 2 . . . , n

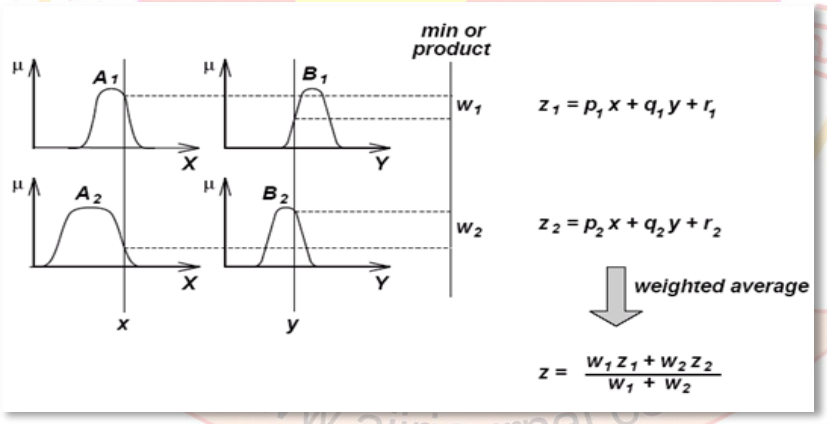

Figure 1.4: Sugeno Fuzzy Model

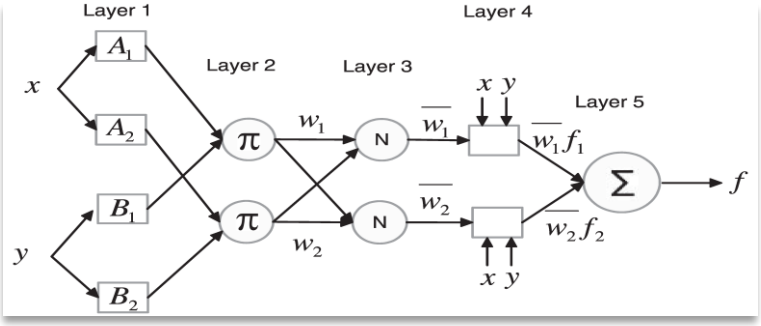

Figure 1.5: Equivalent ANFIS architecture

The TSK model normally selects *z* as first-order polynomial, hence the model is also called the first-order TSK model. When *z* is selected as constant, it is termed as the zero-order TSK model and can be regarded as a special case of the Mamdani model.

In comparison with the Mamdani model, the Sugeno model is based on automatic learning from the data and can accurately approximate a function using few rules. It has a stronger and more flexible illustration capability than the Mamdani model. In the Sugeno model, rules are extracted from the data, but the generated rules may have no meaning for experts. The Sugeno model has found more successful applications in building the fuzzy systems.

The Sugeno Model consists of five layers as depicted in Fig. 1.5, called ANFIS architecture. Details are given below;

Layer 1: Fuzzification layer

Every node I in the layer 1 is an adaptive node with a node function.

$O_{1,I} = \mu_{Ai}(x)$ for i=1,2 or : membership grade of a fuzzy set A1,A2 $O_{1,I} = \mu_{Bi-2}(y)$ for i=3,4.

Parameters in this layer: premise (or antecedent) parameters.

Layer 2: Rule layer

A fixed node labeled as Π where the output is the product of all the incoming signals: $O_{2,I} = w_i = \mu_{Ai}(x)\, \mu_{Bi}(y)$ *for i=1,2….,* firing strength of a rule.

Layer 3: Normalization layer

A fixed node labeled N.

The i-th node calculates the ratio of the i-th rule's firing strength to the sum of all rules' firing strength: $O_{3,I} = \underline{w_i} = w_i / (w_i + w_i)$ for$i=1,2$.

Outputs of this layer are stated as normalized firing strengths.

Layer 4: Defuzzification layer

An adaptive node with a node fn$O_{4,I} = \underline{w_i} f_i = \underline{w_i} (p_i x + q_i y + r_i)$ for$i=1,2,\ldots\ldots\ldots$, where $\underline{w_i}$is the normalized firing strength from layer 3 and $\{p_i\ ,\ q_i\ \ r_i\}$ is the set of parameter pf this node are called the Consequent Parameters.

Layer 5: Summation neuron

A fixed node which computes the overall output as the summation of all incoming signals.

Overall output = $O_{5,1} = \sum \underline{w_i} f_i = \sum \underline{w_i} f_i / \sum \underline{w_i}$.

ANFIS learning:

A learning algorithm of the least-squares estimator including the gradient descent method.

Forward Pass: adjustment of *consequent parameters, pi, qi, ri.*

Rule consequent parameters are known by the least-square estimator.

Find a least-square estimate of $k=[r_1\ p_1\ q_1 .. r_2\ p_2\ q_2 .. r_n p_n q_n]$, k^*, that minimizes the squared error $e=|O_d - O|^2$.

$E = e^2 / 2 = (O_d - O)^2 / 2$.

The consequent parameters are adjusted while the antecedent parameters remain fixed.

Backward Pass: adjustment of antecedent parameters.

The antecedent parameters are tuned while the consequent parameters are kept fixed.

(Ex.) Bell activation function: $1/ [1 + ((x-c)/a)^{2b}]$.

Membership Function:

A fuzzy set is wholly characterized by its membership function (MF). Since most fuzzy sets in use have a universe of conversation X consisting of the real line R, it would not be practical to list all the pair defining a membership function. A more convenient and brief way to define an MF is to express it as a mathematical formula *[5].*

1. Triangular MF:

$$traingle\ (x;a,\ b,\ c) = \max \left[\min \left(\frac{x-a}{b-a}, \frac{c-a}{c-b} \right), 0 \right]$$

2. Trapezoid MF:

$$trapezoid\ (x;a,\ b,\ c,\ d) = \max\left(\min\left(\frac{x-a}{b-a}, 1, \frac{c-a}{c-b} \right), 0 \right)$$

3. Gaussian MF:

$$gaussian\ (x;\ 6\ ,\ c) = \exp\left\{ -\left[\frac{x-c}{6} \right]^2 \right\}$$

1. Generalized Bell MF:

$$bell\ (x;\ a,\ b,\ c) = \frac{1}{1 + \left| \frac{x-c}{a} \right|^{2b}}$$

2. Sigmoidal MF:

$$sigmoid\ (x;\ a,\ b,\ c) = \frac{1}{1 + \exp\left[a\ (x - c\ ) \right]}$$

In the proposed model, we have used Generalized Bell Membership Function. So, brief discussion is given here. Figure1. 7.6 depict the meaning of parameters in Generalized Bell Function. These parameters are referred as premise parameters.

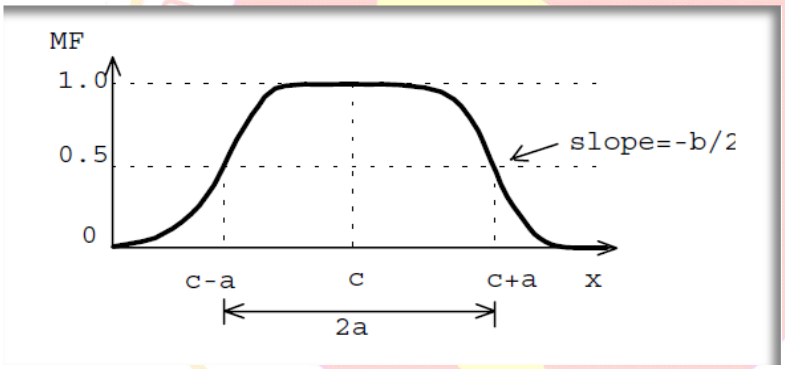

Figure1.6: Meaning of parameters in Generalized Bell Function

The parameter b is usually positive. If it is negative, the shape of this MF becomes an upside-down bell. However, each of these parameters has a physical meaning: *c* determines the centre of the corresponding membership function; *a* is the half width; and *b* (together with *a*) controls the slopes at the crossover points.

Note that this MF is the overview of Cauchy distribution used in probability theory, so it is also referred to as the Cauchy MF. Because of their smoothness and concise notation, Gaussian and bell MFs are becoming increasingly popular for specifying fuzzy sets [2-3].

Advantages and disadvantages of Fuzzy Systems [8-10]:

The advantages of the fuzzy systems are:

- It has capacity to represent inherent uncertainties of the human knowledge with linguistic variables.
- It has ability to interact with the expert of the domain with the engineer designer.
- It represents the natural rules, so it can easily interpret the results.
- It can easily widen the base of knowledge through the addition of new rules.
- It is robust method in relation with the possible disturbances in the system.

Disadvantages of fuzzy system are:

- It is incapable to generalize or answer to what is written in its rule base.
- It is not robust in relation to the topological changes in the system. Topological changes will have to demand alterations in the rule base.
- It has to depend on the existence of a expert to determine the inference logical rules.

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Importance of Artificial Intelligence in Healthcare: A Review

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Abstract

Artificial intelligence (AI) has been developing very rapidly in the various area of biomedical software's algorithms, hardware implementation, and etc. In this review, we summarize the importance of AI, role of AI, in the various branches of biomedical research. The aim of this review is to keep track of new scientific accomplishments, to understand the availability of technologies, to appreciate the tremendous potential of AI. New progress and breakthroughs will continue to push the frontier and widen the scope of AI application, and fast developments are envisioned in the near future.
Keywords: AI, Necessity, Role, Importance

1. Introduction:

Artificial Intelligence (AI), where computers perform tasks that are usually assumed to require human intelligence, is currently being discussed in nearly every domain of science and engineering. Major scientific competitions like Image Net Large Scale Visual Recognition Challenges are providing evidence that computers can achieve human-like competence in image recognition. AI has also enabled significant progress in speech recognition and natural language processing. All of these advances open questions about how such capabilities can support, or even enhance, human decision making in health and health care. Two recent high-profile research papers have demonstrated that AI can perform clinical diagnostics on medical images at levels equal to experienced clinicians, at least in very specific examples [1,2].

Artificial intelligence (AI) is defined as the intelligence of machines, as opposed to the intelligence of humans or other living species. AI can also be defined as the study of ‘‘intelligent agents”—that is, any agent or device that can perceive and understand its surroundings and accordingly take appropriate action to maximize its chances of achieving its objectives. AI also refers to situations wherein machines can simulate human minds in learning and analysis, and thus can work in problem solving. This kind of intelligence is also referred to as machine learning (ML). Typically, AI involves a system that consists of both software and hardware. From a software perspective, AI is particularly concerned with algorithms. An artificial neural network (ANN) is a conceptual framework for executing AI algorithms. It is a mimic of the human brain—an interconnected network of neurons, in

which there are weighted communication channels between neurons . One neuron can react to multiple stimuli from neighboring neurons and the whole network can change its state according to different inputs from the environment [3-9].

The role of artificial intelligence in healthcare has been a huge talking point in recent months and there's no sign of the adoption of this technology slowing down, well, ever really. AI in healthcare has huge and wide reaching potential with everything from mobile coaching solutions to drug discovery falling under the umbrella of what can be achieved with machine learning. That being said, many healthcare executives are still too shy when it comes to experimenting with AI due to privacy concerns, data integrity concerns or the unfortunate presence of various organizational silos making data sharing next to impossible. However, the future of healthcare & the future of machine learning and artificial intelligence are deeply interconnected.

2. The Necessity of Artificial Intelligence:

“Artificial intelligence will be an important tool to help us all end the injustice in the uneven distribution of healthcare, and to make it more accessible and affordable for every person on Earth."

The use of Artificial Intelligence, or AI, is growing rapidly in the medical field, especially in diagnostics and management of treatment. To date there has been a wide range of research into how AI can aid clinical decisions and enhance physicians' judgement. In recent years, AI and machine learning have emerged as powerful tools for assisting diagnosis. This technology could revolutionise healthcare by providing more precise diagnoses.

The importance of AI as a component of the diagnostic process has been steadily increasing since building systems became more practical. There is ongoing enthusiasm for and hype about AI and both researchers and practitioners focus equally on this technology from multiple perspectives. There is no uniform definition for the term AI, but considered as "the ability of a machine to perform cognitive functions that we associate with human minds, such as perceiving, reasoning, learning, interacting with the environment, problem solving, decision-making, and even demonstrating creativity". AI is generally associated with human-like behavior and covers a wide range of research areas, such as natural language processing or robotics. However, current practical applications, including healthcare and disease diagnostics, are narrowed down to a specific task, and are being developed using machine learning. Algorithms exploit medical data to generate predictions and continuously learn and develop over time by constantly processing new and updated data. Algorithms acquire information through different types of knowledge and input or over multiple years of experience. Therefore, AI empowered systems are able to process more knowledge compared with humans, possibly outperforming them for certain medical tasks [10-12].

Role of Artificial Intelligence

The field of healthcare is evolving at an increasing speed, and this is accompanied by a significant increase in the amount of data and challenges in terms of cost and patient outcomes, so AI applications have been used to reduce these challenges. Artificial Intelligence is very useful in solving problematic healthcare challenges and offers a number of advantages over traditional data analytics and clinical decision-making techniques.

The following are the most important examples of the role of artificial intelligence (AI) in healthcare and medicine:

AI in Medical Diagnosis:

Artificial Intelligence has the potential to revolutionize medical diagnostics. Unnecessary routine laboratory testing increases unnecessary financial costs. Therefore, artificial intelligence applications have been used to narrow the circle of laboratory analyzes that the patient may need. AI can detect the presence of early disease as soon as possible as it can automate a large portion of the manual work and speed up the diagnosis process.

Improving Clinical Workflow:

Artificial intelligence is currently being used to efficiently manage workflow and analyze imaging. AI can be used to improve clinical workflow, support better clinical insights, reduce clinical variability, aid in setting study priorities, and minimize physician burnout.

Artificial intelligence has the power to take over the time-consuming task of data input so that clinicians can focus on improving labor utilization, increasing daily productivity and providing the highest quality of care to patients.

Predicting ICU Transfers:

Unplanned transfer of patients to the ICU can have poor outcomes and sometimes even death in patients. Therefore, artificial intelligence has been used to reduce the percentage of these cases, by finding patients with severe cases.As artificial intelligence systems use patients 'medical records, laboratory results, and their vital signs to manage patients' condition before it deteriorates, and forcing them to be transferred to the intensive care unit. Artificial intelligence systems can guide clinicians on where to start treatment.

Predicting Hospital Acquired Infections:

Artificial intelligence can standardize the diagnosis of infections with Infection Prevention and Control (IPC) implications, and facilitate the dissemination of IPC expertise. AI provides opportunities to improve diagnosis through objective pattern recognition. Using AI-driven models, clinicians can monitor high-risk patients, predict which patients are most likely to develop central-line infections and intervene to reduce risk.

Developing the Next Generation of Radiology Tools:

Artificial intelligence can help develop the next generation of imaging tools that will provide accurate information and detailed enough to replace the need for tissue samples in some cases. The next generation of artificial intelligence is expected to be more effective in the healthcare system and there will be further

improvements in performance. All of these developments promise to increase accuracy and reduce the number of routine tasks that exhaust time and effort [13-18].

3. Pros & Cons of Artificial Intelligence

- **Provides Real-Time Data**
  Real-time analytics can help improve physician-patient relationships. Making vital patient data available through mobile devices can engage patients in their treatments. Mobile alerts can inform doctors and nurses of urgent changes in patient statuses and emergencies.
- **Streamlines Tasks**
  For example, intelligent radiology technology is able to identify significant visual markers, saving hours of intense analysis. Other automated systems exist to automate appointment scheduling, patient tracking and care recommendations.
  AI essentially allows hospitals to accept a wide array of plans, benefiting potential and existing patients.
- **Saves Time and Resources**
  As more vital processes are automated, medical professionals have more time to assess patients and diagnose illness and ailment. AI is accelerating operations to save medical establishments precious productivity hours. In any sector, time equals money, so AI has the potential to save hefty costs.
- **Assists Research**
  AI enables researchers to amass large swaths of data from various sources. The ability to draw upon a rich and growing information body allows for a more effective analysis of deadly diseases. Related to real-time data, research can benefit from the wide body of information available, as long as it's easily translated.
- **May Reduce Physician Stress**
  Some latest research reports over half of the primary physicians feel stressed from deadline pressures and other workplace conditions. AI helps streamline procedures, automate functions, instantly share data and organize operations, all of which help relieve medical professionals of juggling too many tasks.

4. Limits of Ai In Medicine

- **Needs Human Surveillance**
  Although AI has come a long way in the medical world, human surveillance is still essential. For example, surgery robots operate logically, as opposed to empathetically. Health practitioners may notice vital behavioral observations that can help diagnose or prevent medical complications.
- **May Overlook Social Variables**
  Patient needs often extend beyond immediate physical conditions. Social, economic and historical factors can play into appropriate recommendations for particular patients. For instance, an AI system may be able to allocate a patient to a particular care center based on a specific diagnosis. However, this system may not account for patient economic restrictions or other personalized preferences.
- **May Lead To Unemployment**
  Although AI may help cut costs and reduce clinician pressure, it may also render some jobs redundant. This variable may result in displaced professionals who invested time and money in healthcare education, presenting equity challenges.
- **Inaccuracies are Still Possible**
  Medical AI depends heavily on diagnosis data available from millions of cataloged cases. In cases where little data exists on particular illnesses, demographics, or environmental factors, a misdiagnosis is entirely possible. This factor becomes especially important when prescribing particular medicine.
- **Susceptible To Security Risks**
  As AI uses data to make systems smarter and more accurate, cyber-attacks will incorporate AI to become smarter with each success and failure, making them more difficult to predict and prevent. Once damaging threats out-maneuver security defences, the attacks will be much more challenging to address [19-22].

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Semi-Static Thermal Stress Analysis of A Medium Thick Disk With A Time- Dependent Heat Source

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Abstract

This paper survey the semi-static thermal stresses of medium thick discs with time-dependent heat source investiture. The lower and upper faces of the plate are kept at zero temperature, while the inner and outer circular curved surfaces are thermally insulated. Laplace transformers have been found to be convenient for obtaining special temperature distribution solutions, which satisfy the time-dependent heat conduction equation.The function of the thermoelastic air and the harmonic potential functions are used to obtain the components of displacement and the stress associated with it. The results are obtained in the form of a basal function. The results of temperature, displacement, and stress are numerically calculated and graphed according to specific functions.

Keywords*: Heat conduction equation, medium thick disk, thermal stress, Laplace transform*

1. Introduction

Many studies have appeared in the literature about the transient response of the plate and its associated thermal stresses. The following references are chosen because they include mathematical methods for deriving the response formulas contained in present description. In classical papers, Nowacki [1] has determined steady-state thermal stresses in a thick circular plate subjected to an axisymmetric temperature distribuion on the upper face with zero temperature on the lower face and the circular edge. Further Roy Choudhuri [2] has succeeded in determining the quasi-static thermal stresses in a circular plate subjected to transient temperature along the circumference of a circle over the upper face with lower at zero temperture and the fixed circular edge thermally insulated.Nasser [3, 4] proposed the concept of heat sources in generalized thermoelasticity and applied to a thick plate problem.In all aforementioned investigations an axisymmetrically heated thick plate has been considered and its results are more useful in engineering problems. Recently, Kulkarni and Deshmukh [5] present paper deals with the determination of a quasi-static thermal stresses in a thick circular plate subjected to arbitrary initial temperature on the upper face with lower face at zero temperature and the fixed circular edge thermally insulated using Lapalce method. Similarly, Kulkarni and Deshmukh [6]has also determinated the transient heat conduction and thermal stresses of a thick annular disc subjected to arbitrary heat flux on the upper and lower surfaces where as the fixed circular edges are at zero temperature, using integral transform technique.Varghese and Lalsingh [7] has determined the thermo-elastic stress in a thick disc due to interior heat generation within the solid, under thermal boundary condition, which is subjected to arbitrary initial temperature on the upper and lower face at zero temperature, and the fixed circular edges with additional sectional heat supply, using unconventional integral transform.Okumura [8] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates.Saidi and Baferani [9] investigated the thermal buckling of simply supported moderately thick functionally graded annular sector plate using first order shear deformation plate theory and obtained the solution by using an analytical method.Hu et al. [10] presented a set of high order partial differential equations for elastic rectangular thick plate with four edges completely clamped support base on Mindlin theory and solved by the double finite integral transform method.Saheb and Aruna [11] developed a simple and efficient coupled displacement field method to study the buckling load parameters of the simply supported moderately thick rectangular plates.Genckal et al. [12] studied the dynamic responses of composite plates on elastic foundation subjected to impact and moving loads by using Galerkin's method, then the equations are solved by using the Runge-Kutta method.However, they did not consider a thermoelastic problem in which a source is generated on the basis of a linear function of temperature that satisfies the time-dependent heat conduction equation. Based on previous literature on moderately-thickness annular disks, the authors observed that no analytical procedure was established in view of the generation of

internal heat sources in the body. Due to the lack of research in this area, the author was motivated to conduct this research. Theoretical calculations have been studied using dimensional parameters, while the graphical calculations are carried out using dimensionless parameters. The success of this novel research lies in new mathematical procedures that have adopted a simpler optimized design approach in terms of material utilization and technical performance, particularly in determining the thermoelastic behavior of moderately-thickness disks engaged as the foundation of pressure container, furnaces, etc.

2. Formulation of the Problem

We consider a moderately thick annular plate occupying the space $D:\{(r,z)\in R^2:\ a<r<b,\ 0<z<l\}$ under unsteady-state temperature field with a time-dependent internal heat sources within it.

2.1 Unsteady-state temperature field

The governing equation for heat conduction in isotropic solids is given as follows

$$\left\{\nabla^2-\frac{1}{\kappa}\frac{\partial}{\partial t}\right\}T(r,z,t)=-q_0\,l\,\Phi(t)[H(r-r_0)-H(r-r_1)],\ r_0<r<r_1 \qquad (1)$$

in which $T=T(r,z,t)$ is the temperature change,

$$\nabla^2\equiv\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}+\frac{\partial^2}{\partial z^2}$$

and

$$\Phi(t)=\begin{cases}(\Phi_0/T_0)\,t, 0\le t\le t_0\\ \Phi_0, \qquad t>t_0\end{cases} \qquad (2)$$

subjected to the boundary conditions

$$T\big|_{t=0}=T\big|_{z=0}=T\big|_{z=l}=\left.\frac{\partial T}{\partial r}\right|_{r=a}=\left.\frac{\partial T}{\partial r}\right|_{r=b}=0 \qquad (3)$$

2.2 Displacement and stress field

Let u_r and u_z be components of displacement is expressed as

$$\begin{aligned}2Gu_r&=\frac{\partial}{\partial r}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_1\right]+\frac{\partial\chi}{\partial r},\\ 2Gu_z&=\frac{\partial}{\partial z}\left[r\frac{\partial\phi_1}{\partial r}+z\frac{\partial\phi_3}{\partial z}-4(1-\upsilon)\phi_3\right]+\frac{\partial\chi}{\partial z}\end{aligned} \qquad (4)$$

in which G and υ denote the shear modulus and Poisson's ration, respectively, and

$$\nabla^2\phi_1=0,\ \nabla^2\phi_3=0,\ \nabla^2\chi=\frac{\alpha E}{1-\upsilon}\tau. \qquad (5)$$

where ϕ_1, ϕ_3 are harmonic functions, χ is a thermoelastic potential function, $\tau=T-T_i$ is temperature change with T_i as initial temperature,respectively.

The components of stress taking account of heat is as follows

$$\begin{aligned}\sigma_{rr}&=2G\left(\varepsilon_{rr}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{\theta\theta}=2G\left(\varepsilon_{\theta\theta}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\\ \sigma_{zz}&=2G\left(\varepsilon_{zz}+\frac{\upsilon}{1-2\upsilon}e\right)-\frac{\alpha E\tau}{1-2\upsilon},\ \sigma_{rz}=2G\varepsilon_{rz}\end{aligned} \qquad (6)$$

in which

$$\varepsilon_{rr}=\frac{\partial u_r}{\partial r},\varepsilon_{\theta\theta}=\frac{u_r}{r},\varepsilon_{zz}=\frac{\partial u_z}{\partial z},\varepsilon_{rz}=\frac{1}{2}\left(\frac{\partial u_r}{\partial z}+\frac{\partial u_z}{\partial r}\right) \quad (7)$$

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z}$$

where $\sigma_{rr},..,\sigma_{rz}$ are the components of stresses, $\varepsilon_{rr},..,\varepsilon_{rz}$ are the components of strain, α represent the coefficient of linear thermal expansion and E is Young's modulus and e is the cubical dilation, respectively.For thetraction-free surfaces the stress functions

$$\sigma_{rz}\big|_{z=0}=\sigma_{zz}\big|_{z=0}=\sigma_{rz}\big|_{z=l}=\sigma_{zz}\big|_{z=l}=0 \quad (8)$$

The equations (1) to (8) constitute the mathematical formulation of the problem.

3. Solution tothe Problem

3.1 Solution for the temperature distribution

Applying the Laplace transformation in Eqs. (1) and (4)

$$\left\{\nabla^2-\frac{p}{\kappa}\right\}\bar{T}(r,z,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (9)$$

$$\bar{T}\big|_{z=0}=\bar{T}\big|_{z=l}=\frac{\partial\bar{T}}{\partial r}\Big|_{r=a}=\frac{\partial\bar{T}}{\partial r}\Big|_{r=b}=0 \quad (10)$$

in which the symbol ($\bar{}$) represents a function in the transformed domain and $\bar{T}(r,z,p)$ is the transformed function of $T(r,z,t)$ with Laplace parameter as p.

Now applying the finite Fourier sine transform in Eqs. (9) one obtains

$$\left\{\frac{\partial^2}{\partial r^2}+\frac{1}{r}\frac{\partial}{\partial r}-\beta_m-\frac{p}{\kappa}\right\}\bar{\bar{T}}(r,m,p)=-\frac{q_0\Phi_0 l}{p^2 t_0}(1-e^{-pt_0})[H(r-r_0)-H(r-r_1)] \quad (11)$$

$$\frac{\partial\bar{\bar{T}}}{\partial r}\Big|_{r=a}=0,\ \frac{\partial\bar{\bar{T}}}{\partial r}\Big|_{r=b}=0 \quad (12)$$

where $\bar{\bar{T}}(r,m,p)$ is the transform of $\bar{T}(r,z,p)$ with respect to nucleus is $\sin(m\pi z/l)$.

To obtain the expression for the temperature $\bar{\bar{T}}(r,m,p)$ of Eqs. (11)-(12), we assume

$$\bar{\bar{T}}(r,m,p)=\sum_{n=1}^{\infty}A_n J_0(\alpha_n r) \quad (13)$$

Assume

$$H(r-r_0)-H(r-r_1)=f(r)=\sum_{n=1}^{\infty}B_n J_0(\alpha_n r) \quad (14)$$

Putting Eq. (13) and (14) in Eq. (11), one obtains

$$A_n=\frac{\kappa q_0 l(1-e^{-pt_0})}{t_0 p^2(p+\gamma_{mn})}B_n \quad (15)$$

in which

$$\gamma_{mn}=\beta_m^2\kappa+\alpha_n^2\kappa.$$

Taking the theory of Bessel function on Eq. (15), one obtains

$$B_n \int_a^b r[J_0(\alpha_n r)]^2 dr = \int_a^b r\, f(r)\, J_0(\alpha_n r) dr = \int_{r_0}^{r_1} r\, J_0(\alpha_n r) dr \qquad (16)$$

since

$$f(r) = \begin{cases} 1 \text{ for } r_0 < r < r_1 \\ 0 \text{ for } a < r < r_0 \text{ and } r_1 < r < b \end{cases}$$

Hence

$$B_n = \frac{2}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (17)$$

Using Eqs. (13), (15), (17) we get,

$$\bar{\bar{T}}(r, m, p) = \frac{2\kappa q_0 l}{t_0} \sum_{n=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r) \qquad (18)$$

Now applying the inverse Fourier sine transform to Eq. (18), one yield

$$\bar{T}(r, z, p) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{(1 - e^{-pt_0})}{p^2(p + \gamma_{mn})\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} \qquad (19)$$
$$\times J_0(\alpha_n r)\sin(m\pi z / l)$$

Applying the Laplace inversion theorems on Eq. (19),one yield

$$\tau = T(r, z, t) = \frac{4\kappa q_0}{t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{1}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (20)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

where

$$L^{-1}\left\{\frac{1 - e^{-t_0 p}}{p^2[p + \gamma_{mn}]}\right\}$$
$$= L^{-1}\left\{\frac{1 - e^{-t_0 p}}{\gamma_{mn}}\left[\frac{1}{p^2} - \frac{1}{\gamma_{mn}}\left(\frac{1}{p} - \frac{1}{p + \gamma_{mn}}\right)\right]\right\}$$
$$= \Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)$$

in which

$$\Phi_n(r, z, t) = \frac{1}{\gamma_{mn}}\left(t - \frac{1 - e^{-\gamma_{mn} t}}{\gamma_{mn}}\right)$$

3.3 Solution for potential functions and thermal stresses

Now assume ϕ_1, ϕ_3 are harmonic functions and χ is a thermoelastic potential function that satisfies Eq. (5) as

$$\chi(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\} J_0(\alpha_n r)\sin\left(\frac{m\pi z}{l}\right) \qquad (21)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_1(r, z, t) = \frac{\alpha E}{1 - \upsilon}\frac{4\kappa q_0}{l\kappa t_0} \sum_{n=1}^{\infty}\sum_{m=1}^{\infty} \frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1 J_1(\alpha_n r_1) - r_0 J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2 - a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{C_1 J_0(\alpha_n r) + D_1(\alpha_n r) J_1(\alpha_n r)\}\sin(m\pi z / l) \qquad (22)$$
$$\times\{\Phi_n(r, z, t) - \Phi_n(r, z, t - t_0) H(t - t_0)\}$$

$$\phi_3(r,z,t)=\frac{\alpha E}{1-\upsilon}\frac{4\kappa q_0}{l\kappa t_0}\sum_{n=1}^{\infty}\sum_{m=1}^{\infty}\frac{\gamma_{mn}}{\alpha_n}\left\{\frac{r_1J_1(\alpha_n r_1)-r_0J_1(\alpha_n r_0)}{b^2[J_0(\alpha_n b)]^2-a^2[J_0(\alpha_n a)]^2}\right\}$$
$$\times\{E_1J_0(\alpha_n r)+F_1(\alpha_n r)J_1(\alpha_n r)\}\sin(m\pi z/l) \quad (23)$$
$$\times\{\Phi_n(r,z,t)-\Phi_n(r,z,t-t_0)H(t-t_0)\}$$

Using Eqs. (21)-(23) in Eq. (4),onegetsthe required displacement components.The components of stress given in Eq. (6) can be obtained using displacement componentsand strain components given in Eq. (7). Finally C_1, D_1, E_1 and F_1 are the unknown constants which can to be determined using traction free conditions given in Eq. (8) as

$$X_1C_1+Y_1D_1+Z_1E_1+T_1F_1=R_1,\ X_2C_1+Y_2D_1+Z_2E_1+T_2F_1=R_2,$$
$$X_3C_1+Y_3D_1+Z_3E_1+T_3F_1=R_3,\ X_4C_1+Y_4D_1+Z_4E_1+T_4F_1=R_4 \quad (24)$$

where,

$$X_1=-a_1J_1-a_2J_{0,2}+a_3,Y_1=(a_1J_{0,2})/2+J_0(a_4-a_3+a_5)-a_6J_{1,13}$$
$$Z_1=-a_1J_1+2\beta\alpha_nJ_1a_3-\alpha_n^2J_2,T_1=-a_7J_2+(a_1/2-a_8)J_{0,2},$$
$$R_1=[a_1J_1(a)+J_0(a)/2-a_9][a],$$
$$X_2=-a_1J_1-2\Im_{12}(a_4-a_5)-a_2J_{0,2}C_L+aS_L\alpha_n^2J_{1,13}/2+\Im_{11}[-1+2(1-\nu)-3aa_4+aa_5]-\Im_{13},$$
$$Y_2=(a_1C_L/2+a_4S_L-a_5S_L\alpha_n)J_{0,2}+[-a_2C_L/\alpha_n+S_L\alpha_n+2(1-\nu)S_L\alpha_n+6\Im_{14}+a_3]J_{1,13}+(1/4+\Im_{14})J_{2,24},$$
$$Z_2=J_1[a_{10}S_L+\Im_{15}-C_L(a_1+La_1/a-2a_8)]-(\alpha_n+\Im_{16})2L\Im_{16},$$
$$T_2=\Im_{16}(2\Im_{14}+a_4-aa_5)-\Im_{15}J_{0,2}-(1/2+\Im_{14})K,$$
$$R_2=a\{a_1J_1C_L+2a_4\Im_{12}+(1+4\Im_{14})K1+a_8(C_L)'+(1/a)[4\Im_{14}(J_0S_L)']+(1+4\Im_{14})2(J_1S_L\alpha_n)'+(1+4\Im_{14})(J_1S_L)''\},$$
$$X_3=2\alpha_n\beta[J_{1r}(12-16\nu)-2r\alpha_n(J_{0r}-J_{2r})],$$
$$Y_3=\alpha_n[(-J_{0r}+J_{2r})\beta(12-16\nu)+2r\beta\alpha_n(3J_{1r}-J_{3r})],$$
$$Z_3=8\alpha_n\beta J_{1r},\ T_3=4\alpha_n\beta(-J_{0r}+J_{2r}),$$
$$R_3=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$X_4=2\alpha_n\beta[J_{1r}C_L(12-16\nu)-(2r\alpha_n\beta C_L-4S_L\alpha_n)(J_{0r}-J_{2r})+rS_L\alpha_n^2(J_{1r}-J_{3r})],$$
$$Y_4=\alpha_n[(-J_{0r}+J_{2r})\beta C_L(12-16\nu)+2r\beta\alpha_nC_L(3J_{1r}-J_{3r})+4S_L\alpha_n(3J_{1r}-J_{3r})+rS_L\alpha_n^2(3J_{0r}-4J_{2r}+J_{4r})],$$
$$Z_4=4\alpha_n[2\beta J_{1r}(C_L-\beta LS_L)+L\beta\alpha_nC_L(J_{0r}-J_{2r})-4S_L\alpha_n((1-\nu)J_{0r}+(1-\nu)J_{2r})],$$
$$T_4=2\alpha_n[(2L\beta^2S_L+\beta C_L)(J_{0r}-J_{2r})+L\beta\alpha_nC_L(3J_{1r}-J_{3r})-12\alpha_nC_L],$$
$$R_4=8[-\Im_{11}\beta J_{1r}-(1/2)\Im_{11}J_{0r}+(\Im_{11}\beta J_{0r})'][r],$$

$$a_1=\beta\nu\alpha_n/(1-2\nu),\ a_2=a\beta\nu\alpha_n^2/[2(1-2\nu)],\ a_3=2(1-\nu)\nu/(1-2\nu),a_4=\nu/[2a(1-2\nu)],$$
$$a_5=[2(1-\nu)\nu]/[a(1-2\nu)],a_6=a\beta\nu\alpha_n^2,a_7=\alpha_n/[2a(1-2\nu)],a_8=2\beta\nu(1-\nu)\alpha_n/(1-2\nu),$$
$$a_9=\beta\nu J_0'/(1-2\nu),a_{10}=\alpha_n/(1-2\nu),S_L=\sin(L\beta),C_L=\cos(L\beta),$$
$$\Im_{11}=J_{0,2}S_L\alpha_n^2,\Im_{12}=J_1S_L\alpha_n,\Im_{13}=a\nu\alpha_n^2S_LJ_{1,13}/[2(1-2\nu)],$$
$$\Im_{14}=\nu/[4(1-2\nu)],\Im_{15}=L\beta^2\nu\alpha_nS_L/(1-2\nu),\Im_{16}=\beta J_{0,2}C_L\alpha_n,$$

$$J_{0,2} = J_0(a\alpha_n) - J_2(a\alpha_n), J_{2,4} = J_2(a\alpha_n) - J_4(a\alpha_n),$$
$$J_{1,3} = J_1(a\alpha_n) - J_3(a\alpha_n), J_{1,13} = J_1(a\alpha_n) + [J_1(a\alpha_n) - J_3(a\alpha_n)]$$
$$J_{2,24} = -[J_0(a\alpha_n) - J_2(a\alpha_n)] - (1/2)[J_2(a\alpha_n) - J_4(a\alpha_n)],$$
$$J_{(0,2)r} = J_0(r\alpha_n) - J_2(r\alpha_n)$$

Using Cramer's Rule, one obtains constants as

$$C1 = \frac{\Delta_2}{\Delta_1}; D1 = \frac{\Delta_3}{\Delta_1}; E1 = \frac{\Delta_4}{\Delta_1}; F1 = \frac{\Delta_5}{\Delta_1} \tag{25}$$

where

$$\Delta_1 = \begin{vmatrix} X1 & Y1 & Z1 & T1 \\ X2 & Y2 & Z2 & T2 \\ X3 & Y3 & Z3 & T3 \\ X4 & Y4 & Z4 & T4 \end{vmatrix}, \Delta_2 = \begin{vmatrix} R1 & Y1 & Z1 & T1 \\ R2 & Y2 & Z2 & T2 \\ R3 & Y3 & Z3 & T3 \\ R4 & Y4 & Z4 & T4 \end{vmatrix}, \Delta_3 = \begin{vmatrix} X1 & R1 & Z1 & T1 \\ X2 & R2 & Z2 & T2 \\ X3 & R3 & Z3 & T3 \\ X4 & R4 & Z4 & T4 \end{vmatrix},$$

$$\Delta_4 = \begin{vmatrix} X1 & Y1 & R1 & T1 \\ X2 & Y2 & R2 & T2 \\ X3 & Y3 & R3 & T3 \\ X4 & Y4 & R4 & T4 \end{vmatrix}, \Delta_5 = \begin{vmatrix} X1 & Y1 & Z1 & R1 \\ X2 & Y2 & Z2 & R2 \\ X3 & Y3 & Z3 & R3 \\ X4 & Y4 & Z4 & R4 \end{vmatrix}$$

The resulting equation of stresses can be obtained by substituting the unknown constant obtained from Eq. (25). The equations of stresses are rather lengthy, and the same has been omitted here for the sake of brevity but have been considered during graphical discussion using MATHEMATICA software.

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$\bar{r} = r/b,\ \bar{z} = z/b,\ \bar{\tau} = \kappa t/b^2, \bar{T} = T/T_0, \tag{26}$$
$$\bar{u}_i = u_i/E\alpha T_0, \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha T_0\ (i, j = r, \theta)$$

Substituting the value of Eq. (26) in Eqs. (20) and components of stresses, we obtained the expressions for the temperature distribution and thermal stresses respectively for the numerical discussion. The numerical computations have been carried out formoderately thick diskhavingthe thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}.The physical parameter for the plate as $a = 0.2$ m, $b = 1$ m, l = 0.08 m and $T_0 = 150^0$C.In order to examine the influence of internal heat source on the moderately thick diskplate, the numerical calculations were performed for all the variables, and numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Plotted Figs. 1-2 illustrate the numerical results of temperature distribution and the thermal stresses of the moderately thick disk due to internal heat generation within the solid.From the Fig.1(a) it is noted that the behaviour of temperature trend is decreasing along redial direction in different value of time due to the available internal heat supply.

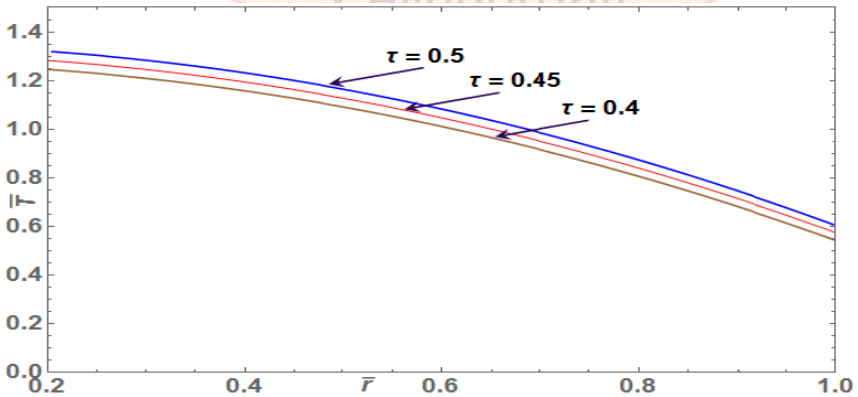

Fig. 1(a): Temperature distribution along $\bar{r}$ -direction for different values of time

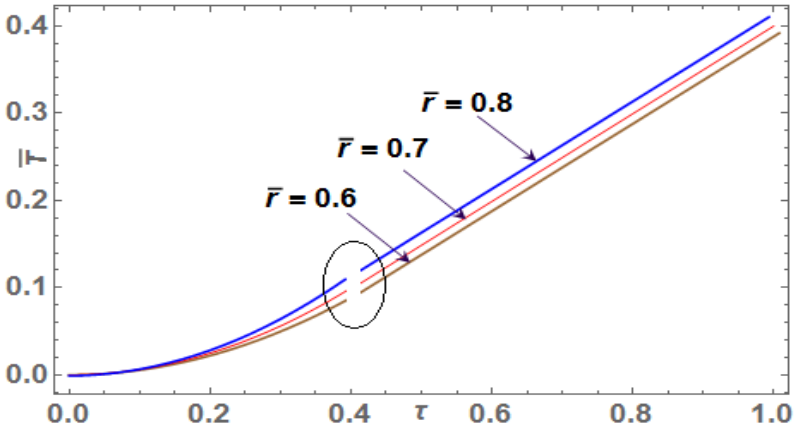

Fig. 1(b): Temperature distribution along time for different values of $\bar{r}$

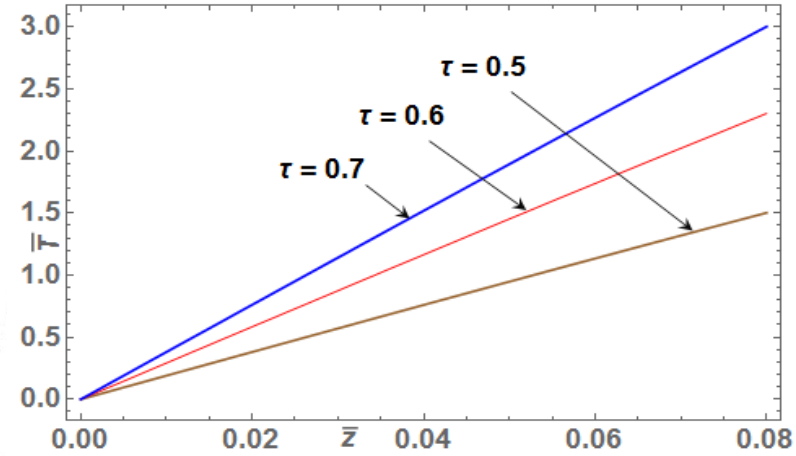

Fig. 1(c): Temperature distribution along $\bar{z}$ *-direction for different values of time*

Fig. 1(b) shows the temperature distribution with increase of time trend for different radius value. In this figure, temperature increases gradually towards the outer end to the internal heat energy, but a discontinuity in temperature was observed at $\bar{\tau} = 0.4$, and it may be due to the fixed time parameter $\bar{\tau}_0 = 0.4$ .In the Fig. 1(c), it is observed that the temperature increaseslinearly along the axial direction for different value of time due to the thickness.

