IMPACT OF E-WASTE ON ENVIRONMENT

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ABSTRACT

Due to several advances, developed technologies, electronic industry grow rapidly and became a biggest industry in the world that assist to change people's lifestyle. The large and small household appliances such as TV, refrigerator, washing machine, microwave, Air Conditioner and radio and telecom devices telephone, mobile phone as well as PC, desktop, and printer devices, etc. has been made by using heavy metals like lead, mercury, cadmium, silver, gold, platinum and plastic. These devices have a specific life span. After long term use of these devices have stretched end to life and discarded. The obsolete unwanted electronic devices generate e–waste. In many regions of the country, this waste is buried, burns in open air or dumped into the water bodies. Thus e–waste creates atmospheric water, soil, and air pollution that are harmful to the aquatic organisms as well as affects human health. This study presents an overview of toxic substances present in e-waste, their potential impact on water bodies and soil together with its management.

Keywords: E-Waste, Electronic devices, Heavy metals, Environmental Impact, Management.

Introduction

The use of electronic devices has been increased everywhere around the world. These devices are modified rapidly according to the need for the new versions. The lifestyle of people has changed during the last century due to the industrial revolution followed by advancements in information technology. The electronic industry became the world's largest and fastest upgrading manufacturing industry (DIT 2003). The emergence of new smart designs in the last 20 years creates the rapid discard of electronic items. The latest design and advancement of electronic goods have attracted the consumer to change these items in a very short interval yield in an increase of e-waste. Electronic waste or e-waste is an emerging problem as well as a business opportunity of increasing significance given the volumes of e-waste being generated and the content of both toxic and valuable materials in them. Thus, generating a large amounts of e-waste to the extent of 20-50 million tonnes per year in the world (Davis and Heart 2008). In India, 330 thousand tons of e-waste generated in 2007 which has risen to about 470 thousand tons by 2011 (Raghupathy *et al*., 2010). The increasingly rapid evolution of electronic technology combined with rapid obsolescence of the product has compounded the issue of e-waste (Otsuka *et al*., 2012). Globally produced e-waste is rising at a rate nearly three times faster than total solid municipal waste (Schluep *et al*., 2009). E-waste accumulates nearly three times faster than other waste (Cucchiella *et al*., 2015). Waste Electronic and Electrical Equipment (WEEE i. e. e-waste) are generated each year (Wang *et al*, 2016). In 2019, 53.6 million metric tonnes of e-waste was produced (Forti *et al*. 2020). In 2014, the United States was the greatest producer of e-waste (7.1 million tonnes) and China the second (6 million tonnes) (Balde *et al*., 2015).

Basic Definition of E - Waste

The definition of e-waste is put forth several ways by several scientists but a few basic definitions of it are summarized as follows

1. According to the European Directives 2002/96/EC the term e-waste is defined as waste of electrical and electronic tools comprising all components, subassemblies and consumables which are part of the product at the time of discarding.
2. Basel Action Network (www.ban.org) defined the e-waste includes a varied and emerging range of electronic devices ranging from large household appliances, such as refrigerators, air-conditioners, cell phones, stereo systems and consumable electronic items to computers discarded by their users.

3. OECD (www.oecd.org) suggested the term e-waste as any household appliance overwhelming electricity and getting its life cycle end. (Gaidajis *et al*., 2010).

E - Waste Producing Devices

There is a large number of electronic products such as computers, servers, mainframes, monitors, CDs, printers, scanners, copiers, calculators, fax machines, battery cells, cellular phones, TVs, medical apparatus, refrigerators, and air-conditioners. Every electronic device has a particular lifespan. The life span of these appliances has reduces therefore it helps to raise the e-waste. Table 1 shows the discarding rate of the few electronic products

Table: 1 The discarding rate of some electronic products

Sr. No.	Electronic Products	Years	References
1.	Mobile telephone	1 - 3	Cobbing M. (2008) and Pandey P. K. (2016)
2.	PC	2 - 3	Betts K. (2088)
3.	Television , Refrigerator and Washing Machine	I1 - 15	Pandey P. K. (2016)
4.	IT accessories	fast rate	
5.	Camera	3 -5	
6.	Fax machine, Video recorder / DVD Player and electronic games	5	Cobbing M. (2008) Robinson B. (2009)
7.	Photocopier	8	
8.	Microwave	7	Cobbing M. (2008)
9.	Air-conditioner	12	Robinson B. (2009)

E – Waste Categorization

Various appliances are regularly used for smoothing the lifestyle without taking more efforts. The size of these appliances may ranges from large to small and produces various types of e-waste. Table 2 shows different categories of various electronic products as followed (Nageswara Rao (2014), Syed R. A. and Mahrukh (2020).

Table 2: Various Categories of different electronic equipments.

Sr. No.	Category	Abbreviation	Appliances/ Equipments
1.	Large household appliances	Large HA	(Refrigerator, Freezer, and Washing machine
2.	Small household appliances	Small HA	Vacuum cleaners, Watches and Grinders.
3.	IT and telecommunications equipment	ICT	PCs, Printers and Telephones.
4.	Consumer equipment	CE	TV, Radio, Video Camera and Amplifiers
5.	Lighting equipment	Lighting	CFL, High Intensity Sodium Lamp
6.	Electrical and electronic tools	E&E tools	Drills, Saws and Sewing machine
7.	Toys, leisure and sports equipment	Toys	Computer, Video games and Electric trains.
8.	Medical devices	Medical devices	All radiotherapy equipment and Dialysis
9.	Monitoring & control instruments	M&C	Heating regulator, Smoke detector and Thermostat
10.	Automatic dispensers	Dispensers	Soap dispensers and Hand sanitizer dispensers

E-Waste Scenario in India

IT and Telecom services are rapidly raising industries in the country. The rank of India in e-waste generation is fifth position globally. In 2014, electronic and electric devices were discarded 1.7 million tonnes (MT). Every year 12.5 lakh MTs of e-waste generated in India. Environmental Performance Index shows that India ranks 155 out of 178 nations. E-waste generated in a few cities across the nation shows an alarming issue. Mumbai generates 11,000 tons of E-waste, Delhi 9000 tons, Bangalore 8000 tons and Chennai 5000-6000 tons each year. Maharashtra State alone produces 20270 tons of e - waste annually (Jha *et al*., 2011). According to the Greenpeace Report of 2007, India generated 380,000 tons of e-waste. In India, about 1.38 million personal computers are outmoded every year increasing the rate of e-waste generation, which is approximately 10%, annually going to

affect environmental health indicators (Monika and Kishore 2020).

Hazardous substances in E-wastes

Electronic products often contain many persistent bioaccumulative and toxic substances like heavy metals such as lead, nickel , chromium and mercury, beryllium as well as persistent organic contaminants (POPs) such as polychlorinated biphenyls (PCBs) and brominated flame-retardants like tetrabromobisphenol - A (TBBA), polybrominated biphenyls (PBB), polybrominated diphenyl ethers (PBDE) (Verma and Prakash 2020). In addition to that metal elements very small quantity of few elements includes americium, antimony, arsenic, barium, bismuth, boron, cobalt, europium, gallium, germanium, gold, indium, lithium, manganese, niobium, palladium, platinum, rhodium, ruthenium, selenium, silver, tantalum, terbium, thorium, titanium, vanadium, and yttrium. polycyclic aromatic hydrocarbons PAHs) and polychlorinated biphenyls have occurred in e–waste.(Sankhla *et al*., 2016).

Table3: The uses of heavy metals in the components of electronic products.

E - waste Pollutants	Used in parts of devices/ equipments	References
Halogenated compounds		
PCB	Condensers and Transformers	Morf *et al* .(2007) and Varma and Prakash (2020)
Heavy Metal		
Antimony	Fire retardant, plastics	Morf *et al*. (2007) and e-waste,
Arsenic	Light emitting diodes	
Barium	CRT	Morf *et al* .(2007) and Nageswara (2014)
Beryllium	X-ray lenses, Motherboards	Morf *et al* .(2007) and Pandey P. K.. (2016)
Cadmium	Rechargeable NiCd-batteries, CRT screens, printer inks, toners and drums	Morf *et al* .(2007) and Pandey P. K. (2016) and Sankhla *et al* , (2016).
Chromium	Floppy-disks	Morf *et al*. (2007)
Copper	Cabling	
Lead	CRT screens, batteries, printed wiring	Morf *et al*. (2007) and Pandey P. K. (2016)
Lithium	Li-batteries	
Mercury	Fluorescent lamps, alkaline batteries, switches and Monitors	Morf *et al*.. (2007) and Pandey P. K. (2016) and Sankhla *et al*..(2016)
Nickel	Rechargeable NiCd-batteries / NiMH-batteries	Varma and Prakash (2020)
Plastic		
PVC	Cable insulation	Pandey P. K. (2016) and Nageswara (2014).

Impacts of E-Wastes on the Environment

Disposal of e-wastes is a critical problem faced and poses a threat to both health and vital components of the ecosystem. Disturbances in an ecosystem affect the biodiversity and human survival (Verma 2018). There are a number of channels through which e-waste goes to the environment. It also influences the overall climate. Climate change has a huge impact on biodiversity (Prakash and Srivastava, 2019). Biodiversity conservation is required for sustainable development (Verma, 2019) and survival of plants and animals because biodiversity is the foundation of human life (Verma and Prakash, 2020). Incineration of e-wastes can emit toxic fumes and gases, thereby polluting the surrounding air.

1. Impact of e-Waste on Water Bodies

E-waste disposal is a particular problem faced in many regions across the globe. The irrigation canals, riverbanks, wetlands, and reservoirs also end up with several tones of e-waste material and repair residues. Landfilled computer waste creates polluted leachates that ultimately contaminate the groundwater. When plastics-containing brominates are filled with flame retardant plastic or cadmium, both polybrominated diphenyl ethers (PBDE) and cadmium can leach into the soil and groundwater. Metals and metalloids can directly diffuse into soils and groundwater (Fent, 2004). Significant quantities of metals and metalloids are mixed with water bodies even at low concentrations Rao, 2014). The high BOD level indicates that organics measured as BOD can

cause taste and odor problems and oxygen depletion in the groundwater, thereby posing threat to those who drink it. The high concentration of TDS suggests a downward transfer of leachate into groundwater (Mor *et al*., 2006).

2. Impact on Air

One of the most common effects of E-waste on the air is through air pollution. A document of British government about Lagos and their residents near landfill scavengers. Lagos looking for improperly disposed electronics which includes wires and blenders etc. to make some income from the recycling of these wastes. These men were shown to burn wires to get in them by open air burning which can release hydrocarbons into the air (Kumar and Prakash 2019). Some of these heavy metals are also carcinogenic (Kumar and Prakash 2019).

3. **Impact on Soil**

The toxic heavy metals and chemicals from e-waste enter the food pathway. The heavy metals enter in to human body by this route.. These chemicals are not biodegradable - they persist in the environment for long periods of time increasing the risk of exposure. These dangers posed by improper disposal on the environment ultimately have impacts on human beings -human cost; the health effects of these toxins on humans include birth defects brain, heart, liver, kidney and skeletal system damage. They also significantly affect the nervous and reproductive systems of the human body. When computer monitors and other electronics are burned, they create cancer producing dioxins which are released into the air we breathe.

E-Waste Management in India

For the purpose of environmental safeguard e-waste management should have e-waste collection center, transportation facility, treatment, storage; recovery and disposal need to be established at national and regional levels. The creation of e-waste collection, exchange and recycling centers should be stimulated in partnership with private entrepreneurs and manufacturers. Number of legislation related to environmental protection in India there are lack of adequate legislation or specific laws or guidelines for electronic waste or computer waste. The public awareness and cooperation of manufacturers are essential for the advancement of e-waste management system. The e-waste management carried out by using the following methods.

1. Sustainable product design

This is one of the simple ways to reduce the quantity of e–waste in the environment. It needs to be made to design a product that requires fewer amounts of hazardous substances. Manufacture the designs of the modern computers that are flatter, lighter, and more integrated the efforts to reduce material usage are reflected. Electronic products should be made using bio-based plastics not even from petrochemicals but from plant-based chemicals or plant-produced polymers. There are more frequent applications of bio-based toners, glues, and inks. Designers must ensure that the product is designed for re-use, repair and/or upgradeability

2. Extended producer responsibility (EPR)

The Organization for Economic Cooperation and Development (OECD) has defined the EPR as an environmental policy approach in which the responsibility of suppliers for a commodity gives to the post-consumer stage of the life cycle of a product including its final disposal (Walls, 2006). The main objectives of EPR are (Langrova 2002).

i. Waste prevention and reduction
ii. Product reuse
iii. Increased use of recycled materials in production.