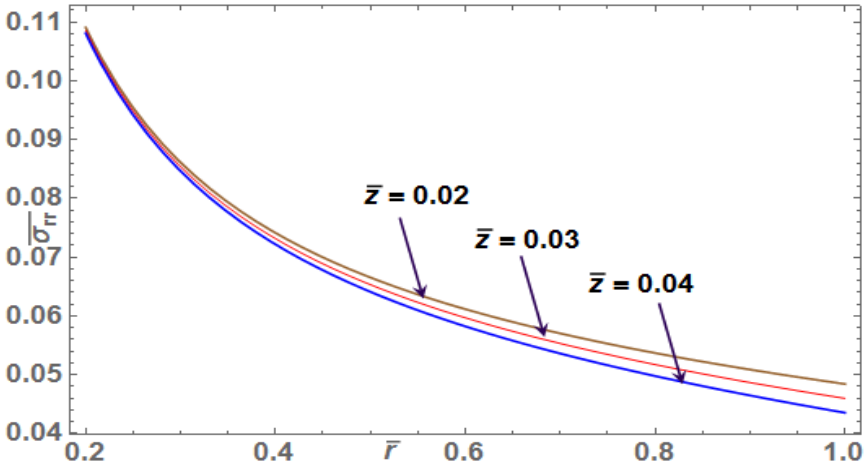

Fig. 2 (a): Radial Stress $\bar{\sigma}_{rr}$ *along* $\bar{r}$ *-direction for different values of* $\bar{z}$

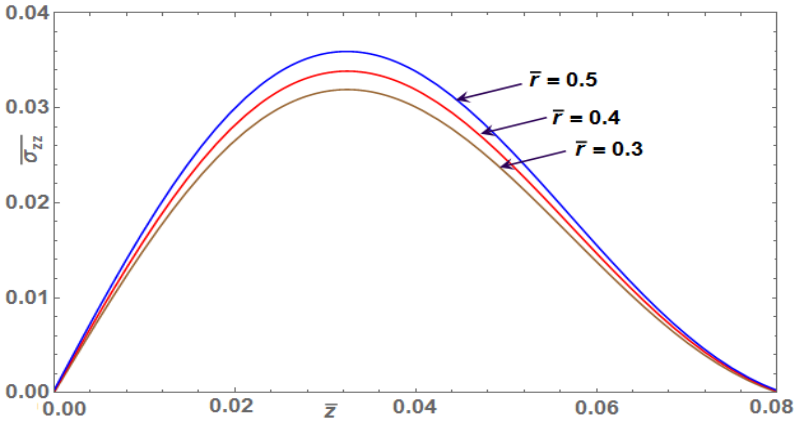

Fig. 2 (b): Axial Stress $\bar{\sigma}_{zz}$ along $\bar{z}$ -direction for different values of $\bar{r}$

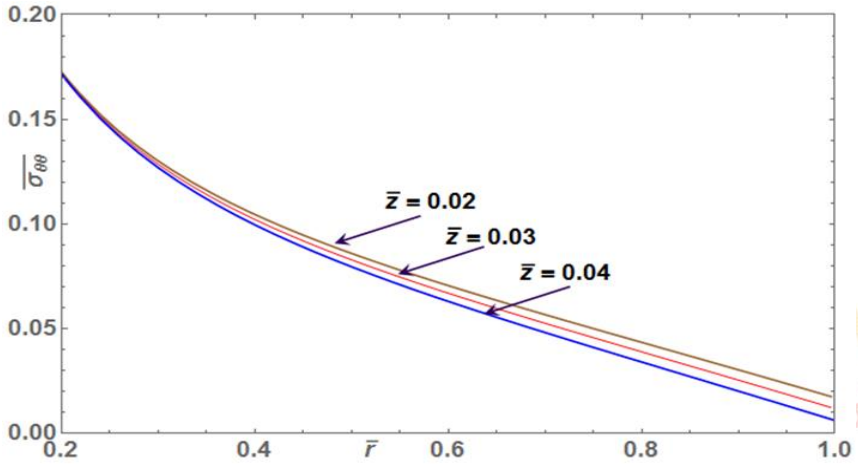

Fig. 2 (c): Tangential Stress $\bar{\sigma}_{\theta\theta}$ along $\bar{r}$ -direction for different values of $\bar{z}$

Fig. 2(a) explains that the stresses are initially on the higher side which goes on decreasing asalong the radial directionat different values of $\bar{z}$. Fig. 2(b) shows the distribution of axial stress along the $\bar{z}$ -direction. It is noted from the figure that the stress along axial direction attains amaximum at centreportion due to the accumulation of heat energy whereas at both boundaries the stress is zero.From Fig. 2(c), it can be concluded that tangential stress will be more at the initial point and gradually decreases along the radial direction.

Conclusion

The proposed analytical solution of the temporal thermal stress of a medium thick plate was stored in a cylinder coordinate system with the presence of an internal heat source. To the best of the author's knowledge, so far there have been very few reports compiling sources according to a linear function of temperature in the medium for a medium-thick plate of finite height with boundary conditions of the Direchletttype.The Using Laplace integral transformation techniques and classical methods, the thermal distribution, thermal stress, is resolved. Compared to other methods proposed by the researchers, the integral transformation technique presented here is relatively simple and widely applicable. This is how our search results can be described astemperature plate is assumed to satisfy the general quasi-static heat conduction equation with a ramp-type internal heat source. The advantage of this method is its versatility and mathematical ability to handle various types of mechanical and thermal boundary conditions.

1. The advantage of this method is its simplicity and its mathematical power to handle a variety of mechanical and thermal boundary conditions.
2. The maximum stress in the region outside the central core may be due to heat, stress, concentration, or internal heat sources available under the region considered.

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Strength of the Singularity in Radiating Dyon Solution on anti-de Sitter Background.

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Abstract:

Here we study the structure of space-time singularities formed during the radial in-fall of a coherent stream of charged "photons"-a piece of the radiating dyon metric. we study the strength of singularities which develop in the space time on the anti-de-sitter background. It is shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. It is also shown that final outcome of collapse gives naked singularity arising in space-time is gravitationally strong, therefore naked singularities are strong in Tripler's sense.

I Introduction

It would be interesting to study whether the singularity forming at the end of gravitational collapse is observable by external observer. One important conjecture related to the singularities known as cosmic censorship hypothesis (CCH) given by Roger Penrose [1]. This states that the collapse of a physically reasonable initial data yields a space-time singularity which is always hidden inside the event horizon. It has two conjecture , i.e., weak and strong. According to the weak conjucture, singularity formed by gravitational collapse is not visible to a far away observer. The strong cosmic censorship hypothesis states that the singularity cannot be observed even by an observer who is very close to it. Wald [2] discussed some examples to justify the validity of weak form of CCH.

When a massive star is on the verge of completing its nuclear cycle, then the thermonuclear reactions in the interior of the star cannot counter balance the immense gravitational pull of the star. Under most general conditions general relativity predicts that such a collapse must end in a singularity, which may or may not be clothed by an event horizon. A singularity may be physically described as a region in the space-time with extreme curvature, vanishing volume and unbounded gravitational forces. However, general relativity remains silent on the nature (BH or NS) or physical properties of such a singularity. This is basically due to the fact that mathematical structure breaks down preventing analysis at and beyond the singularity. This has triggered extensive research on Gravitational collapse during the past few decades. After all one would always like to know whether, and under what conditions gravitational collapse leads to the formation of a black hole (BH). A few decades back R. Penrose (1969) proposed the cosmic censorship hypothesis (CCH), which states that the singularities formed in gravitational collapse of physically reasonable matter cannot be seen by any distant observer in the universe. It implies that the singularities formed in asymptotically flat space-times are always bounded by event horizons and hence are destined to be black holes. With the announcement of this proposal, study of gravitational collapse has gained special importance, because one would always like to know that whether there exists any physical collapse solutions that lead to naked singularities (NS), which will serve as counterexamples of CCH [3]. Important cases of naked singularities analyzed so for include dust collapse [4-9], radiation collapse [10-17] and strange quark matter [18-19].

A.Chamorro and K.S.Virbhadra have obtained an exact solution of the Einstein- Maxwell equations which are a magnetic charge generalization to the Bonnor-Vaidya solution and describe the gravitational and electromagnetic fields of a non-radiating massive radiating dyon [20]. The paper is based on the composite charges i.e. an electric charge and a magnetic charge bound together by their gravitational interaction. Hence it would be interesting to study the nature of the singularities formed in the gravitational collapse of such composite space-time [21]. In this paper, we study the strength of singularity in Radiating Dyon solution on anti-de-sitter background. We also show that gravitational constant does affect the nature of singularity.
We conclude the paper in V section by some concluding remarks.

II Radiating Dyon Solution in Anti-de-sitter space-time

The metric, which describes the gravitational field of non-rotating massive radiating dyon as found by Chamorro and Virbhadra [20] is

$$ds^2 = -\left(1 - \frac{2m(v,r)}{r}\right)dv^2 + 2dvdr + r^2(d\theta^2 + sin^2\theta d\emptyset^2), \quad (1)$$

Where

$$m(v,r) = f(v) - \frac{\left(q_e^2(v)+q_m^2(v)\right)}{2r} - \frac{\Lambda r^3}{3} \quad (2)$$

Here $f(v)$ is the standard Vaidya mass, $q_e(v)$ and $q_m(v)$ are electric and magnetic charge parameters respectively. These parameters depend on the Eddington advanced time coordinate v.

The model considered in this paper is obtained from an energy-momentum tensor of the form

$$G_i^k = R_i^k - \frac{1}{2}Rg_j^k = 8\pi(E_i^k + N_i^k) \quad (3)$$

Where

$$\{x^\mu\} = \{v,\ r,\ \theta,\ \emptyset\}, \qquad (\mu = 0,\ 1,\ 2,\ 3).$$

E_i^k is related to the electromagnetic tensor F_{ki} in the familiar way

$$E_i^k = \frac{1}{4\pi}\left[-F_{im}F^{km} + \frac{1}{4}g_i^k F_{mn}F^{mn}\right] \quad (4)$$

$$N_i^k = V_i V^k \quad (5)$$

is the energy-momentum tensor of the null fluid. V^k is the null fluid current vector satisfying $g_{ik}V^iV^k = 0$. Electric current vector $J_{(e)}^i$ and magnetic current vector $J_{(m)}^i$ are given by

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}F^{ik}\right) = 4\pi J_{(e)}^i \quad (6)$$

$$\frac{1}{\sqrt{-g}}\frac{\partial}{\partial x^k}\left(\sqrt{-g}\,{}^*F^{ik}\right) = 4\pi J_{(m)}^i \quad (7)$$

Where ${}_{*F^{ik}}$ is the dual of the electromagnetic field tensor F^{ik} and is given by

$${}^*F^{ik} = \frac{1}{2\sqrt{-g}}\in^{iklm} F_{lm}\ , \quad (8)$$

Where $\in^{iklm}$ is the Levi-Civita tensor density.

The non-vanishing components of the Einstein tensor for the above metric are given by

$$G_0^0 = G_1^1 = -G_2^2 = -G_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{r^4}\ , \quad (9)$$

$$G_0^1 = k^2\ , \quad (10)$$

Where

$$k^2 = \frac{2(q_e\dot{q_e} + q_m\dot{q_m} - \dot{f}r)}{r^3} \quad (11)$$

Here the over dot denotes the derivative with respect to the retarded coordinate v.

Energy-momentum tensor of the electromagnetic field and null fluids are given by

$$E_0^0 = E_1^1 = -E_2^2 = -E_3^3 = \frac{\left(q_e^2(v)+q_m^2(v)\right)}{8\pi r^4}\ , \quad (12)$$

$$N_0^1 = \frac{k^2}{8\pi} \quad (13)$$

III Nature of the Singularities in Monopole-Radiating Dyon Solution

The physical solution is for < 0 , the space-time becomes flat with $f(v) = 0$, $q_e(v) = 0$, $q_m(v) = 0$. At $v = T$, Say, the radiation is turned off. For $v > T$, $\dot{f}(v) = \dot{q_e}(v)\,\dot{q_m}(v) = 0$, i.e. $f(v), q_e^2(v)\ and\ q_m^2(v)$ are positive definite . Thus the metric for $v = 0\ to\ v = T$ is radiating dyon solution and for $v > T$ it becomes a static dyon solution [22].

To investigate the structure of the collapse, we need to consider the radial null geodesics define by $ds^2 = 0$. $\left(k^\theta = k^\emptyset = 0\right)$. The equation for outgoing radial null geodesic for metric (1) is given by

$$\left(1-\frac{2m(v,r)}{r}\right)dv^2-2dvdr=0$$

i.e.

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2m(v,r)}{r}\right).$$

Using the mass function (2) , above equation becomes

$$\frac{dr}{dv}=\frac{1}{2}\left(1-\frac{2f(v)}{r}+\frac{q_e^2(v)+q_m^2(v)}{r^2}+\frac{\Lambda r^2}{3}\right) \quad (14)$$

In general, Eq. (14) does not yield an analytic solution. However, if $f(v)\propto v$, $q_e^2(v)\propto v^2$, $q_m^2(v)\propto v^2$,Eq. (14) becomes homogeneous and can be solved in terms of elementary functions[23].

In particular, we take

$$f(v)=\lambda v, \quad (15)$$

and

$$q_e^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\mu^2v^2}{2}\ , & 0<v\le T\\ \mu^2T^2(const)\ , & v>T\end{cases} \quad (16)$$

$$q_m^2(v)=\begin{cases}0\ , & v\le 0\\ \frac{\delta^2v^2}{2}\ , & 0<v\le T\\ \delta^2T^2(const)\ , & v>T\end{cases} \quad (17)$$

Where λ, μ^2 and δ^2 are some positive constants. Inserting the expressions for $f(v)$, $q_e^2(v)$ and $q_m^2(v)$ into Eq.(2) we obtain the mass function for monopole radiating dyon solution as

$$m(v,r)=\lambda v-\frac{\mu^2v^2+\delta^2v^2}{4r}-\frac{\Lambda r^3}{6} \quad (18)$$

It follows that with the choice of above mass function, the metric (1) becomes self-similar [1] (a spherically symmetric space-time is a self similar if $g_v(ct,cr)=g_v(t,r)$ and $g_{rr}(ct,cr)=g_{rr}(t,r)$ for every >0) admitting a homothetic killing vector ξ^a given by

$$\xi^a=v\frac{\partial}{\partial v}+r\frac{\partial}{\partial r} \quad (19)$$

and satisfies

$$L_\xi g_{ab}=\xi_{a;b}+\xi_{b;a}=2g_{ab}\ , \quad (20)$$

Where L denote the Lie derivative.

Defining $k^a=dx^a/dk$ as a tangent to radial null geodesics, where k is an affine parameter, it follows that $\xi^a k_a$ is constant along radial null geodesics.

Thus

$$\xi^a k_a=uk_u+rk_r=C, \quad (21)$$

Where C is a constant. Radial null geodesic equations of metric (1), on using the null condition $k^ak_a=0$, takes the simple form

$$\frac{dk^v}{dk}-\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)(k^u)^2=0,$$

$$\frac{dk^r}{dk}+\left(\frac{\dot{m}}{r}-\frac{m'}{r}+\frac{m^2}{r^2}+\frac{2mm'}{r^2}-\frac{2m^2}{r^3}\right)(k^v)^2+2\left(\frac{m'}{r}-\frac{m^2}{r^2}\right)k^vk^r=0 \quad (22)$$

Let

$$k^v=\frac{dv}{dk}=\frac{P(v,r)}{r}, \quad (23)$$

Then from the null condition $k^ak_a=0$ we obtain

$$k^r=\left(1-\frac{2m}{r}\right)\frac{P}{2r},$$

Also

$$k_r=k_1=g_{1j}k^j=g_{10}k^0$$

$$k_r = \frac{P}{r} \tag{24}$$

And

$$k_v = k_0 = g_{0j}k^j = g_{00}k^0 + k^1$$

Therefore

$$k_v = -\frac{P}{2r}\left(1 - \frac{2\lambda u}{r} - 2a + \frac{\mu^2u^2+\delta^2u^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{25}$$

Eq. (21), (24) and (25) yields

$$P = \frac{12C}{12+(12-2\Lambda r^2-6)X+12\lambda X^2-3(\mu^2+\delta^2)X^3} \tag{26}$$

Where X is a self-similarity variable defined by $X = v/r$. The singularity occurring at $r = 0$ is naked if the outgoing radial null geodesic equation has atleast one real positive root [24]. In the case of pure Vaidya space-time it has been shown that for a mass function $m(u) = \lambda v/2$, the central singularity is naked for $\lambda \leq 1/8$, and the collapse ends into black hole if $\lambda > 1/8$ [25].

Hence it would be interesting to investigate whether the gravitational collapse of Vaidya space-time could yield a naked singularity under the influence of the gravitational constant and composite field produced by electric and magnetic charges.

With the help of Eq. (18), the equations of the outgoing radial null geodesics for the metric (1) are given by

$$-\left(1 - \frac{2m}{r}\right)dv^2 + 2dvdr = 0$$

Therefore

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2m}{r}\right)$$

i.e.

$$\frac{dr}{dv} = \frac{1}{2}\left(1 - \frac{2\lambda v}{r} + \frac{\mu^2v^2+\delta^2v^2}{2r^2} + \frac{\Lambda r^2}{3}\right) \tag{27}$$

Let

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{v}{r} = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr}$$

Hence Eq. can be written as

$$X_0 = \lim_{\substack{u\to 0\\ r\to 0}} \frac{dv}{dr} = \frac{2}{1 - 2\lambda X + \frac{\mu^2}{2}X^2 + \frac{\delta^2}{2}X^2 + \frac{\Lambda r^2}{3}}$$

i.e.

$$X_0 = \frac{12}{6-12\lambda X+3(\mu^2+\delta^2)X^2+2\Lambda r^2}$$

$$3(\mu^2 + \delta^2)X^3 - 12\lambda X^2 + (6 + 2\Lambda r^2)X - 12 = 0 \tag{28}$$

The above equation governs the nature of the singularity. If this equation has at least one real and positive root, then the singularity will be naked. If the equation has no positive root, then the collapse ends into a black hole.

In particular, for $\lambda = 0.1,\ \mu = 0.01,\ \delta = 0.02,\ \Lambda = 0.1,\ r = 0.1$, one of the roots of Eq. (28) is $X_0 = 794.9794$, indicating that the gravitational collapse in this case ends into a naked singularity.

IV Strength of the naked singularity

It has seen the nakedness of the singularity in the previous section; in this section we study the strength of singularity. The Clark and Krolak Criterion the strength of singularities has been analyzed and shown that these naked singularities are gravitationally strong. If the naked singularity is not strong then it cannot be considered as a physically reliable singularity and hence such naked singularities may not be considered as counter examples to CCH. A naked singularity is said to be strong if at least along one radial null geodesic with affine parameter k, with k = 0 at the singularity, one should have

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b > 0 \tag{29}$$

Where k^a is tangent to the null g**e**odesics and R_{ab} is the Ricci tensor

using Eq. (22) and (23) we write

$$\Psi = \lim_{k\to 0} k^2 R_{ab}k^a k^b = \lim_{k\to 0} k^2 \frac{2\dot{m}}{r^2}(k^v)^2 \tag{30}$$

$$= [4\lambda - X(\mu^2 + \delta^2) \lim_{k\to 0} \left(\frac{kP}{r^2}\right)^2 \quad (31)$$

as singularity is approached, $k \to 0, r \to 0$ *and* $X \to X_0$ and using L-Hospital's rule, we find that

$$\Psi = \frac{4\lambda - (\mu^2+\delta^2)X_0}{1+\frac{\Lambda r^2}{3} - 2\lambda X_0 + \frac{1}{2}(\mu^2+\delta^2){X_0}^2} \quad (32)$$

Thus the singularity is strong if $4\lambda - (\mu^2 + \delta^2)X_0 > 0$

For our particular case (i.e. λ=0.1, μ=0.01, δ=0.02, Λ=0.1, r=0.1, $X_0 = 794.9794$)

We have $4\lambda - (\mu^2 + \delta^2)X_0 = 0.00251$. Thus the naked singularity arising in the radiating dyon solution in the anti-de-sitter space-time is a strong curvature singularity.

V Concluding Remarks

Here we studied the appearance of singularity that is not hidden by horizon this singularity is called a naked singularity. In the present work we have studied strength of singularity in radiating dyon solution on anti-de-sitter background. It has been shown that the singularities formed in gravitational collapse of radiating dyon solution in anti-de-sitter background are not hidden inside the event horizon. Thus one can argue that composite charged field (electric and magnetic charges) and gravitational constant does not affect to gravity and cannot prevent a naked singularity from forming completely, so that CCH actually violets.

Also, using the clark and krolak criteria [25] the strength of singularities has been analyzed and shown that the naked singularities in the composite solution in anti-de-sitter background are gravitationally strong.

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Fractional Derivative Models for Large Deflection of Beams and Plates: A Review Article

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Abstract:

The article investigates the present review of the fractional order thermoelastic problem for large deflection with homogeneous material properties within a finite length plate. The fractional time derivative heat conduction differential equation is mostly solved using numerical or integral transformation technique. The large deflection of a plate when placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, large deflection, fractional order, thermal stress*

1. Introduction:

Although thermo-mechanical phenomena in the majority of practical engineering applications are adequately simulated with the classical Fourier heat conduction equation, there is an important body of problems that require due consideration of thermo-mechanical coupling: it is appropriate in these cases to apply the generalized theory of thermoelasticity. Serious attention has been paid to the generalized thermoelasticity theories in solving thermoelastic problems in place of the classical uncoupled/coupled theory of thermoelasticity. The absence of any elasticity term in the heat conduction equation for uncoupled thermoelasticity appears to be unrealistic since due to the mechanical loading of an elastic body, the strain so produced causes variation in the temperature field. Moreover, the parabolic type of the heat conduction equation results in an infinite velocity of thermal wave propagation, which also contradicts the actual physical phenomena.

2. Research Background :

The equation of equilibrium for the large deflection of a heated plate as derived by Basuli [1] on the basis of Berger's approximations is givenunder uniform load and stationary distribution [i.e. $T(r,\theta,z) = T_0(r,\theta) + g(z)T(r,\theta)$] as

$$D\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{E\alpha\, f(\mathrm{l})}{1-\upsilon}\nabla^2 T \tag{1}$$

where

$$f(\mathrm{l}) = \int_{-1/2}^{1/2} z\, g(z)\, dz$$

and β_1^2 is a normalising constant of integration.

In deriving the large deflection equation of a heated plate, we have generalized the aforesaid equation of equilibrium for the transient temperature distribution, as

$$\nabla^2(\nabla^2 - \beta_1^2)\, w(r,\theta,t) = -\frac{\nabla^2 M_T}{D(1-\upsilon)} \tag{2}$$

where $w(r,\theta,t)$ is the normal transverse deflection along the *z*-direction, ∇^2 indicates the two-dimensional Laplacian operator in $(r,\ \theta)$, the constant υ denotes the Poisson's ratio of the plate, $D = E\mathrm{l}^3/12(1-\upsilon^2)$ is the flexural stiffness of the plate and β_1^2 is to be determined from

$$u_{,r} + u/r + [w(r,\theta,t)_{,r}]^2/2 + v_{,\theta}/r + [w(r,\theta,t)_{,\theta}]^2/2r^2 = \beta_1^2 l^2/12 + (1+\upsilon)\alpha N_T \quad (3)$$

The result of the above heat conduction gives thermally induced resultant moment and resultant force as [2, pp. 381]

$$M_T = \alpha E \int_{-l/2}^{l/2} z\,T(r,\theta,z,t)\,dz \quad (4)$$

$$N_T = \alpha E \int_{-l/2}^{l/2} T(r,\theta,z,t)\,dz \quad (5)$$

with α as the coefficient of linear thermal expansion and *E* symbolize Young's Modulus of the material of the plate, respectively.

Eqs. (5) and (6) have to be solved for heated thin simply supported annular sector plate along the edges for which the boundary conditions are

$$w(r,\theta,t)\big|_{r=a} = w(r,\theta,t)_{,r}\big|_{r=a} = 0 \quad (6)$$

$$w(r,\theta,t)\big|_{r=b} = w(r,\theta,t)_{,r}\big|_{r=b} = 0 \quad (7)$$

3. Literature Review:

The development of this theory was accelerated by the advent of second sound effects observed experimentally. In heat transfer problems involving very short time intervals and/or very high heat fluxes, it has been revealed that the inclusion of second sound effects in the original theory yields results that are realistic and very much different from those obtained with the classical theory of elasticity. Analytical approaches have been developed many decades ago for one-dimensional multilayer heat conduction problems based on variables separation and methods of finite integral transformation [3-6]. De Monte [7] applied the eigenfunction expansion approach to solve the unstable heat conductivity problem on a two-dimensional two-layered isotropic slab with homogeneous boundary condition.Recently, on a three-layered solid aerosol particle heated by laser energy, a series of solution have beenobtained for heat conduction [8]. The concise preliminary study in the review is by no means comprehensive. Considering a few typical examples, Benjeddou and Andrianarison [9] introduced the equivalent of the Reissner's mixed variational theorem for thermoelastic media by introducing the transverse thermal field-temperature increase relationship as a restriction through a Lagrange multiplier. Few classical cases of quasi-static and steady-state that contribute to uncoupled heat transfer and thermal stress analysis were also investigated. Blanc and Touratier [10] studied the Discrete Layer approach for thermoelastic responses in linearly elastic multi-layered composite plates using quadratic Lagrangian interpolations to establish the one-dimensional finite displacement. Pelassa and Massabo [11] derived the generalized displacements and stresses on simply supported multi-layered wide plates and beams subjected to steady-state thermal and mechanical loading and obtained the closed-form solutions using a multi-scale homogenized model. Sayyad et al. [12] used an exponential shear deformation concept to intervene the thermal stress analysis of cross-ply laminated composite plates in which Navier's solutions for simply supported boundary conditions subjected to thermal loads varying linearly across the thickness were considered. Li et al. [13] developed a semi-analytical model to predict the evolution of stress within a multilayered coating system during cyclic thermal loading in which temperature gradient through each layer thickness was obtained using finite element analysis. Darban and Massabo [14] used the matrix method to formulate the problems of two-dimensional thermoelasticity in simple supported multi-layered beams and plates having an arbitrary number of layers that may be in imperfect mechanical and thermal contact. Kreja and Sabik [15] developed their finite element software based on the first-order shear deformation principle, incorporating several modifications including the correction of transverse shear rigidity and the deployment of zig zag-type functions. In all previous studies, the

aim was to maximize the structural support's load-carrying capacity either by locating the supports or by adjusting their stiffness using a numerical approximation.

The best methodologies for solving these problems have been obtained withboth analytical and numerical approaches. Nevertheless, owing to either non-availability or logical complexity of the corresponding exact solutions, numerical solutions are favoured and widespread in practice. Rather, restricted use of analytical solutions should not minimize their value to numerical solutions; because correct solutions, probably, offer insight into the problem's governing physics, which is seldom prevalent in any numerical solution. Rather, it is comparatively easier to evaluate closed-form solutions to achieve optimal design options for any particular task of interest. But it is not always possible to obtain consistent analytical solutions. However, it is much desired sincegreater information can be achieved through the mathematical process of an analytical solution relative to a discrete numerical solution.It can even be used as a guideline to evaluate and verify the numerical algorithms. Even though useful, analytical approaches are rarely seen in several multi-stacked or multi-layered geometries in multi-dimensional transient thermoelastic problems.

Meanwhile, it has also been discovered that fractional calculus is efficiently used to change several existing models of physical processes, see Hilfer [16], Sherief et al. [17], Tenreiro et al. [18]. It can also be stated that the whole theory of fractional derivatives and integrals was developed in the second half of the 19th century.A good overview of the subject can be noticed in Podlubny [19], Kaczorek [20-21], Sherief and El-Latief [22], Siedlecka and Kukla [23], Abbas [24], Xiong and Niu [25], Mahakalkar et al. [26], Mittal and Kulkarni [27], Hussein [28] and so on.

4. Conclusion:

During the literature review, it was noted that most of the papers on thermoelasticity were taken to derive the temperature, displacement, and stresses in different types of solid due to different thermal loading. Here there is ample possibility of introducing an fractional-order derivative still exist. By intorduing fractional order approach to derive the temperature, displacement and stresses in different types of solid will provide a new dimension in thermoelastic world. Few investigations were cited so far for the determination of the temperature, displacements and its stresses for solid or composite multilayered bodies. The theoretical and experimental studies of the heated structural profile are of considerable practical importance in a wide range of fields such as mechanical, aerospace and food engineering fields throughout the past years. The further analysis of such fractional-order problems may, as it seems, stimulate evaluation of methods. Hence it is strongly desired the rigorous study of fractional-order behaviour of homogenous and nonhomogeneous of different bodies in the different coordinate system with or without an internal heat source.

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Thermoviscoelastic media with fractional-order effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoviscoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoviscoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoviscoelastic problems, we have considered a few practical problems of technical interest, taking into account offractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*temperature distribution, thermal stresses, thermoviscoelastic,fractional order, vibration, deflection, integral transform.*

1 Introduction:

Thermoelasticity investigates the relation between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causes cause deformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration resulting in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

The classical coupled dynamical theory of thermoelasticity wasdeveloped by Biot [1] by assuming that the elastic changes affect the temperature and vice-versa. However, this theorywasbasedon the Fourierlaw of heat conduction. Therefore whenthis theorywascombined withthelawofenergy conservation, aparabolic type heat conductione quation was obtained and predicted an infinite speed of the thermal signal, which contradicted the physical fact.The generalized theories of thermoelasticity have come into existence and attracted several researchers during the last few decades. The generalized theories were specially formulated to account for the finite speed of propagation of thermal signals, which waster medas a second sound effect. In this respect, wewould like to mention here one of the earliest development of the second sound theory for ther moelasticity by Fox [2], in which heapplied the principles of modern continuum the rmodynamics. Further, the two well established and well-studied generalized ther mo-elasticity the ories were also developed by Lordand Shulman [3] and Green and Lindsay [4]. Sherief [5] obtained the fundamental solution of generalized thermoelasticity with one relaxation time. To review and present generalized theories, one can refer to Ignaczak [6] and Chandrasekharaiah [7]. The uniqueness theorem for generalized thermo-viscoelasticity withone relaxation

timeunder different conditions is proved by Ezzat and El-Karamany [8,9]. El- Karamany and Ezzat [10,11] investigated the propagation of discontinuities of solutions in this theory. Ezzat [12] introduced a new model of the equations of generalized thermo-viscoelasticity for an electrically conducting is otropic media permeated by a primary uniformmagnetic field, considering the volume's rheological properties. Among the contributions tothe generalized theory are Ezzat et al.[13, 14], Othman et al.[15], Lata et al.[16], Kumari and Mukhopadhyay [17], El-Karamany and Ezzat [18] and Abbas and Kumar [19].

Viscoelasticity is the material property that exhibits viscous and elastic characteristics when undergoing deformation. Viscous materials, like honey, resist shear flow and strain linearly with time when stress is applied. Elastic materials strain when stretched and quickly return to their original state once the stressisre moved. Viscoelastic materials have elements of both of these properties and, assuch, exhibittime-dependent strain. At the same time, elasticity is usually the result of bond stretching a long crystallographic plane in anordered solid; viscosity results from the diffusion of atoms or molecules inside an amorphous material [20]. Linear viscoelastic materials are rheological materials that exhibit time-temperature rate-of-loading dependence. When their response is a function of the current input and the current and past input history, the characterization of the viscoelastic response can be expressed using the convolution (hereditary)integral. The mechanical-model representation of linear viscoelastic behaviour results was investigated by Gross [21]. One can refer to Atkinson and Craster [22] to review fracture mechanics and generalizations to the viscoelastic materials. A general review of time-dependent material properties has been exhibited in Refs. [23–26]. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

2 Research Background :

The system of governing equations of the linear theromoviscoelasticity theory with fractional order of heat transfer consists of the following [27]:

i. The equation of motion

$$\sigma_{ji,j} = \rho u_{i,tt} \tag{1}$$

ii. The constitutive equation

$$S_{ij}(x,t) = \int_0^t R(t-\xi)\frac{\partial e_{ij}(x,\xi)}{\partial \xi} d\xi = \hat{R}(e_{ij}) \tag{2}$$

in which

$$S_{ij} = \sigma_{ij} - \frac{\sigma_{kk}}{3}\delta_{ij}, \varepsilon_{ij} = \frac{1}{2}(u_{i,j} + u_{j,i}), e_{ij} = \varepsilon_{ij} - \frac{e}{3}\delta_{ij}, e = \varepsilon_{kk}, x = (x_1, x_2, x_3) \tag{3}$$

and $\hat{R}(t)$ is the relaxation modulus functions such that $R(\infty) > 0$ given by

$$\hat{R}(t) = 2\mu(1 - A\int_0^t f(t)\,dt). \tag{4}$$

The function $f(t)$ is taken in the form

$$f(t) = \exp[-\beta t]t^{a^*-1} \tag{5}$$

where $0 < a^* < 1, \beta > 0, 0 \le A < \Gamma(a^*)$.

iii. The stress-strain temperature relation

Assuming that the relaxation effects of the volume properties of the material are ignored, we have

$$\sigma = K\left[e - 3\alpha_T\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon\right] \tag{6}$$

iv. The fractional heat equation

$$\kappa\upsilon_{,ii} = \rho C_E\frac{\partial}{\partial t}\left(1 + \frac{\nu^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)\upsilon + \gamma T_0\frac{\partial}{\partial t}\left(1 + n\frac{\tau^\alpha}{\alpha!}\frac{\partial^\alpha}{\partial t^\alpha}\right)e \tag{7}$$

where n is equal to zero or one, and a comma denotes material derivatives.

3 Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Differential equations of fractional order have been the focus of many studies because of their continuous appearance in different applications in fluid mechanics, viscoelasticity, science, material science and building. Ezzat [56] recently established a new fractional heat conduction equation model utilizing the Taylor–Riemann series expansion of time-fractional order. Sherief etal.[57] introduced afractional formula of heat conduction, proved a uniqueness theorem, and derived a reciprocity relation and a variational principle. Onecanreferto Ezzat and Fayik [58]and Ezzatand El-Bary[59] for a survey of fractional calculus applications. Abbas [60] considered the fractional thermoelastic problem in the presence of a constant magnetic field exposed to a moving plane of heat source. Magneto electro-thermoelasticity was studied in the contex to fanewconsiderationoffractional Green–Naghdiheatconduction law without energy dissipation by Hendy et al. [61]. Yu et al. [62] solved a one-dimensional problem in fractional order generalized electro-magneto-thermoelasticity. Boetal.[63] introducedanovelcompactnumericalmethodforsolvingthe two-dimensional non-linear fractional reaction–subdiffusion equations, while Zhangetal.[64]introduced a time-space spectral method for the time-space fractional Fokker–Planck equation and its inverse problem.

A great number of computational techniques may be found in the research of viscoelastic problems in Danyluketal.[65], Vinogradov and Milton[66], Ashishetal.[67],Aldawody etal.[68]and Sheriefetal.[69]. One of the most popular methods is the Laplace transform, which is a viable strategy for viscoelasticity since the equations may be transformed into pseudo-elastic ones. However, this procedure presents some difficulties when viscous parametersvarya longtime or when imposed by complicated time-dependent boundary conditions. Many inverse transforms cannot be solved analytically.Subsequently, the numerical method for the Laplace inverse change is quickly created and connected. De Chant [70]discussed the limitations of the numerical inversion method in the face of discontinuities and asymptotic methods.Syngellakis[71]pointed out that numerical inversions of the Laplace transform by employing the finite-element and boundary element are effective approximate methods.Temel[72]obtained some solutions in the realspacere sorting the Durbin's numerical method of the inverse Laplace transform. Because of the complexity of the constitutive relations, it is challenging to find analytical solutions of viscoelasticity, and the numerical method is taken into accountas of late withth eassistance of the quick advancement of the PC innovation, especially the boundary element method, which is given in El-Karamany and Ezzat [73,74]. WangandAi[75] established an extended precise integration model to analyse the thermo-mechanical behaviour of multi-layered transversely isotropic materials in the Cartesian coordinate system. Aiand Wang[76]introduced ananalytical layer element solution to axisymmetric thermal consolidation of multi-layered porous thermoelastic media containing a deeply buriedheat source.

4 Conclusion:

During the literature review, it was noted that the expected thermal profile addresses thermoviscoelastic media with a fractional-order effect. The literature still fails to provide the exact solution of the fractional heat conduction equation in two or three-dimensional problems using fractional-order derivate. The present work

determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to thermoviscoelastic problems.

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Thermoelastic media with memory-dependent derivative effect: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of memory-dependent derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, thermal stresses, memory-dependent derivative vibration, deflection, integral transform.*

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy produces a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Therefore, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decrease, the material will compress or contract.

The enormous demand for science and engineering works deals with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it is also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8],

Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as $I^{RL}_{\alpha,\alpha} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\,\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] as

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\,\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\,\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^2)$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D^{(1)}_\omega q(x,t) = -k\,\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx, \ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \qquad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (9)$$

Now combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and $\Delta = \nabla^2 = \nabla \cdot \nabla$ is Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or to characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59,60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivative in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-space in the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity in the context

of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parameters in the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material with constant elastic parameters, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving the effect of thermal inertia during the macro- and micro-scales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity. Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavity based on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity in the context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The thermal profile is determined by solving heat conduction equations with memory-dependent derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Thermoelastic effect of moving heat source in a hollow cylinder with time-fraction derivatives

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Abstract:

The present analysis comprises the mathematical model designed on thermal response in a thin hollow cylinder by a time-fractional thermo-elasticity of order $0 < \alpha \le 2$ *and confined to a region* $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$ *. The thin hollow cylinder is further analyzed utilizing an internal moving heat source assumed to be in a circular trajectory of radius* r_1 *, in which* $a \le r_1 \le b$ *around the centre of the cylinder with constant angular velocity* ω *. The mathematical calculation found the solution using integral transform and Greens theorem for the temperature and stress. The resultant of this calculation provides a series form of Bessel function and trigonometric function.*

Keywords*: Thermal stress, hollow cylinder, fractional derivative, internal heat sources, integral transform*

1. Introduction:

The breakdown of classical thermoelasticity countered by Fourier type heat conduction is observed in many physical processes such as medium of amorphous nature materials [1,2] like glass, and having some porosity, colloids etc. The fractional-order derivatives and integral technique are always preferred over the classical approach in constructing a mathematical model. Popovych [3] has discussed a thin thermosensitive plate for making the model on heat fields. Popovych [4] found the solution of the heat conduction equation to deal with the problems of thermo-sensitive bodies with convective heat transfer. Popovych [5, 6] determined solutions of heat-conduction in thermo-sensitive bodies. Youssef [9] established the uniqueness theorem and devised a new construction of analysis of thermoelasticity with respect to a fractional order. Jiang and Xu [10] investigated the time-fractional heat conduction equation with a time-fractional derivative for the general orthogonal curvilinear coordinate.

Meanwhile, Ezzat [11,12] elaborated on the uses of the concept of fractional thermoelasticity for porous asphaltic materials. Kumar and Kamdi [23] worked on finding the temperature distribution and thermal stresses by using the finite Marchi-Zgrablich and Laplace transform technique. An annular fin's two-dimensional thermoelastic problems were designed with the fractional-order derivative. Kumar and Kamdi [24] analyzed a problem on a finite hollow cylinder to evaluate the temperature and thermal stresses in the context of fractional order. Thakare et al. [25] considered nonhomogeneous thick hollow cylinders and obtained time-fractional heat transfer analysis employing internal heat generation and thermal stresses. Thakare and Warbhe [26] attempted to analyze a nonlocal Caputo type time-fractional heat conduction equation with internal moving heat sources and presented a mathematical model of a thin circular plate. The same result and study proof have been depicted in [7, 8, 14-21].

The current article elaborates on thermal behaviour in the thin hollow cylinder by using *h* Robin's boundary condition connected with the internal moving heat source. The solution to the heat conduction equation in the designed problem was obtained with the help of the Integral transform technique and Green's theorem. The resultant solution is found to contain a series form of Bessel function and trigonometric function. This study finds a vital role in an industry where materials are in the vicinity of heat.

2. Formulation:

A thin hollow isotropic cylinder with inner radius *a*, outer radius *b* and thickness *h* is defined in space $R: a \le r \le b, 0 \le z \le h, 0 \le \phi \le 2\pi$. An internal moving heat source along the circular trajectory of the radius r_1 is moving with constant angular velocity ω inside the cylinder. The heat generation by means of moving heat source activity may depend upon position and time in the form $g(r,\phi,z,t)\ w/s^3$. The thermoelastic problem is presented in the form of a time-fractional heat conduction equation of Caputo type of order α. It is defined for the function $f(t)$ by [14] as

$$\frac{d^\alpha f(t)}{dt^\alpha} = \frac{1}{\Gamma(n-\alpha)} \int_0^t (t-\tau)^{n-\alpha-1} \frac{d^n f(\tau)}{d\tau^n} d\tau, \quad t > 0\ ,\ n-1 < \alpha < n, \tag{1}$$

where the Laplace transform rule as given as

$$L\left\{\frac{d^\alpha f(t)}{dt^\alpha}\right\} = s^\alpha L\{\bar{f}(s)\} - \sum_{k=0}^{n-1} f^{(k)}(0^+)\, s^{\alpha-1-k}, \quad n-1 < \alpha < n. \tag{2}$$

in which the transform parameter is *s* and *n* refers to a positive integer.

The equation for temperature distribution in a thin hollow cylinder as a time-fractional differential equation of heat conduction with heat generation term is presented as follows:

$$\nabla^2 T + g_s^i \frac{1}{2\pi k r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau) = \frac{1}{k'}\frac{\partial^\alpha T}{\partial t^\alpha} \tag{3}$$

where

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2} + \frac{\partial^2}{\partial z^2}$$

and volumetric heat source $g(r,\phi,z,t)$ in cylindrical coordinates is given by

$$g(r,\phi,z,t) = g_s^i \frac{1}{2\pi r} \delta(r-r_1)\delta(\phi-\phi')\delta(z-\xi)\delta(t-\tau)$$

Here g_s^i denotes an instantaneously moving heat source fixed at (r_1,ϕ',ξ) and releasing its energy spontaneously at time τ, $T = T(r,\phi,z,t)$ is temperature distribution, *k* is the thermal conductivity of the material of the cylinder, $k' = k/\rho c_p$ is thermal diffusivity, ρ *is* density, c_p is the specific heat of the material.

Also

$$\phi' = \omega t \tag{4}$$

with initial conditions as,

$$T = f(r,\phi,z) \quad at\ t = 0, r = -\infty;\ 0 < \alpha \le 2$$
$$\frac{\partial T}{\partial t} = 0\ , \qquad at\ \ t = 0\ , \qquad 1 < \alpha \le 2 \tag{5}$$

and corresponding boundary conditions,

$$k\frac{\partial T}{\partial r} - h_1 T = 0 \quad at\ r = a \tag{6}$$

$$k\frac{\partial T}{\partial r} + h_1 T = 0 \quad at\ r = b \tag{7}$$

$$k\frac{\partial T}{\partial z} - h_1 T = 0 \quad at\ z = 0 \tag{8}$$

$$k\frac{\partial T}{\partial z} + h_1 T = 0 \quad at\ z = h \tag{9}$$

where h_1 denotes the heat transfer coefficient of the cylinder.

The above equations (3) to (9) constitute the mathematical formulation of the problem under consideration.

3. Formulation of thermoelastic Problem

Following [7], on introducing a thermal stress function χwe get

$$\sigma_{rr} = \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2 \chi}{\partial r^2} \tag{10}$$

$$\sigma_{\phi\phi} = \frac{\partial^2 \chi}{\partial r^2} \tag{11}$$

$$\sigma_{r\phi} = -\frac{\partial}{\partial r}\left(\frac{1}{r}\frac{\partial \chi}{\partial r}\right) \tag{12}$$

For a traction free surface

$$\sigma_{rr} = 0, \sigma_{r\phi} = 0\ at\ r = a\ or\ r = b \tag{13}$$

where

$$\chi = \chi_c + \chi_p \tag{14}$$

in which χ_c and χ_p denotes complementary and particular solutions.

Next,

χ_c Satisfies the equation $\nabla^4 \chi_c = 0$ (15)

χ_p Satisfies the equation $\nabla^4 \chi_p = -\lambda E \nabla^2 \Gamma$ (16)

in which temperature change is given as $\Gamma = T - T_i$, T_i refers for initial temperature. Further, in the case of a thin cylinder, the thickness can be neglected.

We have Laplace operators as

$$\nabla^2 = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial \chi}{\partial r} + \frac{1}{r^2}\frac{\partial^2}{\partial \phi^2}$$

4. Solution

In order to find the solution to the heat conduction equation, we first define the integral transform of $T(r,\phi,z,t)$ as

$$\bar{T}(\beta_m, v, a_n, t) = \int_R T(r,\phi,z,t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z) dv \tag{17}$$

with its inverse as

$$T(r,\phi,z,t) = \sum_{m,n,v=0}^{\infty} \frac{\bar{T}(\beta_m, v, a_n, t) R_v(\beta_m r)\cos v(\phi - \phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \tag{18}$$

$$R_v(\beta_m r) = J_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] - Y_v(\beta_m r)[\beta_m Y_v'(\beta_m b) + H J_v(\beta_m b)] \tag{19}$$

where

$$H = \frac{h_1}{k}$$

and

$$z(a_n z) = \alpha_n \cos(a_n z) + H \sin(a_n z) \tag{20}$$

Normalization integral is denoted as

$$N(\beta_m) = \int_a^b r\left[R_v(\beta_m r)\right]^2 dr$$

$$N(\beta_m) = \frac{\frac{2}{\pi^2}\left\{\left[\frac{b^2(H^2+\beta_m^2)-v^2}{\beta_m^2 b^2}\right]\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2\right.}{\left[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)\right]^2}$$

$$\left. - \frac{\left[\frac{a^2(H^2+\beta_m^2)-v^2}{\beta_m^2 a^2}\right]\left[\beta_m J_v'(\beta_m \beta) + H J_v(\beta_m \beta)\right]^2\right\}}{\left[\beta_m J_v'(\beta_m a) + H J_v(\beta_m a)\right]^2} \tag{21}$$

Next,

$$N(V) = \int_0^{2\pi}\left[\text{Cos}\, v(\phi - \phi')\right]^2 d\phi = \pi \tag{22}$$

$$N(a_n) = \int_0^h \left[Z(a_n z)\right]^2 dz = \left(a_n^2 + H^2\right)\frac{h}{2} + H \tag{23}$$

where β_m denotes the roots of the transcendental equation

$$\begin{aligned}&[\beta_m J_v'(\beta_m a) + HJ_v(\beta_m a)][\beta_m Y_v'(\beta_m b) + HY_v(\beta_m b)]\\ &-[\beta_m J_v'(\beta_m b) + HJ_v(\beta_m b)][\beta_m Y_v'(\beta_m a) - HY_v(\beta_m a)] = 0\end{aligned} \tag{24}$$

and a_n denotes the roots of the transcendental equation

$$\tan a_n h = \frac{2\alpha_n H}{a_n^2 - H^2} \tag{25}$$

and $v \in W$, in which W is a set of whole numbers.

By taking the integral transform of equation (3) and using following Green's theorem given in [6], one obtains

$$\int_R \nabla^2 T \varphi_k \, dv = \int_R \nabla^2 T \varphi_k \, dv + \sum_{i=1}^{N}\int_{s_1}\left\{\psi_k \frac{\delta T}{\partial n_i} - T\frac{\delta \psi_k}{\partial n_i}\right\} ds_i \tag{26}$$

$$\frac{d^\alpha \bar{T}}{dt^\alpha} + k'(\beta_m^2 + a_n^2)\bar{T} = \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(a_n \xi)\partial(t - \Gamma) \tag{27}$$

Applying Laplace transform and using its inversion formula to equation (27) by using the initial condition, one obtains

$$\bar{T} = \bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]$$

By taking inverse integral transform, we obtain

$$T = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \quad (28)$$

$$\Gamma = \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (29)$$

5. Solution to the thermoelastic problem:

Assume the value of χ_c and χ_c satisfying equation (15), (16), respectively as

$$\chi_c = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') \quad (30)$$

$$\chi_p = \lambda E \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (31)$$

using (30), (31) in(14) one obtains

$$\chi = \sum_{v=0}^{\infty} (Ar^{v+2} + Br^{-v+2})\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2})\sin v(\phi-\phi') + \sum_{m,n,v=0}^{\infty} \frac{R_v(\beta_m r)\cos v(\phi-\phi')\, z(a_n z)}{N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (32)$$

Using (32) in (10) to (12), one obtains

$$\sigma_{rr} = \sum_{v=0}^{\infty} [A(2+v-v^2)r^v + B(2-v-v^2)r^{-v}]\cos v(\phi-\phi') + (Cr^{v+2} + Dr^{-v+2}) \times\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (33)$$

$$\sigma_{\phi\phi} = \sum_{v=0}^{\infty} [A(v^2+3v+2)r^v + B(v^2-3v+2)r^{-v}]\cos v(\phi-\phi') + [C(v^2+3v+2r^v) + D(v^2-3v+2)r^{-v})]\sin v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r} R_v'(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m)\, N(v) N(a_n)} \times\left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2 + a_n^2)(t-\tau)^\alpha] - 1\right\} \quad (34)$$

$$\sigma_{r\phi} = \sum_{v=0}^{\infty}[A(v^2+v)r^v + B(v-v^2)r^{-v}]\sin v(\phi-\phi') + [C(-v^2-v)r^v) + D(v^2-v)r^{-v})]\cos v(\phi-\phi') + \lambda E \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (35)$$

Applying the prescribed condition (13), we have

$$A = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)}\left\{\left(\frac{v+v^2-2-v^2}{2v(v^2-1)}\right)R_v(\beta_m a) - \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (36)$$

$$B = \lambda E \sum_{m,n,v=0}^{\infty} \frac{a^{-v-2} z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)}\left\{\left(\frac{2+v-2v^2-v^3}{2v(v^2-1)}\right)R_v(\beta_m a) + \left(\frac{1}{2v}\right)\beta_m a R_v'(\beta_m a)\right\} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (37)$$

Substituting the above values of *A* and *B* in Eqs. (33) to (35), one obtains

$$\sigma_{rr} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{7v^2-3v^4-v^3+v^5-4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2+v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{-7v^2-v^3+3v^4+v^5+4}{2v(v^2-1)}R_v(\beta_m a) - \frac{2-v\ -v^2}{2v}\beta_m a R_v'(\beta_m a)\right] + \sum_{m,n,v=0}^{\infty}\left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (38)$$

$$\sigma_{\phi\phi} = \lambda E\left\{\sum_{m,n,v=0}^{\infty} a^{-v-2} r^v \left[\frac{(v^2+3v+2)(-v^3+2v^2+v-2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + a^{v-2} r^{-v}\left[\frac{(v^2-3v+2)(-v^3-2v^2+v+2)}{2v(v^2-1)}R_v(\beta_m a) - \frac{v^2+3v+2}{2v}\beta_m a R_v'(\beta_m a)\right] + \left[\frac{\beta_m}{r}R_v'(\beta_m r) - \frac{v^2}{r^2}R_v(\beta_m r)\right]\frac{\cos v(\phi-\phi')\, z(a_n z)}{\beta_m^2 N(\beta_m) N(v) N(a_n)} \times\left[\bar{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi)(t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]\right] \times\left\{E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha]-1\right\} \quad (39)$$

$$\sigma_{r\phi} = \lambda E \sum_{m,n,v=0}^{\infty} a^{-v-2} r^{v} \left[\frac{(-v^5+v^4+3v^3-v^2-2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v^2+v}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ a^{v-2} r^{-v} \left[\frac{(v^5+v^4-3v^3-v^2+2v)}{2v(v^2-1)} R_v(\beta_m a) - \frac{v-v^2}{2v} \beta_m a R'_v(\beta_m a) \right]$$
$$+ \left[\frac{\beta_m}{r} R'_v(\beta_m r) - \frac{v^2}{r^2} R_v(\beta_m r) \right] \frac{\cos v(\phi-\phi') z(\alpha_n z)}{\beta_m^2 N(\beta_m) N(v) N(\alpha_n)} \qquad (40)$$
$$\times \left[\overline{f}(\beta_m, v, a_n) + \frac{k'}{2\pi k} g_s^i R_v(\beta_m r_1) z(k_n \xi) (t-\tau)^{\alpha-1} E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] \right]$$
$$\times \left\{ E_\alpha[-k'(\beta_m^2+a_n^2)(t-\tau)^\alpha] - 1 \right\}$$

6. Numerical calculations:

Dimensions- For the sake of convenience, we choose the inner radius $a = 1m$, outer radius $b = 2.5m$, the thickness of the hollow cylinder $h = 0.2\,m$

Material Properties-

Thermal diffusivity (*m/s*)	Thermal conductivity (*W/mK*)	Density (Kg/m^3)	Specific heat (J/Kg K)	Poisson ratio	CTE (I/K)	Lame's constant
112.34 X 10^{-6}	386	8954	383	0.35	16.5 X 10^{-6}	26.67

Analysis of numerical Solutions

The numerical results and values are summarized and represented by a graph between temperature and stress distribution for weak, normal and strong conductivity. It has been done with MATEMATICA software for the finite hollow cylinder.

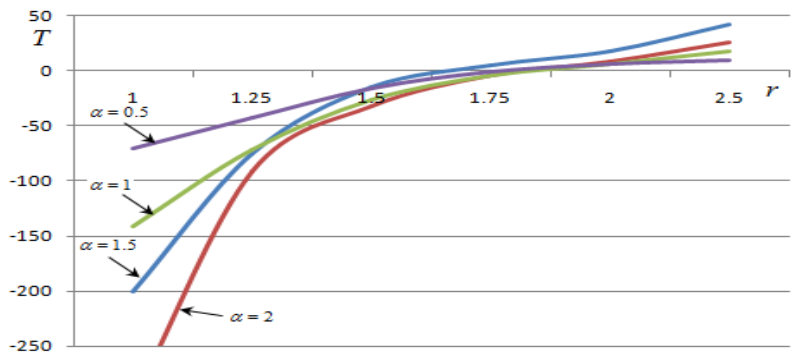

Figure 1: Temperature versus *r* for different values of α

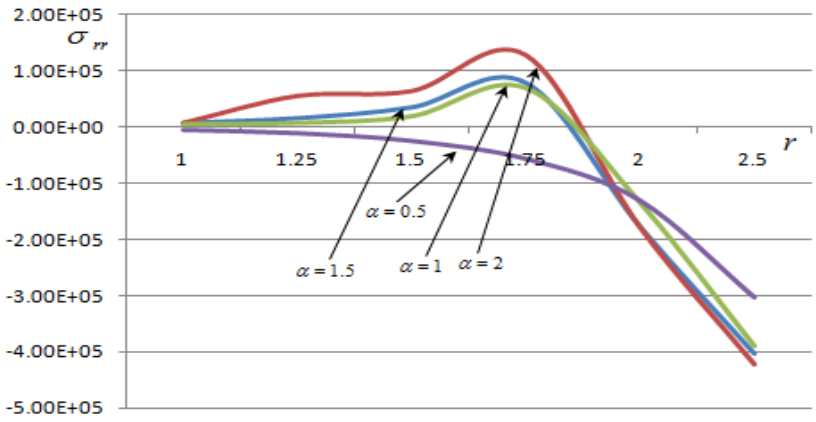

Figure 2: σ_{rr} versus *r* for different values of α

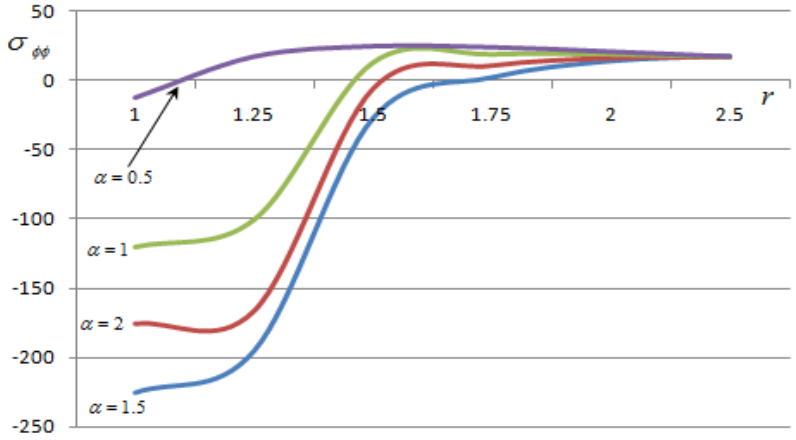

Figure 3: $\sigma_{\phi\phi}$ versus r for different values of α

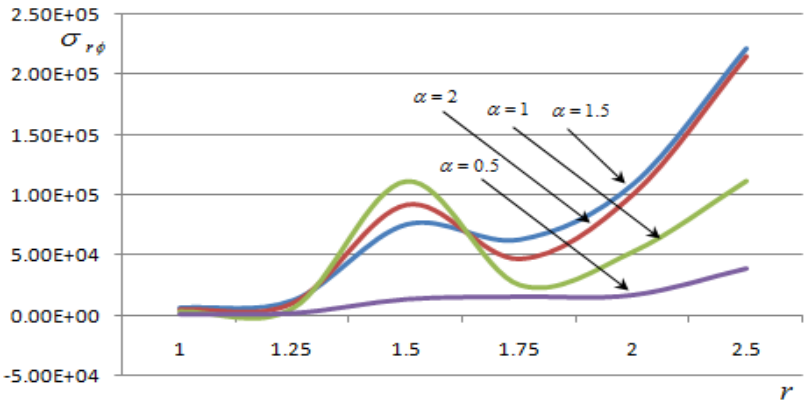

Figure 4: $\sigma_{r\phi}$ versus r for different values of α

Figures 1 to 4: The effect of different values α along the radial direction on temperature and stress distribution variation has been depicted graphically. It indicates the direct impact of the different values of the fractional-order parameter α on the thermal quantities. Studying these parameters helps to understand the properties of any material for domestic and industrial use.

7. Conclusion

In the present analysis, efforts are taken to find a numerical solution to the time-fractional order thermoelastic problem of a thin hollow cylinder that is subjected to an internal moving heat source. The analytical product of temperature change and corresponding stresses has been obtained by using Green's theorem approach and the Integral transform technique. The graphical study established the proportionality relation of wave propagation speed with fraction order. It would provide the base for researchers in thermodynamics and thermoelasticity. This model will be the initial base for designing new materials and applies to real-life situations.

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Hygrothermal Effects On Nanocomposites Objects: A Review Article

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Abstract:

This review article describes the hygrothermal effects on nanocomposite objects. The hygrothermoelastic effects on nanocomposites objects investigation aim to develop operational methods for solving the governing differential equations. In the hygothermoelastic problems, we used numerical algorithms to analyze a few real problems of technical importance while considering the geometry of nanocomposite materials. Few basic equations for hygrothermoelastic problems are discussed.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords:*Hygrothermoelasticity, Nanocomposite objects,Moisture diffusion, Temperature distribution,Thermal stresses.*

Introduction:

Although composites materials are increasingly used in marine, offshore, aeronautics, and civil infrastructures applications, their advantages include lightness, high strength, and high stiffness to weight ratios; however, their durability and long-term integrity are still not comprehensively understood. In such applications, composite materials are exposed to harsh and changing environments ranging from temperature variations and moisture exposure, including elevated temperature immersion and "hot-wet" exposures [1,2,3]. In particular, water diffusion in polymer matrix composite materials may promote material degradation, residual strength reduction, Plasticization, and lowering polymer matrices glass transition temperature, a global decrease in material performance [4, 5]. Thus, it is well known that hygrothermal effects of Polymer Matrix Composites (PMCs) cause degradation of mechanical properties due to the combined effect of moisture and temperature. Given the strong correlation between the rate of deterioration and moisture uptake, the diffusion process in such materials must be understood as a step toward the prediction of long-term durability [6]. Moisture diffusion through polymer or Fibre Reinforced Plastic (FRP) is intrinsically related to its molecular structure, water–polymer interaction, and the degradation processes resulting thereof. The swelling due to moisture absorption leads to the weakening of the fiber/polymer interface and hence affects the long-term durability of the composites [7–11]. Globally research is concentrated on developing PMCs with superior moisture barrier properties. Nanoclay as a filler material in polymers has shown great promise to improve such properties due to increased diffusion path based on tortuosity, which is dependent on the degree of exfoliation in polymers [12]. Thus,the review of the above literature outlines the investigation of the effects of hygrothermal on FRP, and the influence of nano-clay addition on improved mechanical/moisture barrier was well observed.

Literature Review:

The exclusive properties of nanoscale beams are due to their size, and this size plays an essential role in static and dynamic analysis. In front of the difficulties of classical continuum mechanics in considering the size effect in modeling the behaviour of this kind of structure, various size-dependent continuum theories have been developed. These theories include nonlocal continuum theory, strain gradient theory, or a combination of both (nonlocal strain gradient theory), modified couple stress theory, micropolar theory, and the surface elasticity theory.

In this regard, few manuscripts were reviewed like, Karličić et al. [13] used the nonlocal thermoelastic theory to investigate the free banding vibration and stability behaviour of MNBS embedded in Winkler's type of elastic medium and obtained the closed-form solutions for the natural frequencies, and the critical buckling

loads are derived by using the separation of variables method and the trigonometric method. Ebrahimi and Barati [14] developed a nonlocal higher-order beam model for free vibration analysis of magneto-electro-elastic functionally graded nanobeams via Hamilton's principle and solved it using the analytical method. Zarei et al. [15] dealt with the dynamic buckling of a sandwich truncated conical shell composed of polymer–carbon nanotubes–fiber multiphase nanocomposite layers in hygrothermal environments by employing Hamilton's principle. The previously published papers mostly exposed the static and dynamic characteristics of composite or smart material structures to the thermal environment. Recently, a few papers have been published using time-fractional thermoelasticity theory to study the effects of temperature on the material properties under thermal load. For example, Cajić et al. [16] analyzed the free vibration of a nanobeam resting on a viscoelastic foundation using the combined Eringen's nonlocal elasticity and fractional derivative viscoelasticity constitutive equations to model the system and obtained the solution via the Laplace integral transform method. Eyebe et al. [17] studied the nonlinear vibration of a nanobeam resting on the fractional-order viscoelastic Winkler–Pasternak foundation is studied using nonlocal elasticity theory. Thus, several authors (citations are given in the trailing section) have previously investigated the associated hygrothermoelastic problems.

Research Background :

Few basic equations are briefed here are just for reference as

The basic equation for hygrothermoelasticiy:

This subsection summarizes the results of the previous authors' work, namelythe relationship between temperature, dissolved moisture content and vapour concentration, and control equations. As the small variations, σ and ω are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \tag{1}$$

Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \tag{2}$$

and the thermal diffusion is

$$\mathrm{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon \frac{\partial M}{\partial t} \tag{3}$$

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi \frac{\partial T}{\partial t} \tag{4}$$

$$\mathrm{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi \frac{\partial C}{\partial t} \tag{5}$$

in which notation is used from the manuscript of Henry [18].

The basic equation for non-simple hygrothermoelasticiy:

Chen and Gurtin [19] propose the classification of real materials into simple and non-simple materials by considering two temperatures viz., thermodynamic and conductive. The respective theory explains that the two temperatures were not identical for non-simple materials, unlike simple materials in which they are identical. The studies were further extended to deformable bodies by Chen et al. [20] and showed that such materials contain an additional term involving the time derivative of the Laplacian of the conductive temperature, and they have shown that the two temperatures are related by

$$\phi = T - b\nabla^2 T,\ b > 0 \tag{6}$$

The key element that sets the two-temperature thermoelasticity theory apart from the classical theory is the material parameter. Therefore, in the case of a non-simple medium, Eq. (2) can be written as

$$D\left(1+\frac{b}{k}\frac{\partial}{\partial t}\right)\nabla^2\phi=\frac{\partial T}{\partial t}-\varphi\frac{\partial C}{\partial t} \qquad (7)$$

The basic equation for hygrothermoelasticiy:

Zhang and Li [21] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation

$$D\nabla^2 C=\frac{\partial^\alpha C}{\partial t^\alpha}-\lambda\frac{\partial^\alpha T}{\partial t^\alpha} \qquad (8)$$

$$D\nabla^2 T=\frac{\partial^\beta T}{\partial t^\beta}-\eta\frac{\partial^\beta C}{\partial t^\beta} \qquad (9)$$

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [22] proposed a linear hygrothermoelastic theory to analyze transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [23] obtained analytical solutions for the heat and moisture equation and its associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [24] analyzed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [25] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified Formulation framework. Ishihara et al. [26] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [27] studied the static behaviour of a functionally graded magnetoelectroelastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [28] presented the interaction of electric potentials, electric displacement, and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to both mechanical load and electric potential. Zhao et al. [29] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment. Recently, few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [30] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [31] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterized by the time-fractional diffusion-wave equation. Peng et al. [32] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden hygrothermal loadings. Zhang et al. [33] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [34] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform. However, previous researchers have not solved the high-dimensional hygrothermoelastic problems in nanocomposites objects as we know that innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness, and damping at the side of low concrete weight, though, it is susceptible to hygrothermoelastic stress due to its intrinsic heterogeneity evolving at the microscopic macroscopic level. It reduces construction, operation, and development prices, whereas up structural

responsibility and enhances safety. It's crucial for a decent style of multilayered composite structures to correctly account for hygrothermoelastic stresses; even inside the context of an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Conclusion:

According to the literature study, using hypothesized hygrothermal effects on nanocomposite objects addresses hygrothermomechanical difficulties in many ways. The exact solution of the heat conduction equation in two or three dimensions using memory-dependent derivate has yet to be found in the literature. The thermal profile is determined throughout thermodynamics by solving heat conduction equations with memory-dependent derivative effects that provide a precise solution to thermoelastic problems.

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Thermoelastic problems with fractional order derivative: An overview & prospective

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Abstract:

The article investigates the present review of thermoelastic theories with fractional order derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of heat conduction, taking into account of fractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: 35B07; 35G30; 35K05: 44A10
Keywords:temperature distribution, thermal stresses, fractional order derivative, deflection, integral transform.

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to many forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very low likelihood of failure.

Thermoelasticity, which is a branch of applied mathematics which specially deals with the study of temperature change and coupling between mechanical deformation and thermal energy calculated in terms of stress. “It can also be defined as it is a branch of science that deals with the analysis of stresses caused by thermally induced strains which are in the elastic range”.It consists of study of heat conduction, thermoelastic displacement and thermal stresses, etc. The most of the material tend to expand if there temperature rises and to a first approximation, the Expansion and Compression is proportional to the temperature change. This temperature changes induced by expansion and compression is based on thermoelasticity.

Thermoelasticity investigates the relation between a material's elastic properties and temperature, or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, which is partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the body's deformation undergoes the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, the situation where mechanical and thermal causes cause deformation, results in the word 'Thermoelasticity'.

The convolution operator presented in the most popular Riemann-Liouville fractional integral, which is defined as where denotes the convolution operator, is the fractional-order and is the standard power function given as .

Research Background :

The classic heat conduction theory is based on the Fourier law [27,28] (1)
in which is the heat flux vector, denotes the point in the considered region, is the time, is the thermal conductivity of the material, is the gradient operator, and is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [29-31] (2)

in which is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable , one obtains [32] as (3)

where is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [33] as (4)

where without losing the generality appearing in Taylor series is merged in terms, is the gamma function, is introduced to keep the dimension in order and is the fractional time derivative based on Caputo fractional definition [34].

For the limiting case of (or), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for as (5)

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [35] gives (6)

Here it should be noted that the estimated ranges [36] of relaxation time (in seconds) usually involves for metals, for gases, and for porous materials, respectively.

Literature Review:

fractional calculus is the generalisation of the ordinary differential and integration to non integer order. The fractional order theory of thermoelasticity was derived by Sherief et al [8]. It is a generalisation of both the couple and the generalisation theories of thermoelasticity. Open dimensional problem for a half space was solved by Sherief and Abdellatief in [9]. In this work, a new theory of thermoelasticity is derived using the methodology of fractional calculus. The theories of coupled thermoelasticity and of generalisedthermoelasticity with one relaxation time follow as limit cases.

Biot [10] Formulated the theory of coupled thermoelasticity to eliminate the paradox inherentinthe classical uncoupled theory that elastic changes have no effect of temperature. Lord and Shulman [13] introduced the theory of generalisedthermoelasticity with one relaxation time for the special case of an isotropic body. This theory was extended by Dhaliwal and Sherief [11] to include the anisotropic case. In this theory a modified law of heat conduction including both the heat flux and it's time derivative replaces the conventional Fourier's law. Uniqueness of solution for this theory was proved under different conditions by Ignaczak [24] and Ignaczak [25], Sherief and Dhaliwal [11] and Sherief [23]. The state space approach to this theory was developed by Anwar and Sherief [22], and Sherief. The fundamental solution for this theory was obtained by Sherief [20], Sherief and Hamza [21] have solved some two-dimensional problems. Sherief et al., [8] extended this theory to deal with micropalar materials in .Sherief et al., [18] and Sherief and Saleh [19] developed the theory of Thermoelastic diffusion. Green and Lindsay [12] developed to theory Of generalisedthermoelasticity with two dimensions with two relaxation times which is based on generalised inequality of thermodynamics.

Fractional calculus has been used successfully to modify many existing models of physical processes. The first application of fractional derivatives was given by Abel, who applied fractional calculus in the solution of an integral equation that arises in the formulation of the Tautocrone problem. One can state that the whole theory of fractional derivatives and integrales was established in the second-half of the 19th century. Caputo and Mainardi [2], Caputo [3] found Good agreement with experimental result when using fractional derivative for description of viscoelastic material and established the connection between fractional derivatives and the theory of linear viscoelasticity. Povstenko , [6] determined the solution for cauchy problem for time- fractional quasi-static uncoupled theory of thermoelasticity. Povstenko [7] solved Thermoelastic problems of infinite cylinders with time fractional diffusion-wave equation by applying integral transform technique and several problems with Dirichlrt's equation and Neumann boundary conditions was simplified.

The theory of fractional calculus has been used successfully to model polymers material. In this proposed thesis entitled - " Studies of some thermoelastic problems in context of fractional order theory of thermoelasticity". We will investigate the mathematical model for solving fractional order equations will be presented in a random sequence.

Conclusion:

The literature reviewed noted that the use of thermal profile addresses thermomechanical problems with the fractional derivative effect. The literature still fails to provide the exact solution of the heat conduction

equation in three-dimensional problems using time-dependent fractional derivate. The thermal profile is determined by solving heat conduction equations with fractional derivative effects throughout thermodynamics that provide an exact solution to thermoelastic problems.

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Generalized thermoelasticity with memory-dependent derivative: An overview & prospective

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Abstract:

The article investigates the present review of generalized thermoelastic theories with memory-dependent derivative effects on different objects. The main theme of the thermoelastic problems is to establish operational methods to solve the governing differential equations. In the thermoelastic problems, we have considered a few practical problems of technical interest, taking into account of fractional order derivative effect by using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, thermal stresses, thermoelastic, memory-dependent derivative, vibration, deflection, integral transform.*

Introduction:

In several areas of engineering, solid objects are commonly used as integral structural elements. With thermal loading, such structural elements are likely to be subjected to various forms of static loading or excitation, such as seismic, mechanical, hydrodynamic, blast, aerodynamic, etc. Engineers and scientists worldwide are making unwavering efforts to develop and build economic and productive systems with a very little likelihood of failure. Thermal effects produce heat transfer by conduction within an elastic surface, and this distribution of thermal energy develops a temperature field within the material. Many solids undergo a volumetric transition with variance in temperature, and thus the presence of a temperature range typically causes stresses caused by limit or interval constraints. If the temperature variation is high enough, these stresses can reach levels that can lead to structural failure, especially in brittle materials. Hence, understanding stress analysis can be helpful for several issues, including high-temperature variation.

Thermoelasticity can be generalized as investigating the relationship between a material's elastic properties and temperature or between its thermal conductivity and thermal stress. Another complex problem faced by engineers and applied mathematicians is finding solutions to the fundamental problems in their field of study, partial differential equations in some cases. Using the well-known principles of classical mechanics and thermodynamics, the deformation that the body undergoes, the resultant stresses under the combined influence of external loads, body forces, and heat conduction is calculated. This relationship of temperature and displacement fields, where mechanical and thermal causesdeformation, results in 'Thermoelasticity'. Temperature variations allow the material to undergo thermal effects. Some of these are thermal strains, stress, and deformation. Thermal deformation means that as the thermal energy and/or temperature of the material increases, so does the vibration of the atom or molecules and this changes in vibration result in the stretching of molecular bonds, which causes the material to expand, of course, if the thermal energy and temperature of the material decreases, the material will compress or contract.

The enormous demand for science and engineering works dealt with Fractional-Order Equations' dynamical systems that involve derivatives and non-integer integrals. They explain various substances' memory and hereditary properties and cope with the tremendous demand for science and engineering work. Meanwhile, it also discovered that fractional calculus is used effectively to modify many current models of physical processes, see Hilfer [1], Sherief et al. [2], Tenreiro et al. [3]. It can also be claimed that the entire theory of fractional derivatives and integrals was established in the second half of the 19th century. A good overview of the subject will be noticed in Podlubny [4], Kaczorek [5-6], Sherief and El-Latief [7], Siedlecka and Kukla [8], Abbas [9], Xiong and Niu [10], Mahakalkar et al. [11], Mittal and Kulkarni [12], Hussein [13] and so on. The memory effect comes from the convolution operator presented in the most popular Riemann-Liouville fractional

integral, which is defined as $I_{\alpha,\alpha}^{RL} f(x) = (1/\Gamma(\alpha))\int_a^x (x-t)^{\alpha-1} f(t)dt = \Phi_\alpha \bigstar f(x)$, where $\bigstar$ denotes the convolution operator, α is the fractional-order and Φ_α is the standard power function given as $\Phi_\alpha(t) = t^{\alpha-1}/\Gamma(\alpha)$. A further literature review has been described as 'the foundation and inspiration for substantive, useful research' will be done in later sections.

Research Background :

The classic heat conduction theory is based on the Fourier law [14,15]

$$q(x,t) = -k\nabla T(x,t) \qquad (1)$$

in which $q(x,t)$ is the heat flux vector, x denotes the point in the considered region, t is the time, k is the thermal conductivity of the material, ∇ is the gradient operator, and $T = T(r,t)$ is the temperature, respectively.

Introduction of single-phase-lag to evade discrepancy between the mathematical model and the observations [16-18]

$$q(x,t+\tau) = -k\nabla T(x,t) \qquad (2)$$

in which τ is the phase lag of the heat flux or so-called relaxation time.

Expanding the left-hand side of Eq. (2) into the Taylor series with respect to the variable τ, one obtains [19] a

$$q(x,t) + \frac{\tau^\alpha}{\Gamma(1+\alpha)}\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(r,t), 0 < \alpha \le 1 \qquad (3)$$

where α is introduced to keep the dimension in order.

The fractional generalization [20,21] of the classical Cattaneo model by introducing fractional Taylor formula [22] as

$$q(x,t) + \tau^\alpha \frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (4)$$

where without losing the generality $\Gamma(1+\alpha)$ appearing in Taylor series is merged in τ^α terms, Γ is the gamma function, α is introduced to keep the dimension in order and $\partial^\alpha / \partial t^\alpha$ is the fractional time derivative based on Caputo fractional definition [23].

For the limiting case of $\tau = 0$ (or $\alpha = 0$), Eq. (4) reduces to classical Fourier heat conduction and the standard Cattaneo heat conduction equation for $\alpha = 1$ as

$$q(x,t) + \tau\frac{\partial}{\partial t} q(x,t) = -k\nabla T(x,t) \qquad (5)$$

The heat conduction equation in the context of fractional-order generalized thermoelasticity proposed by Sherief [24] gives

$$q(x,t) + \tau\frac{\partial^\alpha}{\partial t^\alpha} q(x,t) = -k\nabla T(x,t), 0 < \alpha \le 1 \qquad (6)$$

Here it should be noted that the estimated ranges [25] of relaxation time (in seconds) usually involves $(10^{-11} : 10^{-14})$ for metals, $(10^{-8} : 10^{-10})$ for gases, and $(10 : 10^{2})$ for porous materials, respectively.

Wang and Li [26] have introduced a memory-dependent derivative (MDD). The first order $(\alpha = 1)$ of function f which is simply defined in an integral form of a common derivative with a kernel function $K(t-\zeta)$ on a slipping interval $[t-\omega, t]$ in the form

$$q(x,t) + \tau D_\omega^{(1)} q(x,t) = -k\nabla T(x,t) \qquad (7)$$

where

$$D_{\omega}^{(1)} f(x,t) = \frac{1}{\omega} \int_{t-\omega}^{\omega} K(t-\zeta) f'_{\zeta}(x,\zeta) dx,\ \omega > 0,$$

$D_{\omega}^{(1)} \to \partial / \partial t$, ω is delay time, and $K(t-\zeta)$ is the kernel function.

Heat conduction equation in MDD thermoelasticity introduced by Ezzat [27]

$$q(x,t) + \omega D_{\omega}^{(1)} q(x,t) = -k \nabla T(x,t) \qquad (8)$$

By combining Eq. (8) with the energy conservation equation

$$-\Delta \cdot q(r,t) = \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (9)$$

Now by combining Eq. (8) and (9) leads to the heat conduction equation as

$$\kappa \nabla T(x,t) = (1 + \tau_{\omega} D_{\omega}) \rho C_v \frac{\partial T}{\partial t}(r,t) \qquad (10)$$

where $\kappa = \rho C_v / k$ is the thermal diffusivity, ρ is the density of the material, C_v is the specific heat capacity, and where $\Delta = \nabla^2 = \nabla \cdot \nabla$ a Laplace operator is a second-order differential operator.

Literature Review:

Many researchers have studied the development and applications of fractional-order equations. The fascinating and recent applications of fractional differential equations in physics, chemistry, biology, engineering, finance, and other research fields built over the last few decades are now not difficult to find. Some of the applications include: diffusion processes [28,29], mechanics of materials [30,31], combinatorics [32,33], inequalities [34], analysis [35], calculus of variations [36-41], signal processing [42], image processing [43], advection and dispersion of solutes in porous or fractured media [44], modeling of viscoelastic materials under external forces [45], bioengineering [46], relaxation and reaction kinetics of polymers [47], random walks [48], mathematical finance [49], modeling of combustion [50], control theory [51], heat propagation [52], modeling of viscoelastic materials [53] and even in areas such as psychology [54,55]. It is easy to find hundreds, if not thousands, of new applications in which the fractional calculus approach is more than welcome.

Fractional-order derivatives have been successfully used in mechanics to model memory-effect damping forces or characterize state feedback controllers, as demonstrated by Bagley and Torvik [56]. It is noticed by Wang and Hu [57] that the term fractional-order derivative whose order is between 0 and 2 often acts as a damping force in fractional-order vibration systems with a single degree of freedom. Fractional calculus has therefore been effectively used to change many current physical process models. The first use of fractional derivatives was made by Abel [58], who applied fractional calculus to the solution of the integral equation of the tautochrone problem formulation. Fractional derivatives were used by Caputo [59, 60] and Caputo and Mainardi [61,62], and their findings were in substantial agreement with the empirical evidence for describing viscoelastic materials.

Some authors have worked on fractional derivatives in the thermoelastic analysis of most recent literature, which can be summarised below: Povstenko [63] proposed a quasi-static uncoupled theory of thermoelasticity based on the heat conduction equation with a time-fractional derivative of order α. Povstenko [64] formulated the theory of diffusive stress based on the time-fractional diffusion equation. Povstenko [65] also obtained the temperature distribution and thermal stresses in an infinite medium with a spherical cavity using the integral transform technique.Youssef and Al-Lehaibi [66] developed a novel theory for the generalized thermoelasticity model based on fractional-order generalized thermoelasticity. Similarly, Youssef and Al-Lehaibi [67] constructed a model of an elastic material with constant parameters in the half-spacein the context of the fractional-order generalized thermoelasticity theory. Sherief et al. [68] developed a new theory of thermoelasticity using the methodology of fractional calculus. Ezzat and El-Karamany [69] attempted to generalize these results to include a magnetic field's effects in two-temperature thermoelasticity. Youssef and Al-Lehaibi [70] developed a mathematical model of an elastic material with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Povstenko [71] obtained the theory of thermal stresses

based on the heat conduction equation with the Caputo time-fractional derivative of order $0 < \alpha \leq 2$. Youssef [72] found a half-space filled with an elastic material taken as constant elastics' parametersin the standard model of thermoelasticity in fractional-order. Sur and Kanoria [73] constructed a new theory of two-temperature generalized thermoelasticity in the context of a new consideration of heat conduction with fractional orders.Youssef [74] considered a half-space filled with an elastic material that had constant elastic parameters was considered, and the governing equations were written in the form of the two-temperature generalized thermoelasticity theory of fractional order. Youssef et al. [75] developed a cylindrical nano-beam mathematical model with constant elastic parameters with fractional order heat conduction. Wang e al. [76] studied thermoelastic behaviours involving in the effect of thermal inertia during the macro- and microscales heat conduction. Bhattacharya and Kanoria [77] obtained the two-temperature thermo-elasto-diffusion interaction inside a spherical shell in the context of fractional order generalized thermoelasticity.Zenkour and Abouelregal [78] determined the thermoelastic displacement, stress, conductive temperature, and thermodynamic temperature in an infinite isotropic elastic body with a spherical cavitybased on the two-temperature generalized thermoelasticity theory (2TT). Youssef [79] derived a new theory of thermoelasticity based on the fraction order of strain, which is considered a new modification to Duhamel-Neumann's stress-strain relation. Bachher [80] considered a one-dimensional problem for a homogeneous and isotropic thermoelastic infinite porous material under the dependence of modulus of elasticity and thermal conductivity on reference temperature subjected to periodically varying heat sources in the context of the fractional-order generalized thermoelasticity with one relaxation time parameter. Santra et al. [81] proposed the three-dimensional generalized thermoelastic coupled problem for a homogeneous isotropic and thermally conducting thermoelastic medium under the effect of rotation in fractional context order generalized thermoelasticity.Yadav et al. [82] employed the theory of generalized thermoelasticity with fractional order strain to study the problem of one-dimensional disturbances in a viscoelastic solid in the presence of a moving internal heat source and subjected to a mechanical load. Bassiouny and Abouelnaga [83] investigated the thermoelastic properties of a sandwich structure made of three piezoelectric layers in the context of fractional-order theory two-temperature generalized thermopiezoelasticity. Gupta and Das [84] applied the eigenvalue approach method, and Laplace transform, a general solution scheme for the thermoelastic deformation of an unbounded transversely isotropic medium fractional-order generalized thermoelasticity with an instantaneous heat source. Sheoran and Kundu [85] presented a comprehensive review of relevant literature to highlight the role of fractional calculus in thermoelasticity.Abbas [86] investigated the temperature, displacement, and stresses due to thermal shock loading on the inner surface cavity in an infinite medium with a cylindrical cavity inthe context of the fractional-order generalized thermoelasticity theory. Bachher and Sarkar [87] studied the theory of generalized thermoelasticity based on the heat conduction equation with the Caputo time-fractional derivative is used to study the magneto-thermoelastic response of a homogeneous isotropic two-dimensional rotating elastic half-space solid. Povstenko et al. [88] studied a control problem of thermal stresses in an infinite cylindrical body in which the time-fractional heat conduction equation defined the temperature distribution with the Caputo derivative of the order $0 < \alpha \leq 2$. Xiong and Niu [89] developed the principle of fractional-order generalized thermoelastic diffusion for anisotropic and linear thermoelastic diffusive media. Chirilă and Marin [90] continued the work on dipolar thermoelastic materials, which are a particular case of multipolar continuum mechanics. The fractional-order derivative effect on a two-dimensional problem with weak, normal and strong conductivity due to thermal shock was examined by Abbas [91].