3. Land Filling

It is a widely used method for the disposal of e-waste. In this method trenches, are made on flat surfaces by removing soil from the trenches and waste material is buried in it, which is covered by a thick layer of soil. The secure landfill is made using modern techniques. Here they are provided with some facilities like an impervious liner made up of plastic or clay leachate collection basin that collects and transfer the leachate to a wastewater treatment plant. The degradation processes in landfills are very complicated and run over a wide span and can be many years.

4. Life Cycle Assessment (LCA)

LCA technique have been used to minimize the e-waste and for eco designing of electronic devices in an environment friendly manner and suited to consumers. LCA is a better option for identification of environmental impacts in eco-design of products such as printers, desktop personal computers, heating and air conditioner devices, washing machines and toys (Munoz *et*

al., 2009). This tool is helpful in improvement of performance of products and in determining the environmental impact of toxic substances such as carcinogens, climate change, ozone layer, ecotoxicity, acidification, and land use (Belboom *et al*., 2011)

5. Material Flow Analysis (MFA)

Studies related to e-waste flowing into recycling sites/disposal areas can be performed using the MFA tool which discusses about the sources, pathways, the intermediate and final destinations of the material. MFA is a decision support tool for management of environment and waste in terms of economic, social and environmental conditions (Brunner and Rechberger, 2004). MFA is used for evaluation of economic values as a tool for system analysis of the Au and Cu that flows from personal computer recycling in India (Streicher-Porte *et al*., 2007).

Conclusion

E-waste is a serious problem at both local and global scales .Every year million tons (MT) e–waste is generated from the various electronic devices. The heavy metals and plastic of such devices do not degraded easily. The lack of inadequate knowledge and strong enforcement of legislators act to degrade the e- waste people are responsible for producing the environment unhealthy to the human life and aquatic organisms. The e–waste of electronic devices entered from source to the other regions of the country by flow of water bodies, sometimes remain in the water bodies and cause several skin diseases to the human being, depletion of BOD and increases TDS in water bodies. Therefore, there is urgent need for a concert-ed effort to be made by the relevant authorities to address the environmental and health hazards posed by the exposure to e - waste.

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NANOCOMPOSITE SYNTHESIS AND SPECTROSCOPIC CHARACTERIZATION OF POLYANILINE DOPED WITH TIN OXIDE (SnO_2)

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ABSTRACT

To study the prevalence of gastrointestinal parasites of Boselaphustragocamelus, 51 faecal samples were collected from Katepurna Sanctuary during the period from February 2022 to July 2022. Thirty five samples were found to be infected with gastrointestinal parasites and overall prevalence rate was 68.62%. Paramphistomum sp. (23.52%), Ascaris sp. (19.6%) Fasciola sp. (11.76%), stomach worm (11.76%), hook worm (9.80%), Strongyloides sp. (3.92%), Balantidium coli (3.92%) Oesophagostomum sp. (1.96%), Eimeria sp. (1.96%) & Mixed type of infections of Ascaris sp. Was found in 5 different scat samples or droppings. Seasonal prevalence of gastrointestinal parasites in summer and winter were 80.01% and 17.3% respectively. This study provided a second overview on parasites in Nilgai of the Katepurna Sanctuary, but to evaluate parasite transmission dynamics much more studies were required on livestock and on wild herbivores.

Keywords:*Boselaphustragocamelus, Nilgai, Faecal sample, Parasite, Scat analysis.*

1. Introduction

In recent years, there has been developing interest in research on conducting polymer nanostructures. Conducting polymers show different promising applications in various fields, for example in transistors, sensors, actuators/ muscles, [1-2]. The composite of the segments in a polymer composite outcomes in interesting mechanical and thermal properties that are infeasible to be accomplished with any material.

Considering conducting polymers, most incredible solidness was observed in polyaniline in its doped, de-doped form. It has may applications like anticorrosion coatings, [3], synthetic detecting, batteries [4], electromagnetic impedance protecting, microelectronics, etc. [5-6], Polymer composites have improved optoelectronic properties due to the expansion of fillers. Polymerization of polyaniline-graphene oxide nanocomposites showed enhanced electrical conductivity of 9.2 S/cm [7]. The conductivity of SnO_2/PANI nanocomposites is found to be 1.75×10^{-1}S/cm by some researchers [8]. Maximum conductivity of PANI/SnO_2nanocomposite was found to be 6.4×10^{-3} s/cm at 9 wt%. Liu *et al* [9] prepared TiO_2/PANI solar cells. The composite of (SnO_2/PANI) was found electrically responsive to humidity in a closed chamber.

In the present work, nanoparticles of polyaniline and polyaniline-SnO_2nanocomposites are prepared by chemical oxidative polymerization method. Their structural characterization is done by scanning electron microscopy technique and x-ray diffraction technique. We are getting crystalline nature of the nanocomposite with agglomeration of crystals over polymer and nanosized particles in nanocomposite. Spectroscopic characterization of crystals is done using FTIR spectroscopy. In FTIR investigation, the peaks of PANI-SnO_2 nanocomposite shows a modification of the spectra of the polyaniline due to embedding SnO_2.

2. Methods and Materials

2.1. Synthesis of Polyaniline (PANI) Nanoparticles:

In this process polyanilinenanocomposite was synthesized by chemical oxidative polymerization method [10]. 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, mixture

is stirred for 2 hr. Then resulting dark green precipitate of PANI was filtered and washed with HCl and acetone. Obtained precipitate was kept in oven to dry for about 8 hrs. at 50-60 ^{0}C.

2.2. Synthesis of Polyaniline-Tin Oxide Nanocomposite:

In this process polymer composite was synthesized by in-situ chemical oxidative polymerization method [11] for 20 wt. % of SnO_2. SnO_2 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-SnO_2 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 ^{0}C. In this way PANI-SnO_2 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.

3.3. FourierTransform infrared Spectroscopy:

(FTIR) is the most widely used method for characterizing the molecular structure of polymers, because it provides a lot of information. The FTIR study of, Pure PANI and PANI–SnO_2nanocomposites was studied on a BRUKER FTIR IR spectrophotometer in the range 500 to 4000 cm^{-1} at room temperature (303 K).

4. Result and Discussion

4.1. Scanning Electron Microscopy:

The surface morphology of PANI and PANI-SnO_2 (25 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.

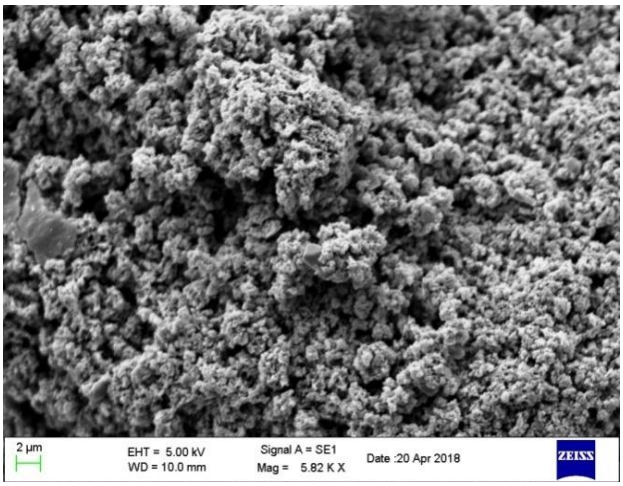


Fig. Pure PANI

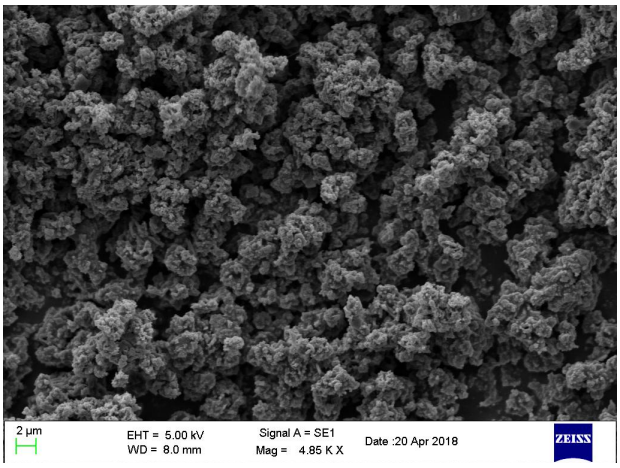


Fig. PANI-SnO_2nanocomposite

The average size of the particles is 15-268 nm. PANI is completely amorphous in nature whereas PANI-SnO_2nanocomposite 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_2nanocomposite than pure conventional PANI, clearly indicated the homogeneous distribution of nanoparticles in the polymer matrix.

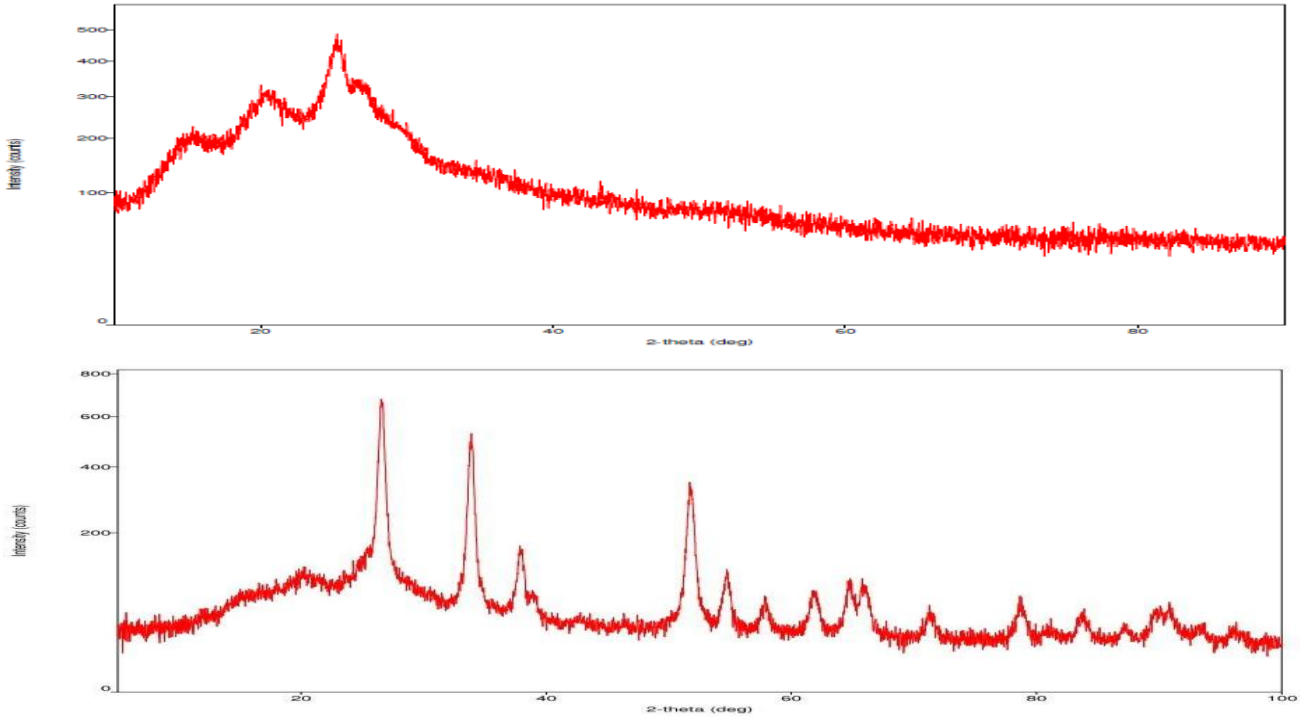
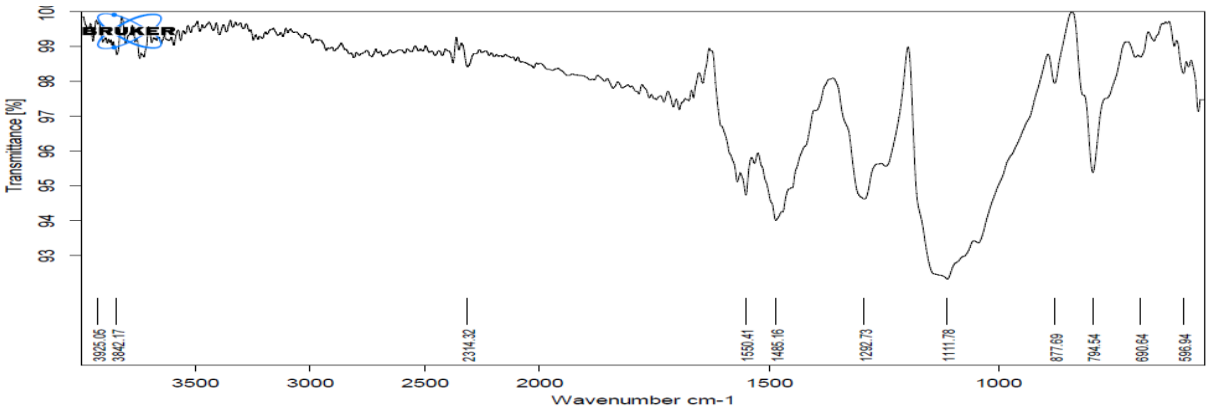