Conclusion:

The literature reviewed noted that the use of the expected thermal profile addresses generalized thermomechanical problems with the memory response effect. The literature still fails to provide the exact solution of the heat conduction equation in two or three-dimensional problems using memory-dependent derivate. The present work determines the thermal profile by solving heat conduction equations throughout thermodynamics that provide an exact solution to generalized thermoelastic problems.

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Thermoelastic vibrations analysis of a thin isotropic solid elliptic cross section

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1.Introduction

The present paper considers the realistic problem of a thin isotropic solid elliptic cross section profile subjected to point-impulsive source on the upper face, zero temperature at lower face, and with simply supported thermally insulated on the curved surface are studied using a typical classical technique. For the theoretical measurements the dimensional parameter was taken, while the dimensionless parameter was used for graphical measurements. In basic equation formulation we have considered the equations of motion, the displacement potential and finally obtained the components of stress in terms of thermoelastic displacement potential function. Finally, by considering a circle as a special kind of ellipse, it is seen that the temperature distribution in a circular solution can be derived as a special case from the present mathematical solution.

2.Formulation of the problem

Taken a thin elliptic isotropic solid assuming the space $D:\{(\xi,\eta,z)\in R^3: 0<\xi<\xi_0, 0<\eta<2\pi, -\ell/2\le z\le \ell/2\}$ in elliptic cylindrical coordinates (ξ,η,z) which is related to the rectangular coordinates (x,y,z) by $x=c\cosh\xi\cos\eta, y=c\sinh\xi\sin\eta, z=z$ (1)

where $c=(a^2-b^2)^{1/2}$ and $2c$ is the length of the interfocal line of the ellipse. The curves $\eta=$ constant denotet a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Thus, at every point in space, both sets of curves intersect each other orthogonally. Its elliptic cross-section using the semi-major and semi-minor axial lengths a and b, respectively, as shown in Fig. 1. The parameter ξ defines the interfocal line having the range $\xi\in(0,\xi_0)$, and by using Eq. (1), the coordinate ξ_0 of the surface of the elliptic solid is obtained as $\xi_0=\tanh^{-1}(b/a)=(1/2)\mathrm{In}\,[(a+b)/(a-b)]$.

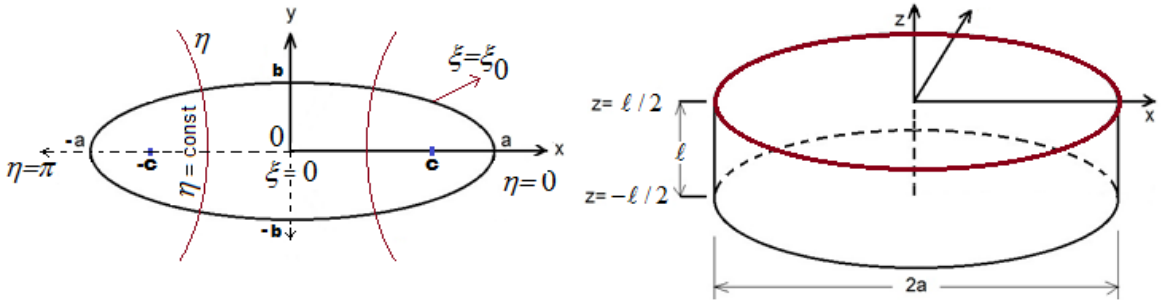

Figure 1: Elliptic solid plate configuration geometry

3. Temperature distribution analysis

We assume that the temperature is given by

$$T(\xi,\eta,z,t)=\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}A_{2n}\,Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\sin\left\{\gamma_{2n}\left[z+\left(\frac{\ell}{2}\right)\right]\right\}e^{-\omega t} \quad (2)$$

in which ω being a constant, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function, $Ce_{2n}(\xi_0,q)$ is a modified Mathieu function, $q_{2n,m}$ is a root of the equation $Ce_{2n}(\xi,q_{2n,m})=0$ and according to McLaclan [26], $ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta$, $Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi$ (3)

with $A's$ being the functions of q, and the constant A_{2n} can be found from the nature of the temperature prescribed on the upper face. Further assuming that the lower face of the plate is kept at zero temperature as $T(\xi,\eta,z,t)|_{z=-\ell/2}=0$ (4)

while thermally insulated curved surface is expressed as $\frac{\partial}{\partial\xi}T(\xi,\eta,z,t)|_{\xi=\xi_0}=0$ (5)

and the sectional heat supply is impacted over the portion $0 < \xi < \xi_0$ that varying with time according to point-impulsive source as$T(\xi,\eta,z,t)|_{z=\ell/2} = e^{-\omega t}\delta(\xi-\xi_0)f_0(\eta)$ (6)

in which $f_0(\eta) = 1(0 \le \eta \le 2\pi)$ at $\xi = \xi_0$ and $\delta()$ is the Dirac delta function. Now the differential equation governing transient temperature distribution $T = T(\xi,\eta,z,t)$ for an elliptic plate can be defined as $\frac{2}{c^2(\cosh 2\xi - \cos 2\eta)}\left(\frac{\partial^2 T}{\partial \xi^2} + \frac{\partial^2 T}{\partial \eta^2}\right) + \frac{\partial^2 T}{\partial z^2} = \frac{1}{\kappa}\frac{\partial T}{\partial t}$ (7)

where $\kappa = \lambda/\rho C$ is the thermal diffusivity, in which λ is thermal conductivity and heat capacity per unit volume is ρC, with ρ as density and C as specific heat, respectively. Substituting Eq. (2) in Eq. (7), one obtains $\gamma_{2n} = [\alpha_n^2 + (\omega/\kappa)]^{1/2}$ (8)

where $\alpha_n^2 = -4q_{2n,m}/c^2$

Using Eqs. (2), (7) and (8), one obtains

$\delta(\xi-\xi_0) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}\ell]\}$ (9)

Here the series quoted on the right-hand side of Eq. (9) is obtained from the well-known theorem of Fourier-Mathieu series [26] for any point within the considered range. Now, multiply Eq. (9) on both the sides by $(\cosh 2\xi - \cos 2\eta)Ce_{2p}(\xi, q_{2p,r})ce_{2p}(\eta, q_{2p,r})$ and integrate with respect to η from 0 to 2π, and with respect to ξ from 0 to ξ_0, then by the orthogonality property [26], all terms vanish except when $p = n, r = m$, therefore, by the theory of Mathieu function, one obtains

$$A_{2n,m} = \frac{\int_0^{\xi}\int_0^{2\pi} Ce_{2n}(\xi,q_{2n,m})\, ce_{2n}(\eta,q_{2n,m})\, \delta(\xi-\xi_0)(\cosh 2\xi - \cos 2\eta)\, d\xi d\eta}{\pi e^{\omega t}\int_0^{\xi} Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi - \Theta_{n,m})\, d\xi} \quad (10)$$

$$\text{Where}\Theta_{n,m} = \frac{1}{\pi}\int_0^{2\pi} ce_{2n}^2(\eta, q_{2n,m})\cos 2\eta\, d\eta$$

Hence inserting the Eqs. (8) and (10) into Eq. (2), one obtains the desired temperature distribution that satisfies the boundary conditions.

At $t = 0$, initial temperature $T_i = T_i(\xi,\eta,z,t)$ is given as

$$T_i(\xi,\eta,z,t) = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m})\sin\{\gamma_{2n}[z + (\ell/2)]\} \quad (11)$$

Hence the temperature change $\tau = T - T_i$ is obtained as

$$\tau = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\sin\left\{\gamma_{2n}\left[z + \left(\frac{\ell}{2}\right)\right]\right\}(e^{-\omega t} - 1) \quad (12)$$

4. Basic equation formulation

The equations of motion are written as follows

$$\begin{aligned}(\lambda+2\mu)\frac{\partial e}{\hbar\partial\xi} - 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\eta} + 2\mu\frac{\partial(\hbar\tilde{\omega}_\eta)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\xi} &= \rho\frac{\partial^2 u_\xi}{\partial t^2},\\ (\lambda+2\mu)\frac{\partial e}{\hbar\partial\eta} + 2\mu\frac{\partial\tilde{\omega}_z}{\hbar\partial\xi} - 2\mu\frac{\partial(\hbar\tilde{\omega}_\xi)}{\hbar\partial z} - (3\lambda+2\mu)\alpha\frac{\partial\tau}{\partial\eta} &= \rho\frac{\partial^2 u_\eta}{\partial t^2}\end{aligned} \quad (13)$$

in which the scale factor $\hbar$, dilatation e and rotations $\tilde{\omega}_\xi, \tilde{\omega}_\eta, \tilde{\omega}_z$ are represented by

$$\begin{aligned}\hbar^2 &= c^2(\cosh^2\xi - \cos^2\eta) = (c^2/2)(\cosh 2\xi - \cos 2\eta),\\ \hbar_\xi^2 = \hbar_\eta^2 &= c^2\hbar^2, \hbar_z = 1, e = \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta},\\ 2\tilde{\omega}_\xi &= -\frac{\partial u_\eta}{\partial z}, 2\tilde{\omega}_\eta = \frac{\partial u_\xi}{\partial z}, 2\tilde{\omega}_z = \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\xi} - \frac{\partial(\hbar u_\xi)}{\hbar^2\partial\eta}\end{aligned} \quad (14)$$

and, where λ and μ are the Lame's constants and they are related to Young's Modulus E and Poisson's ratio υ through the equations given below

$$\lambda = \frac{\upsilon E}{(1+\upsilon)(1-2\upsilon)}, \mu = \frac{E}{2(1+\upsilon)}$$

Applying the divergence and curl operation to Eqs. (11), one obtains

$$\begin{aligned}(\lambda+2\mu)\nabla^2 e + \mu\frac{\partial^2 e}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2 e}{\partial t^2},\\ \mu\nabla^2(2\tilde{\omega}_z) + \mu\frac{\partial^2(2\tilde{\omega}_z)}{\partial z^2} - (3\lambda+2\mu)\nabla^2\tau &= \rho\frac{\partial^2(2\tilde{\omega}_z)}{\partial t^2}\end{aligned} \quad (15)$$

in which $\nabla^2 = (1/\hbar^2)(\partial^2/\partial\xi^2 + \partial^2/\partial\eta^2)$

The solution of the previous Eq. (11) without body forces can be expressed by using the displacement potential φ and ψ as

$$\left.\begin{aligned} u_\xi &= \left(\frac{\partial\varphi}{\hbar\partial\xi} - \frac{\partial\psi}{\hbar\partial\eta}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \\ u_\eta &= \left(\frac{\partial\varphi}{\hbar\partial\eta} + \frac{\partial\psi}{\hbar\partial\xi}\right)\sin\left(\frac{m\pi z}{2\ell}\right)e^{-\omega t} \end{aligned}\right\},\ m = 1,3,5,.. \qquad (16)$$

in which the potential functions φ and ψ must satisfy the following governing equations

$$\nabla^2\varphi = K\tau, \nabla^2\psi = 0 \qquad (17)$$

with the initial condition $\varphi = 0 \quad at \quad t = 0, \qquad (18)$

where $K = \alpha\,(1+\upsilon)/(1-\upsilon)$ is restraint coefficient. The components of stress in terms of thermoelastic displacement potential are

$$\begin{aligned} \sigma_{\xi\xi} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\xi)}{\hbar\partial\xi} + \frac{u_\eta}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \\ \sigma_{\eta\eta} &= \lambda\left\{\frac{\partial(\hbar u_\xi)}{\hbar^2\partial\xi} + \frac{\partial(\hbar u_\eta)}{\hbar^2\partial\eta}\right\} + 2\mu\left\{\frac{\partial(u_\eta)}{\hbar\partial\eta} + \frac{u_\xi}{\hbar^2}\frac{\partial(\hbar)}{\partial\eta}\right\} - K\tau, \qquad (19) \\ \sigma_{\xi\eta} &= \mu\left\{\frac{\partial}{\partial\eta}\left(\frac{u_\xi}{\hbar}\right) + \frac{\partial}{\partial\xi}\left(\frac{u_\eta}{\hbar}\right)\right\} \end{aligned}$$

Eqs. (1) to (19) establishes the mathematical formulation of the problem under consideration.

5.Approach to the problem

5.1 Displacement distribution

By assuming the suitable displacement function φ which satisfies Eqs. (1)-(2) as

$$\varphi = \frac{K\kappa}{\omega}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\, Ce_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (20)$$

Now suitable form of ψ satisfying second expression of Eq. (14) is given by

$$\psi = -\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}[C_{2n}\sinh 2\xi + D_{2n}\alpha_n^2\xi\sin 2\eta]Ce_{2n}(\eta, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \qquad (21)$$

The expressions for displacements may be put as

$$\begin{aligned} u_\xi &= \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce'_{2n}(\xi, q_{2n,m})\, ce_{2n}(\eta, q_{2n,m}) + \omega[C_{2n}\xi \\ &\quad \times Ce_{2n}(\xi, q_{2n,m}) + D_{2n}\alpha_n^2\xi^2]ce'_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)e^{-\omega t} \qquad (22) \\ &\quad \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \\ u_\eta &= \frac{1}{\hbar}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\{K\kappa Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\ &\quad -\omega\,[C_{2n}\{\xi Ce'_{2n}(\xi, q_{2n,m}) + Ce_{2n}(\xi, q_{2n,m})\} \\ &\quad +2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta, q_{2n,m})\}\sin(m\pi z/2\ell)\, e^{-\omega t} \qquad (23) \\ &\quad \times \sin\{\gamma_{2n}[z + (\ell/2)]\}(1 - e^{-\omega t}) \end{aligned}$$

5.2 Thermal stresses solution

The expressions for stresses related to displacement as given in Eq. (16) may be put as

(24)

$$\sigma_{\eta\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\frac{A_{2n}}{\omega\hbar}\Big\langle\frac{1}{\hbar}\Big[[\lambda\{K\kappa Ce''_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\} + (\lambda+2\mu) \times \{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce''_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce'_{2n}(\eta,q_{2n,m})]\}\Big] + \frac{1}{\hbar^{3/2}}\Big[[\lambda\sinh 2\xi\{K\kappa\, Ce'_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}Ce_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2\xi ce'_{2n}(\eta,q_{2n,m})]\}\Big] + (\lambda+2\mu)\sin 2\eta\{\kappa KCe_{2n}(\xi,q_{2n,m})\,ce'_{2n}(\eta,q_{2n,m}) - \omega[C_{2n}\eta \times Ce'_{2n}(\xi,q_{2n,m}) + D_{2n}\alpha_n^2 ce_{2n}(\eta,q_{2n,m})] - K\omega\hbar Ce_{2n}(\xi,q_{2n,m}) \times ce_{2n}(\eta,q_{2n,m})\,cosec(m\pi z/2\ell)e^{\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}\sin(m\pi z/2\ell)\Big\rangle \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \tag{25}$$

$$\sigma_{\xi\eta} = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}\lambda\Big\langle\{K\kappa Ce'_{2n}(\xi,q_{2n,m})\,ce_{2n}(\eta,q_{2n,m}) + D_{2n}\,\omega\alpha_n^2\xi^2 ce'_{2n}(\eta,q_{2n,m})\} + \{\hbar\omega\,[C_{2n}\xi Ce'_{2n}(\xi,q_{2n,m}) + 2D_{2n}\alpha_n^2\xi]ce_{2n}(\eta,q_{2n,m})\Big\rangle\sin(m\pi z/2\ell) \times e^{-\omega t}\sin\{\gamma_{2n}[z+(\ell/2)]\}(1-e^{-\omega t}) \tag{26}$$

6. Special case and numerical calculations

We add the following dimensionless values in order to facilitate the computation

$$\left.\begin{aligned}&\bar{b}=b/a,\ \bar{a}=a/a,\ e=c/a,\ \bar{z}=[z-(-\ell/2)]/a,\ \tau=\kappa t/a^2,\\ &\overline{T}(\xi,\eta,t)=T(\xi,\eta,t)/\theta_k,\bar{\phi}(\xi,\eta,t)=\phi(\xi,\eta,t)/E\alpha_t\tau a^2,\\ &\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha_t\tau\ (i,j=\xi,\eta)\end{aligned}\right\} \tag{3.27}$$

Substituting the value of equation (27) in equations (12), (16) and (19), we obtained the expressions for the temperature, displacement and stresses respectively for our numerical discussion. The numerical computations have been carried out for Aluminum metal with parameter a = 2.65 cm, b = 3.22 cm, ℓ= 0.08 cm, Modulus of Elasticity $E = 6.9 \times 10^{6}$ N/cm^{2}, Shear modulus $G = 2.7 \times 10^{6}$ N/cm^{2}, Poisson ratio υ = 0.281, Thermal expansion coefficient, $\alpha_t = 25.5 \times 10^{6}$ cm/cm-^{0}C, Thermal diffusivity κ = 0.86 cm^{2}/sec, Thermal conductivity λ = 0.48 cal sec^{-1}/cm^{0}C with $q_{n,m}$ =0.0986, 0.3947, 0.8882, 1.5791, 2.4674, 3.5530, 4.8361, 6.3165, 7.9943, 9.8696, 11.9422, 14.2122, 16.6796, 19.3444, 22.2066, 25.2661, 28.5231, 31.9775, 35.6292, 39.4784 are the positive. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software. Figs.2-11 illustrates the numerical results of dimensionless temperature and stresses of elliptical plate, under thermal boundary condition that are subjected to arbitrary initial temperature on the upper and lower face at zero temperature and boundary conditions. Fig. 2 indicates the angular variation of temperature distribution along radial direction of the plate. Due to extra heat source the optimum amount of temperature is achieved on the outside edge. The distribution of the dimensionless temperature gradient at each time increases towards the heated area of the central part of ellipse boundary.

As shown in Fig. 3, temperature is reached to a minimum at both extreme ends, i.e. at due to more compressive force, while due to tensile force, the temperature at the centre is high, giving an average bell-shaped curve for various values of ξ. Fig. 4 as probable due to less thickness, the temperature along $\bar{z}$ axis for different values of η varies linearly from zero temperature to the highest due to the availability of sectional heat supply at $z = \ell/2$.

Figs. 5 and 7 illustrates that the displacement distribution along η is high due to the sectional heat supply accompanied by the low distribution that exists on the inner centre of the ellipse at the outer side. Fig. 6 shows the displacement distribution beside axial direction and it was observed that with lower angular angle the displacements are little curvy and with higher angle it is following sinusoidal nature.

From Fig. 8, it was noted that the displacement distribution along ξ gets lower value for different values of z. Fig. 9, it was observed that the radial, tangential and shear stresses follows a sinusoidal trend, the large expansion and tensile stress arises at the inner, mid and outer edge, which lies in the axial direction. It was detected from Fig. 10 that the thermal stresses attains zero at ξ=0 and the radial and tangential stresses increases gradually along the radial direction, while the shear stress decreases along ξ direction. But the nature of all stresses behaves oppositely along the time span as observed in the Fig. 11

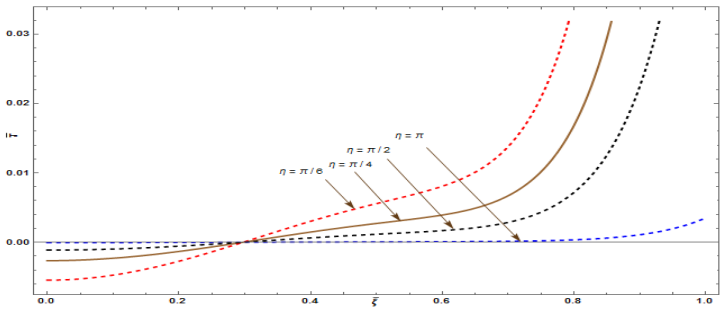

Figure 2: Temperature distribution $\overline{T}$ trending towards ξ for various values of η.

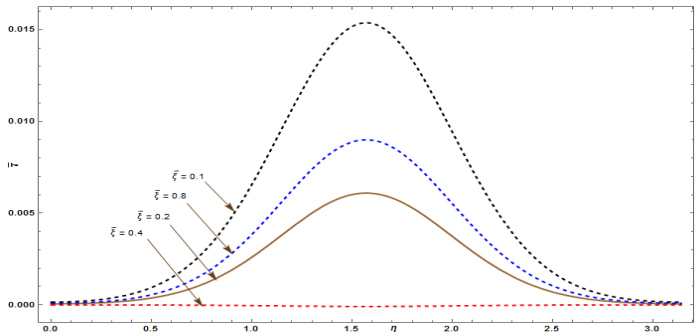

Figure 3: Temperature distribution $\overline{T}$ trending towards η for various values of ξ.

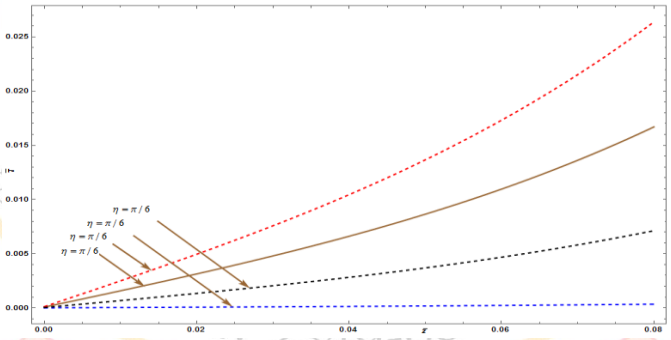

Figure 4: Temperature distribution $\overline{T}$ trending towards z for various values of η.

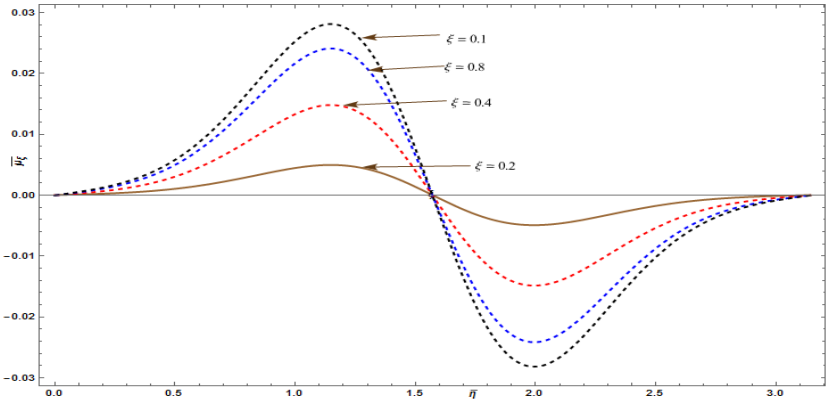

Figure 5: Displacement distribution trending towards η for various values of ξ.

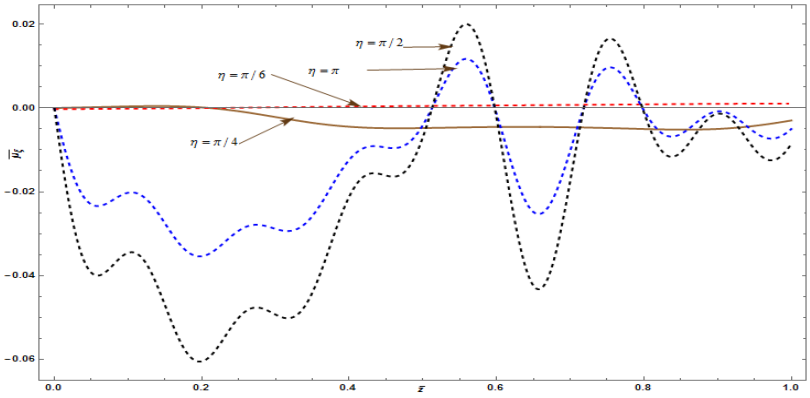

Figure 6: Displacement distribution trending towards z for various values of η.

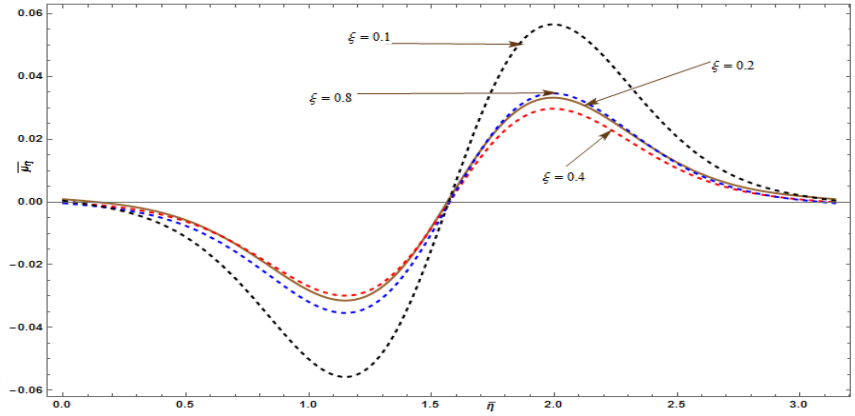

Figure 7: Displacement distribution trending towards η for various values of ξ.

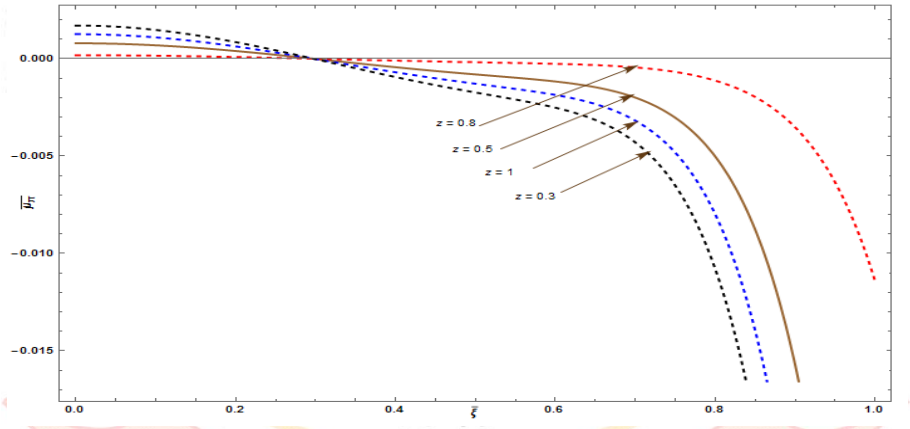

Figure 8: Displacement distribution trending towards ξ for various values of z.

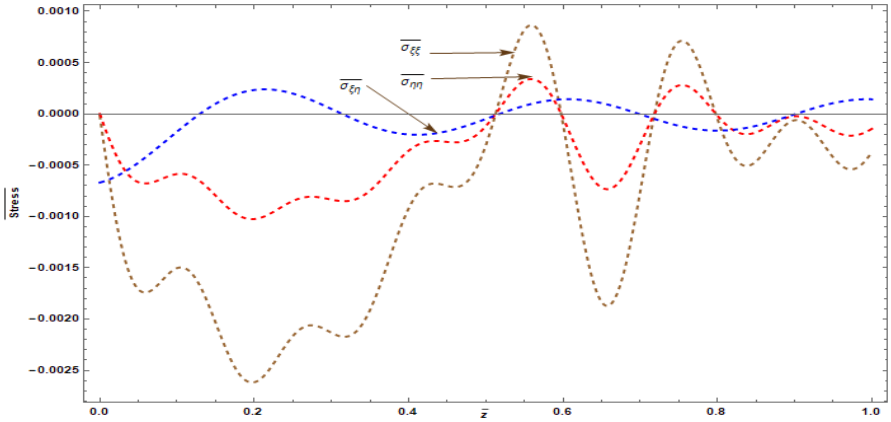

Figure 9: Thermal stresses distribution trending towards z

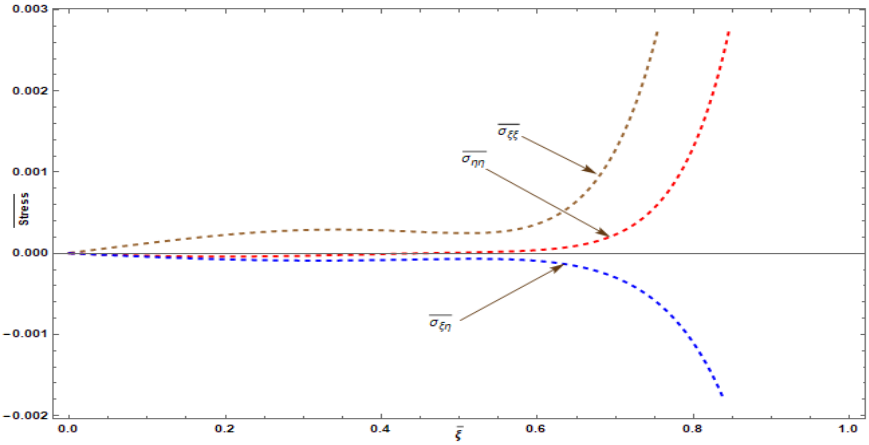

Figure 10: Thermal stresses distribution trending towards ξ

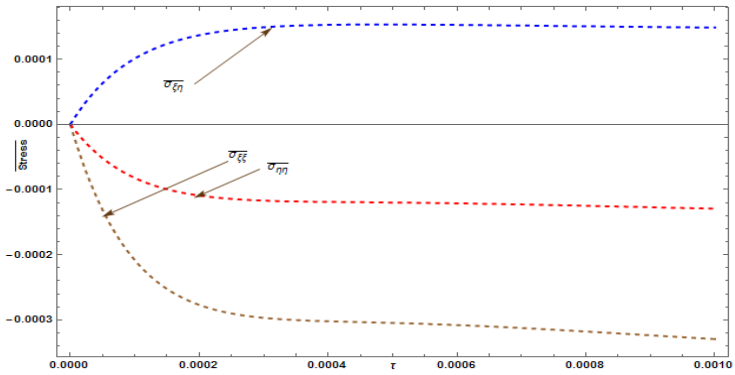

Figure 11: Thermal stresses distribution trending towards τ

7. Conclusion

In this article, we describe the theoretical treatment of thermally induced vibrations and their related stresses. The temperature distribution of the normal and modified Mathieu function forms is used to determine the thermal stress by the proposed classical method. The results obtained during the study are described below.

1. The benefit of this approach is its simplicity and mathematical ability to accommodate various forms of mechanical and thermal boundary conditions in vibration analysis under thermal load.
2. Owing to the maximum expanstion outside the plate, the maximum tensile stress moves from the outer surface and its absolute value increases with radius. This can be due to heat, stress, concentration or available heat source under known temperature fields.

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A short note on Shafer-Fink's double inequality involving Arcsine function

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In this article, we present the very sharp bounds of the form $\left(1-\frac{2}{3}x^2\right)^a$ *for the inverse trigonometric Sinc function* $\frac{sin^{-1}x}{x}$, *which tighten the bounds of this kind in the existing literature, where* a *is some real number.*

Subject Classification: *26A09, 26D05, 33B10.*
Keywords: *Inverse Circular functions, arcsine function, Shafer-Fink type inequality, inverse Sinc function.*

1 Introduction

Shafer introduced the following inequality (1.1), that can be seen in [5]

$$\frac{3x}{2+\sqrt{1-x^2}} < \frac{6(\sqrt{1+x}-\sqrt{1-x})}{4+\sqrt{1+x}+\sqrt{1-x}} < \sin^{-1}x, \ for x > 0. \tag{1.1}$$

The above inequality was generalized by Fink [3] as follows:

$$\frac{3x}{2+\sqrt{1-x^2}} \le \sin^{-1}x \le \frac{\pi x}{2+\sqrt{1-x^2}}, \ for \ 0 \le x \le 1, \tag{1.2}$$

where 3 and π are the best possible constants for (1.2). The above double inequality is termed as the Shafer-Fink's inequality in the literature. The gradual development for the bounds of $\sin^{-1}x$can be seen in [2]-[5] and the references therein.

Recently, Bagul and Dhaigude [2] proved inequality involving simple efficient bounds for $\sin^{-1}x$ as follows:

Theorem 1.1 *[2, Theorem 2] Let* $x \in (0,1)$ *and* $d \in (0,1]$. *Then the function* $f(x) = \frac{ln\left(\frac{sin^{-1}x}{x}\right)}{ln(1-dx^2)}$ *is strictly decreasing if* $d \le 1/2$. *In particular, we have following several inequalities*

$$\frac{1}{(1-dx^2)^{\alpha}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-dx^2)^{\beta}} \tag{1.3}$$

with the best possible constants $\alpha = 1/6d$ *and* $\beta = \frac{ln(2/\pi)}{ln(1-d)}$.

If we put $d = 1/2$, then 1.3 yields the following inequality

$$\frac{1}{(1-\frac{x^2}{2})^{1/3}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{x^2}{2})^{\beta_2}} \tag{1.4}$$

where $\beta_2 = \frac{\ln(2/\pi)}{ln(1/2)} \approx 0.651496.$

Authors in [2] claimed that the inequality given by (1.4) is the sharpest inequality of kind (1.3). Here, in this article, we refine the upper and lower bounds of inequality (1.4) and that will be discussed in the next section.

2 Main Result

This section is dedicated to the main theorem of this article, the statement of which is given below:

Theorem 2.1 *If* $x \in (0,1)$ *and* k *is any real number in* $(0,1)$, *then the following inequality holds good*

$$\frac{1}{(1-\frac{2x^2}{3})^{\eta_1}} < \frac{\sin^{-1}x}{x} < \frac{1}{(1-\frac{2x^2}{3})^{\eta_2}} \tag{2.1}$$

*Corresponding Author

for the best possible constants $\eta_1 = 1/4$ *and* $\eta_2 = \ln\left(\frac{k}{\sin^{-1}k}\right)/\ln\left(1-\frac{2k^2}{3}\right)$.

To prove the above theorem, we need following lemmas:

Lemma 2.2 *([l'Hôpital's rule of monotonicity] [1], [6]) Let* α, β *be two real valued functions which are continuous on* $[a,b]$ *and differentiable on* (a,b)*, where* $-\infty < a < b < \infty$ *and* $\beta'(x) \neq 0$*, for* $\forall x \in (a,b)$*. Let,*

$$r_1(x) = \frac{\alpha(x)-\alpha(a)}{\beta(x)-\beta(a)} \text{ and } r_2(x) = \frac{\alpha(x)-\alpha(b)}{\beta(x)-\beta(b)}.$$

Then

i) $r_1(x)$ *and* $r_2(x)$ *are increasing on* (a,b) *if* α'/β' *is increasing on* (a,b) *and*

ii) $r_1(x)$ *and* $r_2(x)$ *are decreasing on* (a,b) *if* α'/β' *is decreasing on* (a,b).

The strictness of the monotonicity of $r_1(x)$ *and* $r_2(x)$ *depends on the strictness of monotonicity of* α'/β'.

Lemma 2.3 *If* $x \in (0,1)$*, then* $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$ *is positive.*

Proof.

Differentiating $\sigma(x)$ with respect to x and equating to 0, then we get $\sigma'(x) = 1296x^5 + 1696x^3 + 380x = 4x(324x^4 - 424x^2 + 95) = 0$. This implies that either $x = 0$ or $324x^4 - 424x^2 + 95 = 0$. This is quartic equation in x. To solve this equation, we put $x^2 = y$, which gives us $324y^2 - 424y + 95 = 0$ a quadratic equation in y. This can be solved by traditional method. We get $x^2 = y = 0.287$ or $x^2 = y = 1.022$. Now we solve these quadratic equations in x. Finally, we have $\{0, \pm 0.535724, \pm 1.010940\}$, which is the solution set of $\sigma'(x) = 0$.

Now, we check the nature of $\sigma''(x)$ at $\{0, 0.535724, 1.010940\}$, because they all lie in the smallest neighbourhood of $(0,1)$ i.e. the region of investigation. Differentiating $\sigma'(x)$ w.r.t. x, which gives us $\sigma''(x) = 6480x^4 - 5088x^2 + 380$.

$\sigma''(0) = 380 > 0$ $\sigma(x)$ hasminima 48 at 0,

$\sigma''(0.535724) = -546.50516 < 0$ $\sigma(x)$ hasmaxima 72.711763 *at* 0.535724

and

$\sigma''(1.010940) = 1948.3177 > 0$ $\sigma(x)$ hasminima 29.8 90716 *at* 1.010940.

From above information, we confirm that the graph of $\sigma(x)$ never touches $x-$axis on $(0,1)$, that means it lies completely inside the strip $(0,1) \times (0,\infty)$ and hence in the first quadrant. Therefore, we conclude that, $\sigma(x)$ is positive on $(0,1)$.

Lemma 2.4 *If* $x \in (0,1)$*, then*

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x$$

positive increasing.

Proof. For this, we must show that $\rho'(x) > 0$. First we find the derivative of each term in $\rho(x)$ as follows:

$$\frac{d}{dx}\left(\frac{(24x^6 - 108x^4 + 144x^2 - 45)(\sin^{-1}x)}{\sqrt{1-x^2}}\right)$$

$$= \frac{24x^6-108x^4+144x^2-45}{(1-x^2)} + \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{3/2}}$$

and

$$\frac{d}{dx}(-48x^7 + 116x^5 - 98x^3 + 45x) = -336x^6 + 580x^4 - 294x^2 + 45$$

With this information, $\rho'(x)$ is given by the following expression

$$\rho'(x) = \frac{(-120x^7+468x^5-576x^3+243x)(\sin^{-1}x)}{(1-x^2)^{\frac{3}{2}}} + \frac{336x^8-892x^6+766x^4-195x^2}{(1-x^2)}$$

i.e.

$$\rho'(x) = \frac{x^2}{(1-x^2)} \cdot \lambda(x),$$

where

$$\lambda(x) = \frac{(-120x^6+468x^4-576x^2+243)(\frac{\sin^{-1}x}{x})}{\sqrt{1-x^2}} + 336x^6 - 892x^4 + 766x^2 - 195$$

Now we use $\frac{\sin^{-1}x}{x} > 1$ and $\frac{1}{\sqrt{1-x^2}} > 1$ in the above expression of $\lambda(x)$, which boils down to

$$\lambda(x) > (-120x^6 + 468x^4 - 576x^2 + 243) + 336x^6 - 892x^4 + 766x^2 - 195,$$

i.e. $\lambda(x) > \sigma(x)$ where $\sigma(x) = 216x^6 - 424x^4 + 190x^2 + 48$. $\sigma(x)$ is a polynomial in x. And we want to show that, $\sigma(x) > 0$ on (0,1). By lemma 2.3, $\sigma(x) > 0$ on (0,1).Therefore, $\lambda(x) > 0$ and hence $\rho'(x)$, because $\frac{x^2}{(1-x^2)} > 0$ on (0,1). So, $\rho(x)$ is increasing and hence positive on (0,1), as $\rho(0) = 0$.

Lemma 2.5 *A real valued function*

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2$$

is positive increasing on (0,1).

Proof. The first differentiation of $\mu(x)$ with respect to x gives rise to the following:

$$\mu'(x) = \frac{(4x^4-12x^2+9)(\sin^{-1}x)}{(1-x^2)\sqrt{1-x^2}} - 12x(\sin^{-1}x)^2 + \frac{(-8x^5+18x^3-9x)}{(1-x^2)},$$

Again by differentiating w.r.t. x, we get

$$\mu''(x) = \frac{(-28x^5+52x^3-21x)(\sin^{-1}x)}{(1-x^2)^2\sqrt{1-x^2}} - 12(\sin^{-1}x)^2 + \frac{(24x^6-54x^4+33x^2)}{(1-x^2)^2},$$

Another differentiation of above gives us $\mu^{(3)}(x)$, which is given below:

$$\mu^{(3)}(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{(1-x^2)^3\sqrt{1-x^2}} + \frac{(-48x^7+116x^5-98x^3+45x)}{(1-x^2)^3},$$

With slight rearrangement of terms, above equation can be written as

$$\mu^{(3)}(x) = \frac{1}{(1-x^2)^3} \cdot \rho(x),$$

where

$$\rho(x) = \frac{(24x^6-108x^4+144x^2-45)(\sin^{-1}x)}{\sqrt{1-x^2}} - 48x^7 + 116x^5 - 98x^3 + 45x.$$

By lemma 2.4, $\rho(x)$ is positive increasing on (0,1). Also, for $x \in (0,1)$, we have $\frac{1}{(1-x^2)^3} > 0$. This implies that $\mu^{(3)}(x) > 0$, so, $\mu(x)$ is increasing and hence positive. As required.

Proof of Theorem 2.1. Denote,

$$f(x) = \frac{\ln\left(\frac{x}{\sin^{-1}x}\right)}{\ln\left(1-\frac{2x^2}{3}\right)} := \frac{f_1(x)}{f_2(x)},$$

where $f_1(x) = \ln\left(\frac{x}{\sin^{-1}x}\right)$ and $f_2(x) = \ln\left(1-\frac{2x^2}{3}\right)$ with $f_1(0^+) = 0 = f_2(0^+)$.

Differentiating with respect to x, we get

$$\frac{f_1'(x)}{f_2'(x)} = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{4x^2\sin^{-1}x\sqrt{1-x^2}} = \frac{1}{4}f_3(x) \ say,$$

where

$$f_3(x) = \frac{(2x^2-3)(\sin^{-1}x\sqrt{1-x^2}-x)}{x^2\sin^{-1}x\sqrt{1-x^2}} := \frac{f_4(x)}{f_5(x)} say.$$

Now, we show that $f_3(x)$ is increasing i.e. to show that $f_3'(x) > 0$. For this it is sufficient to show that the numerator $N(x)$ (say) of $f_3'(x)$ is positive.

To get the expression for $N(x)$, we differentiate $f_3(x)$ w.r.t. x

$$\begin{aligned} N(x) &= f_5(x)\cdot f_4'(x) - f_4(x)\cdot f_5'(x) \\ &= \frac{(4x^4-3x^2)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6x-6x^3)(\sin^{-1}x)^2 + 2x^5 - 3x^3 \\ &= x\cdot\mu(x), \end{aligned}$$

where

$$\mu(x) = \frac{(4x^3-3x)(\sin^{-1}x)}{\sqrt{1-x^2}} + (6-6x^2)(\sin^{-1}x)^2 + 2x^4 - 3x^2.$$

By lemma 2.5, $\mu(x)$ is positive on $(0,1)$.

$$\therefore N(x) > 0 \;\; f_3'(x) > 0.$$

This means that $\frac{1}{4}f_3(x) = \frac{f_1'(x)}{f_2'(x)}$ is increasing on $(0,1)$. So, by lemma 2.2 $f(x)$ is increasing on $(0,1)$.

Therefore, for $0 < x < 1$ and some $k \in (0,1)$ we must have $f(0^+) < f(x) < f(k)$, where $\eta_1 = f(0^+) = 1/4$ and $\eta_2 = f(k) = \frac{\ln\left(\frac{k}{\sin^{-1}k}\right)}{\ln\left(1-\frac{2k^2}{3}\right)}$. Hence the result follows.

3 Conclusion

From our findings in this paper depicted in the theorem 2.1, we conclude that the upper and lower bounds in the inequality (2.1) are sharper than that of the inequality (1.4) of kind (1.3).

4 Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical approval This article does not contain any studies involving human participants or animals performed by any of the authors.

Informed consent Informed consent was obtained from all participants in this study.

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Thermoelastic analysis of a semi-infinite cylinder with moving sectional heat supply

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Abstract

The aim of this paper is concerned with the transient thermoelastic analysis of the axisymmetric problem of a semi-infinite solid cylinder having an internal heat source considering a moving boundary. It is assumed that the upper edge of the cylinder is heated with an arbitrary sectional heat supply that moves with a constant velocity. The potential functions, displacements and the associated thermal stress distribution are determined. As an illustration, numerical analysis is carried out for different velocity values of the moving boundary for the temperature and the thermal stresses precisely.
Keywords: *Heat conduction, thermal stresses, homogeneous, potential function, moving heat*

1. Introduction

It is assumed that most materials tend to expand if the temperature rises, and in the first approximation, expansion and compression are proportional to temperature changes. This temperature change caused by expansion and compression is based on thermoelasticity, a branch of applied mathematics specializing in the coupling between temperature and mechanical deformation and thermal energy calculated by stress. It is also assumed that the homogeneous materials and elastic properties are the same at every point in the body and constant during translation. However, the properties do not have to be the same in all directions for homogeneous materials. Isotropic materials have the same elasticity in all directions. Therefore, the material must be uniform and isotropic such that the transverse strain is the same at each point of the particular component. The uniformly loaded homogeneous and isotropic plate has attracted the focus of researchers over the past long time because of its application to various machines and structures.

Some authors have worked on homogeneous materials in the most recent literature, which can be summarised below. Aksoy et al. [1] performed the thermoelastic stress analysis of a cylinder made of laminated isotropic material under thermomechanical loading. Deshmukh et al. [2] investigated the thermoelastic behaviour of circular plates, and the simply supported plates with thermal bending moments caused by moving heat sources and point heat sources were investigated. Janjgava [3] solved the thermoelastic two-dimensional problem by considering the micro-temperature. Kedar et al. [4] discussed the transient heat conduction problem of finite and semi-infinite thick cylinders and determined the thermal stress by the quasi-static method.

Further, it is also noted that the moving heat source is the subject of transient heat transfer and is suitable for engineering problems, especially for welding. At the beginning of the 20th century, welding engineers began to study moving heat sources, both empirically and theoretically [5]. Kim [6] obtained the temperature distribution around a rectangular shape source moving at a constant speed along the axis of a bar using a Fourier series procedure. Shokouhmand and Ghaffari [7] performed the temperature analysis of the nonlinear and transient magneto-thermal coupled problem with moving coils studied by a valid finite element program, which is considered a moving heat source using numerical methods. Deshmukh et al. [2] obtained the most exciting result of dynamic thermal stresses in a circular plate by a moving heat source subject to certain boundary conditions using the integral transform technique. Things become complicated when internal heat persists on the object under consideration and further becomes unpredictable when part of the heat is affected. Both analytical and numerical techniques have proven to be the best way to solve such problems. In previous works, the temperature and stress distributions were analyzed analytically or numerically using a computer code, and this study points out the importance of the topic in a workpiece. This work presents the temperature distributions and associated thermal stresses in a cylindrical profile workpiece with an internal heat source subjected to heated partly-axially from its outer surface by a moving uniform heat source.

Mathematical modelling

For this study, a solid cylinder is heated partly-axially from its outer surface (processed surface) by a moving uniform heat source under stagnant ambient conditions is considered to analyze the transient temperature distributions analytically. As already known, heat is released in a solid subjected to manufacturing processes such as grinding, hardening, cutting, coating, metal forming, etc. Temperature differences occurring in this solid because of non-uniformities of the released heat, cooling and/or thermal properties of the solid material may cause thermal stress. This study also presents the thermal stresses proportional to the temperature differential. The axisymmetric geometric model of the considered cylinder and the coordinate system is shown in figure 1.

2.1 The governing heat conduction equation

The governing equation of temperature distribution is given as follows

$$\frac{\partial^2\theta}{\partial r^2}+\frac{1}{r}\frac{\partial\theta}{\partial r}+\frac{\partial^2\theta}{\partial z^2}+Q=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \tag{1}$$

subjected to boundary conditions

$$\theta=0 \quad \text{at} \quad t=0 \tag{2}$$

$$\theta=0 \ \text{at} \ \ r=a \tag{3}$$

$$\frac{\partial\theta}{\partial z}-\theta=-\theta_0 \ \text{at} \ \ z=vt \tag{4}$$

in which $\theta(r,z,t)$ is the temperature distribution function, and $\kappa=\lambda/\rho C$, λ is the thermal conductivity of the material, ρ is the density and C is the calorific capacity, assumed to be constant, respectively.

2.2 The governing thermal displacements and stress equations

The Navier's equations without the body forces can be expressed as

$$\begin{aligned}\nabla^2u_r-\frac{u_r}{r^2}+\frac{1}{1-2\nu}\frac{\partial e}{\partial r}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial r}=0\\ \nabla^2u_z-\frac{1}{1-2\nu}\frac{\partial e}{\partial z}-\frac{2(1+\nu)}{1-2\nu}\alpha\frac{\partial\theta}{\partial z}=0\end{aligned} \tag{5}$$

where u_r and u_z are the displacement components in the radial and axial directions, respectively and the dilatation e as

$$e=\frac{\partial u_r}{\partial r}+\frac{u_r}{r}+\frac{\partial u_z}{\partial z} \tag{6}$$

The displacement functions represented by the Goodier's displacement potential function $\phi(r,z,t)$ and Michell's function $M(r,z,t)$ is given as

$$\begin{aligned}u_r=\frac{\partial\phi}{\partial r}-\frac{\partial^2M}{\partial r\partial z},\\ u_z=\frac{\partial\phi}{\partial z}+2(1-\nu)\nabla^2M-\frac{\partial^2M}{\partial z^2}\end{aligned} \tag{7}$$

in which Goodier's thermoelastic potential must satisfy the equation

$$\nabla^2\phi=\frac{1+\nu}{1-\nu}\alpha\theta \tag{8}$$

and Michell's function must satisfy the equation

$$\nabla^2\nabla^2M=0 \tag{9}$$

where

$$\nabla^2 = \frac{1}{r}\frac{\partial}{\partial r}\left(r\frac{\partial}{\partial r}\right)+\frac{\partial^2}{\partial z^2}$$

The component of the stresses can be given as

$$\begin{aligned}
\frac{\sigma_{rr}}{2G} &= \frac{\partial^2\phi}{\partial r^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{\partial^2 M}{\partial r^2}\right),\\
\frac{\sigma_{\theta\theta}}{2G} &= \frac{1}{r}\frac{\partial\phi}{\partial r}-\nabla^2\phi+\frac{\partial}{\partial z}\left(\upsilon\nabla^2 M-\frac{1}{r}\frac{\partial M}{\partial r}\right),\\
\frac{\sigma_{zz}}{2G} &= \frac{\partial^2\varphi}{\partial z^2}-\nabla^2\phi+\frac{\partial}{\partial z}\left((2-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right),\\
\frac{\sigma_{rz}}{2G} &= \frac{\partial^2\phi}{\partial r\partial z}+\frac{\partial}{\partial r}\left((1-\upsilon)\nabla^2 M-\frac{\partial^2 M}{\partial z^2}\right)
\end{aligned} \tag{10}$$

where G is the shear modulus and υ is the Poisson's ratio.

The boundary conditions on the traction free surface are

$$\sigma_{rr}=\sigma_{rz}=0 \text{ at } r=a \tag{11}$$

The equations (1) to (11) constitute the mathematical formulation of the problem under consideration.

2.3 Temperature distribution and its associated stress in dimensionless quantities

For the sake of simplicity, the following dimensionless quantities are introduced as

$$\begin{aligned}
&T=\theta/\theta_0, \tau=\kappa t/a^2, \bar{r}=r/a=\xi, \bar{z}=z/a, \bar{\nu}=\nu a/\kappa,\\
&\bar{M}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^3}, \bar{\phi}=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a^2}\phi, \bar{u}_i=\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0 a}u_i\\
&\bar{\sigma}_{ij}=\frac{1}{2G}\frac{1-\upsilon}{(1+\upsilon)\alpha\theta_0}\sigma_{ij}\ (i,j=r,z)
\end{aligned} \tag{12}$$

Substituting the Eq. (12) in Eqs. (1)-(4), (7), (9)-(10) and (11), one obtains the expressions in dimensionless form as

$$\frac{\partial^2 T}{\partial\xi^2}+\frac{1}{\xi}\frac{\partial T}{\partial\xi}+\frac{\partial^2 T}{\partial\zeta^2}+\bar{\nu}\frac{\partial T}{\partial\zeta}+Q=\frac{\partial T}{\partial\tau} \tag{13}$$

$$T=0 \text{ at } \tau=0 \tag{14}$$

$$T=0 \text{ at } \xi=1 \tag{15}$$

$$\frac{\partial T}{\partial\zeta}-T=-1 \text{ at } \zeta=\bar{z}-\bar{\nu}\tau=0 \tag{16}$$

$$\begin{aligned}
\bar{u}_\xi &= \frac{\partial\bar{\phi}}{\partial\xi}-\frac{\partial^2\bar{M}}{\partial\xi\,\partial\zeta},\\
\bar{u}_z &= \frac{\partial\bar{\phi}}{\partial\zeta}+2(1-\nu)\nabla^2\bar{M}-\frac{\partial^2\bar{M}}{\partial\zeta^2}
\end{aligned} \tag{17}$$

$$\Delta^2\bar{\phi}=\bar{T} \tag{18}$$

$$\Delta^2\Delta^2 M=0 \tag{19}$$

$$\bar{\sigma}_{\xi\xi} = \frac{\partial^2\bar{\phi}}{\partial\xi^2} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\xi^2}\right),$$
$$\bar{\sigma}_{\theta\theta} = \frac{1}{\xi}\frac{\partial\bar{\phi}}{\partial\xi} - \Delta^2\bar{\phi} + \frac{\partial}{\partial\zeta}\left(\upsilon\Delta^2\bar{M} - \frac{1}{\xi}\frac{\partial\bar{M}}{\partial\xi}\right), \qquad (20)$$
$$\bar{\sigma}_{zz} = \frac{\partial^2\bar{\phi}}{\partial\zeta^2} - \Delta^2\phi + \frac{\partial}{\partial\zeta}\left((2-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right),$$
$$\bar{\sigma}_{rz} = \frac{\partial^2\bar{\phi}}{\partial\xi\partial\zeta} + \frac{\partial}{\partial\xi}\left((1-\upsilon)\Delta^2\bar{M} - \frac{\partial^2\bar{M}}{\partial\zeta^2}\right)$$

$$\sigma_{\xi\xi} = \sigma_{\xi\zeta} = 0 \quad \text{at } \xi = 1$$
$$\sigma_{\zeta\zeta} = \sigma\xi\zeta = 0 \quad \text{at } \zeta = 0 \qquad (21)$$

where

$$\Delta^2 = \frac{1}{\xi}\frac{\partial}{\partial\xi}\left(\xi\frac{\partial}{\partial\xi}\right) + \frac{\partial^2}{\partial\zeta^2}$$

3. The solution to the Problem

3.1 Solution for temperature distribution

In order to solve Eq. (13) under the boundary condition (15), we firstly introduce the integral transform [6] of order $n = 0$ over the variable r, then the integral transform and its inversion theorem are written as

$$H_{0j}\{f(\xi)\} = \bar{f}(\mu_j) = \int_0^1 \xi f(\xi) J_0(\mu_j\xi) d\xi, \; j = 1, 2, ..\infty$$
$$H_{0j}^{-1}\{\bar{f}(\mu_j)\} = f(\xi) = \sum_{j=1}^{\infty} \bar{f}(\mu_j) J_0(\mu_j\xi), 0 \le \xi \le \xi_0 \qquad (22)$$

in which μ_j are the roots of $J_0(\mu_j\xi) = 0$ and $J_0(\,)$ is the Bessel functions of the first kind of order $n = 0$.

Applying the transform defined by Eq. (22) to the Eqs. (14) and (16), and using Laplace transform, one obtains

$$\frac{\partial^2\overline{T}}{\partial\zeta^2} + \bar{v}\frac{\partial\overline{T}}{\partial\zeta} - (\mu_j^2 + p)\overline{T} + \frac{\delta(\zeta)J_0(\mu_j)}{p+\varpi} = -Q \qquad (23)$$

where $\overline{T}$ is the transformed function of T. The symbol ($\bar{}$) means a function in Hankel transformed domain, ($\tilde{}$) is for the function in Laplace transformed domain and p is Laplace parameter.

The solution of Eq. (23), in conjunction with the condition (16), one finds in the form

$$\tilde{\overline{T}}(\mu_j, \zeta, p) = \frac{Q}{p+\mu_j^2} + \left[1 - \left(\frac{Q}{p+\mu_j^2}\right)\right]\left(\frac{2\exp[-1/2\,\zeta(\nu + \sqrt{4(p+\mu_j^2)+\nu^2})]}{2+\nu+\sqrt{4(p+\mu_j^2)+\nu^2}}\right) \qquad (24)$$

Further taking the inverse transform of Eq. (24) and making use of the convolution theorem, one obtains

$$\bar{T}(\mu_j, \zeta, t) = Q\exp(-\tau\mu_j^2) + 2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu)$$
$$\times\int_0^{\tau}\exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^{\tau}\exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\} \qquad (25)$$

Lastly, by the application of the inverse formulae Eq. (22), one gets the solution of the boundary value problem

$$T(\xi,\zeta,t)=\sum_{j=1}^{0} J_0(\mu_j\xi)\{Q\exp(-\tau\mu_j^2)+2\exp(-2\zeta(\nu+1)^2)[(-1+\mu_j^2-\nu)\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[\tau(1-\mu_j^2+\nu)]ds]\} \quad (26)$$

3.2 Solution for Goodier's potential and the Michell's function

Assuming the potential function which satisfies Eq. (18) as

$$\phi(\xi,\eta,\tau)=\sum_{j=1}^{0} A_1 J_0(\mu_j\xi)\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (27)$$

Substituting Eq.(25) into Eq. (18), one obtains

$$A_1=8(1+\nu)^2\left[\mu_j^2-\mu_j(\mu_j+1)\frac{1}{\xi}\frac{J_1(\mu_j\xi)}{J_0(\mu_j\xi)}\right] \quad (28)$$

Similarly, assume Michell's function satisfying Eq. () as

$$M(\xi,\zeta,\tau)=\sum_{j=1}^{0}[B_1 J_0(\mu_j\xi)+B_2\mu_j\xi J_0(\mu_j\xi)]Q\exp(-\tau\mu_j^2)\{\exp[2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (29)$$

Substituting Eqs. (27)-(29) into Eq. (20), one obtains

$$\bar{\sigma}_{\xi\xi}=\sum_{j=1}^{0}\{A_1[\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))-(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]-2[B_1+B_2\mu_j]\{\upsilon(\mu_j^2J_0(\mu_j\xi)-\frac{\mu_j}{\xi}J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4-\mu_j^2(J_0(\mu_j\xi)-\frac{1}{\xi}J_1(\mu_j\xi))\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (30)$$

$$\bar{\sigma}_{\theta\theta} = \sum_{j=1}^{0} \{A_1[-\frac{\mu}{\xi} J_1(\mu_j\xi) - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{\upsilon(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$+\frac{\mu}{\xi} J_1(\mu_j\xi)\}(\nu+1)^2\}\exp[-2\zeta(\nu+1)^2]Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (31)$$

$$\bar{\sigma}_{\zeta\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$-2[B_1 + B_2\mu_j]\{(2-\upsilon)(\mu_j^2 J_0(\mu_j\xi) - \frac{\mu}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4$$
$$-J_0(\mu_j\xi)4(\nu+1)^4\}(\nu+1)^2\}\exp\{-2\zeta(\nu+1)^2\}Q\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2]$$
$$+(2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds$$
$$+Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/[4(\nu+1)^4]\} \quad (32)$$

$$\bar{\sigma}_{\xi\zeta} = \sum_{j=1}^{0} \{A_1[J_0(\mu_j\xi)4(\nu+1)^4 - (\mu_j^2 J_0(\mu_j\xi) - \frac{\mu_j}{\xi} J_1(\mu_j\xi)[\mu_j+1])4(\nu+1)^4]$$
$$+[B_1 + B_2\mu_j]\{(1-\upsilon)(-\mu^3 J_1(\mu_j\xi) - 4\mu_j[\mu_j+1](\nu+1)^4$$
$$\times\left[\frac{\mu_j\xi J_0(\mu_j\xi) - J_1(\mu_j\xi)[\mu_j+1]}{\xi^2}\right] + \mu_j J_1(\mu_j\xi)4(\nu+1)^4\}\exp[-2\zeta(\nu+1)^2]Q$$
$$\times\exp(-\tau\mu_j^2)\{\exp[-2\zeta(\nu+1)^2] + (2/Q)\exp(\tau\mu_j^2)\{(-1+\mu_j^2-\nu)$$
$$\times\int_0^\tau \exp[s(1-\mu_j^2+\nu)]ds + Q\int_0^\tau \exp[-(\tau-s)\mu_j^2]\exp[s(1-\mu_j^2+\nu)]ds\}/4(\nu+1)^4\} \quad (33)$$

Now substituting Eqs. (30) and (33) into Eq. (21), one obtains

$$B_1 = 0$$

$$B_2 = \frac{-A_1[J_0(\mu_j)4(\nu+1)^4 - (\mu^2 J_0(\mu_j) - \mu J_1(\mu_j)[\mu+1])4(\nu+1)^4]}{\mu_j\{(1-\upsilon)(-\mu^3 J_1(\mu_j) - 4\mu[\mu+1](\nu+1)^4\mu\ J_0(\mu_j) - J_1(\mu_j)[\mu+1] + \mu J_1(\mu_j)4(\nu+1)^4\}}$$

4. Numerical Results, Discussion and Remarks

The numerical computations have been carried out for Aluminium (pure) annular sector plate with the thermo-mechanical properties: modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6}/^{0}C, thermal diffusivity κ = 84.18×10-6 m^{2}s^{-1} and thermal conductivity λ = 204.2 Wm^{-1}K^{-1}. The physical parameter for the sector plate as $a = 1$m, $b = 1$m, l = 0.08 m and $T_0 = 150^0$C. In order to examine the influence of heating on the plate, numerical calculations were performed for all the variables. The numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

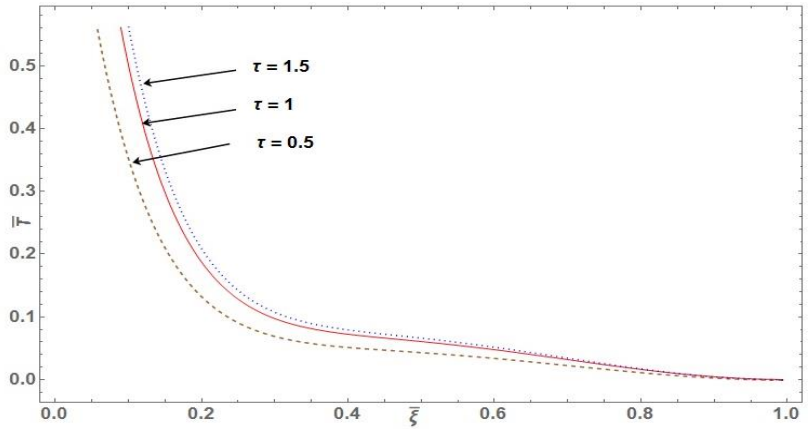

Fig. 1: Temperature distribution along ξ-direction for different time

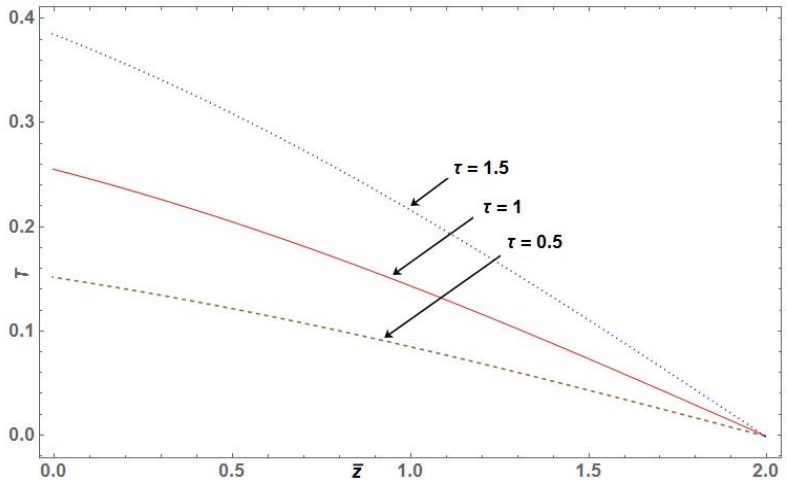

Fig. 2: Temperature distribution along z-direction for different time

Fig. 1 illustrates the temperature distribution along the radial direction for different values of time, and it decreases as the time proceeds along the radial direction but attains its maximum at the inner core. The maximum value of temperature magnitude occurs at the outer edge due to additional heat supply with available internal heat energy throughout the body. Fig. 2 indicates the temperature distribution along the axial direction of the plate for different values of time, but the curve shows a straight line due to the shallowness of the cylinder and the maximum value of temperature magnitude occurring at the edge, that is energized due to sectional heat supply.

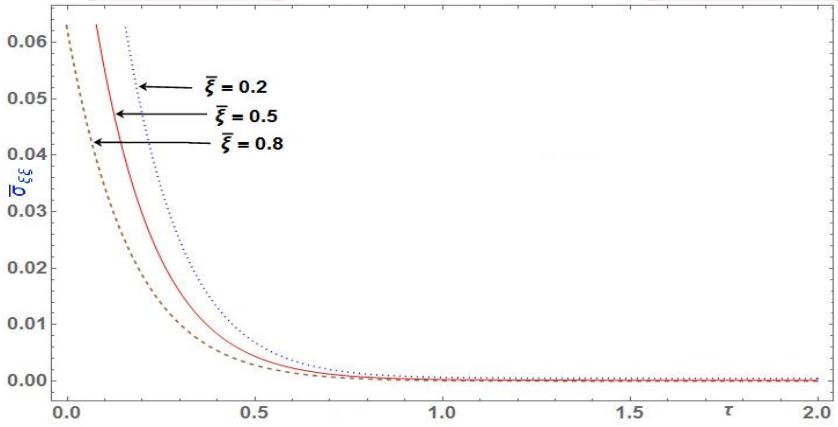

Fig. 3: Radial stress distribution along τ-direction for different ξ

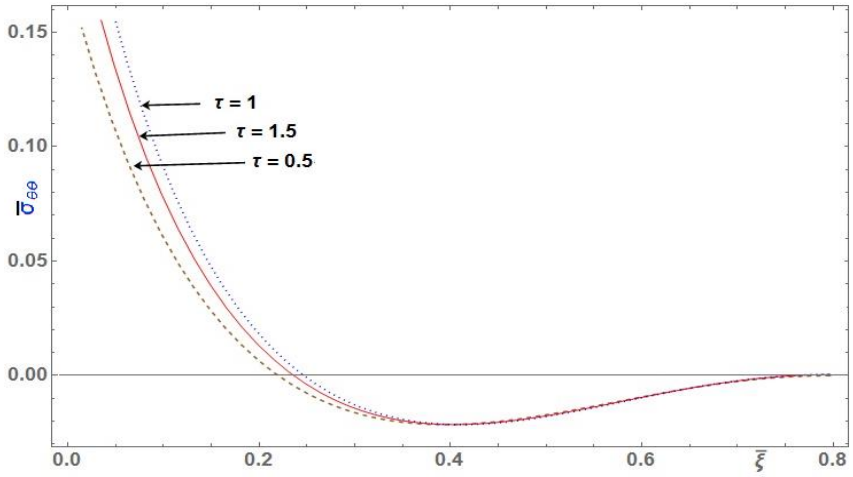

Fig. 4: Tangential stress distribution along ξ-direction for different time

Fig. 3 depicts the thermal radial stress along the axial direction for different values of the time. The expansion occurs, and its magnitude increases at the inner edge; it may be due to compressive force, whereas maximization towards the outer edge may be due to energized heat supply. The tangential stress decreases gradually along the radial direction with the thermal load, as shown in Fig. 4. The stresses attain certain maxima and decrease gradually at the outer edge towards infinity.

1. Conclusion

This study has treated the thermoelastic problem of a semi-infinite cylinder in which sources are generated. We successfully obtained the temperature distribution, displacements and stress functions with additional sectional heating available at the cylinder's edge. Then, the numerical calculations were carried out. We may conclude that the system of equations proposed in this study can be adapted to the design of useful structures or machines in engineering applications to determine thermoelastic behaviour with radiation.

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Magnetized Bianchi Type-III Perfect Fluid Cosmological Model in Brans-Dicke Theory of Gravitation

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Abstract:
In this paper, we investigate the role of relativistic charged perfect fluid in Bianchi type-III cosmological model in Brans-Dicke theory of gravitation. Solutions of the models are obtained by volumetric exponential expansion, power law expansion and power law relation between scalar field ϕ and the scale factor a .Some physical and kinematical properties of the model are also discussed.
Keywords: *Bianchi type-III universe, Brans-Dicke theory of gravitation, electromagnetic field, perfect fluid, constant vector potentials.*

1. Introduction:

Brans and Dicke (BD) theory of gravitation is a well-known modified version of Einstein's theory. (Brans and Dicke 1961) formulated a theory of gravitation in which, besides a gravitational part, a dynamical scalar field is introduced to account for variable gravitational constant and to incorporate Mach's [1]Principle in Einstein's theory. In this theory, the scalar field has the dimension of the universe of a gravitational constant and its role is confined to its effect on gravitational field equations.[2] BD scalar-tensor theory of gravitation is quite important in view of the fact that scalar fields play a vital role in inflationary cosmology. In recent years, there has been a renewed interest of the gravitational constant.[3] The latest inflationary models (Mathiazhagan and Johri 1984),possible "graceful exit" problem (Pimental 1997) and extended chaotic inflations (Linde 1990) are based on BD theory of gravitation.[4-6]

The scalar-tensor theories have been subject of considerable interest in the study of various cosmological models due to their relevance for the inflationary expansion of the universe and to solve many outstanding problems in cosmology. Several aspects of BD cosmology have been extensively investigated by[7] many authors. Bardeen et al. (1983) explored the inflationary universe models which provide a mechanism for galaxy formation by generating small scale density fluctuation in the universe, Banerjee et al.(1990) studied Bianchi type-I string cosmological models with and without a source-free magnetic field, Johri and Desikan (1994) have investigated cosmological models with constant deceleration parameter in Nordtvedt's theory,[8] Bianchi type-III cosmological model with a negative constant deceleration parameter in BD theory of gravity in presence of perfect fluid has been studied by Adhav et al.(2012), Katore et al. (2012) explored plane symmetric space-time filled with dark energy models in BD theory, Bhoyar et al. (2018) studied Bianchi type-III and Kantowski Sachs cosmological model containing magnetic field with variable cosmological constant. [9-11]

Lorenz-Petzold (1982), Kumar et al. (2008), Pawar et al. (2009), Rao et al.(2011), Naidu et al.(2012), Kandalkar et al. (2014),Mete et al. (2018), are some of the authors who have investigated several aspects of BD theory of gravitation.[12-15]

Tikekar and Patel (1992) have obtained some exact Bianchi type-III cosmological solutions of massive string in the presence of magnetic field,[16] Singh and Shri Ram (1996) have presented a technique to generate new exact Bianchi type-II cosmological solutions of massive strings in the presence and absence of the magnetic field, Tripathy et al. (2009) and Pradhan (2007) studied string cosmological models in the presence of the electromagnetic field,[17-20] A detailed discussion of BD cosmology is given by Singh et al. (2010),Singh J. K and Sharma N. K (2010a) have investigated some Bianchi type-II cosmological models in BD theory,

Shamir et al. (2012) explored anisotropic dark energy Bianchi type-III cosmological models in BD theory of gravity, Solanke and Karade (2016,2017) have investigated Bianchi type-I and III universe[21] field with perfect fluid and scalar field coupled with electromagnetic fields in theory of gravity. Recently Katore et al. (2018) have investigated Bianchi type-I dark energy cosmological model with power-law relation in BD theory of gravitation.[22-25]

In this paper, we discuss Bianchi type-III perfect fluid cosmological model with electromagnetic field in BD theory of gravitation.

2. The Metric And Field Equation:

We consider a spatially homogeneous Bianchi Type-III space time in the form

$$ds^2 = -dt^2 + A^2dx^2 + B^2e^{-2mx}dy^2 + C^2dz^2, \quad (1)$$

where A, B and C are functions of t and m is a constant.

Brans-Dicke field equations for the combined scalar and tensor fields are

$$G_j^i = \frac{-8\pi}{\phi}T_j^i - \frac{\omega}{\phi^2}\left(g^{ii}\phi_{,i} - \frac{1}{2}g_j^i\phi_{,k}\phi^{,k}\right) - \frac{1}{\phi}\left(g^{ii}\phi_{i;j} - g_j^i\phi_{;k}^{,k}\right), \quad (2)$$

where G_j^i is Einstein's tensor, ϕ is a dimensionless coupling constant and T_j^i is energy momentum tensor for perfect fluid with conservation equation.

$$\phi_{;k}^{,k} = \frac{1}{\sqrt{-g}}\left[\sqrt{-g}\phi^k\right]_{,k} \quad (3)$$

3. Energy Momentum Sources:

The energy momentum tensor for matter under discussion given by

$$T_j^i = {}^pT_j^i + E_j^i, \quad (4)$$

where ${}^pT_j^i$ is energy momentum tensor for perfect fluid and E_j^i is energy momentum tensor for electromagnetic field is given by

$$E_{ij} = \frac{1}{4}F_{ab}F^{ab}g_{ij} - F_{ai}F_{bj}g^{ab}. \quad (5)$$

Here the electromagnetic field tensor F_{ij} has the expression

$$F_{ij} = \frac{\partial A_i}{\partial x^j} - \frac{\partial A_j}{\partial x^i}. \quad (6)$$

where A_i is a four potential vector.

To achieve the compatibility with the metric (1), we assume electromagnetic vector potential as

$$A_i = [\lambda(x)v_1(t), v_2(t), v_3(t), v_4(t)]. \quad (7)$$

From equations (6) and (7), we deduce

$$F_{14} = \lambda\dot{v}_1,\ F_{24} = \dot{v}_2,\ F_{34} = \dot{v}_3,\ F_{43} = -\dot{v}_3. \quad (8)$$

Using equations (6), (7) and (8), we obtained

$$F_{ab}F^{ab} = -2\left[\frac{\lambda^2\dot{v}_1^2}{A^2} + \frac{\dot{v}_2^2}{B^2e^{-2mx}} + \frac{\dot{v}_3^2}{C^2}\right], \quad (9)$$

The energy momentum tensor for a perfect fluid is given by

$${}^pT_j^i = (\rho + p)u^iu_j - p\delta_i^j, \quad (10)$$

where ρ is the density, p is the pressure of perfect fluid and four velocity u_i is given by

$$g_{ij}u^i u^j = -1.$$

For co-moving coordinate system, we have

$$u_x = 0, \quad u_y = 0, \quad u_z = 0, \quad u_t \neq 0. \tag{11}$$

Accordingly equation (10), provides

$${}^pT_1^1 = {}^pT_2^2 = {}^pT_3^3 = -p, \; {}^pT_4^4 = \rho, \; T_i^j = 0 \quad \forall i, j \tag{12}$$

Using equations (5), (9) and (12), we obtained

$${}^pT_1^1 + E_1^1 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^{\,2}}{C^2} - p, \tag{13}$$

$${}^pT_2^1 + E_2^1 = {}^pT_1^2 + E_1^2 = \frac{\lambda \dot{v}_1 \dot{v}_2}{A^2}, \tag{14}$$

$${}^pT_3^1 + E_3^1 = {}^pT_1^3 + E_1^3 = \frac{\lambda \dot{v}_1 \dot{v}_3}{A^2}, \tag{15}$$

$${}^pT_2^2 + E_2^2 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} - \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p, \tag{16}$$

$${}^pT_3^2 + E_3^2 = {}^pT_2^3 + E_2^3 = \frac{\dot{v}_2 \dot{v}_3}{B^2 e^{-2mx}}, \tag{17}$$

$${}^pT_3^3 + E_3^3 = -\frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} - \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} - p \tag{18}$$

$${}^pT_4^4 + E_4^4 = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^2}{A^2} + \frac{1}{2}\frac{\dot{v}_2^2}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^2}{C^2} + \rho. \tag{19}$$

4. Conservation Law:

The Conservation equation is given by

$$\frac{\partial}{\partial x^i}\left(\sqrt{-g}F^{ij}\right) = 0. \tag{20}$$

Equation (20) with different combination of i and j gives following equations

$$\left[\frac{\dot{v}_1}{v_1}\right]^{\bullet} + \frac{\dot{v}_1^{\,2}}{v_1^{\,2}} + \frac{\dot{v}_1}{v_1}\left[\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right] = 0, \tag{21}$$

$$\left[\frac{\dot{v}_2}{v_2}\right]^{\bullet} + \frac{\dot{v}_2^2}{v_2^2} + \frac{\dot{v}_2}{v_2}\left[\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right] = 0, \tag{22}$$

$$\left[\frac{\dot{v}_3}{v_3}\right]^{\bullet} + \frac{\dot{v}_3^2}{v_3^2} + \frac{\dot{v}_3}{v_3}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right] = 0, \tag{23}$$

$$\phi_{;k}^{;k} = -\ddot{\phi} - \dot{\phi}\left[\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right]. \tag{24}$$

From the vanishing components of Einstein's tensor and using (5) and (7), we deduce

$$\frac{\dot{v}_1 \dot{v}_2}{v_1 v_2} = \frac{\dot{v}_1 \dot{v}_3}{v_1 v_3} = \frac{\dot{v}_2 \dot{v}_3}{v_2 v_3} = 0, \tag{25}$$

$$\frac{\dot{v}_1}{v_1} = \frac{\dot{v}_2}{v_2} = \frac{\dot{v}_3}{v_3} = \frac{\dot{D}}{D}, \tag{26}$$

where D is an unknown function of t

Integrating equation (26) with respect to t, we get

$$v_1 = k_1 D,\ v_2 = k_2 D,\ v_3 = k_3 D, \tag{27}$$

where k_1, k_2 and k_3 are constants.

Using equations (25) and (27), we get

$$\left(\frac{\dot{D}}{D}\right)^2 = 0. \tag{28}$$

With an aid of equation (27), we can write the equations (21) to (23) as

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C} - \frac{\dot{A}}{A}\right) = 0, \tag{29}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C} - \frac{\dot{B}}{B}\right) = 0, \tag{30}$$

$$\left(\frac{\dot{D}}{D}\right)^{\bullet} + \left(\frac{\dot{D}}{D}\right)^2 + \frac{\dot{D}}{D}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} - \frac{\dot{C}}{C}\right) = 0. \tag{31}$$

We attempt to express the component of T_j^i in terms of T_4^4 already used as in (Solanke and Karade (2016,2017). For this, we consider the expression as

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_2^{\,2}}{B^2 e^{-2mx}}\left(\frac{\dot{D}}{D}\right)^2 + \frac{v_3^{\,2}}{C^2}\left(\frac{\dot{D}}{D}\right)^2\right] = 0 \tag{32}$$

$$\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{\dot{v}_3^{\,2}}{C^2} = \left[\frac{\lambda^2 v_1^{\,2}}{A^2} + \frac{v_2^{\,2}}{B^2 e^{-2mx}} + \frac{v_3^{\,2}}{C^2}\right]\left(\frac{\dot{D}}{D}\right)^2 = 0 \tag{33}$$

$$T_4^{\,4} = \frac{1}{2}\frac{\lambda^2 \dot{v}_1^{\,2}}{A^2} + \frac{1}{2}\frac{\dot{v}_2^{\,2}}{B^2 e^{-2mx}} + \frac{1}{2}\frac{\dot{v}_3^{\,2}}{C^2} + \rho = \rho, \tag{34}$$

$$T_1^1 = -p = T_2^2 = T_3^3,$$

5. Solution of Field Equations:

Considering the non-vanishing component of Einstein's tensor from equation (3), we derive

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{35}$$

$$\frac{\ddot{A}}{A} + \frac{\ddot{C}}{C} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right) - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{C}}{C}\right), \tag{36}$$

$$-\frac{m^2}{A^2} + \frac{\ddot{A}}{A} + \frac{\ddot{B}}{B} + \frac{\dot{A}\dot{B}}{AB} = -\frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \tag{37}$$

$$-\frac{m^2}{A^2} + \frac{\dot{A}\dot{B}}{AB} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi\rho}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{38}$$

$$\frac{\dot{A}}{A} - \frac{\dot{B}}{B} = 0. \tag{39}$$

Integrating (39) with respect to t, we get

$$A = k_4 B, \tag{40}$$

where k_4 is a constant of integration. Without loss of generality let us assume k_4 as unity so that equation (40) written as

$$A = B. \tag{41}$$

Using equations (41) and (35) to (38), we yield

$$\frac{\ddot{B}}{B} + \frac{\ddot{C}}{C} + \frac{\dot{B}\dot{C}}{BC} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right), \tag{42}$$

$$-\frac{m^2}{B^2} + \frac{2\ddot{B}}{B} + \frac{\dot{B}^2}{B^2} = \frac{8\pi p}{\phi} - \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\ddot{\phi}}{\phi} - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right), \quad , \tag{43}$$

$$-\frac{m^2}{B^2} + \frac{2\dot{A}^2}{A^2} + \frac{\dot{B}\dot{C}}{BC} + \frac{\dot{A}\dot{C}}{AC} = \frac{8\pi p}{\phi} + \frac{1}{2}\omega\left(\frac{\dot{\phi}}{\phi}\right)^2 - \frac{\dot{\phi}}{\phi}\left(\frac{\dot{A}}{A} + \frac{\dot{B}}{B} + \frac{\dot{C}}{C}\right). \tag{44}$$

Since the field equations are highly nonlinear with three equations and five unknown. Therefore two extra conditions can be considered to solve the field equations.

Let us choose power law form of metric potential (Katore et al. (2018) given by

$$B = \alpha t^n, \text{ and } C = \beta t^n \tag{45}$$

The power law relation between scalar field ϕ and the scale factor a has already used by Johri and Desikan (2014) in the context of Robertson Walker Brans-Dicke models. Thus the power law relation between ϕ and the scale factor a is $\phi = \eta a^m$, where a is constant of proportionality. The average scalar factor is given by

$$a = (ABC)^{\frac{1}{3}} = k_5 t^n, \tag{46}$$

where $k_5 = \alpha^{\frac{2}{3}}\beta^{\frac{1}{3}}$ is a constant.

Hence scalar field ϕ is obtained as

$$\phi = k_5 t^{mn}$$

$$\phi = k_5 t^s,$$

where $s = mn$ is a constant.

Using equations (24) and (25), we have

$$\frac{\dot{D}}{D} = k_6, \tag{47}$$

where k_6 is a constant of integration.

Integrating equation (47), we deduce

$$D = e^{k_6 t}. \tag{48}$$

Using equations (46) and (27), we have

$$v_1 = k_1 e^{k_6 t}, \tag{49}$$

$$v_2 = k_2 e^{k_6 t}, \tag{50}$$

$$v_3 = k_3 e^{k_6 t}, \tag{51}$$

v_4 remained undetermined.

The metric in (1), with the help of (45), can be redefined in the form

$$ds^2 = \alpha^2 t^{2n}(dx^2 + e^{-2mx})dy^2 + \beta^2 t^{2n} dz^2 - dt^2 . \quad (52)$$

6. Physical and Kinematical Properties of the Model:

The physical and kinematical properties of the model (52) are obtained as follows.

For the investigated model the pressure p and the density ρ are given by

$$p = \frac{k_5 t^s}{8\pi}\left[\frac{2n(n-1)+n^2}{t^2} + \omega\frac{s^2}{2t^2} + \frac{s^2(s-1)}{t^2} + \frac{2sn}{t^2}\right], \quad (53)$$

$$\rho = \frac{k_5 t^s}{8\pi}\left[\frac{4n^2}{t^2} - \frac{m^2}{\alpha t^n} - \omega\frac{s^2}{2t^2} + \frac{3sn}{t^2}\right], \quad (54)$$

where k_5 is a constant of integration.

The physical quantities of observational interest in cosmology are,

The spatial volume is obtained as

$$V = \sqrt{-g} = \left(\alpha^2 \beta t^{3n}\right)e^{-mx}. \quad (55)$$

The expansion scalar become

$$\theta = 3H = \left(2\frac{\dot{A}}{A} + \frac{\dot{B}}{B}\right),$$

$$\theta = 3H = \frac{3n}{t}, \quad (56)$$

The shear scalar is given by

$$\sigma^2 = \frac{1}{2}\sum_{i=1}^{3} H_i^2 - \frac{\theta^2}{6} = 0 \quad (57)$$

The mean anisotropic parameter A_m as

$$\Delta = \frac{1}{3}\sum_{i=1}^{3}\left(\frac{H_i - H}{H}\right)^2$$

$$\Delta = 0. \quad (58)$$

The mean Hubble parameter

$$H = \frac{n}{t}. \quad (59)$$

The deceleration parameter is given by

$$q = \frac{d}{dt}(H) - 1 = \frac{1-n}{n} \quad (60)$$

The cosmic Jerk parameter is given as,

$$J = q + 2q^2 - \frac{\dot{H}}{H}$$

$$= \frac{(n-1)(n-2)}{n^2}. \quad (61)$$

7. Conclusion:

In this paper, we have presented Bianchi Type-III charged fluid universe in BD theory of gravitation in presence of perfect fluid with electromagnetic field. The spatial volume V of the model increases with time showing the spatial expansion of the universe. It is observed that Hubble's parameter H vanishes with extremely large value and continue to decrease with time. The scalar expansion and the physical parameters energy density and pressure diverge at $t = 0$ and they all vanish as t approaches to infinity. The scalar field increases with time and at $t = 0$, it vanishes. The recent observations of type Ia supernovae reveal that the present universe is accelerating and the value of deceleration parameter lies somewhere in the range $-1 < q < 0$. It follows that one can choose the value of n in the range $0 < n < 1$ to ensure that the derived model is consistent with observations. It is also seen that the value of the cosmic jerk parameter is positive throughout the entire history of this model. This shows that our model strongly agrees to present day observations.