Fig. XRD pattern of Pure PANI and PANI-SnO_2nanocomposite

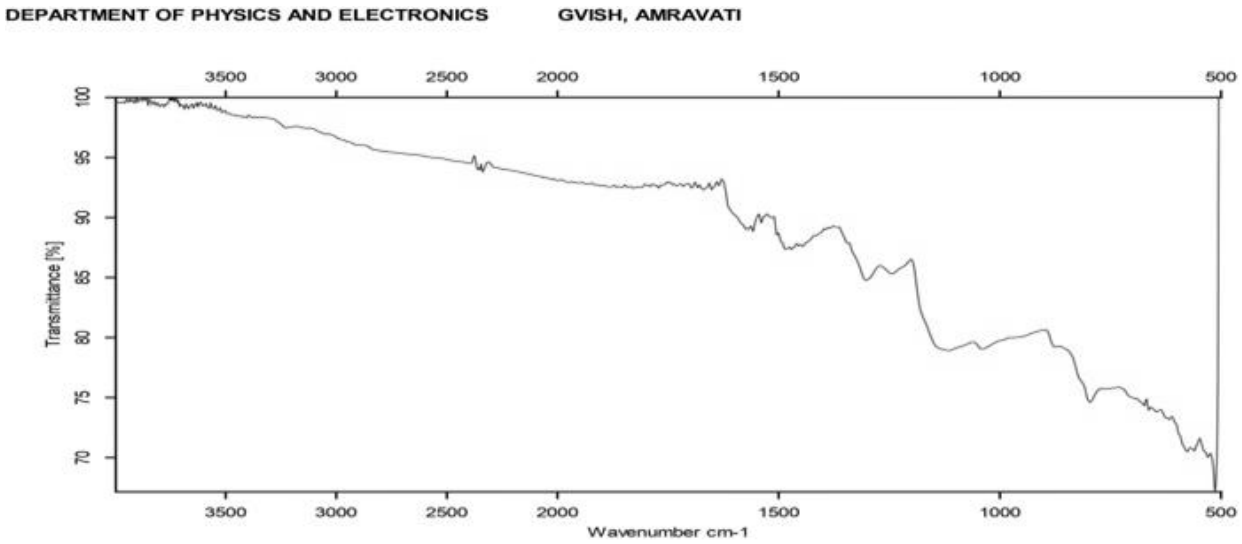
The crystallite size can be determined using Debye Scherrer formula and found as 40 nm. The XRD-pattern of PANI-SnO_2 shows sharp diffraction peaks at 26°, 34°, 51° which confirms the presence of SnO_2 nanoparticles are highly crystalline and can be indexed as (110), (101) and (211) planes of SnO_2. 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^o, 20.34^o, 25.20^o.PANI showed two broad hallows at 2θ =20.34^o and 25.20^o. A nanocomposite show the greater crystallinity due to the addition of SnO_2.

4.3. Fourier Transform Infrared Spectroscopy(FTIR)

An infrared spectra of pure Polyaniline and PANI doped with 25 wt. % of Tin Oxide (SnO_2) is shown in figure below. The spectral studies of the synthesised polymer composite films show number of absorption peaks. From FTIR spectra of all synthesised samples, it is observed that basic nature of the polymer composite is same. An attempt is made to explain the structure of PANI-SnO_2 nanocomposite film with the help of infrared spectra.



(a) FTIR spectra of Pure Polyaniline



(b) FTIR spectra of Polyaniline doped with 25 weight % of SnO_2nanocomposite

The infrared spectra of pure PANI and PANI doped with 25 wt. % of Tin Oxide (SnO_2) shows the different absorption bands these values are listed in table below.

Table : Vibrational frequencies from FTIR spectra for Polyaniline polymer doped with Tin Oxide (SnO_2)

SnO_2 wt. %	Position of absorption maxima (cm^{-1})										
PANI	596.94	690.64	794.54	877.59	1111.78	1292.73	1485.16	1550.41	2314.32	-	3842.17
PANI + 25% SnO_2	516.6	574.7	798.8	865.2	1122.5	1247.6	1396.6	1562.64	2350.6	3237.5	3775.5

FTIR spectra of SnO_2, polyaniline and PANI-SnO_2 nanocomposite are displayed in Figure. The peaks of PANI-SnO_2 nanocomposite is a modification of the spectra of the polyaniline due to embedding SnO_2 .This approves the SnO_2 polymerization and formation of core-shell model. Table includes the bonds corresponding to each wave number. Similar bands have been observed by others but at shifted wave numbers [16].

FTIR spectrum of PANI shows all important absorption peaks 1550, 1485, 1292, 1111, and 877 cm^{-1}. The peaks at 1550 and 1485 cm^{-1} are assigned to C–C ring asymmetric and symmetric stretching vibrations. The peaks at 1292 cm^{-1} correspond to N–H and C–C bending vibrations. The bands at 1111 and 877

cm^{-1} can be attributed to the in-plane and out-of-plane C–H bending, respectively. The corresponding peaks PANI/ SnO_2 appear at shifted position. The spectrum of the PANI/SnO_2 exhibits some new peaks which shows interaction between PANI and tin oxide. The peak at 3227 cm^{-1} could be attributed to N–H stretching and peak at 1562 $cm^{-1}$to C-N bending vibration of quinoid rings and peaks associated with 1396 cm^{-1}could be attributed to C-N stretching vibrations associated with benzenoid ring [17]. Peak at wave number 1122 cm^{-1} is considered to be due to N-Q-N stretching. The peak at the wave number 798 cm^{-1} is attributed to C–H out of plane bending vibrations. These peaks are slightly shifted with respect to their normal positions for pure PANI [16] due to the presence of tin oxide in the PANI matrix It shows two absorption peaks at 574 cm^{-1} which are assigned to the stretching vibration frequency of Sn-O-Sn in SnO_2[18].

5. Conclusion

SEM micrograph shows the partly crystalline behaviour as well as amorphous morphology of Polyaniline doped with Zinc Oxide (SnO_2). Nanoparticles formed are not of homogeneous size. Agglomeration of the crystals were seen. These materials are polycrystalline in nature. The surface morphology changes severely from rough to smooth. Also the addition of SnO_2 shows further drastic improvement of surface morphology of polymer composite. The average size of the particles PANI and PANI-SnO_2nanocomposite are found to be range between 200-550 nm, and 100-250 nm respectively.

From the X-Ray diffraction technique it was observed that Polyaniline doped with SnO2 indicating the partly crystalline and partly amorphous in nature. The sharp peak observed in PANI-SnO_2nanocompositeis due to the presence of SnO_2 in the nanocomposite. A nanocomposite show greater crystallinity due to the addition of SnO_2 in PANI matrix as compared to pure PANI.

In FTIR investigation, the peaks of PANI-SnO_2 nanocomposite shows a modification of the spectra of the polyaniline due to embedding SnO_2 .This approves the SnO_2 polymerization and formation of core-shell model. The results give the confirmation that there is strong interaction between the PANI and SnO_2 nanoparticles, also the presence of SnO_2 nanoparticles doping with PANI.

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AN INVESTIGATION OF THE STATUS AND DISTRIBUTION OF SCOPS OWLS IN MELGHAT TIGER RESERVE, AMRAVATI, MAHARASHTRA

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ABSTRACT

Scops owls (Genus: otus) are small, cryptically marked, and only active at night. They have noticeable ear tufts and face discs. By using survey methodologies, the distribution and population status of these owl species were evaluated. This study found that Indian scops owls were more common than Oriental scops owls.

Keywords:*MTR, Owls, Owlets, Population status, Birds of prey, Scops owls, Oriental Scops owl.*

1. Introduction

Owls can be found in a variety of environments, including human settlements as well as deserts and woodlands. Despite their widespread prevalence, they are constrained and challenging to perceive (Kumar et al. 2017). Due of owls' significant economic, scientific, and aesthetic values, the species has received a lot of attention (Santhankrishnan et al, 2011).

Scops owls (Genus: otus) comprises a vast family of raptorial birds with soft, cryptically patterned plumage, huge heads with rounded but incomplete facial discs, large, immovable forward-facing eyes, and short, sharply curved bills with feathers mostly covering them. The majority of species roost and lay their eggs in tree holes, some of which are nocturnal exclusively. Owls have keen vision and can see clearly in both light and dim light. Although there is little sexual dimorphism in plumage, females are typically bigger. Except in a few genera of tiny owls, juveniles frequently leave the nest with some down still present (in a transitional or mesoptlie plumage). However, once the first contour plumage is reached, it only slightly differs from that of adults. The majority of species are challenging to find until their characteristic songs are mastered; several are much more common than is often thought. Male owls' territorial songs are typically highly stereotyped, patterned hoots or whistles.

Amravati district boasts of dense forest cover of about 1500 sq.miles. 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 scops 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.

2. Materials and Methods

Melghat Tiger Reserve, in the Amravati district, is where the majority of the state's biodiversity can be found. It is situated in the southern region of the Satpuda hill range in central India. The Melghat Tiger Reserve and surrounding forest are located at the northernmost point of Maharashtra State's Amravati district, close to the Madhya Pradesh border. Melghat Tiger Reserve is an example of the Central Highlands Biogeographic Zone "6 E Deccan peninsula" in central India.

To assess the status of the species, a thorough survey of the Melghat Tigre reserve was conducted between July 2013 and December 2017. To gather information about owl sightings, interviews with local indigenous people were held. Other suggestions from the locals were also taken into consideration. In the current investigation, the following survey approaches were employed:

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).

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.

3. Results

In the present studyOreintalScops owl (*Otussunia)* is very rare species, in Melghat Tiger Reserve, The species were recorded from dense forest. Total 8 individuals were reported by calls and direct sightings from 3 locations (Table 1).

Table 1: Habitat details and G.P.S location data of Oriental scops owl recorded during survey.

S.N.	No.	Habitat area	Location
1.	03	Chikhaldara range	N21°25’.25.2’’E077°17’.34.2’’
2.	04	Near Andherianikat area	N21°25’.25.1’’E077°17’.34.1’’
3.	01	Bhosakhandi Camp	N21’37.18.2 E077’19.43.4

However, Indian Scops owl (*Otusbaccamoena*)was found to be more Common owl and found all over Melghat Region. However few sightings were recorded from East Melghat. Total 26 individuals were reported by calls and direct sightings from 21 locations (Table 2). The owl species was generally observed to be present in nest during day time and comes out from nest at evening at. Owl calls are observed as it comes out of the nest, but after sometime the calling ceases.

Table 2: Habitat details and G.P.S location data of Indian scops owls recorded during survey.

S.N.	No’s	Habitat details	Location
1.	02	AndheriChikhaldara range	N21°25’.25.1’’ E077°17’.34.1’’
2.	2	Taragolai camp	N21’39.20.7 E077’26.56.9
3.	1	Rajadoah camp road	N21’39.03.6 E077’26.28.1
4.	1	Kolkas Lower rest house area	N21’30.02.5 E077’12.32.2
5.	1	Kolkas Upper rest house	N21’29.54.5 E077’12.06.6
6.	1	Ghatang to semadoah	N21’29.06.5 E077’22.37.5
7.	01	Near Jarida Village	21°38'06.6"N 77°28'57.7"E
8.	2	Near pilikolkas road	N 21’29.46.9 E 077’16.52.3
9.	1	Belkundresthouse	N21’03.2 E077’08.02.9
10.	1	Belkund road	N21’20.48.8 E077’08.15.14
11.	01	Bhosakhandi camp	N21’37.18.2 E077’19.43.4
12.	01	Near Bhawaiphata to Ghatang	N21’29.01.1 E077’23.13.0
13.	01	Near Chaddupati camp in turist area	N21’31.52.8 E077’14.32.4

14.	01	Semadoh to Bhawaiphata	N21’29.05.5 E077’22.57.9
15.	01	Raipur Rest house	N-21O34.610’ E-077O16.175’
16.	01	Near around Alkund camp	N-21O33.508’ E-077 O26.424’
17.	1	Semadoah To Sipnapadaw Road Nr SipnaPadaw	N21`28.761 E077`18.777
18.	01	In semadoh village	N21°30'08.2"E 77°19'13.4"
19.	01	Near Semadoh Village	N21°30'07.7"E 77°18'57.8"
20.	3	Memna road 3km from semadoah	N1°29'24.9"E77°19'09.0"
21.	1	Bhanvar river	N21^{0}36.758’E, 077^{0}06.812’

4. Discussion

Study by Rasmussen and Anderton (2012) asserts that Oriental scops owls spend the summer in Muree Hills, North East Pakistan, Uttaranchal, and at least Nepal, as well as being possibly resident there. These claims are in agreement with the current findings, as Oriental scops owls have only been reported in Melghat Tiger Reserve protected areas and are considered to be rare. The present findings are also supported by the Checklist of MTR, (1994).