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The behaviour of Composite Objects Subjected to Hygrothermal Environment : A Review Article

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Abstract:

The article investigates the present review of hyrgrothermoelastic theories with different thermal loading effects on various objects. The main theme of the hyrgrothermoelastic problems is to establish operational methods to solve the governing differential equations. In the hyrgrothermoelastic problems, we have considered a few practical problems of technical interest, considering hygrothermal loading using numerical or exact procedures.

AMS Subject classifications: *35B07; 35G30; 35K05: 44A10*

Keywords: *temperature distribution, moisture concentration, thermal stresses, hyrgrothermoelastic, fractional order, deflection, integral transform.*

Introduction:

Compared to usual metal structures, multilayered materials still expertise the amplified application in automobile, marine, aerospace, and civil and mechanical structures because of their higher strength and stiffness to weight ratios. It may be because of material property; analysing and coming up with these materials are a lot of difficult than metallic materials. Most structures, categorically for composite materials, are sometimes subjected to dynamical environmental conditions like temperature and moisture throughout initial manufacture and final practice. The effects of warmth and wetness on the stresses and deformation of those materials and structures are of great interest. Innovative fibre-reinforced composites have gained extensive use within the region and physical science engineering industries. The benefits of those materials result from their high strength, stiffness and damping at the side of low concrete weight, though it is susceptible to hygrothermoelastic stress due to their intrinsic heterogeneity evolving at the microscopic and macroscopic level. It reduces the prices in construction, operation and development, whereas up structural responsibility and enhances safety. A decent style of multilayered composite structures must account for hygrothermoelastic stresses correctly; even inside an uncoupled theory, the hygrothermal fields are uncoupled from the strain ones; this task is scarcely unconventional.

Research Background :

This subsection summarises the previous authors' work results, namely the nonlinear relationship between temperature, dissolved moisture content and vapour concentration, and control equations. Many researchers [1,2] following the alternative microscopic approach proposed by Henry [3] have suggested that slight variations, $\sigma = \partial M / \partial C$ and $\omega = -(\partial M / \partial T)$ are related to the mass of absorbed moisture as

$$M = \text{constant} + \sigma C - \omega T \qquad (1)$$

in a unit mass of solid to the mass of moisture, C, in a unit volume of void space and the temperature, T, and to keep equations readily soluble, we assume σ and ω as constant to avoid mathematical complexity. Now taking the rate of change of C in which mass of moisture is being absorbed or given off by the solid as $\gamma(\partial M / \partial t)$, where $\gamma = [(1-\alpha)/\alpha]\rho_S$, ρ_S is the true density, α is the ratio of the capacities for the diffusing material of equal volumes of the solid and the surrounding medium, D'' is vapour diffusion coefficient under no-absorption condition, respectively. Then the equation for moisture diffusion is

$$D''\nabla^2 C = \gamma \frac{\partial M}{\partial t} + \frac{\partial C}{\partial t} \qquad (2)$$

The rate of evolution of heat per unit volume is $k\rho'(\partial M/\partial t)$, where $\rho' = [(\rho - \rho_p)/(\rho_s - \rho_p)]\rho_s$ is the mass of solid per unit volume of the whole, and the equation for the thermal diffusion is

$$\mathsf{D}''\nabla^2 T = \frac{\partial T}{\partial t} - \varepsilon\frac{\partial M}{\partial t} \tag{3}$$

in which D'' is the thermal diffusion coefficient under the condition of no absorption, $\varepsilon = k/c_v$, with k being the overall thermal conductivity of the material, c_v is the total calorific capacity, and $\kappa = k/c_v\rho$ is representing thermal diffusivity, respectively.

Now eliminating M from Eqs. (2) and (3) using Eq. (1), one gets

$$D\nabla^2 C = \frac{\partial C}{\partial t} - \psi\frac{\partial T}{\partial t} \tag{4}$$

$$\mathsf{D}\nabla^2 T = \frac{\partial T}{\partial t} - \varphi\frac{\partial C}{\partial t} \tag{5}$$

in which ψ is the adiabatic coefficient, φ is isothermal coefficient, D is vapour diffusion coefficient under isothermal condition, D is the thermal diffusion coefficient under the state of constant vapour concentration and it is represented as

$$D = \frac{D''}{\gamma\sigma+1},\ \psi = \frac{\gamma\omega}{\gamma\sigma+1},\ \mathsf{D} = \frac{\mathsf{D}''}{1+\varepsilon\omega},\ \varphi = \frac{\varepsilon\sigma}{1+\varepsilon\omega} \tag{6}$$

Literature Review:

Several authors have previously investigated the associated hygrothermoelastic problems. Chang and Weng [4] proposed a linear hygrothermoelastic theory to analyse transient responses in an axisymmetric double-layer annular cylinder subjected to hygrothermal loading using the Hankel transform method. Sugano [5] obtained analytical solutions for the heat and moisture equation and associated hygrothermal stress in a functionally graded material plate under the prescribed surface temperature and moisture load. Chiba and Sugano [6] analysed transient heat and moisture diffusion and the resulting hygrothermal stress field in a layered plate subjected to hygrothermal loadings at the external surfaces. Brischetto [7] examined the hygrothermal loading effects in the bending of two-dimensional multilayered composite plates on Carrera's Unified formulation framework. Ishihara et al. [8] formulated and quantified the hygrothermal field in porous media exposed to heat and moisture, considering nonlinear coupling. Saadatfar and Aghaie-Khafri [9] studied static behaviour of a functionally graded magneto-electro-elastic hollow sphere subjected to hygrothermal loading in the spherically symmetric state. Ensour [10] presented the interaction of electric potentials, electric displacement and elastic deformations to describe the hygrothermal responses in inhomogeneous piezoelectric hollow cylinders subjected to mechanical load and electric potential. Zhao et al. [11] proposed the steady-state solution for three-dimensional hygrothermoelastic media based on the potential theory methodology. Previously published papers exposed the static and dynamic characteristics of composite or smart material structures to the hygrothermal environment.

Recently, a few papers have been published using time-fractional hygrothermoelasticity theory to study the effects of temperature and moisture concentrations on the material properties under hygrothermal load. Benkhedda et al. [12] evaluated the hygrothermoelastic stress in composite plates during moisture desorption, taking into account the change of mechanical characteristics induced by temperature and moisture variation. Zhang and Li [13] formulated fractional hygrothermoelasticity theory within the framework of fractional calculus by coupling the classical Fourier's and Fick's laws to anomalous diffusion, which is characterised by the time-fractional diffusion-wave equation. Peng et al. [14] presented a hyperbolic diffusion law with different phase lags of thermal and moisture fluxes to simulate coupled heat-moisture diffusion-propagation behaviour and studied transient hygrothermal and elastic response of an infinitely long cylinder subjected to sudden

hygrothermal loadings. Zhang et al. [15] proposed a hygrothermal elastic problem within the framework of time-fractional calculus theory for a centrally symmetric sphere subjected to physical heat and moisture flux at its surface by using the integral transform method. Very recently, Zhang et al. [16] investigated the time-fractional diffusion-wave equations introduced to describe the coupled heat conduction and moisture diffusion in a hollow pipe using the separation of variables and the Laplace transform.

Conclusion:

During the literature review, it was noted that most of the papers on hygrothermoelasticity were taken to derive the temperature, moisture, displacement, and stresses in different types of solid due to hygro-thermal taken for different structures. Few investigations were cited so far to determine the temperature, moisture, displacements, and stresses for composite multilayered bodies. The theoretical and experimental studies of the heated structural profile have been of considerable practical importance in various fields such as mechanical, aerospace, and food engineering throughout the past years. The further analysis of such hygrothermoelastic problems may, as it seems, stimulate the evaluation of methods. Hence, the rigorous study of hygrothermoelastic behaviour of composite homogenous and nonhomogeneous of different bodies with or without an internal heat source is strongly desired.

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Analysis of Thermoelastic Large Deflection Bending in Elliptic Plate on Elastic Foundation due to Thermal Loading

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Abstract

In this paper, the three-dimensional transient asymmetric heat conduction equation comprised of internal source and sectional thermal flux outflow decreasing linearly with time from the surface on an elliptical plate is analysed by means of Laplace integral technique. The associated large deflection of a plate placed on the elastic foundation is formulated from the potential energy equation neglecting the second strain invariant and its expression is obtained in the form of Mathieu functions. The numerical calculations of the distribution of the transient temperature, thermal deflection and the maximum normal bending stress are carried out on the outer elliptical boundary and illustrated graphically. Finally, the corresponding results for circular plates have been presumed when the ellipse degenerates to a circle. The results reveal that the highest tensile stress exists on the major axis of the circular core relative to the elliptical core, which suggests the propagation of low heating due to inadequate heat penetration into the elliptical surface.

Keywords: *Temperature distribution, large deflection, Berger, elliptical, Mathieu function, bending moments, stresses*

1. Introduction

As a result of the increased construction materials are considered in engineering application under server load intensity or thermal environments, the interest in elliptical objects with thermoelastic problems has grown considerably. An extensive investigation has been done on small and large deflections of the plate on an elastic foundation based on the linear theory of elasticity due to its practical interest of their wide applications in structures. The determination of large deflection and its associated bending stress of plates, especially of thin plates, are of vital importance in the design of machine structures, because of excessive deflection may cause undesirable thermal stress. It is well known that the classical large deflection of thin plate problems is very complicated and usually lead to the non-linear differential equation which is difficult to solve exactly.

In this regard, Berger [1] neglected the second invariant from the potential energy equation and was able to furnish a simple fourth-order differential equation. However, there doesn't seem to be any physical justification for this approximation. But in comparison of the outcomes with known solutions indicates that it has a broad scope in simplifying the problem; thus, Berger's approach yields adequately accurate results [2]. Previously also few authors have obtained a large deflection based on the total strain energy concept devised by Berger. Even few reports have been based on the calculus of variation [3], Hamilton's principle [4], and many others have performed large deflection studies for different objects [5, 6] and for various materials [7, 8]. It is also observed that few authors [3, 9] have investigated the large deflection solution when the plates on an elastic foundation are uniformly heated. Recently, Horibe and Asano [10] proposed a solution for the large deflection of beams resting on Pasternak type elastic foundation. Bhad et al. [11,12] have investigated thermoelastic deflection for the elliptic plate, and Dhakate et al. [13] performed thermal stress analysis on an annular sector plate using integral transform techniques.

A brief overview of the theoretical work with the bending analysis on elastic foundations insights of various approximate methods is cited below. Addou et al. [14] used a basic quasi three-dimensional hyperbolic theory to examine the influence of Winkler / Pasternak / Kerr base and porosity on the dynamic behavior of functionally graded plates. Chaabane et al. 2019 [15] used a hyperbolic shear deformation theory to present an analysis of the static and dynamic actions of simply supported functionally graded beams resting on the elastic

base utilizing the method of Hamilton. Mahmoudi et al. [16] derived the governing equations using the principle of virtual displacements, and a refined quasi-threedimensional shear deformation theory has been developed for the thermo-mechanical study of functionally graded sandwiched plates resting on a two-parameter elastic base. Kaddari et al. [17] introduced a new kind of quasi three-dimensional hyperbolic shear deformation theory to address static and free vibration of dynamically graded, elastic-based porous surfaces in which the equations of motion have been derived from the Hamilton principle. Bourada et al. [18] obtained the analytical solutions of the buckling and free vibrational behaviors using the theory of Hamilton and the Navier method. They performed the dynamic and stability analysis of the simply supported single-walled Carbon Nanotubes reinforced concrete beam on elastic-foundation using an integral first-order shear deformationbeamprinciple. Abualnour et al. [19] proposed a novel displacement field to investigate the thermo-mechanical bending action of the antisymmetric cross-ply laminates. Quite recently, few scholars such as Bousahla et al. [20], Bellal et al. [21] and Shariati et al. [22] investigated the structural behaviors of plate resting on elastic foundation using integralfirst shear deformation theory or four variable trigonometric integral plate theory. In the above articles, the aim was to increase the structural support's load-bearing ability either by finding the supports or by adjusting the rigidity. Compared to the freely hinged extreme or simply supported boundaries or point-supported surfaces, the studies on the bending analysis on elastic foundations were limited due to the mathematical difficulties in handling more complicated boundary conditions, and generally, numerical methods have been applied in these studies.

The most recent literature, the research on thermal bending effect was conducted by several scholars, which can be summarized as given below. Eltaher et al. [23] derived the governing equations using Hamilton's principle to study the combined effects of nonlocal elasticity and surface properties on static and vibration characteristics of piezoelectric nano-beams and solved it numerically using the finite-element method. Belbachir et al. [24] used the principle of virtual work to obtain governing equations. They discussed a refined plate theory to explain the reaction of antisymmetric cross-ply laminated plates undergoing uniform nonlinear thermo-mechanical loading. Zarga et al. [25] determined the governing equations based on the principle of virtual work and used the basic theory of quasi-3D shear deformation to study the thermo-mechanical bending of functionally graded material sandwich boards. Belbachir et al. [26] performed the flexural analysis of antisymmetric cross-ply laminated plates under nonlinear thermal loading using a refined plate theory with four variables. Matouk et al. [27] used a novel integral Timoshenko beam theory to analyze the free vibrational action of the functionally graded nano-beams incorporated into the hygro-thermal system and reposed on the elastic base. Refrafi et al. [28] used a novel shear deformation hypothesis to analyze the hygrothermal and mechanical buckling responses of simply supported functionally graded sandwich plate seated on Winkler-Pasternak elastic base. Tounsi et al. [29] proposed a simple four-variable trigonometric integral shear deformation model to study the static behavior of advanced functionally graded ceramic-metal plates supported by a two-parameter elastic foundation. Boussoula et al. [30] developed the governing equations based on the principle of virtual work to perform thermomechanical flexural analysis of functionally graded material sandwich plates. A new principle of refined trigonometric shear deformation is used by Chikr et al. [31] to analyze the buckling nature of material sandwich plates centered on a twoparameter elastic structure under various boundary conditions by applying the theory of abstract displacements. The best approach for solving these problems can be through both theoretical and computational methods. But due to either non-availability or mathematical complexity, numerical solutions are still favored and widespread in practice. It is also noted that previous researchers have not considered the transient distribution of temperature during their thermoelastic bending analysis, captivating the plate mainly in elliptic coordinates.

From the above point of view, this paper is concerned with the analysis for thermalbending maximum stresses of an elliptic plate of uniform thickness, in such a way that the origin coincides with the centee of the plate and the axes are along the major and minor axis of ellipse respectively. In this paper, an elliptical plate placed on the elastic foundation of Winkler type is considered. The foundation is assumed to be such that its reaction is proportional to the deflection. During the problem formulation, we have initially investigated the problem from a different point of view by incorporating inside a thermal source of heat at a rate of

$(\lambda / K)\exp(-\beta t)$ per unit volume in a temperature field differential equation and a thermal flux $(Q_0 / K)(1-\nu t)$ outflow decreasing linearly with time. In the second part following Berger's method, the evaluation of large deflection of a heated clamped plate placed on the elastic foundation has been investigated under transient temperature distribution. Finally, the thermal maximum stress components are obtained based on the concept that bending stresses are distributed linearly over the thickness of the plate. Furthermore, the method is applicable to the bending of the circular plate, which has been deduced when the ellipse degenerates to a circle.

2. Basic thermoelastic deflection formulation

The potential energy obtained taking in account the strain energy due to thermal bending and stretching in mid-surface during transient temperature change is given as

$$V = \frac{D}{2}\iint_s \left\{ \left[(\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 \right] - 2(1-\upsilon)\left[\frac{12}{l^2} e_2 + \frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{k}{D} W^2 \right\} ds \qquad (1)$$
$$- \frac{E\alpha_t}{1-\upsilon}\iint_s \int_{-l/2}^{l/2} (e_1 - z\nabla^2 W)\,\tau\, dsdz$$

in which W is the lateral displacement, D the flexural rigidity, E Young's modulus, α_t the coefficient of thermal expansion, υ is Poisson ratio, k is the reaction of foundation per unit area per unit deflection, ∇^2 is a Laplacian operator in Cartesian coordinate, s the surface under consideration, e_1 is first invariant and e_2 is second invariant, respectively, and is represented as

$$\nabla^2 = \frac{\partial^2}{\partial x^2} + \frac{\partial^2}{\partial y^2}, \qquad ds = dxdy, \qquad e_1 = e_x + e_y, \qquad e_2 = e_x e_y - \gamma_{xy}^2 / 4,$$

$$e_x = \frac{\partial u}{\partial x} + \frac{1}{2}\left(\frac{\partial W}{\partial x} \right)^2, \qquad e_y = \frac{\partial u}{\partial y} + \frac{1}{2}\left(\frac{\partial W}{\partial y} \right)^2, \qquad \gamma_{xy} = \frac{\partial u}{\partial x} + \frac{\partial u}{\partial y} + \frac{\partial W}{\partial x}\frac{\partial W}{\partial y}$$

with u and v is the in-plane displacement in cartesian coordinate (x, y).

By adding potential energy due to the thermal load and of the foundation reaction to the energy expression of Eq. (1) and neglecting the terms containing the second strain invariant, the modified energy expression becomes

$$V = \frac{D}{2}\iint_s \left\{ (\nabla^2 W)^2 + \frac{12}{l^2} e_1^2 - 2(1-\upsilon)\left[\frac{\partial^2 W}{\partial x^2}\frac{\partial^2 W}{\partial y^2} - \left(\frac{\partial^2 W}{\partial x \partial y} \right)^2 \right] + \frac{\kappa}{D} W^2 \right\} dx\, dy \qquad (2)$$
$$- \frac{1}{1-\upsilon}\iint_s [e_1 N_T - \nabla^2 W M_T]\, ds$$

Applying Euler's variational [32] equations to Eq. (2), one yield

$$\nabla^4 W - \alpha^2 \nabla^2 W + \frac{\kappa}{D} W = -\frac{12\alpha}{l^3}\nabla^2 M_T \qquad (3)$$

in which M_T is bending resultant moment, N_T is a resultant force, $\alpha^2 = 12e_1 / l^2$ is a normalised constant of integration.

3. Formulation of the Problem

It is well known that elliptical-cylindrical coordinates (ξ,η) are the most appropriate for elliptic boundary conditions that are expressed in rectangular coordinates which are maintaining the relationship $x+iy=c\cosh(\xi+i\eta)$. into

$$x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z \tag{4}$$

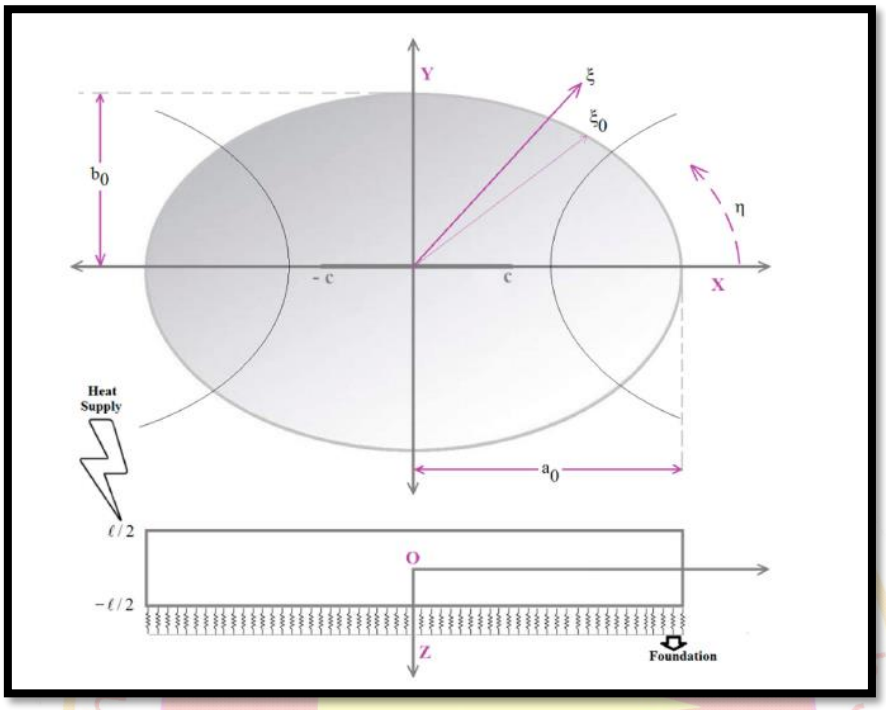

Fig.1 Elliptic plate geometry on an elastic foundation

in which $\xi=$ represents the family of confocal ellipses, $\eta=$ represents the family of confocal hyperbolas and they both in the form of curves interacts each other orthogonally at each instant. Here c being an interfocal distances between two foci of the ellipse and defined as $2c=2(a_0^2-b_0^2)^{1/2}$ with a_0 is the diameter along a semimajor axis and b_0 a diameter along the semiminor axis. The parameter ξ defines the interfocal line having the range $\xi\in(0,\xi_o)$, $\xi_o=\tanh^{-1}(b_o/a_o)$ and the parameter η is taken as $\eta\in(0,2\pi)$, as shown in Figure 1.

3.1 Temperature distribution

The modified form of the heat conduction differential equation in the non-simple in accordance with the first law of thermodynamics takes the following form

$$h^2\left(\frac{\partial^2T}{\partial\xi^2}+\frac{\partial^2T}{\partial\eta^2}\right)+\frac{\partial^2T}{\partial z^2}=\frac{1}{\kappa}\frac{\partial T}{\partial t}-\left(\frac{\xi_0}{2\pi l}\right)\frac{\lambda}{K}\exp(-\beta t) \tag{5}$$

subjected to the initial and thermal boundary conditions

$$T\big|_{t=0}=T\big|_{\xi=\xi_0}=T\big|_{z=-l/2}=0 \tag{6}$$

$$T\big|_{z=l/2}=-(Q_0/K)(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{7}$$

in which $T=T(\xi,\eta,z,t)$ is the temperature distribution, $\tau=T-T_i$ the temperature change with $T_i=T_i(\xi,\eta,z,t)$ is the initial temperature at $t=0$, $h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta)$ the scalar factor,

$f(\xi,\eta,t) = -(Q_0/K)(1-\nu t)\ h^2(\cosh^2\xi - \cos^2\eta)^{1/2}$ denoted the prescribed surface temperature (i.e. sectional heat supply source) on the upper face, Q_0 is constant heat flux intensity, ν the uniform speed, β represents the surface reflectance, λ is the absorption coefficient of the material, and $\kappa = K/\rho C_V$ representing thermal diffusivity in which K is the thermal conductivity of the material, ρ is the density, and C_V is the calorific capacity, respectively.

3.2 **Transient thermal bending stress**

The resultant bending moments per unit width is given [11] as

$$M_\xi = -Dh^2\left\{\left(\frac{\partial^2 W}{\partial\xi^2}+\nu\frac{\partial^2 W}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon}$$

$$M_\eta = -Dh^2\left\{\left(\upsilon\frac{\partial^2 W}{\partial\xi^2}+\frac{\partial^2 W}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial W}{\partial\eta}\right\}-\frac{M_T}{1-\upsilon} \quad (8)$$

$$M_{\xi\eta} = D(1-\upsilon)h^2\left\{\frac{\partial W}{\partial\xi}\sin 2\eta+\frac{\partial W}{\partial\eta}\sinh 2\xi-\frac{\partial^2 W}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right\}$$

The maximum normal bending stresses are distributed linearly over the thickness of the plate is

$$\sigma_{\xi\xi} = \left[\frac{M_{\xi\xi}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\eta\eta} = \left[\frac{M_{\eta\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2}, \sigma_{\xi\eta} = \left[\frac{M_{\xi\eta}}{\lambda^2/6}\right]\frac{z}{\lambda/2} \quad (9)$$

The resultant moment and resultant force are represented as

$$M_T = \alpha E\int_{-1/2}^{1/2} z\tau(z)dz,\ N_T = \alpha E\int_{-1/2}^{1/2}\tau(z)dz \quad (10)$$

The boundary condition of the clamped plate is given as

$$W(\xi,\eta,t)\big|_{\xi=\xi_0} = \left.\frac{\partial W(\xi,\eta,t)}{\partial\xi}\right|_{\xi=\xi_0} = 0 \text{ for all } t \quad (11)$$

The Eqs (1) to (11) constitute the mathematical formulation under consideration.

4. **Solution to the problem**

4.1 **Solution for the temperature distribution**

Taking Laplace transform of Eqs. (5)-(7), one gets

$$h^2\left(\frac{\partial^2\bar{T}}{\partial\xi^2}+\frac{\partial^2\bar{T}}{\partial\eta^2}\right)+\frac{\partial^2\bar{T}}{\partial z^2}-\frac{s}{\kappa}\bar{T} = -\frac{\lambda}{K}\frac{1}{s+\beta} \quad (12)$$

$$\bar{T}\big|_{\xi=\xi_0} = \bar{T}\big|_{z=-1/2} = 0 \quad (13)$$

$$\bar{T}\big|_{z=1/2} = -\frac{Q}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \quad (14)$$

in which $\bar{T}(\xi,\eta,z,p)$ is the transformed function of $T(\xi,\eta,z,t)$ and p the Laplace parameter.

Now to obtain the solution to Eq. (12), we assume

$$\bar{T} = \left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty} C_{2n}Ce_{2n}(\xi,q)ce_{2n}(\eta,q) \text{ with } Ce_{2n}(\xi_0,q)=0 \text{ at } \xi=\xi_0 \quad (15)$$

in which $q=\alpha_{2n,m}c^2/4$, C_{2n} will be determined from the nature of sectional heat supply prescribed on the upper face, $ce_{2n}(\eta,q)$ is the ordinary Mathieu function of the first kind of order n and $Ce_{2n}(\xi,q)$ is the modified Mathieu function of the first kind of order n, and denoted [33] as

$$ce_{2n}(\eta,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cos 2r\eta,\ Ce_{2n}(\xi,q)=\sum_{r=0}^{\infty}A_{2r}^{(2n)}\cosh 2r\xi \tag{16}$$

with A's being the function of q. Now as q has those values $q_{2n,m}$ which makes $Ce_{2n}(\xi_0,q)$ zero and thus $\alpha_{2n,m}$ depends on m and n.

Hence Eq. (15) can be rewritten as

$$\bar{T}=\left(z+\frac{1}{2}\right)\frac{\lambda\kappa}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{17}$$

which satisfies both boundary condition of Eq. (13).

Now we consider the Eq. (14) using Eq. (17) as

$$\frac{\lambda\kappa l}{p(p+\beta)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})=-\frac{Q_0}{K}\left(\frac{1}{p}-\frac{\alpha}{p^2}\right)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{18}$$

Using inversion transform of t on Eq. (18), one yield

$$\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})=-\frac{Q_0}{K}(1-\nu t)h^2(\cosh^2\xi-\cos^2\eta)^{1/2} \tag{19}$$

Now multiplying Eq. (19) on both sides by $Ce_{2p}(\xi,q_{2p,r})ce_{2p}(\eta,q_{2p,r})(\cosh 2\xi-\cos 2\eta)$ and integrating with respect to η from limits 0 to 2π, and with respect to ξ from 0 to ξ_0. Then by the orthogonal property [33], all terms vanish when $p=n,\ r=m.$

Hence, C_{2n} depends on m as well as on n and further simplifying by taking $h\cosh\xi_0=a$ and $e<1$ as the eccentricity, and considering the theory of uniform convergence, one yield

$$C_{2n}=\frac{-\frac{2a\pi Q}{K}(1-\nu t)h^2\int_0^{\xi_0}Ce_{2n}(\xi,q_{2n,m})\left[A_0^{2n}\left(1-\frac{e^2}{2^2}-\ldots\right)+A_2^{2n}\left(\frac{-e^2}{24}\ldots\right)+\ldots\right]\cosh 2\xi d\xi}{\frac{\lambda\kappa l}{\beta}[1-\exp(-\beta t)]\int_0^{\xi_0}Ce_{2n}^2(\xi,q_{2n,m})[\cosh 2\xi-\Theta_{2n,m}d\xi} \tag{20}$$

Again applying the rules of the Laplace inversion theorem to Eq. (17), one arrives at the required expression for temperature change stated above as

$$\tau=T=\frac{\lambda\kappa}{\beta}[1-\exp(-\beta t)]\left(z+\frac{1}{2}\right)\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{21}$$

4.2 **Solution for the thermal displacement**

Substituting Eq. (21) into Eq. (10), one obtains

$$M_T=\frac{\lambda\kappa l^3}{12\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}C_{2n}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m}) \tag{22}$$

$$N_T = \frac{\lambda\kappa l^2}{2\beta}[1-\exp(-\beta t)]\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (23)$$

Now considering Eq. (3) in elliptic coordinate and taking Eq. (22) in the account, one obtains

$$\nabla_1^4 W - \alpha^2\nabla_1^2 W + \frac{\kappa}{D}W + \frac{\alpha\lambda\kappa}{\beta}[1-\exp(-\beta t)]\nabla_1^2\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) = 0 \quad (24)$$

in which ∇_1 is the two-dimensional Laplacian operator in (ξ,η).

In order to find the complete solution of above Eq. (24), one must obtain a solution that comprised of complementary function and the particular integral which satisfies the boundary conditions given in Eq. (11). To obtain the complementary function of Eq. (24) which can be represented as

$$\nabla_1^4 W_c - \alpha^2\nabla_1^2 W_c + \frac{\kappa}{D}W_c = (\nabla_1^2 + \delta_1^2)(\nabla_1^2 - \delta_2^2)W_c = 0 \quad (25)$$

where

$\delta_1^2 + \delta_2^2 = -\alpha^2$

and

$\delta_1^2\delta_2^2 = -\kappa / D$.

Thus, we assume a solution as

$$W_c = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + \sum_{n=0}^{\infty}\sum_{m=1}^{\infty} B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2)ce_{2n}(\eta, -q_{2n,m}^2) \quad (26)$$

in which $q_{2n,m}^i = c^2\delta_i^2/4\ (i=1,2)$, A_{2n} and B_{2n} are constants is determined using boundary conditions given in Eq. (11) as

$$A_{2n} = \frac{1}{2\pi A_0^{2n}\phi_1},\ B_{2n} = \frac{1}{2\pi A_0^{2n}\phi_2} \quad (27)$$

in which

$$\phi_1 = Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2) - C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2),$$

$$\phi_2 = C'e_{2n}(\xi_0, q_{2n,m}^1)Ce_{2n}(\xi_0, -q_{2n,m}^2) - Ce_{2n}(\xi_0, q_{2n,m}^1)C'e_{2n}(\xi_0, -q_{2n,m}^2)$$

and the prime dash represents the differentiation with respect to the variable ξ.

The particular integral of Eq. (24) can be obtained as

$$W_p = -\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]}{\beta(\alpha_{2n,m}-\delta_2^2)(\alpha_{2n,m}-\delta_1^2)}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty} C_{2n}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \quad (28)$$

Thus, the complete solution of Eq. (24) can be obtained by adding Eqs. (26) and (28).

$$W = \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle\{A_{2n}Ce_{2n}(\xi, q_{2n,m}^1)ce_{2n}(\eta, q_{2n,m}^1) + B_{2n}Ce_{2n}(\xi, -q_{2n,m}^2) \times ce_{2n}(\eta, -q_{2n,m}^2)\} - B_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle \quad (29)$$

In order to determine the α, the first invariant e_1 is transformed to elliptic coordinates as

$$h_\xi h_\eta\left[\frac{\partial}{\partial\xi}\left(\frac{u_\xi}{h_\eta}\right) + \frac{\partial}{\partial\eta}\left(\frac{u_\eta}{h_\xi}\right)\right] + \frac{h_\xi h_\eta}{2}\left[\left(\frac{\partial W}{\partial\xi}\right)^2 + \left(\frac{\partial W}{\partial\eta}\right)^2\right] = \frac{\alpha^2 h^2}{12} + (1+\upsilon)\alpha_t\tau \quad (30)$$

in which the scale factors is given as $h_\xi = h_\eta = (1/c)(\sinh^2\xi + \sin^2\eta)^{1/2}$, $h_z = 1$.

Here u_ξ and u_η are the displacement in elliptical coordinates with $u_\xi = 0$ at $\eta = \pi/2$, $\xi = \xi_0$ and $u_\eta = 0$ at $\eta = 0$, $\xi = \xi_0$, thus the first term reduces to zero.

Now integrating the reduced Eq. (30), one yield

$$\alpha = \frac{1}{ch}\left\{\frac{6}{\phi_3}\int_0^{2\pi}\int_0^{\xi_0}\left[\left(\frac{\partial W}{\partial \xi}\right)^2 + \left(\frac{\partial W}{\partial \eta}\right)^2\right] d\xi d\eta - 2\phi_3(1+\upsilon)\alpha_t \tau\right\}^{1/2} \tag{31}$$

where

$\phi_3 = \pi \cosh 2\xi_0 \sinh \xi_0$.

4.3 **Solution for the resultant bending moments per unit width**

Substituting Eq. (29) into Eq. (8), one obtains

$$\begin{aligned}
M_\xi = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\
& + \upsilon Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) - A_{11}\{\sinh 2\xi \\
& \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\
& \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\
& + \upsilon Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) - A_{11}\{\sinh 2\xi \\
& \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\
& \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\
& + \upsilon Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) - A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\
& \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\
& - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle
\end{aligned} \tag{32}$$

$$\begin{aligned}
M_\eta = -Dh^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\upsilon Ce''_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\
& + Ce_{2n}(\xi, q^1_{2n,m})ce''_{2n}(\eta, q^1_{2n,m}) + A_{11}\{\sinh 2\xi \\
& \times Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q^1_{2n,m}) \\
& \times ce'_{2n}(\eta, q^1_{2n,m})\}\} + B_{2n}\{\upsilon Ce''_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) \\
& + Ce_{2n}(\xi, -q^2_{2n,m})ce''_{2n}(\eta, -q^2_{2n,m}) + A_{11}\{\sinh 2\xi \\
& \times Ce'_{2n}(\xi, -q^2_{2n,m})ce_{2n}(\eta, -q^2_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, -q^2_{2n,m}) \\
& \times ce'_{2n}(\eta, -q^2_{2n,m})\}\} - B_{11}\{\upsilon Ce''_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\
& + Ce_{2n}(\xi, q_{2n,m})ce''_{2n}(\eta, q_{2n,m}) + A_{11}\{\sinh 2\xi Ce'_{2n}(\xi, q_{2n,m}) \\
& \times ce_{2n}(\eta, q_{2n,m}) - \sin 2\eta Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\} \\
& - C_{11}Ce_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m})\Big\rangle
\end{aligned} \tag{33}$$

$$\begin{aligned}
M_{\xi\eta} = D(1-\upsilon)h^2 \sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle & A_{2n}\{\sin 2\eta Ce'_{2n}(\xi, q^1_{2n,m})ce_{2n}(\eta, q^1_{2n,m}) \\
& + Ce_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\sinh 2\xi - (\cosh 2\xi - \cos 2\eta) \\
& \times Ce'_{2n}(\xi, q^1_{2n,m})ce'_{2n}(\eta, q^1_{2n,m})\} + B_{2n}\{\sin 2\eta Ce'_{2n}(\xi, -q^2_{2n,m}) \\
& \times ce_{2n}(\eta, -q^2_{2n,m}) + \sinh 2\xi Ce_{2n}(\xi, -q^2_{2n,m}) \\
& \times ce'_{2n}(\eta, -q^2_{2n,m}) - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, -q^2_{2n,m}) \\
& \times ce'_{2n}(\eta, -q^2_{2n,m})\} - B_{11}\{\sin 2\eta Ce'_{2n}(\xi, q_{2n,m})ce_{2n}(\eta, q_{2n,m}) \\
& + \sinh 2\xi Ce_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m}) \\
& - (\cosh 2\xi - \cos 2\eta)Ce'_{2n}(\xi, q_{2n,m})ce'_{2n}(\eta, q_{2n,m})\}\Big\rangle
\end{aligned} \tag{34}$$

where

$$A_{11}=\frac{1-\upsilon}{\cosh 2\xi-\cos 2\eta},\quad B_{11}=\frac{\alpha\lambda\kappa[1-\exp(-\beta t)]C_{2n}}{\beta(\alpha_{2n,m}-\delta_2^2)(\alpha_{2n,m}-\delta_1^2)},\quad C_{11}=\frac{\lambda\kappa l^3[1-\exp(-\beta t)]C_{2n}}{12(1-\upsilon)\beta}.$$

4.4 Solution for the thermal bending stress

Substituting Eqs. (32)-(34) into Eq. (9), one obtains

$$\begin{aligned}\sigma_{\xi\xi}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\upsilon Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+\upsilon Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+\upsilon Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})-A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{35}$$

$$\begin{aligned}\sigma_{\eta\eta}=&-\frac{12Dh^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\upsilon Ce_{2n}''(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}''(\eta,q_{2n,m}^1)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)-\sin 2\eta Ce_{2n}(\xi,q_{2n,m}^1)\\&\times ce_{2n}'(\eta,q_{2n,m}^1)\}\}+B_{2n}\{\upsilon Ce_{2n}''(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)\\&+Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}''(\eta,-q_{2n,m}^2)+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}(\eta,-q_{2n,m}^2)-\sin 2\eta Ce_{2n}(\xi,-q_{2n,m}^2)\\&\times ce_{2n}'(\eta,-q_{2n,m}^2)\}\}-B_{11}\{\upsilon Ce_{2n}''(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\\&+Ce_{2n}(\xi,q_{2n,m})ce_{2n}''(\eta,q_{2n,m})+A_{11}\{\sinh 2\xi\\&\times Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})-\sin 2\eta Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})\}\}-C_{11}Ce_{2n}(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})\Big\rangle\end{aligned}\tag{36}$$

$$\begin{aligned}\sigma_{\xi\eta}=&\frac{12D(1-\upsilon)h^2z}{l^3}\sum_{n=0}^{\infty}\sum_{m=1}^{\infty}\Big\langle A_{2n}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}(\eta,q_{2n,m}^1)\\&+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)-(\cosh 2\xi-\cos 2\eta)\\&\times Ce_{2n}'(\xi,q_{2n,m}^1)ce_{2n}'(\eta,q_{2n,m}^1)\}+B_{2n}\{\sin 2\eta Ce_{2n}'(\xi,-q_{2n,m}^2)\\&\times ce_{2n}(\eta,-q_{2n,m}^2)+\sinh 2\xi Ce_{2n}(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\\&-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,-q_{2n,m}^2)ce_{2n}'(\eta,-q_{2n,m}^2)\}\\&-B_{11}\{\sin 2\eta Ce_{2n}'(\xi,q_{2n,m})ce_{2n}(\eta,q_{2n,m})+\sinh 2\xi Ce_{2n}(\xi,q_{2n,m})\\&\times ce_{2n}'(\eta,q_{2n,m})-(\cosh 2\xi-\cos 2\eta)Ce_{2n}'(\xi,q_{2n,m})ce_{2n}'(\eta,q_{2n,m})\}\Big\rangle\end{aligned}\tag{37}$$

5. Transition to the circular plate

When the elliptical plate tends to a circular plate of radius a, the semi-focal $c\to 0$ and therefore α_m is the roots of the transcendental equation $J_0(\alpha_m)=0.$

Also $e \to 0$ [as $\xi \to \infty$], $\cosh 2\xi\, d\xi \to 2\cosh 2\xi \sinh 2\xi\, d\xi \to 2rdr/l^2$, $\sinh\xi \to \cosh\xi$, $\mathrm{h}\cosh\xi \to r$ [as $h \to 0$], $\cosh\xi\, d\xi \to r\, dr$, $\mathrm{h}\sinh\xi\, d\xi \to dr$.

Using results from [33]

$Ce_0(\xi, q_{0,m}) \to p_0' J_0(\lambda_m r)$, $Ce_0'(\xi, q_{0,m}) \to p_0' J_0'(\lambda_m r)$, $Ce_0''(\xi, q_{0,m}) \to p_0' J_0''(\lambda_m r)$, $ce_0(\eta, q_m) \to 1/\sqrt{2}$, $A_0^{(0)} \to 1/\sqrt{2}, A_2^{(0)} \to 0$, $\Theta_{2m} \to 0$, $\lambda_{0,m}^2 = \alpha_{0,m}^2 / a^2 = \alpha_m^2 / a^2 = \lambda_m^2$, $p_0' = Ce_0(0, q_{0,m})$ $ce_0(2\pi, q_{0,m}) / A_0^{(0)}$.

Eq. (21) degenerates into temperature distribution into a circular plate

$$\tau = T = \left(z + \frac{1}{2}\right) \sum_{m=1}^{\infty} C_m p_0' J_0(\lambda_m r) \tag{38}$$

in which

$$C_m = -\frac{\pi Q(1-\nu t)}{K\mathrm{l}} \left\{ \left[\int_0^a r J_0(\lambda_m r) dr \right] / \left[\int_0^a r J_0(\lambda_m r)^2 dr \right] \right\}$$

The aforementioned degenerated results agree with the results [34].

6. Numerical Results, Discussion and Remarks

Firstly, introduce the dimensionless parameter for numerical computations as follows

$$\left.\begin{aligned} &\bar{\xi} = \xi / \xi_0,\ \bar{z} = [z - (-\mathrm{l}/2)]/\xi_0,\ e = c/\xi_0, \tau = \kappa t / \xi_0^2 \\ &\bar{\theta} = T/T_0, \bar{W} = W/\alpha\theta_0\xi_0, \bar{N}_{ij} = N_{ij}/E\xi_0^3, \bar{F}_{ij} = F_{ij}/E\xi_0^2\theta_0, \\ &\bar{M}_{ij} = M_{ij}/E\xi_0^3,\ \bar{\sigma}_{ij} = \sigma_{ij}/E\alpha\theta_0 \quad (i, j = \xi, \eta) \end{aligned}\right\} \tag{39}$$

The numerical computations have been carried out for an Aluminum elliptic plate with physical parameter as ξ_0 = 1 m, $\lambda = 0.06$ m and reference temperature as 273 K.

The thermomechanical properties[34] take the form as

- Modulus of elasticity E, 70 GPa
- Thermal diffusivity κ, 84.18 m^2/s
- Poisson's ratio υ, 0.35
- Thermal expansion coefficient α, 23 x 10^{-6} / ^{o}C
- Thermal conductivity G, 204.2 W/mK

To study the results of heating on the elliptic plate, numerical calculations for all variables have been performed and the numerical calculations are seen in the following figures with the use of MATHEMATICA software. In Figures (2)-(13) explains that numerical results of the dimensionless temperature distribution, thermal deflection and its associated bending stresses of the elliptic plate under the boundary conditions and that are subjected to sectional heat supply on the upper face, the lower face at zero temperature.

Figure 2 displays the dimensionless temperature field in an elliptic plate along the radial direction for a separate fixed time. The temperature distribution is initially at zero at the right boundary (i.e. $\xi = \xi_0$), and then increases along the radial direction towards the left boundary (i.e. $\xi = 0$). It may be due to the available internal heat generation and sectional prescribed temperature. Initially, the end of the plate is at compressed state, and gradually tensile force increases towards the mid-plate.

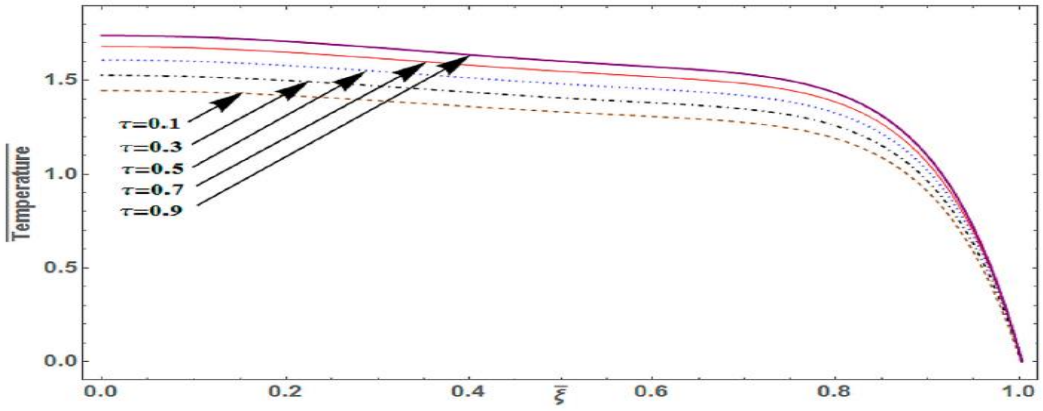

Figure 2. The dimensionless temperature in an elliptic plate along $\bar{\xi}$ *for various locations of* τ.

Figure 3 illustrates the dimensionless temperature distribution along the angular direction for different values of $\bar{\xi}$. In the central part of the elliptic plate, thermal expansion is more significant, thereby giving high tensile force, while at both endpoints, temperature decreases to the minimum. Probably, due to an internal heat source, the temperature variation is more stable, and energy storage is more responsive to the heat sources.
Figure 4 demonstrates the distribution of the temperature along the thickness direction of the plate. Due to the external heat supply, the maximum values of temperature magnitude increase from the upper face and at each instance reduces towards the axial direction; and attains minimum on the lower face at zero temperature.

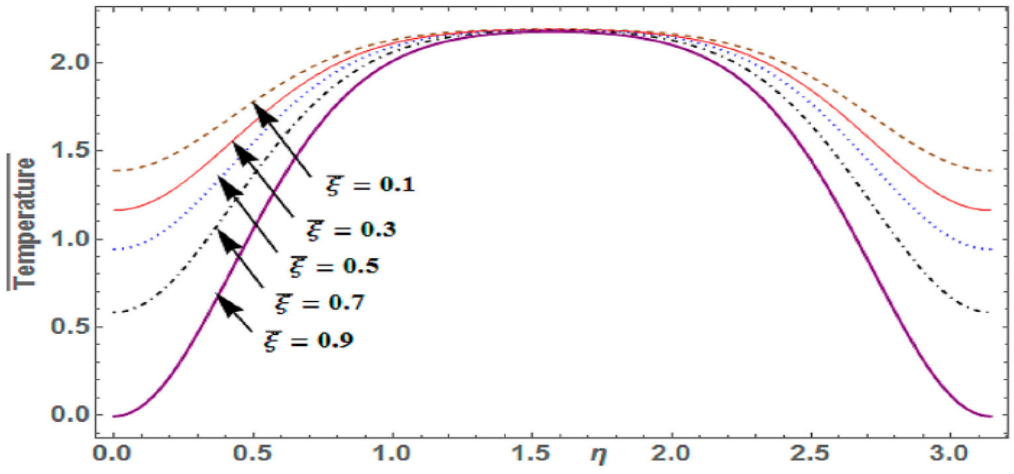

Figure 3. The temperature in an elliptic plate along η *for various locations of* $\bar{\xi}$.

Figure 5 indicates thermal deflection along the $\bar{\xi}$ direction for different values of η and fixed value of $\bar{z} = 0.06$, and reaches the outer limit at zero to satisfy the condition $\overline{W} = \partial\overline{W}/\partial\bar{\xi} = 0$ at $\bar{\xi} = \bar{\xi}_0$. The dimensionless large deflection is maximum at the center of the plate due to accumulation of heat source at the inner core. Figure 6 shows that initially, the deflection is zero at $\tau = 0$ and gradually increases along the timeline up to $\tau = 0.25$, and finally, its uniformity is attained. Figure 7 and 9 depicts the dimensionless radial $\bar{\sigma}_{\xi\xi}$ and tangential stresses $\bar{\sigma}_{\eta\eta}$ in the η direction at fixed $\bar{\xi} = 0.6$ and $\tau = 0.6$. The facts shows that radial and tangential stress achieves its highest possible tensile stress at left and right boundaries while the compressive stress is higher at the central part. The resulting finding shows that the two stress produces the same thermal effect apart from small magnitude variation.

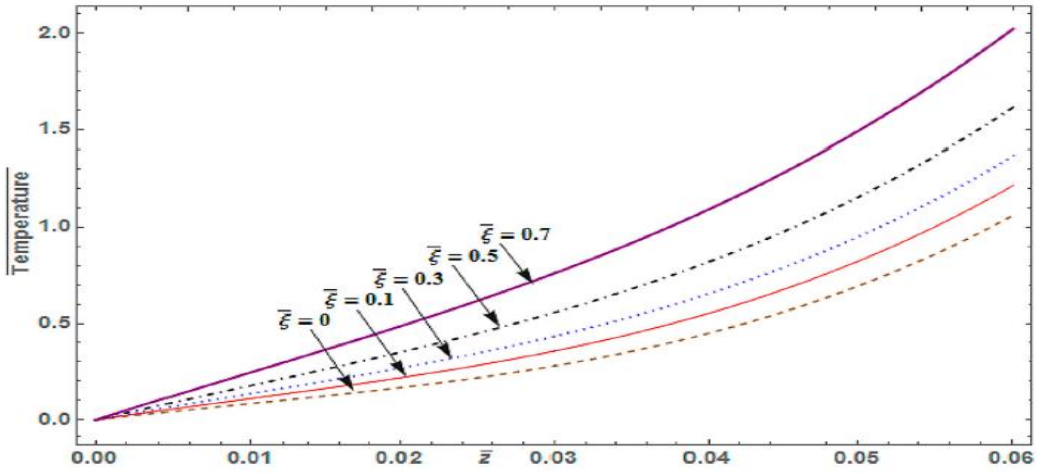

Figure 4. The dimensionless temperature in an elliptic plate along $\bar{z}$ for various locations of $\bar{\xi}$.

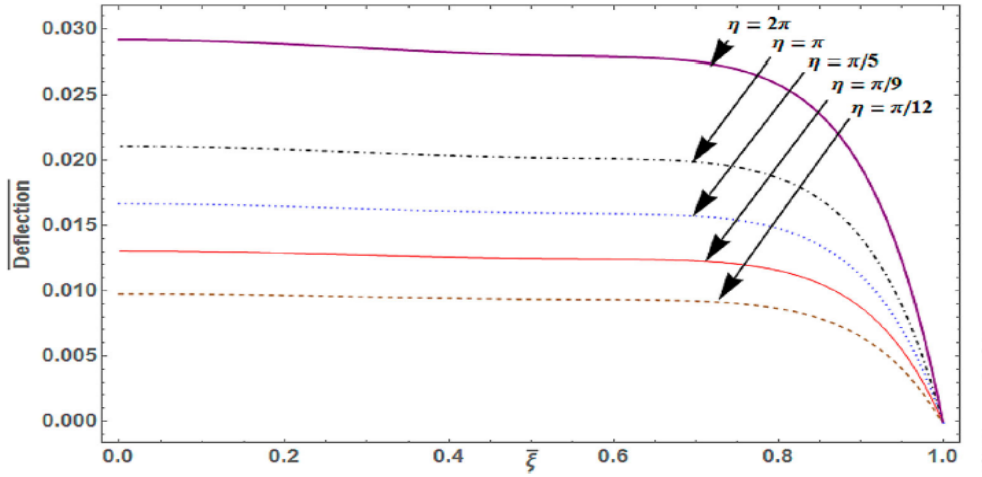

Figure 5. The dimensionless deflection along $\bar{\xi}$ for various locations of η.

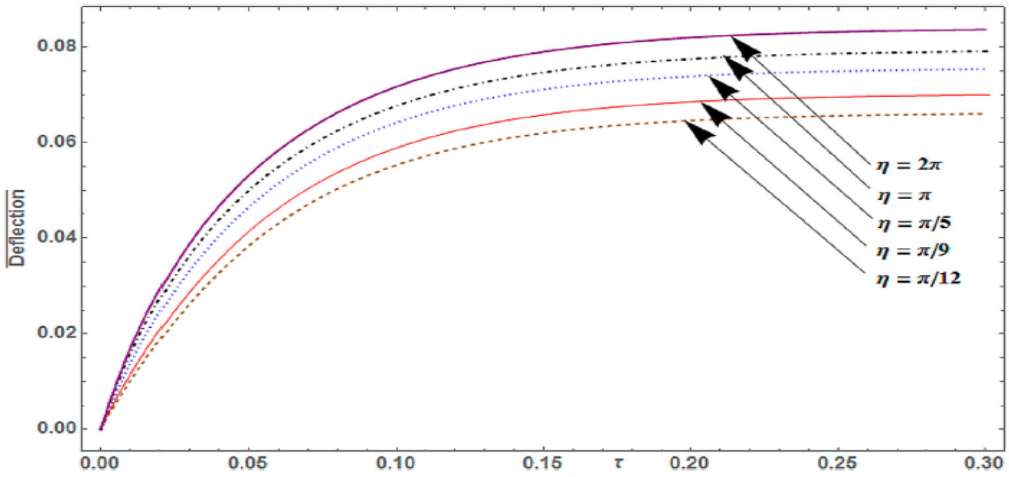

Figure 6. The dimensionless deflection along τ for various locations of η.

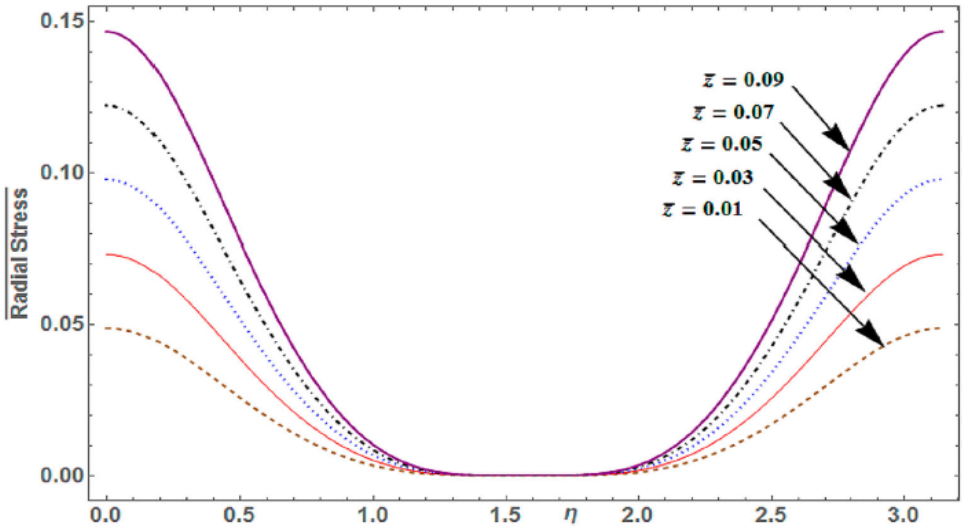

Figure 7. The dimensionless thermal radial stress along η for various locations of $\bar{z}$.

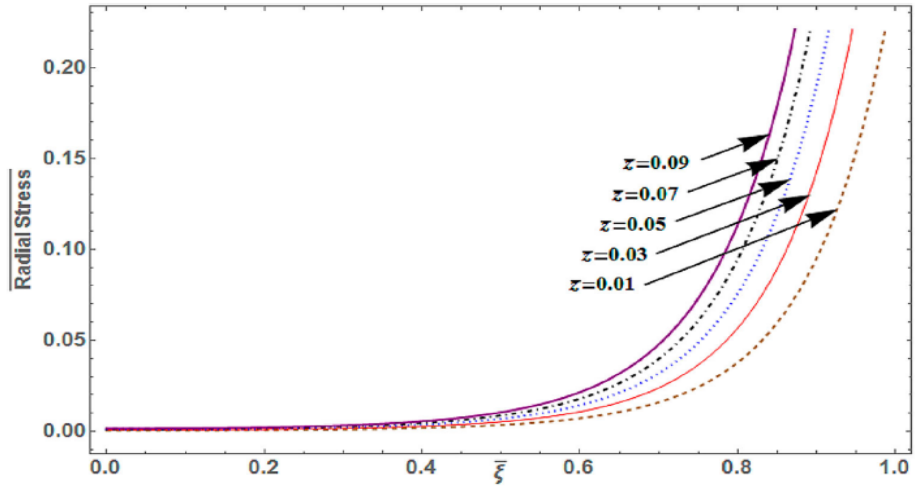

Figure 8. The dimensionless thermal radial stress along $\bar{\xi}$ for various locations of $\bar{z}$.

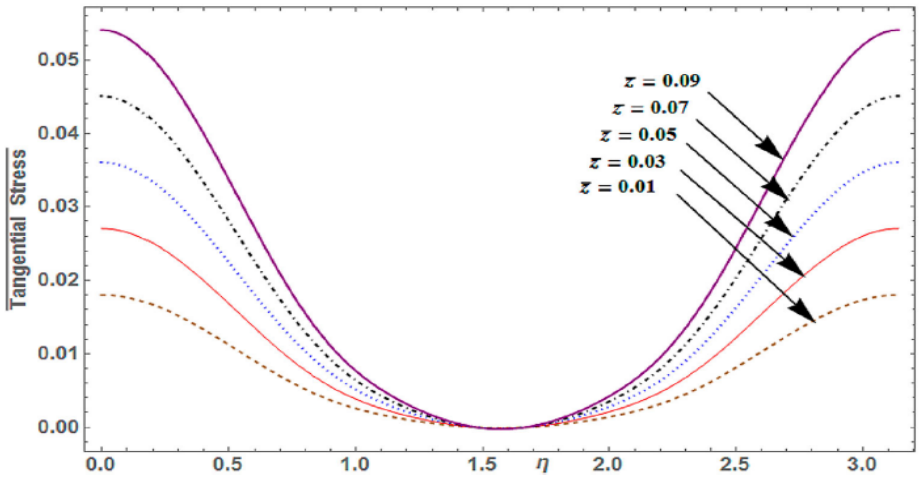

Figure 9. The dimensionless thermal tangential stress along η for various locations of $\bar{z}$.

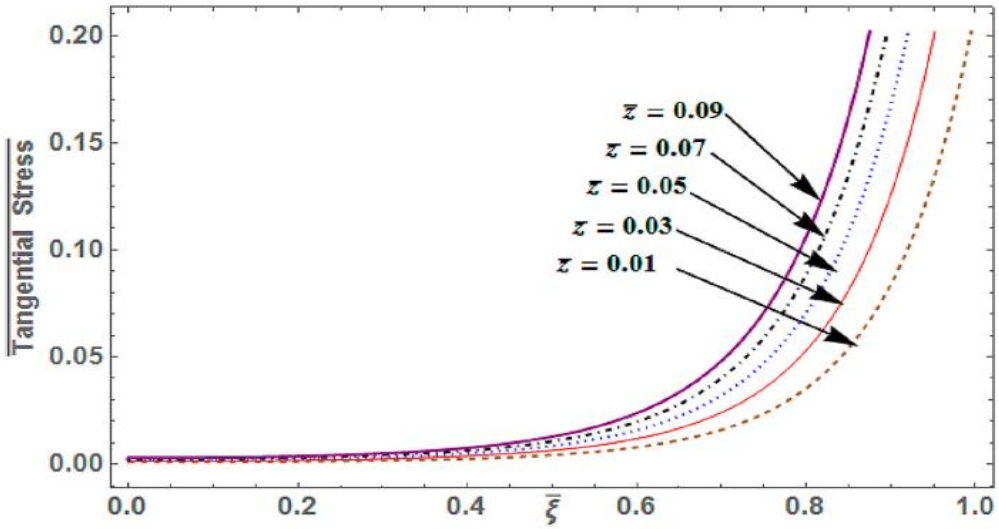

Figure 10. The dimensionless thermal tangential stress along $\bar{\xi}$ *for various locations of* $\bar{z}$.

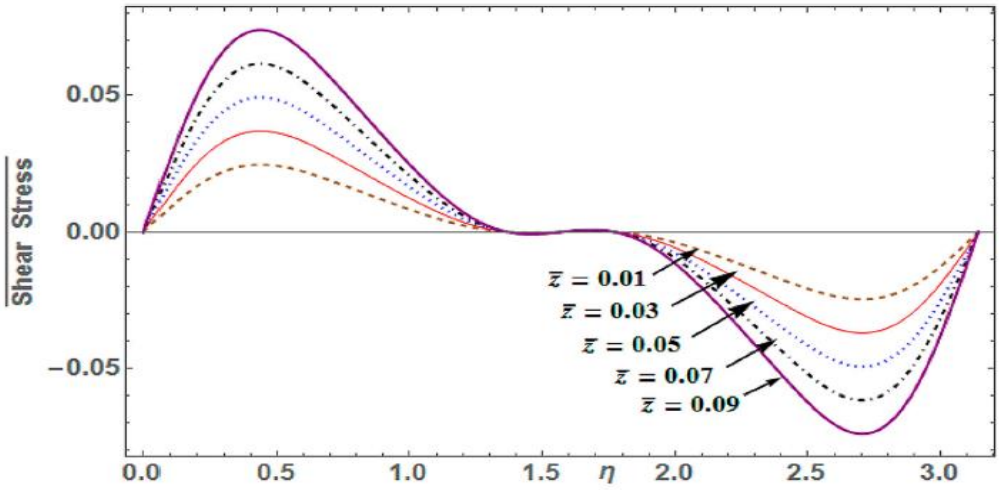

Figure 11. The dimensionless thermal shear stress along η *for various locations of* $\bar{z}$.

Figure 8 and 10 shows the distribution of radial $\bar{\sigma}_{\xi\xi}$ and normal stress $\bar{\sigma}_{\eta\eta}$ along the $\bar{\xi}$- direction at fixed $\eta = \pi / 3$ and $\tau = 0.6$. The nature of stress gradually increases along the radial direction and attains maximum magnitude towards the outer edge. This could probably be due to the sectional prescribed temperature.

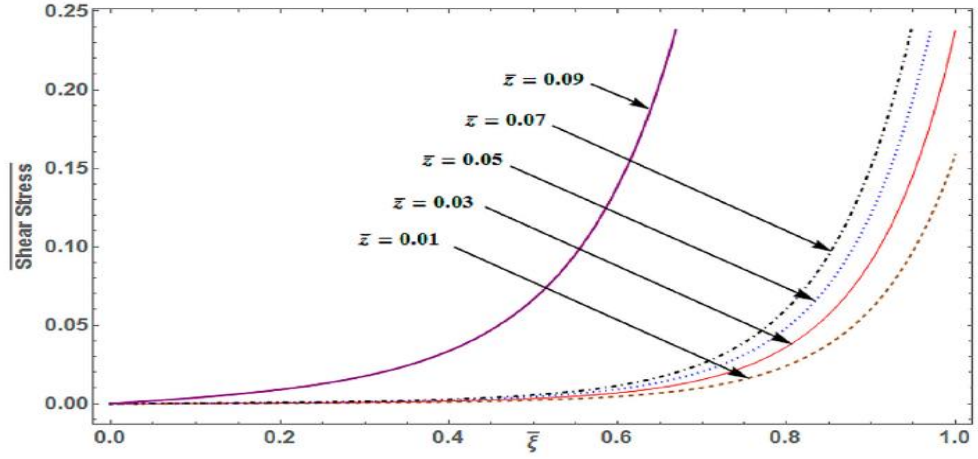

Figure 12. The dimensionless thermal shear stress along $\bar{\xi}$ *for various locations of* $\bar{z}$.

Figure 11 shows a plane sinusoidal heat propagating along the angular direction, and it attains zero when they are odd. The behavior may be due to the absorption of heat dissipated by sectional heat and internal heat supply. Figure 12 shows the distribution of shearing stress $\overline{\sigma}_{\xi\eta}$ along the $\overline{\xi}-$ direction at fixed $\eta = \pi/3$ and $\tau = 0.6$. The result demonstrates that the influence of radius on $\overline{\sigma}_{\xi\eta}$ is more than those on $\overline{\sigma}_{\xi\xi}$ and $\overline{\sigma}_{\eta\eta}$. Figure 13 shows that the resulting moment reveal patterns that vanishes in the middle of the plate, but changes its characteristics as $\overline{\xi} \to 1$. This may be due to the distribution of internal heat supply available and the transfer of thermal energy into the outer curve. The residual bending moments ($\overline{M}_{\xi\xi}$, $\overline{M}_{\eta\eta}$) trend is maximum and displays positive values on the outer side, while the resultant moment ($\overline{M}_{\xi\eta}$) drops towards the negative magnitude value. The $\overline{\sigma}_{\xi\xi}$, $\overline{\sigma}_{\eta\eta}$ and $\overline{\sigma}_{\xi\eta}$ has maximum compressive stress inside the plate, whereas, the tensile stress occurs on the outer surface of the plate.

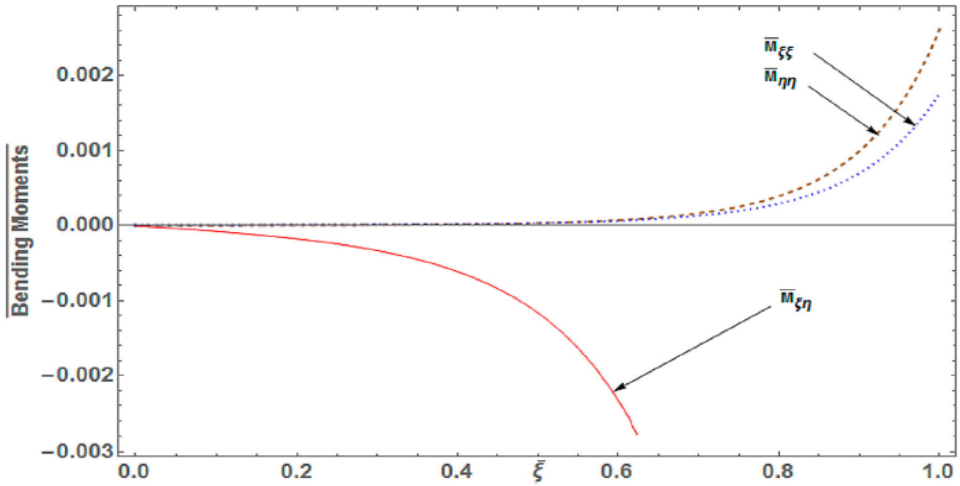

Figure 13. Bending Moments along $\overline{\xi}$ for a fixed value of $\eta = \pi/4$.

7. Conclusion

In this paper, we have described the theoretical treatment of stress analysis distribution for the thermosensitive elliptic plate with a clamped edge. The temperature distribution and the deflection in the form of ordinary and modified Mathieu functions are used to determine thermal stresses by proposed classical methods. The analytical technique proposed here is relatively simple and widely applicable compared with methods proposed by other researchers. The advantage of this approach is its generality and its mathematical power to handle different types of mechanical and thermal boundary conditions during small deflection under thermal loading. The aforementioned thermo-sensitivity concept can be very well applicable in the field of hybridizing metallurgy, ceramics, solid state physics and chemistry. They have a lot of application in the biomedical field and so forth.

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State-space approach to the thermoelastic problem of a one-dimensional semi-infinite rod

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Abstract

In this paper, a transient of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod which is unstrained and unstress initially and has uniform temperature distribution, is tackled by solving the coupled one dimensioned equation of heat conduction and equation of motion by following the state space approach of modern control theory in Laplace transform domain for small value of time. The subsequent temperature distribution and deformation from which stresses are calculated. The results are explained by numerical calculation and illustrated graphically.
Keywords: *Transient Temperature, Isotropic Homogeneous, Coupled Thermoelasticity, Thermal Displacement*

1. Introduction

Chandrasekharaiah and Srinath [1] explained that the linear theory of thermoelasticity without energy dissipation for homogeneous and isotropic materials is used to study plane waves in a half-space. Abbasi [2] obtained the Finite Element Method (FEM) solution of the vibration behaviour of a Functionally Graded Material (FGM) Timoshenko beam under lateral thermal shock with coupled thermoelastic assumption. Adams and Bert [3] obtained the results using the interaction between the strain and temperature fields and further investigated the effect of accounting for the orthotropic material properties in the governing elastic and thermal equations. Sharma and Grover [4] derived a closed-form expression for the transverse vibrations of a homogeneous isotropic, thermoelastic thin beam under clamped and simply supported conditions based on the Euler-Bernoulli theory. Okumura [5] has analysed the thermal-bending stresses in an annular sector by the theory of moderately thick plates. Kawamura [6] has analysed the equations of motion governing thermally induced vibration of plates with inhomogeneous material properties through the thickness direction are presented. Kar [7] problem deals with the thermo-elastic interaction due to step input of temperature on the boundaries of a homogeneous isotropic spherical shell in the context of generalised theories of thermo-elasticity. This paper deals with the study of waves propagation in an infinite rod by following state-space approaches using the Laplace transform.

2. Formulation of the problem

Consider a bounded isotropic homogeneous elastic material undergoing small temperature variation. The displacement component and the small temperature variation from an equilibrium temperature are connected by following differential equations

$$\mu u'_{j,kk} + (\lambda + \mu) u'_{k,kj} = (3\lambda + 2\mu)\alpha\theta'_{,j} + \rho\ddot{u}_j \tag{1}$$

$$\theta'_{,ii} = \frac{C_v}{k}(\dot{\theta}' + \tau\ddot{\theta}') + \frac{1}{k}(3\lambda + 2\mu)\alpha T_0(\dot{u}'_{i,i} + \tau\ddot{u}'_{i,i}) \tag{2}$$

and the stress is

$$\sigma'_{ij} = E\varepsilon'_{ij} - E\alpha(\theta' - T_0) \tag{2a}$$

where i and j take value $1, 2$ and 3 and few other notations are given below

- λ and μ are Lame's constants.
- α is the coefficient of linear thermal expansion.
- C_v is the specific heat at a constant volume
- κ is the thermal conductivity
- T is the relaxation time

- T_0 is the temperature in the equilibrium state
- , (comma) denote partial differentiation to space coordinates
- . (Dot) denote partial differentiation w.r.to time

Now define the following dimensionless quantities,

$$x_i = \frac{\kappa}{C_v C} x_i' \ , \ u = \frac{\kappa u'}{C_v C} \ , \ \theta = \theta' T_0 \ , \ t = \frac{\kappa}{C_v C} t' \ , \ \sigma_{ij} = \frac{\sigma'_{ij}}{\mathrm{E}\,\alpha(\theta' - T_0)}$$

where

$$C^2 = \frac{(\lambda + 2\mu)}{\rho} \tag{3}$$

Introduction the above quantities in Eq. (1) and (2) and suppressing the primes, one obtains

$$\mu u_{j,kk} + (\lambda + \mu) u_{k,kj} = \eta \theta_{,j} + \rho C^2 \ddot{u}_j \tag{4}$$

$$\theta_{,ii} - \dot{\theta} + m\dot{\theta} = \beta(u_{\kappa,\kappa} + m\dot{u}_{\kappa,\kappa}) \tag{4}$$

$$\sigma_{ij} = E\,\varepsilon_{ij} - E\alpha(\theta - \mathrm{T}_0) \tag{5}$$

where

$$\beta = \frac{(3\lambda + 2\mu)\alpha}{C_v} \ , \ m = \frac{T\,C^2 C_v}{\kappa} \ , \ \text{and} \ \ \eta = T_0(3\lambda + 2\mu)\alpha$$

From Eq. (4) and Eq. (5), one deduces the one-dimensional equations as follows

$$(\lambda + 2\mu)\frac{\partial^2 u}{\partial x^2} - \eta \frac{\partial \theta}{\partial x} = \rho C^2 \frac{\partial^2 u}{\partial t^2} \tag{6}$$

$$\frac{\partial^2 \theta}{\partial x^2} - \beta \frac{\partial^2 u}{\partial t\,\partial x} - \beta m \frac{\partial^3 u}{\partial t^2\,\partial x} - m\frac{\partial^2 \theta}{\partial t^2} = \frac{\partial \theta}{\partial t} \tag{7}$$

$$\sigma_x = E\,\varepsilon_x - E\alpha(\theta - \mathrm{T}_0) \tag{7a}$$

In this paper, the general case of wave prorogation in thermoelastic couple half-space is considered, the boundary conditions are expressed as

$$\left.\frac{\partial u}{\partial x}\right|_{x=0} = \exp[-\alpha t] \ , \tag{8}$$

$$\theta(x,t)\big|_{x=0} = 0 \ , \tag{9}$$

$$\sigma_x\big|_{x=0} = 0, \tag{9a}$$

3. Solution to the heat conduction equation

Define Laplace Transform as follows

$$\bar{u}(x,s) = \int_0^\infty u(x,t)\exp[-st]dt \tag{10}$$

$$\bar{\theta}(x,s) = \int_0^\infty \theta(x,t)\exp[-st]dt \tag{11}$$

Taking Laplace Transform of Eq. (6) and Eq. (7), one obtains the resulting equations in the form

$$\frac{\partial^2 \bar{u}}{\partial x^2} = \frac{\rho C^2 s^2}{\lambda + 2\mu}\bar{u} + \frac{\eta}{\lambda + 2\mu}\frac{d\bar{\theta}}{dx} \tag{12}$$

$$\frac{\partial^2 \theta}{\partial x^2} = s(1 + ms)\bar{\theta} + \beta s(1 + ms)\frac{d\bar{u}}{dx} \tag{13}$$

One can write Eq. (12) and Eq. (13) as

$$\frac{d\bar{u}(x,s)}{dx} = \bar{u}', \quad \frac{d\bar{\theta}(x,s)}{dx} = \bar{\theta}', \tag{14}$$

$$\frac{d^2\bar{u}(x,s)}{dx^2} = A\bar{u} + B\bar{\theta}', \quad \frac{d^2\bar{\theta}(x,s)}{dx^2} = C\bar{\theta} + D\bar{u}', \tag{15}$$

The homogeneous matrix form of Eq. (14) and Eq. (15) is expressed as

$$\frac{d}{dx}\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ A & 0 & 0 & B \\ 0 & C & D & 0 \end{bmatrix}\begin{bmatrix} \bar{u} \\ \bar{\theta} \\ \bar{u}' \\ \bar{\theta}' \end{bmatrix} \tag{16}$$

where the prime indicates differentiation w.r.to x and

$$A = \frac{\rho C^2 s^2}{\lambda + 2\mu}, \quad B = \frac{\eta}{\lambda + 2\mu}, \quad C = s(1 + ms), \quad D = \beta Q \tag{17}$$

One can write Eq. (16) as

$$\frac{\partial \upsilon(x,s)}{\partial x} = Q(s)\upsilon(x,s) \tag{18}$$

Substituting $\upsilon(x,s) = \chi(s)\exp[\gamma x]$ in Eq. (18), one obtains

$$\frac{\partial \chi(s)}{\partial x}\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{19}$$

$$Q\chi = \gamma\chi,$$

where γ is a scalar.

Thus, one obtains the eigenvalue problem

$$\chi(s)\exp[\gamma x] = Q(s)\chi(s)\exp[\gamma x] \tag{20}$$

Here $Q\chi = \gamma\chi$, where γ is the eigenvalue and χ is the corresponding eigenvector of Q.

The characteristic equation corresponding to the matrix Q can be written as

$$|Q - \gamma I| = \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix} = 0 \tag{21}$$

$$\text{i.e } \gamma^4 - \gamma^2(A + BD + C) + AC = 0 \tag{22}$$

The eigenvector χ corresponding to the eigenvalue γ can be calculated from $|Q - \gamma I|\chi = 0$

$$\text{i.e.} \quad \begin{bmatrix} -\gamma & 0 & 1 & 0 \\ 0 & -\gamma & 0 & 1 \\ A & 0 & -\gamma & B \\ 0 & C & D & -\gamma \end{bmatrix}\begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \tag{23}$$

$$\text{i.e.} \quad \left.\begin{aligned} -\gamma x_1 + 0x_2 + x_3 + 0x_4 &= 0 \\ 0x_1 - \gamma x_2 + 0x_3 + x_4 &= 0 \\ A x_1 + 0x_2 - \gamma x_3 + B x_4 &= 0 \\ 0x_1 + C x_2 + D x_3 - \gamma x_4 &= 0 \end{aligned}\right\} \qquad (24)$$

Solving Eq. (24) by Cramer's rule, one obtains

$$\chi = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} (C-\gamma^2)/\gamma \\ -D \\ C-\gamma^2 \\ -D\gamma \end{bmatrix} \qquad (25)$$

Eq. (22) is quadratic in γ whose roots are

$$\gamma = \pm\gamma_1 \, , \pm\gamma_2 \qquad (26)$$

$$\gamma_1 = \left[\frac{(A+BD+C)+\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (27)$$

$$\gamma_2 = \left[\frac{(A+BD+C)-\sqrt{(A+BD+C)^2-4CA}}{2}\right]^{1/2} \qquad (28)$$

Hence the matrix of eigen vectors $\chi(s)$ is

$$\chi = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \qquad (29)$$

and the solution of Eq. (18) is given by

$$\upsilon(x,s) = \chi(s)Y \qquad (30)$$

where

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ y_4 \end{bmatrix} = \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (31)$$

Substituting Eq. (29) and Eq. (31) into the Eq. (30), one obtains

$$\begin{bmatrix} \bar{u}(x,s) \\ \bar{\theta}(x,s) \\ \bar{u}'(x,s) \\ \bar{\theta}'(x,s) \end{bmatrix} = \begin{bmatrix} (C-\gamma_1^2)/\gamma_1 & (C-\gamma_2^2)/\gamma_2 & (C-\gamma_1^2)/-\gamma_1 & (C-\gamma_2^2)/-\gamma_2 \\ -D & -D & -D & -D \\ C-\gamma_1^2 & C-\gamma_2^2 & C-\gamma_1^2 & C-\gamma_2^2 \\ -D\gamma_1 & -D\gamma_2 & D\gamma_1 & -D\gamma_2 \end{bmatrix} \begin{bmatrix} C_1 & \exp[\gamma_1 x] \\ C_2 & \exp[-\gamma_1 x] \\ C_3 & \exp[\gamma_2 x] \\ C_4 & \exp[-\gamma_2 x] \end{bmatrix} \qquad (32)$$

Applying the physical condition of the problem as in Eq. (6) and Eq. (7), the solution of equation Eq. (18) can be written as

$$\bar{u}(x,s) = C_2[(C-\gamma_1^2)/\gamma_1]\exp[-\gamma_1 x] + C_4[(C-\gamma_2^2)/\gamma_2]\exp[-\gamma_2 x] \qquad (33)$$

$$\bar{\theta}(x,s) = -D\{C_2\exp[-\gamma_1 x] + C_4\exp[-\gamma_2 x]\} \qquad (34)$$

Applying Laplace Transform to Eq. (8) and Eq. (9), one obtains

$$\frac{\partial \bar{u}}{\partial x} = \frac{1}{s+\alpha} \tag{35}$$

$$\bar{\theta}(x,s) = 0 \tag{36}$$

Applying transformed boundary conditions Eq. (35) and Eq. (36) into the Eq. (33) and Eq. (34), one obtains

$$\bar{u}(x,s) = -\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} [(C-\gamma_1^2)/\gamma_1] \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} [(C-\gamma_2^2)/\gamma_2] \exp[-\gamma_2 x] \right\} \tag{37}$$

$$\bar{\theta}(x,s) = -D\left\{ \frac{1}{(s+\alpha)\left(\gamma_1^2 - \gamma_2^2\right)} \exp[-\gamma_1 x] + \frac{1}{(s+\alpha)\left(\gamma_2^2 - \gamma_1^2\right)} \exp[-\gamma_2 x] \right\} \tag{38}$$

Substituting the value of A, B, C, D, γ_1 and γ_2 from Eq. (17), Eq. (27) and Eq. (28) into the Eq. (37) and Eq. (38), and inverting by Laplace Transform for large value of s (i.e. small value of time t), one obtains

$$u(x,t) = \frac{1}{V_1 V_3}\left[\frac{(t-V_1 x)^2}{2} + (m-V_1)^2 (t-V_1 x) \right] - \frac{1}{V_2 V_3}\left[\frac{(t-V_2 x)^2}{2} + (m-V_2)^2 (t-V_2 x) \right] \tag{39}$$

$$\theta(x,t) = \frac{\beta}{V_3}\left[(t-V_1 x) + mu(t-V_1 x) - (t-V_2 x) \right] - mu\ (t-V_2 x) \tag{40}$$

where,

$$V_1 = \left\{ \frac{[1+(1+B\beta)m] + \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{41}$$

$$V_2 = \left\{ \frac{[1+(1+B\beta)m] - \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)}}{2} \right\}^{1/2} \tag{42}$$

$$V_3 = \sqrt{1+m^2(1+2B\beta)+2m(B\beta-1)} \tag{43}$$

4. Numerical Results, Discussion and Remarks

For the interests of simplicity of calculation, we introduce the following dimensionless values

$$C_V = 383.1, \quad \tau = 10^{-14}, \quad K = 386, \lambda = 9.5\times 10^{10},$$

$$\mu = 4.5\times 10^{10}, \alpha = 17\times 10^{-6}, p = 8954$$

One obtains the expressions for the temperature, displacement respectively for our numerical discussion

corresponding graphs are plotted as follows

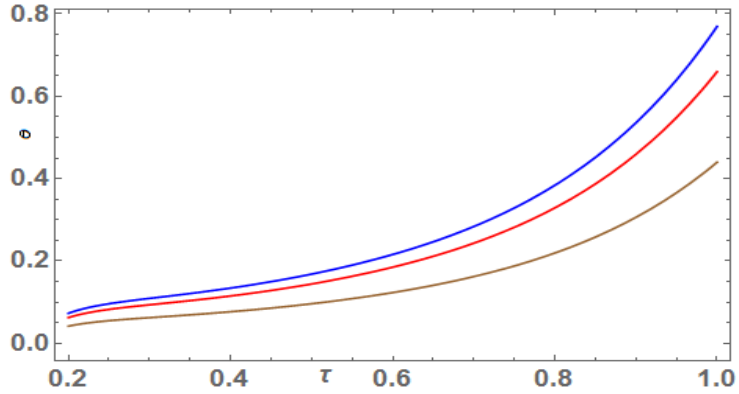

Fig. 2 (b): Temperature distribution along time form not equal to zero

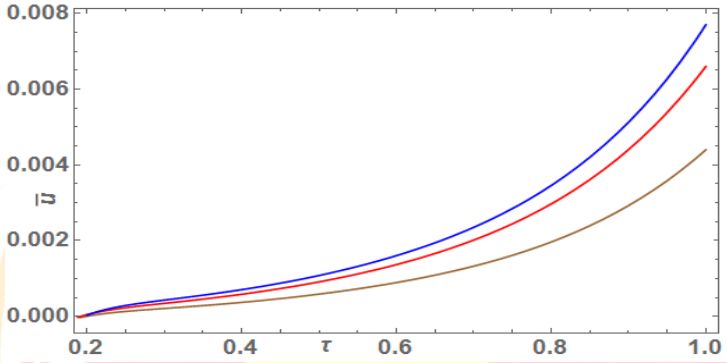

Fig. 2 (b): Temperature distribution along time for m=0

Conclusion

From this study of a transient problem of generalised thermoelasticity in an isotropic homogeneous elastic infinite rod, it is clear that the effect of thermoelastic parameter 'm' for the generalised coupled thermoelasticity of a single parameter as expected is not much pronounced in the displacement and temperature fields. The temperature field has a small oscillatory character about the time axis, while the displacement field decreases as time increases.

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An analysis for thermal stresses in a thin elliptic annulus plate with elastic supports on the curved surfaces

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Abstract

In this study, integral operational methods are used to investigate the thermally induced transverse vibration of a thin elliptic annulus plate with elastic supports at both radial boundaries. The axisymmetric temperature distribution is determined by the heat conduction differential equation and its corresponding boundary conditions by employing a unified integral transform technique by use of Mathieu functions and modified Mathieu functions. The solution of thermally induced vibration of the plate with both ends encased with elastic supports is obtained by employing an integral transform for double Laplace differential equation. The thermal moment is derivedon the basis of temperature distribution, and its stresses are derived based on resultant bending moments per unit width. The numerical calculations of the distributions of the transient temperature and its associated stress distributions are shown in the figures.

Keywords: Thermoelastic vibrations, elliptic annulus plate, elastic supports, heat conduction, thermal stresses, integral transform

1. Introduction

The thermoelastic vibration analysis is necessitated in many engineeringsscience applications such as design and computation of structures and mechanical devices, maintenance or predictions of breakdown. These reasons make the study of thermoelastic vibrations in structures and the control of their behaviour under dynamic loads an interesting study.