According to Sharma et al. (2018), Indian Scopsowl were sporadically observed in forested areas. On the contrary, the owl species was more frequently noted in the current investigation.

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"GREEN" IS THE NEW SCENARIO OF MARKETING!

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ABSTRACT

Green is the new concept of new era. The boom of environment friendly products, themes is everywhere in globe. So the banking and commerce is also the field where the green concepts are implemented. Like paperless transactions, maximum use of e-resources for routine work, use of mobiles, DIY- Do it yourself type of transactions by consumers. By avoiding physical presence of customers in the banks, by avoiding use of vehicle, by avoiding use of electricity we will be minimize the use of natural resources and the target of 'green' will be achieved. This paper is about the concepts of green banking, green commerce and green marketing.

Keywords:*Green Banking, Green Commerce, Green Marketing,*

1. Introduction

The sustainable development is very prominent issue in the global scenario. Issues like increasing global warming, continuously fluctuating climate changes, Covid-19 like disasters, resources scarcity make it more complex nowadays. Everyone in the government or private entity or authority, other stakeholders i.e., financial institutions like banks, NBFCs may also play vital role in this regard. Green business, green banking, green marketing etc. terms have become important to decision making for MNCs, bankers, marketers small scale industries, entrepreneurs. Environmental issues matters everyone still very few are taking this things seriously.

2. Objectives

1. Throw some light on term and concepts related to Green Marketing.
2. To find the importance of Green Marketing.
3. To find the challenges against Green Marketing.

3. Review of Literature

Charter Etel elaborate, "Green market is marked as a part of market segment based on the greenness of the consumer."
MuthamizhVendanMurugavel (2010) observed that, the impact of global warming is likely to affect developing countries mostly. Global warming is the threat for potable water, food security and generation of natural resources.
Philip Kotler said, the Companies need to make drastic changes in their research & development, production, financial, and marketing practices if sustainability has to be achieved.
LubnaKably, Senior Editor, TOI says, Lubna (2007) in Economic Times has written that Eco-friendly measures seem attractive on paper, but they do entail a higher cost, at least initially. No wonder then that 46% of companies surveyed have declared they will only invest in low-carbon equipment if the running cost is the same or lower than those of conventional equipments. A mere 40% have invested in low-carbon equipments and only 38% have a company policy to do so. It is because of the same reason that in approx two decades of its existence, only 12 companies have secured Eco-Mark license from the Bureau of Indian Standards (BIS), the scheme's implementing agency. It can be called as catastrophe only that till date only seventeen licenses have been issued under product categories of paper, wood substitutes and finished leather products.

4. Concept of Green Marketing

Green marketing or environmental marketing is the promotion of environmentally friendly products, services, and initiatives. Furthermore green marketing stands a vast range of

environment friendly practices and strategies.The AMAs perception for Green Marketing is the marketing the products that are presumed to be environment safe.

Some green marketing examples include:

- Creating eco-friendly products
- Using nature-friendly package for products made up of recycled materials
- Reducing greenhouse effects or emission of gases from production process.
- Adopting sustainable business practices

For example, products made locally in North India tend to be more expensive than those made south using cheap labor, but local sourcing and supply chain means they have a much smaller carbon emitting than from south.

5. Evolution of Green Marketing

Green marketing word firstly used in a seminar on "Ecological Marketing," organized by American Marketing Association (AMA) in year of 1975. The phrase green marketing gets popular in the decade of 80s. The phrase green marketing used in the books by Ken Pattie (1992) in the UK & by Jacquelyn Ottman (1993) in the US.Peattie (2001) the birth of green marketing have 03 levels. The first is ecological green marketing, within these marketing activities are intended to help environmental issues and to avail solutions for the same. Second is environmental green marketing and the light diverted on clean technology that included designing of innovative new products, which were caring of pollutants and wasted issues. Third is sustainable green marketing. It came into prominence in the last 90s & starting of the year 2000 concerned with developing good quality products which can meet consumers need by focusing on the quality, price, performance and convenience with environment supportive manner.

6. Green Marketing Strategy

- Adopting responsible waste disposal practices
- Seeking official certifications for sustainability and
- Using efficient packing and shipping methods
- Taking steps to offset carbon emissions via investment

Green companies take a long view of their businesses, prioritizing the well-being of the planet and future generations over short-term profits.

We can say that, Green Marketing deals with ethical trade of social and economic advantages and environmental responsibilities through green business. Due to raise in environment related concerns, which influenced the globe; there has been a raise in consumer concern with regard to environment awareness and increasing demand of Green Products.

Green Marketing refers to holistic marketing concepts. Green marketing incorporates a vast range of activities including, product designing, change, new ideas for manufacturing

process, packaging and new ides of advertising. There are several entities implemented strategies which aim to resolve ecological issues and build up the loyalty towards consumers.

7. Challenges against the Green Marketing

1. The cost of sustainable R & D (Research & Development), needs a technology with big investment.
2. Green products needs renewable, recyclable raw material, which is expensive
3. Current costs of using eco-friendly goods & manufacturing methods,
4. Unawareness regarding the green products and their uses among the peoples.
5. The threats of false promotions around green efforts.
6. Un-willingness of the majority of the consumers to pay for expensive green products

8. Suggestions

1. All the end users should take lead and aware everyone to understand the benefits of green/ organic product and must literate for the same.
2. Social Media is very powerful medium of promotion and now a day, there are

several ways to transmit and spread the information through social networking sites.

3. Government policies should be liberal towards green oriented businesses and corporate sector.
4. Educational institutions should create and inculcate the research culture for environment and green related issues for sustainable development.
5. Green related product and services should be subsidies for some extent.

9. Conclusion

1. Tremendous economical growth, technical findings, neck-cutting competition profit making strategies and blast of population have exploited the natural resources to optimum level. It resulted in the down gradation of environment.
2. Consumers in this era are environment conscious and demanding eco-friendly products.
3. CSR (Corporate Social Responsibilities), green and sustainable development trend is continuously increasing due to changing governmental policies for MNCs and local companies from various dimensions, including consumers, shareholders, employees, partners, governments & media, for sustainable and green practices.

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SNAKE & ITS IMPORTANCE: A REVIEW

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ABSTRACT

As we heard about snakes suddenly fear comes to our mind. Some very important facts are not know so aim of this review article to investigate some important facts to.

1. Introduction

Snakes are the important reptiles They are also called as serpent, due to absence of limbs and greatly elongated body and tail. All snakes lack external limbs, but not all legless reptiles are snakes. Snakes also lack external ear openings. Internally, they have lost the urinary bladder. The visceral organs are elongated, with reduction of the left member in relation to the right; the left lung is greatly reduced or even lost entirely. However, snakes possess increased numbers of vertebrae and have developed two novelties among vertebrates: a tracheal lung in the neck region and a venom-conducting system for Snakes are misunderstood and often maligned, primarily out of ignorance about their true nature and position in the natural world. All snakes are predators, but venomous snakes have given an inaccurate reputation to the entire group, as most people cannot tell the dangerous from the harmless. Only a small percentage (fewer than 300 species) are venomous, and of those only about half are capable of inflicting a lethal bite. Although snakebite mortality worldwide is estimated at 80,000–140,000 people per year, the majority of deaths occur in Southeast Asia, principally because of poor medical treatment, malnutrition of victims, and a large number of venomous species. Although there are about 8,000 venomous snakebites per year in the United States, the average number of annual fatalities is less than 10 or so per year—fewer than are attributed to bee stings and lightning strikes. In Mexico, 10 times as many people die annually from bee stings as from snakebites.

Why the snake is used a symbol of healing in medical Besides being destructive in nature snake (Jones KB2008) Well, if we go through the history when Moses, around 1400 BC, used the bronze serpent erected on the pole to cure the people who were bitten by snakes.[5] The other reasons why serpent has been used is the shedding of the skin that indicated longevity and immortality. The snake's ability to change from a lethargic stage to one of rapid activity symbolized the power to convalesce from an illness.(Schupp EW1995) Charas and Martyn (1673) subjected the viper(Reiserer Randall S2017) to innumerable experimental investigations and concluded they were valuable remedies for itch, erysipelas, measles, smallpox, leprosy and were a valuable adjunct to the production of a beautiful skin.(Reiserer Randall S2017) Hence, the snake has been a powerful symbol of healing itself.(Ramoutsaki IA2000)

Snakes are killed in enormous numbers as their skin is over the top expensive when sold in the global market. Snake's skin is utilized to get ready costly extravagant things like purses, salves and costly medications. Snakes don't encounter companionship with people. Be that as it may, they can be agreeable with people assuming they are appropriately focused on and are accustomed to being taken care of by individuals. Some snakes, for example, Corn snakes, are non-venomous and exceptionally innocuous whenever took care of appropriately. They are viewed as the most amicable of the multitude of snakes.

2. Material and Methods

Published data were searched for this review article on different topics such as role of snake in ecosystem, role of snakes in agriculture, snakes in ecosystem, snakes in medicine etc. Different databases namely Medline (PubMed), Cochrane Central, WHOLIS, Scopus, Science Direct, Ovid, Google Scholar, POPLINE, have been adopted for systematic search of publication. Scopus, and Cochrane library PubMed, have provided a good data of peer-reviewed articles, while google scholar has been included to have a broader coverage of the report literature, government publications, policy documents, fugitive literature, non-conventional literature, given the sufficient information of publications on importance of snakes. All the collected articles were screened by title and abstract and after analyzing, the finally comprehend articles were summarized. Literature collected covered research articles, review articles from national and international literature.

3. Snakes Act as 'Ecosystem Engineers

Some recent research revealed that snakes act as secondary seed dispersing bio-agent. (Reiserer et al. 2018) as reported by many researchers that rodents are granivorous mammals. They play a critical, destructive, role in primary dispersal. Rodents have specialized type of pouches in cheeks that enable them to transport seeds from plant one place to another. These seed-loaded rodents are consumed by snakes specially rattlesnake, which eat rodents and are known or implicated to be secondary seed dispersers as these snakes can travel long distance so they transport seed form one place to another. Seed dispersal has played a foundational role in the population ecology and evolutionary dynamics of terrestrial plants throughout their evolution (Schupp EW1995).one of the study revealed that three desert-dwelling rattlesnake species consumed heteromyids with seeds in their cheek pouches and those ingested seeds can germinate in rattlesnake colons. In terms of secondary dispersal, rattlesnakes are best described as diplochorous.

4. The Role of Snakes in Ecology

Snakes play a crucial role in maintaining balance in the ecosystem. In most systems, snakes can act as both predator and prey. Snakes prey on frogs, insects, rats, and other rodents, thus significantly keeping their population in check. According to an estimation rodents can destroy large number of food grains each year, which can feed as many as 200 million people. It is important to check rodent population. Snakes are the important creature which can balance the rodents population as they act as predator on them. Snakes are not only save ecology but also plays important role in economy by saving our stored grain food which is destroyed by rodents.

5. The Role Snakes in Biodiversity

Some snake species going to be extinct due to fast urbanization, land clearing for agriculture, and through the introduction of domestic animals such as pets and the cane toad. All life on earth is equally important for maintaining a high level of biodiversity in natural ecosystem. As human and snakes are an important part of that biodiversity. We forget that snakes and other reptiles have a significant proportion of the middle-order predators that keep our natural ecosystems working. Without them the numbers of prey species would be uncontrolled and the predators that eat snakes struggle to find food and whole ecosystem will be unbalanced.