A short history of the research investigations associated with the thermoelastic vibrations insights using various operational and approximate methods like the Ritz energy method, Galerkin's method, finite element models and perturbation theory are reviewed that is used to solve the system.For example, Chen et al. [1] introduced three displacement functions to decompose three displacement components so that the three-dimensional equations of motion of a transversely isotropic body are uncoupled. Further expanding these functions in terms of orthogonal series, the equations of free vibration problem of a transversely isotropic cylindrical shell with ends simply supported are simplified to be readily dealtwith. Sato [2, 3] obtained solutions for composite elliptical membrane consisting of confocal elliptical parts under certain conditions during free as well as forced vibration analysis. Hutchinson and El-Azhari [4] use exact series solutions to the exact governing equations and present highly accurate resonance frequencies of stress-free cylinders on the basis of the linear three-dimensional theory of elasticity. Very recently, Bhad et al. [5, 6] and Dhakate [7]determined the thermally induced transverse vibration of a uniform thin elliptical object using few new integral transform methods. The aim of this work is to determine the thermal bending stresses using the exact formal solution of the partial differential equation prevailing the transverse vibration in terms of Mathieu functions and modified Mathieu functions. During problem formulation, we have initially solved heat conduction equation using the integral operation method. Secondly, we shall study the thermoelastic symmetrical vibration with elastic supported boundaries conditions using the theory of integral transform. Finally, the analytical solution for the thermal stress components is obtained based on resultant bending moments per unit width. The results presented here will be more useful in engineering problems particularly in vibrational analysis and in determining the state of strain in elliptical disk constituting foundations for reactors, pressure vessels, furnaces, etc.

2. Formulation of the problem

It is assumed that a thin elliptical annulus plate is occupying the space $D:\{(\xi,\eta,z)\in R^3 : a<\xi<b,\ 0<\eta<2\pi,\ 0<z<\lambda\}$ under transient temperature state having internal heat source within it, while supports at the boundaries as non-rigid. The geometry of the elliptical annulus plate indicates that an elliptic-cylindrical

coordinate system (ξ,η,z) is the most appropriate choices of the reference frame, which are related to the rectilinear coordinate system (x,y,z) by the relation $x=c\cosh\xi\cos\eta,\ y=c\sinh\xi\sin\eta,\ z=z$. The curves $\eta=$ constant represent a family of confocal hyperbolas while the curves $\xi=$ constant constitute a family of confocal ellipses. Both sets of curves intersect each other orthogonally at every point in space. The geometry parameters are given as $\xi\in[a,b],\ \eta\in[0,2\pi)$ and $z\in(0,\lambda)$.

2.1 Temperature distribution analysis

The heat conduction equation and boundary conditions are given as

$$\nabla^2\theta+\frac{\partial^2\theta}{\partial z^2}+\frac{Q(\xi,\eta,t)}{\lambda}=\frac{1}{\kappa}\frac{\partial\theta}{\partial t} \qquad (1)$$

in which $\theta(\xi,\eta,z,t)$ is temperature of the plate at point (ξ,η,z) at t time, ∇^2 denotes the two-dimensional Laplacian operator in elliptical coordinate, $Q(\xi,\eta,t)$ represents an energy generation term, $\kappa=\lambda/\rho C$ represents thermal diffusivity in which λ being the thermal conductivity of the material, ρ is the linear density, C is the specific heat of the material, assumed to be constant and the metric coefficient h is given as

$$h^{-2}=(c^2/2)(\cosh 2\xi-\cos 2\eta). \qquad (2)$$

The heat generation term is assumed in the form

$$Q(\xi,\eta,z,t)=Q_0\delta(\xi-a_0)\delta(\eta-2\pi)\delta(z-\lambda_0) \qquad (3)$$

in which Q_0 is typical value of the internal heat generation per unit time and per unit volume, $\delta(\ )$ is the Dirac delta function specifying the distribution of the internal het generation in which $\xi\neq a_0, a_0\in[a,b]$ and $z\neq\lambda_0$, $\lambda_0\in[0,\lambda]$.

The temperature distribution in the elliptical plate is obtained as a solution of the equation (1) with the following initial and boundary conditions

$$\left.\begin{aligned}&\theta(\xi,\eta,z,0)=0,\\&\theta(a,\eta,z,t)+k_1\frac{\partial\theta}{\partial\xi}(a,\eta,z,t)=0,\theta(b,\eta,z,t)+k_2\frac{\partial\theta}{\partial\xi}(b,\eta,z,t)=0,\\&\theta(\xi,\eta,0,t)=0,\theta(\xi,\eta,\lambda,t)=f(\xi,\eta,z,t)\end{aligned}\right\} \qquad (4)$$

with $f(\xi,\eta,z,t)$ as thesectional heat supply on the lower face, $k_i=k(T/\rho_i),\ i=1,2$ as the surface coefficients linearly related to the corresponding heat transfer coefficients which are supported by elastic supports [8, pp.1343] submerged in a non-viscous medium at the internal and external radial surfaces (i.e. $\xi=a$ and $\xi=b$),whereas T is the tension submitted to the upper face of plate, $\rho_i,\ i=1,2$ are the elastic constants of the supports given by the Hooke's law and they, in general, are different and k is the heat flux.

2.2 Thermal deflections formulation

During the formulation we assume few postulates that (i) the thickness of the elliptical annulus plate is small compared with the other dimensions of theplate, (ii) strain is nil at the middle surface of the plate, (iii) transverse shear and normal strains are neglected during investigation, (iv) shear stress is small compared to other stress, influence of shear and rotary inertia is neglected, and (v) finally the temperature distribution depends upon variable position and time. The differential equation for the transverse displacement in an elliptical annulus plate with small amplitude, in elliptic-cylindrical coordinate system and with the restriction that the transverse displacement on a point on the middle plane can be considered in two parts: the quasi-static solution $\omega_{st}(\xi,\eta,t)$, in which inertia effects and damping are disregarded, satisfying the equation

$$D\nabla^2\nabla^2\omega_{st}(\xi,\eta,t)=-\frac{M\theta(\xi,\eta,t)}{1-\upsilon} \qquad (5)$$

and the dynamic solution $\omega_d(\xi,\eta,t)$ satisfying the equation

$$D\nabla^2\nabla^2\omega_d(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_d(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega_{st}(\xi,\eta,t) \qquad (6)$$

Now putting together both equations (5) and (6), yields the complete solution as

$$D\nabla^2\nabla^2\omega(\xi,\eta,t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\omega(\xi,\eta,t)+\frac{p(\xi,\eta,t)}{T}=-\frac{M_\theta(\xi,\eta,t)}{1-\upsilon} \qquad (7)$$

in which $\omega(\xi,\eta,t)=\omega_d(\xi,\eta,t)+\omega_{st}(\xi,\eta,t)$ is the normal transverse deflection along the z-direction taking into account the effect of inertia, $\alpha^2=T/\rho\lambda$, $p(\xi,\eta,t)$ is the external pressure applied normally to the thin elliptical annulus plate, $D=E\lambda^2/[12(1-\upsilon^2)]$ is the modulus of rigidity of the annulus plate, E is the modulus of elasticity constant υ denotes the Poisson's ratio, and M_θ is the thermally induced resultant moment

$$M_\theta=\alpha E\int_0^\lambda z\,\theta(\xi,\eta,t)\,d\theta \qquad (8)$$

with α and E denoting coefficient of linear thermal expansion and Young's modulus of the material of the elliptical annulus plate, respectively. The Laplace operator in the elliptical coordinates has the form

$$\nabla^2=h^2(\partial/\partial\xi^2+\partial/\partial\eta^2) \qquad (9)$$

If we suppose that the boundaries of the thin annulus plate, $\xi=a$ and $\xi=b$, are supported by elastic supports [9, pp.1343] submerged in a non-viscous medium, then the boundary conditions, expressed in mathematical forms, as

$$\left.\begin{aligned}\omega(\xi,\eta,\lambda,t)+k_1\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=a}&=0,\\ \omega(\xi,\eta,\lambda,t)+k_2\frac{\partial}{\partial\xi}\omega(\xi,\eta,\lambda,t)\Big|_{\xi=b}&=0\end{aligned}\right\} \qquad (10)$$

and the initial conditions as

$$\omega(\xi,\eta,t)\big|_{t=0}=g_1(\xi,\eta),\ \ \omega(\xi,\eta,t)_{,t}\big|_{t=0}=g_2(\xi,\eta) \qquad (11)$$

2.3 Thermal bending stresses

The maximum normal stresses acting on those sections are parallel to ξz or ηz planes. Furthermore, the thermal stress components can be determined using small deflection and resultant moment as

$$\left.\begin{aligned}\sigma_{\xi\xi}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\frac{\partial^2\omega}{\partial\xi^2}+\upsilon\frac{\partial^2\omega}{\partial\eta^2}\right)-\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}+\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\eta\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\left(\upsilon\frac{\partial^2\omega}{\partial\xi^2}+\frac{\partial^2\omega}{\partial\eta^2}\right)+\frac{(1-\upsilon)\sinh 2\xi}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\xi}-\frac{(1-\upsilon)\sin 2\eta}{(\cosh 2\xi-\cos 2\eta)}\frac{\partial\omega}{\partial\eta}\right]+\frac{M_\theta}{1-\upsilon}\right\}\\ \sigma_{\xi\eta}&=\frac{6}{\lambda^2}\left\{Dh^2\left[\frac{\partial\omega}{\partial\xi}\sin 2\eta+\frac{\partial\omega}{\partial\eta}\sinh 2\xi-\frac{\partial^2\omega}{\partial\xi\partial\eta}(\cosh 2\xi-\cos 2\eta)\right]\right\}\end{aligned}\right. \qquad (12)$$

The equations (1)-(12) constitute the mathematical formulation of the problem under consideration.

3. Solution to the problem

3.1 Temperature distribution

In order to solve fundamental differential equation (1), firstly we introduce the here a finite transform (refer Appendix) over the variables (ξ,η) as

$$\bar{f}(\pm q_{2m}) = \int_a^b \int_0^{2\pi} S_{2m}(k_1,k_2,\xi,\pm q_{2m})\,(\cosh 2\xi - \cos 2\eta) \times ce_n(\eta,\pm q_{2m})\, f(\xi,\eta)\, d\xi\, d\eta \qquad (13)$$

In this way, we may define the inversion theorem of equation (13) in the form

$$f(\xi,\eta) = \sum_{m=0}^{\infty} \sum_{n=1}^{\infty} \bar{f}(\pm q_{2m}) S_{2m}(k_1,k_2,\xi,\pm q_{2m}) ce_n(\eta,\pm q_{2m}) / N_{2m,n} \qquad (14)$$

in which

$$N_{2m,n} = \pi \int_a^b S_{2m}^2(k_1,k_2,\xi,\pm q_{2m})(\cosh 2\xi - \Theta_n)\, d\xi$$

and

$$\Theta_n = \frac{1}{\pi}\int_0^{2\pi} \cos 2\eta\, ce_n^2(\eta, q_{2m})\, d\eta = A_0^{(n)} A_2^{(n)} + \sum_{r=0}^{\infty} A_{2r}^{(n)} A_{2r+2}^{(n)} \qquad [8, \text{p.177}]$$

The notations of the Mathieu functions used in this paper follow those adopted by McLachlan [8]. So, the symbols ce_n and Ce_{2m} denote the Mathieu and modified Mathieu functions of order n and m respectively. The prime $(')$ attached Ce_{2m} and ce_n represent the $\xi-$ and $\eta-$ derivatives respectively. The symbols $A^{(n)}$ is the Fourier coefficients of the Mathieu functions. On applying integral transform to the differential equation (13), and taking into account the boundary conditions (4), the differential equation (1) transformed into

$$\frac{\partial^2 \bar{\theta}}{\partial z^2} - \alpha_{2m}^2 \bar{\theta} + \frac{Q_0}{\lambda}\delta(z-\lambda_0)\exp[\alpha_{2m}^2(a_0 - 2\pi)] = \frac{1}{\kappa}\frac{\partial \bar{\theta}}{\partial t} \qquad (15)$$

with initial and boundary conditions

$$\left.\begin{aligned} &\bar{\theta}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \\ &\bar{\theta}(q_{2m},\eta,0,t)\big|_{z=0} = 0, \bar{\theta}(q_{2m},\eta,\lambda,t)\big|_{z=\lambda} = \bar{f}(q_{2m},z,t) \end{aligned}\right\} \qquad (16)$$

in which $\alpha_{2m}^2 = 4q_{2m}/c^2$, $\bar{\theta}$ is the transformed function of θ respectively.

Applying Fourier sine transform to the eq. (16), using the boundary conditions (16), one yields,

$$\frac{\partial \bar{\bar{\theta}}}{\partial t} + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\bar{\bar{\theta}} = \kappa\left(\frac{Q_0}{\lambda}\right)\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)] + \kappa\left(\frac{\wp\pi}{\lambda}\right)[(-1)^{\wp+1}\,\bar{f}(q_{2m},\wp,t)] \qquad (17)$$

with initial condition as

$$\bar{\bar{\theta}}(q_{2m},\eta,z,0)\big|_{t=0} = 0 \qquad (18)$$

Applying Laplace transform to the equation (17) and taking into account the condition (18), the equation after mathematical simplification reduce to

$$\bar{\bar{\theta}}^*(q_{2m},\wp,s) = \left\{\frac{Q_0\kappa}{\lambda}\left[\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)]\right] + \left(\frac{\kappa\wp\pi}{\lambda}\right)(-1)^{\wp+1} \times \bar{\bar{f}}(q_{2m},\wp,s)\right\} \Big/ \left[s + \kappa\left(\alpha_{2m}^2 + \frac{\wp^2\pi^2}{\lambda^2}\right)\right] \qquad (19)$$

Applying inverse Laplace transform on equation(19), one obtains

$$\bar{\bar{\theta}}(q_{2m},\wp,t)=\frac{Q_0\,\kappa}{\lambda}\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\;\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{\kappa\wp\pi}{\lambda}\right)\times\int_0^t\bar{f}(q_{2m},\wp,\tau)\exp[-\kappa(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau \quad (20)$$

$$\text{in which } \bar{g}(q_{2m},\wp)=\sin\left(\frac{\wp\pi\lambda_0}{\lambda}\right)\exp[-\alpha_{2m}^2(a_0+2\pi)].$$

Applying inversion theorem of the finite Fourier Sine transform on equation (20), one obtains,

$$\bar{\theta}(q_{2m},z,t)=\frac{2}{\lambda}\sum_{\wp=1}^{\infty}\left\{\frac{Q_0\,k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\times\int_0^t\bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right\}\sin\left(\frac{\wp\pi z}{\lambda}\right) \quad (21)$$

Applying inversion theorem of the transformed rules defined by equation(14) on equation(21), the temperature is obtained as,

$$\theta(\xi,\eta,z,t)=\frac{2}{\lambda}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0\,k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t\bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right)\times\sin\left(\frac{\wp\pi z}{\lambda}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\} \quad (22)$$

The function is given in equation (22) represents the temperature at every instant and at all points of the elliptic annulus plate of finite height under conditions of radiation type on the surface.

3.2 Thermal deflections analysis

Substituting the equation (22) in equation (8), the thermally induced resultant moment is obtained as

$$M_\theta=\frac{2\lambda\alpha E}{\pi^2}\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\sum_{\wp=1}^{\infty}\left\{\left(\frac{Q_0\,k}{\lambda}\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})]\bar{g}(q_{2m},\wp)+(-1)^{\wp+1}\left(\frac{k\wp\pi}{\lambda}\right)\int_0^t\bar{f}(q_{2m},\wp,\tau)\exp[-k(\alpha_{2m}^2+\frac{\wp^2\pi^2}{\lambda^2})(t-\tau)]d\tau\right)\times\left(\frac{-\wp\pi\cos(\wp\pi)+\sin(\wp\pi)}{\wp^2}\right)S_{2m}(k_1,k_2,\xi,\pm q_{2m})ce_n(\eta,\pm q_{2m})/N_{2m,n}\right\} \quad (23)$$

In order to solve fourth order differential equation (7), using another integral transformation (refer Appendix) of order *m*and *n*over the variable ξ and η as

$$\bar{f}(q_{2m,n})=\int_a^b\int_0^{2\pi}(\cosh 2\xi-\cos 2\eta)\;Be_{2m}(k_1,k_2,\xi,q_{2m,n})\times ce_{2m}(\eta,q_{2m,n})\,f(\xi,\eta)d\xi\,d\eta \quad (24)$$

The inversion theorem of (24) is

$$f(\xi,\eta)=\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\bar{f}(q_{2m,n})\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})/C_{2m,n} \quad (25)$$

in which

$$\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n}) = \acute{B}e_{2m}(k_1,k_2,\xi,q_{2m,n})ce_{2m}(\eta,q_{2m,n})$$

and

$$C_{2m,n} = \pi\int_a^b(\cosh 2\xi - \Theta_{2m,n})\grave{B}e^2_{2m,n}(k_1,k_2,\xi,q_{2m,n})\,d\xi$$

On applying integral transform defined in equation (24) to the differential equation (7), and taking into account the boundary conditions (10), the differential equation transformed into

$$4Dq^2_{2m,n}\,\bar{\omega}(q_{2m,n},t)+\frac{1}{\alpha^2}\frac{\partial^2}{\partial t^2}\bar{\omega}(q_{2m,n},t)+\frac{\bar{p}(q_{2m,n},t)}{T}=\frac{\bar{F}(q_{2m,n},t)}{1-\upsilon} \qquad (26)$$

in which $F(\xi,\eta,t)=-\nabla^2 M_\theta$, $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ are the transformed function of $\omega(\xi,\eta,t)$ and $F(\xi,\eta,t)$ respectively.

Using Laplace transform on equation (26), the differential equation is reduces to

$$4Dq^2_{2m,n}\bar{\bar{\omega}}(q_{2m,n},s)+\frac{1}{\alpha^2}s^2\bar{\bar{\omega}}(q_{2m,n},s)+\frac{\bar{\bar{p}}(q_{2m,n},s)}{T}=\frac{\bar{\bar{F}}(q_{2m,n},s)}{1-\upsilon} \qquad (27)$$

in which $\bar{\bar{\omega}}(q_{2m,n},t)$ and $\bar{\bar{F}}(q_{2m,n},t)$ are the transformed function of $\bar{\omega}(q_{2m,n},t)$ and $\bar{F}(q_{2m,n},t)$ respectively.

Using the inverse Laplace theorem and the inverse theorem defined in equation (25), one obtains,

$$\begin{aligned}\omega(\xi,\eta,t)=\sum_{m=0}^{\infty}\sum_{n=1}^{\infty}\frac{\zeta_{2m,n}(k_1,k_2,\xi,\eta,q_{2m,n})}{C_{2m,n}}\Bigg\{\, & g_1(\xi,\eta)\\ &\times\cos(2q_{2m,n}\alpha\sqrt{D})+\frac{g_2(\xi,\eta)}{2q_{2m,n}\alpha\sqrt{D}}\sin\left(2q_{2m,n}\alpha\sqrt{D}\right)t\\ &+\frac{\alpha}{2q_{2m,n}\sqrt{D}}\int_0^t\left(\frac{\bar{F}(q_{2m,n},\tau)}{1-\upsilon}-\frac{\bar{p}(q_{2m,n},\tau)}{T}\right)\\ &\times\sin(2\alpha\sqrt{D}\,q_{2m,n})(t-\tau)\,d\tau\Bigg\}\end{aligned} \qquad (28)$$

The resulting equation of stresses can be obtained by substituting Eqs. (23) and (28).

4. Numerical Results, Discussion and Remarks

For the sake of simplicity of calculation, we introduce the following dimensionless values

$$\left.\begin{aligned}&\bar{\xi}=\xi/b,\ \bar{z}=[z-(-\lambda/2)]/b,\ e=c/b,\ \tau=\kappa t/b^2,\\ &\bar{\theta}=\theta/\theta_0,\ \bar{h}^2=h^2b^2,\ \bar{\omega}=\omega/\alpha\theta_0 b,\\ &\bar{M}_\theta=M_\theta/Eb^3,\bar{\sigma}_{ij}=\sigma_{ij}/E\alpha\theta_0\ \ (i,j=\xi,\eta)\end{aligned}\right\} \qquad (29)$$

The mathematical computations have been carried out for Aluminum (pure) elliptic annulus plate with the thermo-mechanical properties are considered as modulus of elasticity E = 70 GPa, Poisson's ratio υ = 0.35, thermal expansion coefficient α = 23×10^{-6} /0C, thermal diffusivity κ = 84.18×10^{-6} m^2 /s^{-1}, density ϱ = 2712 kg/m^3 and thermal conductivity λ = 204.2 Wm^{-1} K^{-1}. The q_{2m} = 0.0989, 0.3987, 0.889, 1.5792, 2.4694, 3.5550, 4.8861, 6.3467, 7.9993, 9.8696, 11.9523, 14.2322, 16.6792, 19.0234, 21.2164, 23.6036, 25.0374, 27.7169, 29.2712, 31.0449are the positive and real roots of the $Ce_{2m}(\xi_o,q)Fey'_{2m}(\xi_i,q) - Fey_{2m}(\xi_o,q)Ce'_{2m}(\xi_i,q)=0$. The physical parameter as $\bar{a}$ = 0.3 m, $\bar{b}$ = 1 m, $\bar{\lambda}$ = 0.05 m, and reference temperature θ_0 as 150^0C. For numerical thermoelastic analysis, we have considered various values of time as $\tau(<\tau_0=2,$ a fixed value). In order to examine the influence of heating on the plate, the numerical calculations

were performed for all the variables and numerical calculations are depicted in the following figures with the help of MATHEMATICA software.

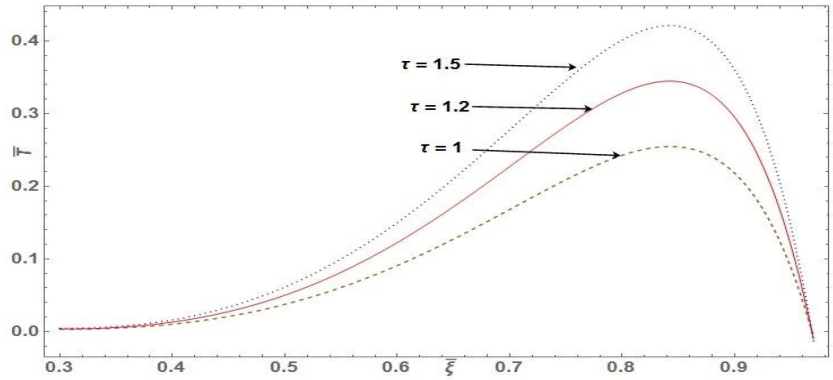

Fig. 1(a): Temperature distribution along radial direction for different values τ.

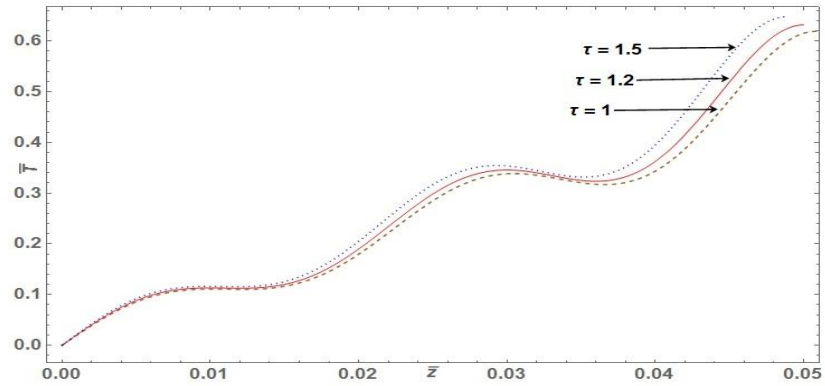

Fig. 1(b): Temperature distribution along $\bar{z}$ - direction for different values τ.

Figs. 1–3 illustrates the numerical results of temperature distribution, thermal deflection and stresses on elliptic annulus plate. As shown in Fig. 1(a), the temperature increases as the time proceeds along radial direction and is greatest at the other edge of the plate due to the combined energy of internal heat generation and known temperature. Fig. 1(b) shows that the temperature distribution along the $\bar{z}$ -direction for different values of time τ , which is maximum towards outer edge due to energized heat supply.

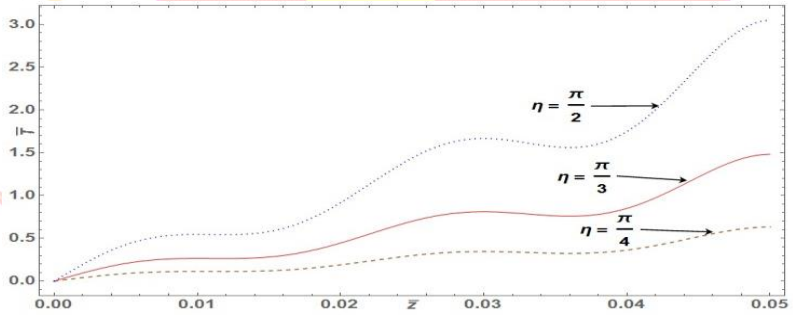

Fig. 1(c): Temperature distribution along $\bar{z}$ - direction for different values η.

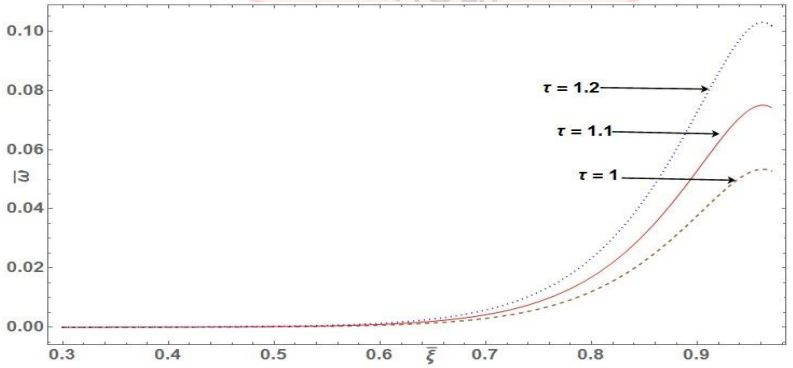

Fig. 2(a): Thermal deflection along radial direction for different τ.

Fig. 1(c) depicts that the temperature distribution along $\bar{z}$ -direction for different values of η attains maximum expansion at its outer core. There is an increment in the rate of heat propagation with thickness which leads to compressive force in the inner part and expands more on the outer surface whenever graph were plotted for temperature distributions, stress functions and deflection.Figs. 2(a) and 2(b) illustrates that the thermal deflection distribution over plate with elastic supported edges. Fig. 2(a) shows that the changes of thermal deflection along ξ-direction for different time parameter. The deflection is highest at the other edge of the plate due to the combined effect of internal and external supplied energy.

Fig. 3(a)-3(c) shows the variation of thermal radial stress $\sigma_{\xi\xi}$, tangential stress $\sigma_{\eta\eta}$ and shear stress $\sigma_{\xi\eta}$ along radial direction for different time parameter τ. From Fig. 3(a), the large compressive stress occurs at the inner edge while the tensile stress occurs at the outer edge which drops along the radial direction.

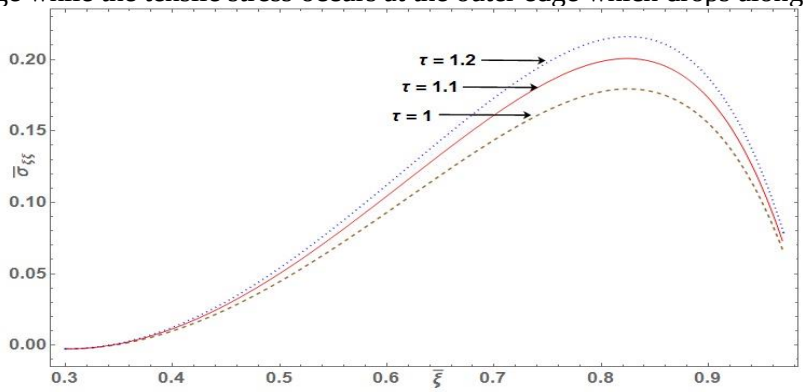

Fig. 3(a): Radial stress $\bar{\sigma}_{\xi\xi}$ along radial direction for different τ.

Fig. 3(b)-3(c) illustrates the thermal radial stress $\sigma_{\xi\xi}$, shear stress $\sigma_{\xi\eta}$ along angular direction for different values of $\bar{\xi}$. it is evident from the fig. 3(d) that at the early stage, radial stress increases gradually and maximum radial stress occurs at the mid-core and suddenly attains minimum value. The similar curve nature was observed for the angular stress along angular direction for different values of $\bar{\xi}$ and has been omitted here for the sake of brevity. It is observed from fig. 3(e) that shear stress has large influence of negative forces at the mid core for η- direction.

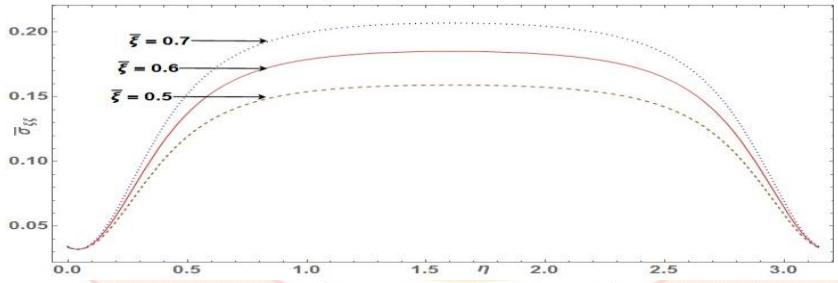

Fig. 3(b): Radial stress $\bar{\sigma}_{\xi\xi}$ along angular direction for different $\bar{\xi}$.

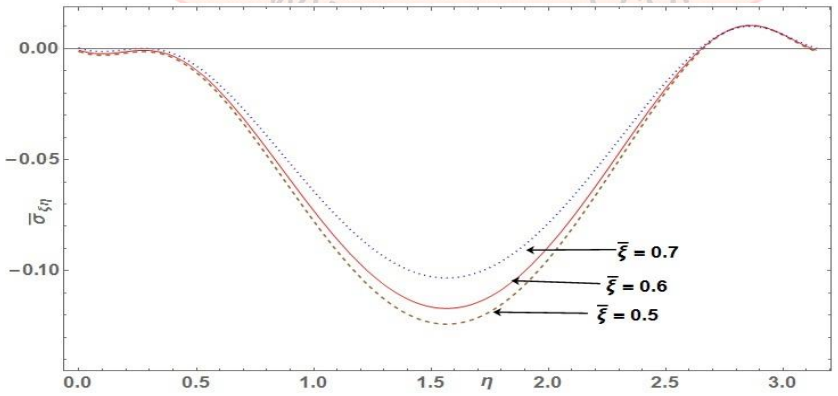

Fig. 3(c): Shear stress $\bar{\sigma}_{\xi\eta}$ along angular direction for different $\bar{\xi}$.

5. Conclusion

In this article, we have described the theoretical treatment of dynamic thermally induced vibration with its deflection and its associated stresses. The analytical technique proposed here is relatively simple and widely applicable compared to the methods proposed by other researchers. The results obtained while carrying research are described as follows

- The maximum tensile stress shifting from the outer surface due to maximum expansion of an outer part of the plate, its absolute value increases with the radius. This could be due to heat, stress, concentration or available internal heat sources under known temperature field.
- The value of radial stress $\bar{\sigma}_{\xi\xi}$ shows discontinuity at the boundaries whereas plateau type curve at the middle part along angular direction.

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Knowledge and Attitude of Health Care Professionals Regarding Placental Stem therapy

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Abstract

Background: The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells.1 Aim: The present study aims to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy. , Objectives: 1. To assess the knowledge of health care professionals regarding placental stem cell therapy. 2. To assess the attitude of health care professionals regarding placental stem cell therapy. 3. To co-relate the knowledge and attitude with various demographic variables. Methods: A descriptive survey approach with Purposive sampling was used to select 150 health care professionals working NMCH, Nellore, Andhra pradesh. Results: Maximum no. of health care professionals (55.3%) had inadequate knowledge and most of them (98%) had positive attitude. Conclusion: The study concluded that, 55.33% of health care professionals had inadequate knowledge and 98% of health care professionals had positive attitude.

Key words: Knowledge, Attitude, Health Care Professionals, Placental Stem Cell therapy.

Introduction

The notion of stem cells is a developing concept. Stem cells are undifferentiated cells, capable of self-regeneration and differentiation into specific lineage cells. Self-regeneration can be maintained along many generations, increasing the number of cells. Umbilical Cord blood (UCB), which is also called "placental blood," is the blood that remains in the umbilical cord and placenta following birth and after the cord is cut. Umbilical cord blood could be considered as a rich source of stem cells.2

The Cord blood is one of the richest and non controversial sources of stem cells. Cord blood is the blood left in the umbilical cord and placenta after the birth of the child and is collected within 10-15 minutes after the cord has been cut off by simple venipuncture, in the umbilical vein followed by gravity drainage in to a sterile anti- coagulant filled blood collection.3

The placenta is one of the most important sources of stem cells, and has been studied extensively over the past period. The placenta fulfills two main desiderata of cell therapy: obtaining of an as high as possible number of cells and use of non-invasive methods for their harvesting. Stem cells in cord blood have exceptional properties that make them desirable, such as high proliferative potential, increased ability for self-renewal, and decreased ability for antigen presentation.4

Need For The Study

During the 1970's researcher discovered that umbilical cord blood could supply the same kind of hematopoietic stem cells as bone marrow donor. And so, umbilical cord blood banking began by collecting and storing umbilical cord blood. Cord blood stem cells are currently used in the treatment of several life-threatening diseases, and play an important role in the treatment of blood and immune system related genetic diseases, cancer and blood disorders.5

The first clinically documented use of cord blood stem cells was in the successful treatment of a six-year-old boy affected by Fanconi anemia in 1988. Since then, cord blood has become increasingly recognized as a source of stem cells that can be used in stem cell therapy.6

Rajeshwari C (2015) conducted a study on knowledge and attitude of health professionals regarding placental stem cell, preservation and utilization. The study concluded that 84% of health professionals had inadequate knowledge and 25% had neutral attitude.7

Perlow JH. (2018) conducted a study to determine the Knowledge on umbilical blood banking among 425 patients. The data were collected by using questionnaire. This revealed that 37% patients had no knowledge regarding umbilical cord blood banking, 2.6% patients had knowledge and 74% patients were minimally informed about umbilical cord blood banking only 14% patients were educated about umbilical cord blood banking by their

nurses, although 90% patients expected their obstetrician to answer their questions on umbilical cord blood banking. This study concluded that patients are poorly informed about umbilical cord blood banking and they are expecting information from the health care professionals.8

Though there are many benefits of cord blood these fascinating stem cells are continued to be discarded as a medical waste even today due to the lack of Knowledge and negative attitude caused by the high cost involved. It is the responsibility of the health professionals to create awareness about Cord Blood Banking and to motivate its utilization by general public to move towards this bio health insurance. 9

Problem Statement

A study to assess the knowledge and attitude of health care professionals regarding placental stem cell therapy at NMCH, Nellore, A.P.

Objectives of The Study

1. To assess the knowledge of health care professionals regarding placental stem cell therapy.
2. To assess the attitude of health care professionals regarding placental stem cell therapy.
3. To co-relate the knowledge and attitude with various demographic variables such as age, sex, work experience, educational status and designation.

Delimitations

The study is delimited to:

1. Health care professionals who are working at NMCH, Nellore, A.P
2. Who are willing to participate in the study.

Materials & Methods:

Research approach: Non-experimental descriptive approach
Research design: Descriptive cross-sectional research design
Setting: The present study was conducted in NMCH, Nellore, A.P
Sample: Health care professionals in NMCH, Nellore, A.P and who fulfilled the inclusion criteria were selected for the study.
Sampling technique: Purposive sampling technique
Sample size: The sample size of the study was 150 health care professionals.
Criteria for sample selection
Inclusion criteria:

- Health care professionals working in NMCH, Nellore, A.P.
- Health care professionals who are present during study period and are willing to participate during the study period.

Exclusion criteria:

- Health care professionals not working in NMCH, Nellore, A.P.

Description of the tool
The tool is divided into three parts.
Part I: This part of tool included demographic information of study subjects such as age, sex, work experience, educational status and designation.
Part II: This part consisted of 20 structured multiple choice questions to assess the knowledge of health care professionals regarding placental stem cell therapy.
Part- III: This part consisted of 12 statements concerning the attitude of health care professionals regarding placental stem cell therapy. The statements were developed for the respondents to respond on five points Likert's scale i.e. strongly agree, agree, uncertain, disagree and strongly disagree.

Results& Discussion:

Table-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy. (N=150)

Level of knowledge	Frequency (n)	Percentage (%)
Adequate (≥50%)	67	44.66
Inadequate(<50%)	83	55.33

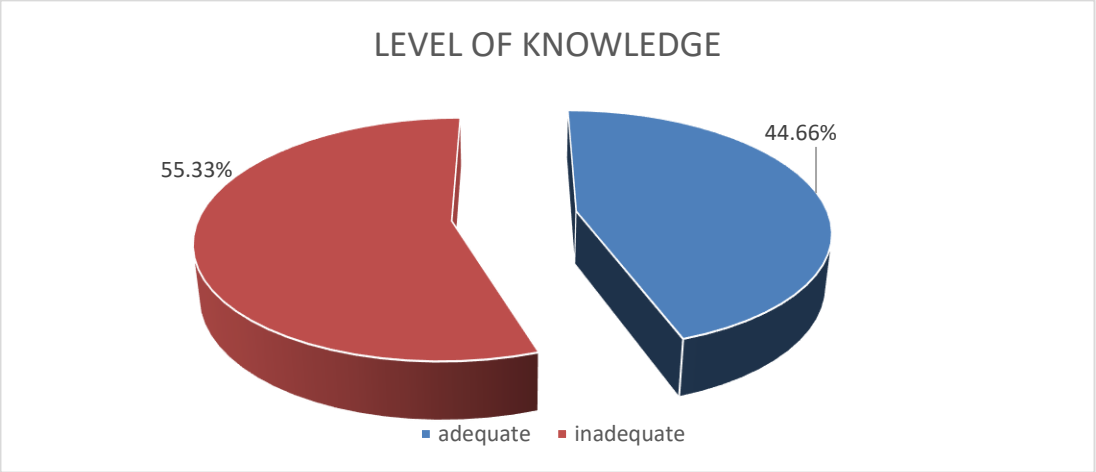

Fig-1: Frequency, Percentage distribution of health care professional's knowledge regarding placental stem cell therapy.

Table-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy. (N=150)

Level of attitude	Attitude	
	Frequency (n)	**Percentage (%)**
Positive (≥50%)	147	**98**
Negative (<50%)	**3**	**2**

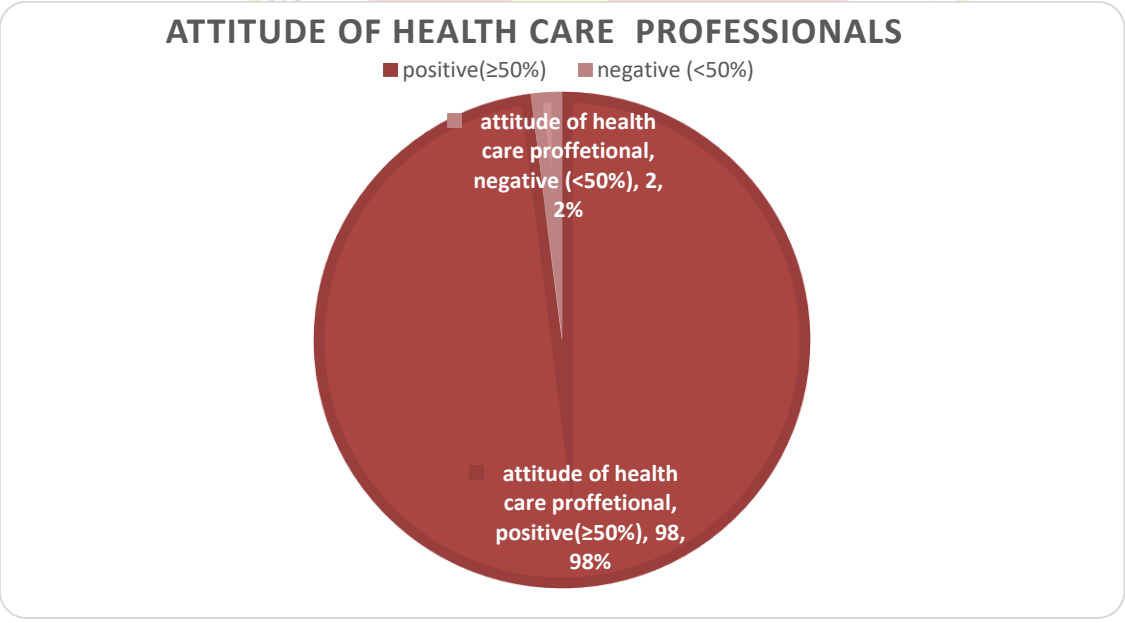

Fig-2: Frequency, Percentage distribution of health care professional's attitude regarding placental stem cell therapy.

Major Findings Of The Study

- The study shows that 44.66% of health care professionals were having adequate knowledge and 55.33% of health care professionals were having inadequate knowledge.
- Majority of health care professionals (98%) had positive attitude and only 2% of them had negative attitude regarding placental stem cell, cord blood banking and its utilization.
- The co-relation of attitude regarding placental stem cell, cord blood banking and its utilization according to age, sex, work experience, educational status and designation was found statistically non significant at ($p<0.05$) level.

Conclusion:

The study concluded that, 55% of health care professionals were having inadequate knowledge and 98% health care professionals had positive attitude regarding placental stem cell, cord blood banking and its utilization.

Recommendations

- On the basis of present findings it is recommended that a large sample should be studied in order to provide better picture of knowledge and attitude regarding stem cell, cord blood banking and its utilization.
- The study may be conducted at different community setting.
- The instrument used for assessing knowledge and attitude towards stem cell, cord blood banking and its utilization can further be developed and field tested for standardizing.
- There should be in- service workshop and seminar to enhance the health care professionals knowledge regarding stem cell, cord blood banking and its utilization.

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