In the intricate web of life, everything is connected to everything else. Snakes are not on top of the food chain: they are meso-predators, hunted by other predators such hawks, skunks, eagles, and even other snake-eating snakes species, such as the king cobra. In essence, snakes control the population of their prey, while also serving as food for other animals. Thus, the loss of snake populations would consequently affect the population of their predators, and thus the balance of the entire ecosystem. Additionally, snakes also provide essential ecosystem services through secondary seed dispersal, which contributes to the reproduction of plants. Simply put, the seeds consumed by rodents when they are eaten by snakes are excreted in an intact manner. Since snakes usually have longer home ranges than

rodents, this facilitates the dispersal of seeds farther from the parent plant. Furthermore, it has also been found out that such ingestion proves to be favorable for the germination of seeds.

6. Population Check

Maintaining population of different animals is important to maintain biodiversity in any ecosystem. Snakes checks the population of frogs, insects, rats, and other rodents by praying on them. According FAO it is estimated that the number of food grains destroyed by rodents each year can feed as many as 200 million people. Not only they destroying food but also carriers of zoonotic diseases such as leptospirosis, hantavirus, and Lyme disease. If the population of rodents will not be controlled then we will face catastrophic consequences in future. As the pest population growing continuously, the presence of predators like snake plays a significant role in keeping the rodents population under control. Silently, snakes are doing critical jobs for us: ensuring food security and shielding us from disease outbreaks.

7. Snake in Medicine

Ironically, the anti-venom for snakebites is also made from snake venom. Scientists do this by injecting venom into horses and sheep and collecting and purifying the produced antibodies afterward to make the life-saving anti-venom. More so, this creates benefits beyond the production of anti-venom, as many drugs also derived from this venom have proven therapeutic value. For instance, the venom from a saw-scaled viper (Echiscarinatus) is an integral component of Tirofiban, a drug approved for clinical use for the treatment of acute coronary syndrome and unstable angina.

The snakes have an important position in the field of medicine. After searching various literature related to mythological, archeological data and a variety of texts from the ancient Greek world, it was found that the meaning and the roots of the snake's usage as a symbol of medicine, the medical profession, toxicology was associated with Asclepios, the ancient Greek God of medicine, and possessed benevolent properties. According to one of the study it was thought that a patient or a wounded person can be cured just by touch. As snake has antivenom property against its own poison so it connected with pharmacology and antisepsis. The snake is associated toxicology and toxinology, and it also implies a metaphysical idea. The snake can shed their skin and which is associated with the circle of life, and the renaissance spirit also, ever since early Hellenic antiquity. Consequently, as a symbol of the modern medical profession, toxicology and toxinology, the snake twisted around a stick or the snake beside a pharmapeutic cup, which likewise suggests the utilization of drugs or even toxin, has its foundations in the old Mediterranean region as demonstrated by the archeological information joined with scholarly references. Because of benevolent and its poisonous properties, it could be paralleled by the similar properties of medicines (7).

Snakes are most important to humans is the role of producing venom as well as other venomous creatures, in the development of medicines. A study shows that the use of the symbol is very surprising as how can destructive creatures like snake can be used to represent a healing purpose. The answer is best represented by snake,s , skin shedding character which shows immortal life, sudden change in activity emphasizing transit from sickness to cure, early use in the bible, and most important of all it was used by Asclepius who is the god of healing(8)

8. Snakes in Agriculture

Snake are important in farms from both an agricultural and ecological/biodiversity perspective. As snake, feed on rats, mice, and insects like aphids, beetles, and slugs so they act as biocontrol agent in fields, which ultimately reducing the use of more insecticides and other chemicals for pest control and it is a big point for snakes for their contributions to the ecosystem and the farm-business, although it is indirect benefit. Their more direct effects are impressive as well. They are predators on rodents and poisonous snake species so they can check their population. If snake will not be there then the

population of these rodents will be uncontrolled. They have an important role in maintaining food chain. Snakes are also prey for animals like owls, hawks, foxes, and racoons, they help feed other animals and connect the links of the food chains. Snakes are essential to maintain a balanced ecosystem. This is why to kill snakes is so damaging. If you site a snake in the wild, tell it thank you and leave it without attempting to touch, pick up, trap, or kill it. Not only will you be asking for a bite if you disturb a snake, you'll be straightforwardly harming the environment.

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COMPARATIVE STUDY ON SOCIAL BEHAVIOUR BETWEEN TEAM AND INDIVIDUAL GAME PLAYERS AND ITS CORRELATION WITH THEIR SELF ESTEEM

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ABSTRACT

Self-esteem is very much essential component for better result in every spectrum of sports. Self-esteem helps the participants to perform in unique way. Social behaviour also enhances the confidence level, which is also an important variable for success in spots. So the researcher has taken the study entitled Comparative Study on Social Behaviour between Team and Individual Game Players and Its Correlation with their Self Esteem. The aim of this investigation was to compare the social behaviour between team and individual game players. Additionally, the researcher wants to find out the correlation of social behaviour with their self-esteem of team and individual game players separately. For fulfilling the purpose, the researcher collected the data from team and individual game players of physical education colleges of Amravati and yavatmal district, affiliated under SantGadge Baba Amravati University, Amravati of Maharashtra. The researcher has taken 27 Team and 27 Individual game player's age ranging from 18-25 years by purposive sampling method. The data of social behaviour was collected by using the standard questionnaire of social behaviour constructed by M. C. Joshi and JagdishPandeand the data of self-esteem was collected by using the standard questionnaire of self-esteem. Self-esteem Scale prepared by Dr. Morris Rosenberg was used. The data of social behaviour of team and individual game players was analyzed using t-test, where the relationship between social behaviour and self-esteem was analyzed with Pearson correlation matrix. At last it is found that there is significant difference in social behaviour between team and individual game players, so the researcher's hypothesis is accepted. Also, it can be conclude that there is no significant relationship between social behaviour and self- esteem of team and individual game players. So, the researcher's hypothesis is rejected.

Keywords:*Comparison, Social Behaviour, Self Esteem, Correlation, Team and Individual Game Players, etc.*

1. Introduction

In the academic and applied field of psychology, mental processes and behaviours are studied scientifically. By applying general principles and researching specific examples, psychology studies the immediate understanding of an individual's as well as groups, and via a variety of other means, it ultimately attempts to serve society. A psychologist is a trained analyst or researcher in this area. Psychologists do research to comprehend the role of a person's mental processes and social behaviour. They also provide information about the physiological and neurological processes that underpin particular cognitive processes and behaviours.

Psychology changes its type with the change in condition: In education, it is educational psychology, in medicine it is medical psychology, in industry, it is industrial psychology, in sport, it is sport psychology, so on and so onward. Sport psychology, as such, is a current addition to the ever-expanding family of psychology.

2. Social Behaviour

Although "social psychology" is a term that is frequently used to refer to the study of social behaviour, sociologists and anthropologists, among others, are also involved in various forms of social interaction research. The centrality of the individual as the subject of research sets social psychology apart from these other fields; specifically, social psychologists tend to concentrate on how people behave in social circumstances and how they are affected by social processes. Sometimes the emphasis is on how a person is influenced by others; this is known as social influence. A social effect might be direct, such as collective decision-making, or indirect, such as anticipating how friends would respond in a given circumstance. In other instances, social psychologists research social cognition, the

mental processes we employ to comprehend ourselves and others. Some examples of social cognitive processes include stereotyping and shifting attitudes.

3. Self-Esteem

Viewpoints and feelings such as victory, desolation, vanity, and humiliation are all part of self-esteem. Risk perceptions and accompanying changes in feeling of discomfort are also linked to self-esteem. Self-esteem (SE) is described as a person's more or less long-term feeling of like for themselves. Self-esteem refers to a person's overall sense of self-worth or self-value, or the value they place on themselves. SE is self-esteem, which is defined as being aware of and accepting one's inherent strengths and positive traits. To put it another way, it is the judgment that individuals pass on themselves. Self-esteem is essential since it demonstrates how we evaluate ourselves and our own intelligence.

Risk perceptions and accompanying changes in feeling of discomfort are also linked to self-esteem. For example, athletes with low self-esteem have less confidence and suffer more state anxiety than athletes with high self-esteem. Self-confidence strategies are key tools for lowering the amount of state anxiety that people feel. Hence tall trail anxiety and low self-esteem are related to heighten state anxiety reactions in athletes.

4. Objectives

The main purpose of the study was to compare the social behaviour between team and individual game players. Additionally, the researcher wants to find out the correlation of social behaviour with their self-esteem of team and individual game players separately.

Hypothesis

On the basis of experience and knowledge it was hypothesized by the researcher that, there would be significant difference in social behaviour between team and individual game players. Also, there would be a significant relationship between social behaviour and self-esteem of team and individual game players.

5. Methodology

Source of Data

For the present study the data was collected from the players of the physical education colleges of Amravati and yavatmal district, affiliated under SantGadge Baba Amravati University, Amravati of Maharashtra, who has represented Inter-collegiate competition at least one time.

Selection of subjects

For the present study, 27 Team and 27 Individual game players (students) age ranging from 18-25 years old were selected.

Sampling Method

For the present study the subjects were selected by using purposive sampling method.

Criterion measures

Following are the criterion measures which were responsible for collection of data, to testing the hypothesis.

S. No	Variables	Equipment's
01	Social Behaviour	Standard Questionnaire
02	Self-Esteem	Standard Questionnaire

Social Behaviour

The data of Social Behaviour was collected by standard questionnaire of Social Behaviour constructed by M.C. Joshi and JagdishPandi. There are total 34 items. It is a five point Likert type scale ranging from always, frequently, sometime, occasionally and never.

Self-Esteem Scale

Standard questionnaire meant for Self-Esteem by Dr. Morris Rosenberg's. Self-Esteem Scale has used 10 items. The Self-Esteem Scale is the set of 10 questions and has four responses each viz. strongly agree, Agree, Disagree and strongly disagree. Among them five statements are positive and five negative. The scale ranges from 0-30. Score between 15 and 25 are within normal range: score below 15 suggest low Self-Esteem where, as above 25 suggests high self-esteem or above normal. The interpretation of

raw scores is such that higher the scores, more is the magnitude of self-esteem. This scale is highly reliable and valid.

Collection of Data

At the first researcher explained about the aim of the research study; thereafter the questionnaires were administered. The subjects were assured about the confidentiality of their responses.

Level of Significance

To test the hypothesis the level of significance was set at 0.05 level of confidence which was considered adequate and reliable for the purpose of this study.

Statistical Analysis

After collection of data from team and individual game player of SantGadge Baba Amravati University, the raw data were converted into standard one by using a statistical technique 't 'test and Pearson correlation test for testing of hypothesis.

Table 1:Comparison of Social Behaviour between Team and Individual Game Player

Observation	Mean	SD	MD	SE	df	Obtained 't'	Tabulated 't'
Team Game	110.67	11.279	6.259	2.848	52	2.198	2.006
Individual Game	104.41	9.581					

According to Table 1, it is found the mean of social behaviour of team game player is 110.67 which is greater than the mean of individual game player which is 104.41. So this mean difference is found as 6.259. The calculated value of 't' is found as 2.198 which is greater than tabulated 't' which is 2.006 at 0.05 level of significance. This indicates that there is significant difference in social behaviour between team and individual game players. Hence the hypothesis which was given by the researcher is accepted.

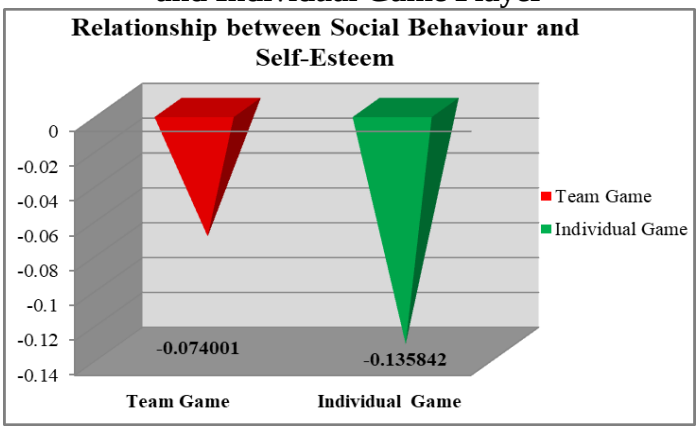
Graph 1: Showing Social Behaviour between Team and Individual Game Player

Table 2: Relationship of Social Behaviour and Self-Esteem between Team and Individual Game Player

Relationship	Mean of Social Behaviour	Mean of Self-Esteem	Obtained 'r'	Tabulated 'r' (df =25)
Social Behaviourand Self-Esteem of Team Game	110.67	17.074	-0.0740	0.3808
Social Behaviour and Self-Esteem of Individual Game	104.41	19.074	-0.1358	

According to Table 2, correlation between social behaviour and self-esteem of team game players, inter correlation matrix was calculated. The calculated 'r' was found (-0.0740), which is less than tabulated 'r' (0. 3808) at 0.05 level of significance. This indicates or shows that there is no significant relationship between social behaviour and self-esteem of team game players. Also, in Table 2, correlation between social behaviour and self-esteem of individual game players, inter correlation matrix was calculated. The calculated 'r' was found (-0.1358), which is less than tabulated 'r' (0.3808) at 0.05 level of significance. This indicates or shows that there is no significant relationship between social behaviour and self-esteem of individual game players. So, the researcher's hypothesis is rejected.

Graph 2: Showing Relationship between Social Behaviour and Self-Esteem between Team and Individual Game Player



6. Conclusion

In the beginning of this study it was hypothesizedby the researcher that there would be a significant difference in social behaviour between team and individual game players. Also, there would be a significant relationship between social behaviour and self- esteem of team and individual game players. On the basis of results it can be concluded that there is significant difference in social behaviour between team and individual game players, so the researcher's hypothesis is accepted. Also, it can be conclude that there is no significant relationship between social behaviour and self-esteem of team and individual game players. So the researcher's hypothesis is rejected.

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FOG WATER COLLECTION: A SUSTAINABLE APPROACH TO RESOLVE WATER CRISIS

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ABSTRACT

Water scarcity has been the most pressing challenge to socio-economic and human development since ages. Globally, almost 800 million people do not have access to potable water. Reports from the United Nations state that one in every three people in the world is facing the water crisis. India is no exception to this.
Fog water collection has been studied in over 20 countries across six continents, and is typically done only in areas that meet specific conditions, including a high occurrence of fog. .Additionally, fog harvesting is useful when other sources of water are scarce and is typically limited to remote arid and semiarid regions with tropical or subtropical climates. The objectives of this paper is to provide a review for fog water harvesting as an age old but newly identified technique to harvest fresh water from air.

Keywords:*Fog water harvesting, climates, arid semiarid region.*

1. Introduction

A 2019 NITI Aayog report said that India is suffering from the worst water crisis in its history, and almost 600 million of its population is water-deprived. The report goes on to add that 21 cities including Bangalore, Delhi, Hyderabad and Chennai probably exhausted their groundwater resources in 2021. https://theprint.in/opinion/india-faces-a-severe-water-crisis-modi-govt-cant-tackle-it-alone-heres-what-we-can-do/853979/.

With the current rate of population growth, combined with the growing pressure on available water resources, India will be having the largest number of water-deprived persons in the world in the next 25 years. This acute shortage of water points to a grim situation and necessitates the exploration of alternate sources of water. A mixture of traditional wisdom and new techniques must be found to overcome the inadequacy of water as well as arrest groundwater decline[1-2].

One commonly overlooked aspect of the water cycle is fog, which is an important part of the hydrology of coastal, high-altitude, and forested regions [3-5]. Fog water harvesting is being investigated as a sustainable alternative water resource for drinking water and reforestation. Fog water harvesting involves using mesh nets to collect water as fog passes through them. The materials of these nets, along with environmental factors such as wind speed, influence the volume of water collected. Fog nets can provide communities with clean, cheap water [6-9]. There are many successful stories of fog water collection in different countries that changed the life of people living in a water scarcity area. Peru has a long tradition of fog collection. Many projects have been developed by the communities, with varying degrees of success, from Trujillo in the northern part of the country to Tacna in the South. A major project between 1995 and 1999 near the town of Mejia on Peru's south coast proved the feasibility of fog collectors to provide water for a forestation and restoration. The water collected is used to grow fruits and provide fresh water for the population. As well, the local support for reforestation is strong. https://www.bbc.com/future/article/20200221-how-fog-can-solve-water-shortage-from-climate-change-in-peru. It is estimated that in India, 12.5 billion litres of water can be effectively collected through fog capturing in net screens (Singh, 2004). Fog harvesting technology has already been used in some part of India such as Gujarat and Uttarakhand.

2. Better Ways to Harvest Fog Water:

Fog harvesting is a simple process. It involves systematic collection of dew through natural or associated methods. The moisture present in the air is the source of fresh water in this quest.

Through the process of condensation, atmospheric water vapour from air naturally condenses on cold surfaces of various types of mesh nylon, polyethylene, polypropylene, metal into droplets of liquid water known as dew.

The process can be used where fog density is high, especially in coastal and hilly areas where fog is carried over the land by wind. The technology involves surveying for ideal sites based on geographical and meteorological conditions, erection of vertical tarps known as "fog collectors" and storage facility for the collected water. Number of such tarps is erected according the wind direction, & as fog passes through the nets, the water vapour in it gets collected on the net[10-11]. When this volume of water droplets grows, water starts dripping. Dripping water is collected in generally through PVC pipes attached at the bottom of the nets using the gravity flow principle &then in a storage tank. A series of collectors can be arranged in a row, in fog prone regions to collect a considerable amount of water. The water collection may range from 200 to 1000 litres per day and is subjected to seasonal variations [12-13].

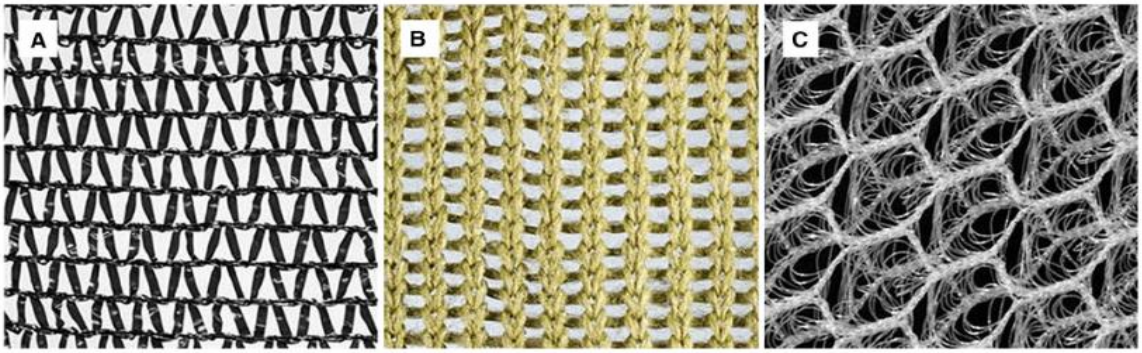
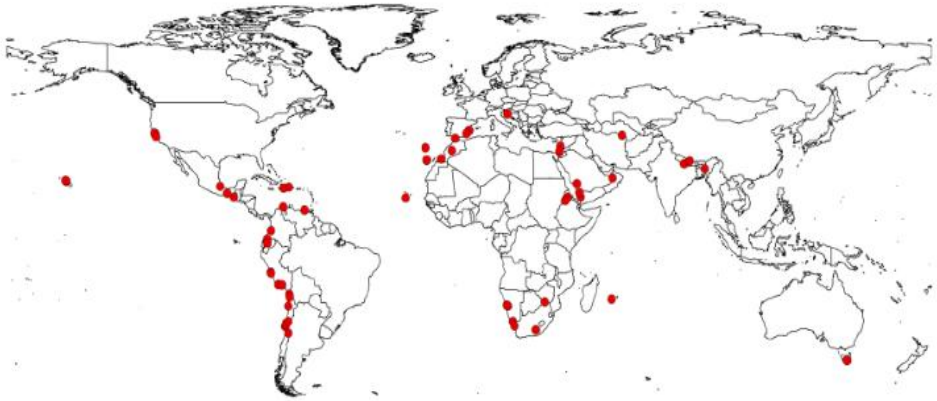


Fig 1.Types of Mesh

3. Cost Involved in Installation

As per the United Nations Environment Programme or UNEP estimates, the capital investment and other costs for this technology is generally found to be low in comparison with other conventional sources of water supply. Though costs of the system can vary with the size and the quality of fog catchers and the labour and location of the site, a small system can be installed in about Rs 5000 to Rs 12,000 each. While a moderate system can be installed for about Rs 25000 and large collectors of 40 m^2 size can cost nearly Rs 1,000,00 that lasts for about 10 years. A very large village level project that can produce about 2000 litres per day would cost nearly Rs 6,000,00 (Fog Quest, 2011). However, the exact cost of the infrastructure will depend on local topography, the demand for water, and availability of financial resources and materials.

Locations where for fog collection has high potential for success



4. Conclusion

Fog water harvesting has great potential to supply communities with little annual rainfall, but frequent occurrence of fog events, with a source of fresh water. Current studies and full scale applications indicate the technology is both feasible and sustainable.

India's semi-arid & arid hot & cold deserts with quantitative water scarcity, parts of Meghalaya with qualitative water scarcity, Peninsular India hilly regions are most suitable places for the fog water collection processes. Proper water management systems are the keys to open our sustainable doors toward water conservation.

The fog was seen as a negative element of nature that caused humidity, illness and excessive moisture. Today it is a lifeline.

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ASSESSMENT OFANTIMICROBIAL ACTIVITY IN LEAF EXTRACT OF *DIOSPYROS MELANOXYLON* ON PATHOGENIC MICROORGANISMS

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ABSTRACT

*Antimicrobial properties ofDiospyrosmelanoxylon, often known as Tendupatta, were studied. By using the agar-well diffusion method, antimicrobial activity was assessed against certainpathogenic microorganisms. Significant efficacy against the studied microorganisms was shown using ethanol extract. In the current investigation, the zone of inhibition for the leaf extract by ethanol was 26 mm (for **S. aureus**) 22 mm (for E. coli)and 14 mm(Pseudomonas auraginosa), whereas the zones of inhibition for the leaf extracts by petroleum ether and chloroform were20 mm(for **S. aureus**)and 18 mm for E. coli) ,Pseudomonas auraginosa (Chloroform extract)10mm for **S. aureus**)and 11 mm for E. coli)respectively.Least activity against Chloroform extract andno activity againstPseudomonas auraginosa Ciprofloxacin was taken asstandardfor controlexperiment. A study demonstrated the potential of several extracts against microorganisms for the creation of novel antibacterial agents.*

Keywords:*Diospyrosmelanoxylon,Phytochemicalanalysis solvent extract,* ***S. aureus****,E. coli and Pseudomonas auraginosa.*

1. Introduction

In the majority of the world's traditional healthcare systems for thousands of years, phytomedicines have played a crucial role. More than 80% of the world's population relies on traditional medicine for their primary healthcare requirements, according to the World Health Organization[1, 2]. The antibacterial capabilities of plant extracts and natural products have been thoroughly studied in recent years due to the rise in demand for safe medications brought on by the overuse of antibiotics.

One of the most significant areas of traditional medicine around the globe is herbal medicine. It is crucial to conduct more in-depth research on medicinal plants with a folklore reputation in order to promote the right use of herbal remedies and assess their potential as sources for novel medications.

The antimicrobial activity of plant components was examined in this experiment.

In order to determine whether using a crude preparation as a replacement for commercial items is feasible, standard technique is used against a few reference strains of human pathogenic bacteria.

DiospyrosMelanoxylon, are popular astendupatta and a member of the Ebeaceae family, is a medium-sized tree or shrub with a height of up to 20- 25 metres. The bark is pelican-colored and peels off in scale-like rectangles. Although D. melanoxylon is drought and cold resistant, it is sensitive to water logging and needs light. It is indigenous to Sri Lanka, Pakistan, and India. 6. Its primary use was as an anti-hyperglycemic, making it a crucial raw material for the "Bidi" (cheap smoking) industry in India. The seeds have been used as a treatment for mental illnesses, nervous breakdowns, and heart palpitations in India. They can also be intoxicating. The fruits have an astringent and cooling effect. According to reports, blood, skin, and urinary ailments can all benefit from dried flowers. The decoction of the astringent bark is utilized in diarrhea.

2. Material and Methods

Assortment of Plants

Diospyrosmelonoxylon (Tendupatta) leaves were purchased (dried) from Chandarpur between the months of June and September 2021. The leaves were separated, thoroughly cleaned, and rendered dust-free.

With the use of a mixer grinder, it was ground into a coarse powder. To preserve homogeneity, the coarse powder was pass

through sieve No. 22 before being sealed inside an airtight container and kept in a cool, dry location.

Bacterial Cultures

The three bacteria culturalviz., *Pseudomonas aeruginosa, Escherichia coli and Staphyloccusaureus*were taken from our Microbiology laboratory.Bacterial cultures were maintained on Mullar Hinton agar medium.

Preparation of Crude Extract

50 gram of powdered plant material was extracted using a Soxhlet apparatus with 50 ml 90% ethanol and 50 gram with petroleum ether at 60–70°C. The extracts were dried at 30–40°C.

Microorganism

Test for Antibacterial Sensitivity Using the Disk Diffusion Susceptibility Method (Kirby-Bauer Method). The pure cultures of *Escherichia coli, Streptococcus aureus, and Psudomonasauraginosa* were kept at 37°C until use. The nutrient broth and Muller Hinton Agar (MHA) were employed for the antibacterial assay. Results of measuring the diameters of the well and the zone of growth inhibition surrounding the wellto assess antimicrobial activity are shown.

Antimicrobial Activity

The selected micro-organisms were culture on nutrient agar by using spread plate technique and a well of 6 mm diameter was madeit in agar.Theprepare desired dilutions with concentration of 20, 40, 60, 80 mg/l, 100ul of each dilution was poured into the well and the sample extracts were allowed to diffuse properly by keeping the per plates in refrigerator at 4^0 C for 4 hours followed by incubation at 37^0 C for24 hours. The diameter of zone of inhibition was taken as measurement of antimicrobial activity of a extract.

3. Result and Discussion

The antibacterial activity of several crude extracts from Diospyrosmelanoxylon leaf against threehuman pathogenic bacteria strains was investigated. The ethanolic and petroleum extracts of Diospyrosmelanoxylon leaf demonstrated promising antibacterial activity against all strains. The ethanolic extract among the extracts had the highest level of activity, whereas petroleum ether had the lowest level of activity against all bacterial strains. Leaf extract was effective against grampositive and gram negative bacteria. Plant extracts were more effective than gram negative bacteria at killing gram positive bacteria. Above information was compared to conventional ciprofloxacin, which had zones of inhibition of 26 mm, 30 mm and 10mm for each strain, respectively. Gram positive ***S. aureus,E.coliandPseudomonas aeruginosa***was found to be the most responsive in the current study, with inhibition zones of 26 mm,18 mm and 20in ethanolic and least activity inpetroleum ether extract and Chloroform extract respectively.

Phytochemical Analysis

The presence or absence of active principles such as carbohydrates, alkaloids, glycosides, flavonoids, tannins, steroids, saponics, triterpenoids, proteins, resins, fixed oils, and fats were analysed in various extracts (such as petroleum ether, chloroform, ethanol, and water extract).

4. Discussion

The primary foundation for treating bacterial illnesses is provided by antibiotics. However, due to their enormous genetic variety, bacteria are able to evolve antibiotic resistance and quickly avoid the effects of antibiotics. The rise of multidrug resistance in pathogenic bacteria and parasites in recent years has caused significant clinical issues in the management of infectious disorders. The search for new antimicrobial substances and drugs of plant origin was sparked by this and other issues, such as the toxicity of some antimicrobial drugs on the host tissue.

It is anticipated that screening and scientific evaluation of plant extract for their antimicrobial activity will produce new anti-microbial substances given the rich diversity of plants. Therefore, the current study unequivocally demonstrates the plant's antibacterial properties and suggests that it might be used in human care management.

It's noteworthy to note that solvent extracts have far stronger antibacterial activity than aqueous extract did. It is also crucial to remember that different pathogens have different levels of susceptibility to solvent extract and aqueous extract. This suggests that Disopyrusmelanoxylon contains many active principles.

Antimicrobials are abundant in plants. It has been proven through several active observations that a single plant contains biologically significant principles. The current discovery is therefore very encouraging in identifying a plant with intriguing antibacterial action.

Table No.1

Antibacterialactivityofdifferent extract*againstStaphylococcusaureus ,E.Coli and Pseudomonas aeruginosa.*

Microorganism	Zone of Inhibition in diameter (mm)											
	Standard Antibiotics (Ciprofloxacin)	Ethanol extract				Petroleum extract				Chloroform Extract			
		20mg /1	40mg/1	60mg/1	80mg/1	20mg/1	40mg/1	60mg/1	80mg/1	20mg/1	40mg/1	60mg/1	80mg/ ml
Staphylococcus aureus	26	12	16	21	26	10	14	17	20	-	-	9	10
E.Coli	24	10	14	18	22	14	16	17	18	-	8	10	11
Pseudomonas aeruginosa	20	8	12	14	14	-	-	-	-	-	-	-	-

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ENVIRONMENT CHALLENGES OF INDIAN SOCIETY AND VALUE BASED EDUCATION

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ABSTRACT

In India Value Based Education is the real need of the hour. As we see how the Society is diminishing in case of values day by day. It is necessary to develop the programs for inculcating values in the society. Today"s Indian youths are little bit confused because of the bombarding of the new technological devices, information explosion and violent news by the press & media. To inculcate the value system in their confused minds and make them value-oriented-powerful leaders, educational institutions should take the initiative to impart Value Based Spiritual Knowledge to this new generation. "Imbibing the qualities of good conduct, self-confidence and high values would help students earn a significant place in society. Education without values is like a flower without fragrance. Students should realize that character building is equally important as career building. A good character in life is ultimate thing that stretches person"s self-realization". In conclusion, mere desire or aspiration to progress in life is not enough; success should be based on values. And for that value-based education must be imparted in today"s institutions. So that the students may emerge as good leaders in their chosen fields.

Keywords:*Value-Based Education, Values, Society, Education, Vedanta.*

1. Introduction

Education has long been known as a vital aspect in progress. It is considered as an essential factor for social and economic development for developing countries especially India. Education spreads the knowledge, skills, habits, values, or attitudes and understanding of the people so it is important for the development of any society and backbone of the growth of any country. Education helps people to live more satisfying lives and become a useful member of the society thus, there must be a great deal of concern in the ways in which the education conveys the necessary knowledge and information to the students. There is an acute need for values to be inclusion in the areas of religion, education, social services, business and politics in India. The term “Value” refers to a development of your soul, your heart. It is not enough to be more modern, independent, developed, secular, technological hub or advance society if, in this process we have lost soul, our heart.

"Education based on the value is very necessary in our modern society because our life has become despondent." The quantity of education has increased significantly, but the quality has declined. The number of educated people has reached a high level, however murder, hatred and selfishness have spread throughout the building. Many organizations are open, but few people are civilized products. Degrees have been awarded for all but the dignity has gone down. Skilled people are produced by many institutions, but sincere people are very few. Many books are written, much research is done, many professional achievements are achieved, but humanity is threatened. Therefore, we need education based on value. An educated person must have all kinds of qualities. Education must make every individual physically, mentally, intellectually, emotionally and spiritually capable. Therefore, some universal ideals of "love, peace, respect, tolerance, forgiveness, coexistence and non-violence" should be accepted by all the educators worldwide. These values are truly indispensable, devoid of which, our society cannot sustain itself and people will forget humanity. The real difficulty is that people have no idea what education is exactly. Nous evaluates the value of education in the same way that we value the value of the land or of stocks on the stock market. We want to provide such education that allows the students to earn more. We are not concerning character improvement of educated one. The girls, we

say, do not have to earn; so why should they be educated? As long as such ideas exist, there is no hope to know the true value of education.

2. Objective of the Study

The objective of this study is to review different opinion about Values given by the different scholars and their use and importance in education as well as the todays education system and need and role of Value-based education in the Society.

3. Research Methodology

Secondary data collected from various reference books and web resources.

4. Goal of Education

Each society wants their children to acquire a desirable set of values. The goal of education in any country is the development of desirable values. Obviously, it is important to know what values are held by students. What kind of values do they possess? Such knowledge is important in order to allow curricular experiences to achieve the educational goals that the society would formulate. Today we see decadence in society. One of the reasons for the decline is conflicting values. If we go through history, we find that the society is changing rapidly. The impact of the West has led to changes. The western way of thinking, dressing and behaving influenced the Indians. This embargo effect is seen in any large society and likely to increase.

The values have social, psychological, economic, spiritual and philosophical aspects. They have a broad effect. One cannot say that life-long steps in a person's life are worthless. So if the values are good, life will be quiet and useful, if the values are not desirable, life will be difficult and undesirable.

5. Value-Based Education

Sri.Prakash, Dr. Mudolia Azad, Dr. Kothari, Mahatma Gandhi, Dr. Radha Krishnan, etc. has already advocated value education. It is not a new concept for India. Education not only develops morality, but also makes an individual capable of leadership and intelligent companionship. Concerning the need of introducing religious values, Peters (1979, p.473) writes that the religious values are arraigned and sternly censored in authoritarian or socialist. Peters further states that the progress of various types of awareness, abilities and skills are demands of the education and in a democratic set up, one should specified some form of proposal to inculcate religious values in the trust that he may develop them. Peters (1973, p. 473) reveals that in democracy broadminded view of the role of religious values is taken because of the importance attributed to freedom and acceptance and because shrinking in transmitting cultural heritage. But certainly religious values are not idiosyncratic of democracy. Morality, knowledge and understanding of human condition, self-fulfillment of the individual, preparation of work satisfaction are engendering as the aims of education.

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and likely to increase. The values have social, psychological, economic, spiritual and philosophical aspects. They have a broad effect. One cannot say that life-long steps in a person's life are worthless. So if the values are good, life will be quiet and useful, if the values are not desirable, life will be difficult and undesirable.

9. Conclusions

In conclusion, mere desire or aspiration to progress in life is not enough; success should be based on values. And for that value-based education must be imparted in today‟s institutions. So that the students may emerge as good leaders in their chosen fields. As Swami Chinmayananda in his "We Must" booklet states "All our success entirely depends upon ourselves. Let us never look outside ourselves for help. Let us not fall into the delusion that the influence of others would enable us to do better or accomplish more." He firmly says : "Spiritual education and religious practices make us realize that we are a part of a whole scheme, and the essential creativeness behind the whole universe is the essential Essence ruling in the heart of each one of us : ShivohamShivoham ". Incorporating Value-Based-Education in society will result in growth of character, growth in virtues like self-control, tolerance, selfless service, practice of prayer, harmony, to love all people, to help them in need & respect them etc… Man being the „cast in the mold of God‟ cannot easily deny Him. Even the great scientists like Newton and Einstein have believed in the existence of God as an intelligent power regulating and guiding the destinies of the universe. In the words of Swami Vivekananda Religion is nothing but a manifestation of the divinity already in man. Man is not just the body or even the combination of the body & the mind. He is essentially the spirit. The aim of our teaching should be to help manifest this spirit in every thought, word and action.26 So, it should aim at a full and harmonious development of the body & the intellect and tune it to the spirit within. In other words, value-based-education should help build up an integrated personality, a perfect character.

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ENVIRONMENTAL ISSUE - CLIMATE CHANGE AND INDIAN AGRICULTURE

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Introduction

Agriculture plays a vital role in India's economy. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. As per the 2nd advised estimates by the Central Statistics Office (CSO), the share of agriculture and allied sectors (including agriculture, livestock, forestry and fishery) is estimated to be 17.3 per cent of the Gross Value Added (GVA) during 2016-17 at 2011-12 prices.

The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year due to its immense potential for value addition, particularly within the food processing industry. The Indian food and grocery market is the world's sixth largest, with retail contributing 70 per cent of the sales. The Indian food processing industry accounts for 32 per cent of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth. It contributes around 8.80 and 8.39 per cent of Gross Value Added (GVA) in Manufacturing and Agriculture respectively, 13 per cent of India's exports and six per cent of total industrial investment.

Structure and Structural Transformation of Indian Agriculture

The agriculture sector in India has undergone significant structural changes in the form of decrease in share of GDP from 30 percent in 1990-91 to 14.5 percent in 2010-11 indicating a shift from the traditional agrarian economy towards a service dominated one. This decrease in agriculture's contribution to GDP has not been accompanied by a matching reduction in the share of agriculture in employment. About 52% of the total workforce is still employed by the farm sector which makes more than half of the Indian population dependent on agriculture for sustenance (NSS 66th Round). However, within the rural economy, the share of income from non-farm activities has also increased.

With the declining share of agriculture to GDP, the continuing high pressure of population on agriculture and the increasing fragmentation of land holdings leading to decreasing availability of cultivated land area per household, the agriculture sector alone would hardly be in a position to create additional employment opportunities to sustain the livelihood of the rural households. This calls for creation of additional employment opportunities in the non-farm and manufacturing sector, especially in agro based rural industries which have area specific comparative advantage in terms of resources endowment and development possibilities. This would require suitable skill development of the people so as to gainfully employ them in non-farm activities. This alone would be able to make agriculture viable in a sustainable manner. In addition, by creating more employment and absorbing some of the surplus labour in agriculture, this will contribute to achieving our objective of inclusive growth.

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surplus labour in agriculture, this will contribute to achieving our objective of inclusive growth.

Growth Performance of Agriculture :Overall Growth

The growth performance of the agriculture sector has been fluctuating across the plan periods . It witnessed a growth rate of 4.8 per cent during the Eighth plan period (1992–97). However, the agrarian situation saw a downturn towards the beginning of the Ninth plan period (1997–2002) and the Tenth plan period (2002–07), when the agricultural growth rate came down to 2.5 percent and 2.4 percent respectively. This crippling growth rate of 2.4 percent in agriculture as against a robust annual average overall growth rate of 7.6 per cent for the economy during the tenth plan period was clearly a cause for concern. The trend rate of growth during the period 1992-93 to 2010- 11 is 2.8 percent while the average annual rate of growth in agriculture & allied sectors GDP during the same period is 3.2 percent.

The Eleventh Plan had sought to reverse the deceleration of agricultural growth which occurred in the Ninth Plan and continued into the Tenth Plan. It has had some success in that food grain production touched a new peak of 250.42 million tons in 2011-12. Agricultural GDP growth has accelerated to an average 3.9 percent growth during 2005-06 to 2010-11, partly because of initiatives taken since 2004. As per the latest advance estimate of National Income released by the Central Statistics Office (CSO), agriculture and allied sectors are likely to grow at 2.5 percent during 2011-12 as against 7 percent during the previous year at constant (2004-05) prices. The Approach Paper to Twelfth Plan drafted by Planning Commission estimates that with a revision of the farm sector GDP growth rates for 2010-11 and the expected good harvest in 2011-12, the average growth in agriculture & allied sectors in the Eleventh Plan may be higher at 3.3-3.5 percent per year against a target of 4 percent.

The increasing divergence between the growth trends of the total economy and that of agriculture & allied sectors suggests an under performance by agriculture. It is also significant that unlike the overall economic growth pattern, agricultural performance in India has been quite volatile (the Coefficient of Variation (CV) during 2000-01 to 2010-11 was 1.6 compared to 1.1 during 1992-93 to 1999-2000). This is almost six times more than the CV observed in the overall GDP growth of the country indicating that high and perhaps increasing volatility is a real challenge in agriculture, which is likely to increase in the years to come in the wake of climate change.

Irrigation, Seeds, Fertilizers and Credit

There is no doubt that the overall size, quality, and efficiency of investment are always the key drivers of growth in any sector. In case of public investments in agriculture, as defined in the National Accounts Statistics, more than 80 percent is accounted for major and medium irrigation schemes. Even in the case of private investments in agriculture, almost half is accounted for by irrigation (minor, primarily through groundwater, but also now increasingly drip, etc.). So irrigation remains the most dominant component in the overall investment in agriculture. Without proper use of water, it is difficult to get good returns on better high yielding seeds and higher doses of fertilizers. Water will remain a critical input for agriculture in the decades to come until science develops seeds that can thrive in dry climate with very little water. The net sown area has remained around 141 million hectares during the last 40 years. The cropping intensity, i.e., the ratio of gross cropped area to Indian Agriculture: Performance and Challenges net cropped area has however, gone up from 118 per cent in 1970-71 to 138 percent in 2008-09.

Emerging Demand—Supply Imbalances

With the Indian economy growing at 8 percent and higher expenditure elasticity of fruits & vegetables and livestock as compared to cereals, there is an increasing pressure on the prices of such high value perishable commodities. The per capita monthly consumption of cereals has declined from 14.80 kg in 1983-84 to 12.11 kg in 2004-05 and further to 11.35 kg in 2009-10 in the rural areas. In the urban areas, it has declined from 11.30 kg in 1983-84 to 9.94 kg in 2004-05 and

to 9.37kg. in 2009-10. The agricultural production basket is still not fully aligned to the emerging demand patterns.

Government Initiatives

Given the importance of the agriculture sector, the Government of India, in its Budget 2017–18, planned several steps for the sustainable development of agriculture-

- Total allocation for rural, agricultural and allied sectors for FY 2017-18 has been increased by 24 per cent year-on-year to Rs 1,87,223 crore (US$ 28.1 billion). A dedicated micro-irrigation fund will be set up by National Bank for Agriculture and Rural Development (NABARD) with a corpus of Rs 5,000 crore (US$ 750 million). The government plans to set up a dairy processing fund of Rs 8,000 crore (US$ 1.2 billion) over three years with initial corpus of Rs 2,000 crore (US$ 300 million).
- The participation of women in Mahatma Gandhi National Rural Employment Gurantee Act (MGNREGA) has increased to 55 per cent and allocation to the scheme has been increased to a record Rs 48,000 crore (US$ 7.2 billion) for FY2017-18.
- Short-term crop loans up to Rs 300,000 (US$ 4,500) at subsidized interest rate of 7 per cent per annum would be provided to the farmers. An additional incentive of 3 per cent is provided to farmers for prompt repayment of loans within due date, making an effective interest rate for them at 4 per cent.

Some of the recent major government initiatives in the sector are as follows:

- With an aim to boost innovation and entrepreneurship in agriculture, the Government of India is introducing a new AGRI-UDAAN programme to mentor start-ups and to enable them to connect with potential investors.
- The Government of India has launched the Pradhan MantriKrishiSinchaiYojana (PMKSY) with an investment of Rs 50,000 crore (US$ 7.7 billion) aimed at development of irrigation sources for providing a permanent solution from drought.
- The Government of India plans to triple the capacity of food processing sector in India from the current 10 per cent of agriculture produce and has also committed Rs 6,000 crore (US$ 936.38 billion) as investments for mega food parks in the country, as a part of the Scheme for Agro-Marine Processing and Development of Agro-Processing Clusters (SAMPADA).
- The Union Cabinet, Government of India, approves Rs 9,020 crore (US$ 1.4 billion) as Extra Budgetary Resources (EBR) for execution of projects under Accelerated Irrigation Benefits Programme (AIBP) and their command area development (CAD) works under PMKSY.
- A new platform for selling agricultural produce named e-RaKam has been launched by the Government of India and will operate as a joint initiative of Metal Scrap Trade Corporation Limited and Central Railside Warehouse Company Limited (CRWC).
- The NITI Aayog has proposed various reforms in India's agriculture sector, including liberal contract farming, direct purchase from farmers by private players, direct sale by farmers to consumers, and single trader license, among other measures, in order to double rural income in the next five years. The Ministry of Agriculture, Government of India, has been conducting various consultations and seeking suggestions from numerous stakeholders in the agriculture sector, in order to devise a strategy to double the income of farmers by 2022.
- The Government of India has allowed 100 per cent FDI in marketing of food products and in food product e-commerce under the automatic route.
- The Maharashtra State Agriculture Marketing Board (MSAMB) has operationalised 31 farmer-to-consumer markets in the state, and plans to open 100 more such markets in the future, which would facilitate better financial remunerations for the farmers by allowing them to directly sell their produce in open markets.

- The Ministry of Labour and Employment plans to amend the Minimum Wage Act to raise the daily minimum wage of unskilled agricultural labour in C-class towns to Rs 350 (US$ 5.2) in the central sphere, from the current wage of Rs 160 (US$ 2.4) per day.
- The Government of India and the Government of Israel have expressed their commitment to further strengthen bilateral relations in the field of agriculture and allied sectors, as well as enhance cooperation at the government-to-government and business-to-business levels between the two countries, in a bid to further enhance the relationship.
- According to the Agriculture Ministry, 50,000 hectares of area is available for coconut cultivation in Bihar, the Coconut Development Board plans to equip the farmers thus making India the world leader in production, productivity, processing for value addition and export of coconut.

Market Size

India's GDP is expected to grow at 7.1 per cent in FY 2016-17, led by growth in private consumption, while agriculture GDP is expected to grow above-trend at 4.1 per cent to Rs 1.11 trillion (US$ 1,640 billion).$ It ranks third in farm and agriculture outputs. As per the 2nd Advance Estimates, India's food grain production is expected to be 271.98 MT in 2016-17. Wheat production in India is expected to touch an all-time high of 96.6 MT during 2016-17.! Production of pulses is estimated at 22.14 MT.India has been the world's largest producer of milk for the last two decades and contributes 19 per cent of the world's total milk production. India is emerging as the export hub of instant coffee which has led to exports of coffee reaching 177,805 tons valued at US$ 447 million between April-August 2017, as against 162,641 tons valued at US$ 363.1 million during the same period last year.

India topped the list of shrimp exporters globally, as the value-added shrimp exports rose 130 per cent year-on-year to 23,400 tons in 2016. The production of food grains in India reached a record 275.68 million tonnes (MT) during FY 2016-17, as per the Fourth Advance Estimates (AE) released by the Department of Agriculture, Cooperation and Farmers Welfare, Government of India. The total sown area for kharif crops was 68.53 million hectares as on July 2017, compared to 67.34 million hectares on July, 2016.

India is the second largest fruit producer in the world. India's horticulture output, is estimated to be 287.3 million tonnes (MT) in 2016-17 after the first advance estimate.

Agricultural export constitutes 10 per cent of the country's exports and is the fourth-largest exported principal commodity. India's exports of basmati rice may rise to Rs 22,000-22,500 crore (US$ 3.42-3.49 billion), with volume to around 4.09 MT in 2017-18, backed by a rise in average realisations. Groundnut exports from India are expected to cross 700,000 tonnes during FY 2016-17 as compared to 537,888 tonnes during FY 2015-16, owing to the expected 70 per cent increase in the crop size due to good monsoons. India's groundnut exports rose to 653,240 MT during April 2016-February 2017.@ India is the largest producer, consumer and exporter of spices and spice products. Spices exports from India grew by 9 per cent in volume and 5 per cent in value year-on-year to 660,975 tonnes and US$ 1.87 billion respectively, during April-December 2016. The online food delivery industry grew at 150 per cent year-on-year with an estimated Gross Merchandise Value (GMV) of US$ 300 million in 2016. The Indian gourmet food market is currently valued at US$ 1.3 billion and is growing at a Compound Annual Growth Rate (CAGR) of 20 per cent. India's organic food market is expected to increase by three times by 2020.

Conclusion

Agriculture plays a vital role in India's economy. Over 58 per cent of the rural households depend on agriculture as their principal means of livelihood. As per the 2nd advised estimates by the Central Statistics Office (CSO), the share of agriculture and allied sectors (including agriculture, livestock, forestry and fishery) is estimated to be 17.3 per cent of the Gross Value Added (GVA) during 2016-17 at 2011-12 prices. The Indian food industry is poised for huge growth, increasing its contribution to world food trade every year

due to its immense potential for value addition, particularly within the food processing industry. The Indian food and grocery market is the world's sixth largest, with retail contributing 70 per cent of the sales. The Indian food processing industry accounts for 32 per cent of the country's total food market, one of the largest industries in India and is ranked fifth in terms of production, consumption, export and expected growth. It contributes around 8.80 and 8.39 per cent of Gross Value Added (GVA) in Manufacturing and Agriculture respectively, 13 per cent of India's exports and six per cent of total industrial investment.

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EDUCATION AS A TOOL TO RAISE ENVIRONMENTAL AWARENESS IN PHYSICAL EDUCATION INDUSTRY

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Introduction

Governments and corporations must take climate action to reduce their carbon emissions in response to the global climate catastrophe.It is important to keep in mind from a sporting aspect that athletes participate in sports primarily to compete, socialise, and have fun. Therefore, it's important to include environmental education and awareness in a clever and engaging manner. It is necessary to establish a foundation for understanding why environmental issues are significant in order to prevent role-players from becoming demanding.People have enjoyed sports as a kind of entertainment for aeons. Sports are a symbol of good health since the best games are played by players who are in top physical condition. Ironically, sports can also harm the environment, which is essential to maintaining good health. The use and exploitation of natural resources during sporting activities, whether they are being played or observed, has the potential to leave significant environmental "footprints"(Schmidt, 2006).

Among the most powerful people in the planet are those involved in sports. They may motivate others through their actions, both those who are actively participating inside the sports and those who are spectators. Sport may therefore play an important role in society by implementing best environmentally friendly practices and promoting environmental awareness. People are more prone to emulate the behaviour of people or organisations they can identify with. The Ecological Ambassadors programme, for instance, uses the popularity of well-known sportsmen to increase global sustainability among supporters, attendees, marketers, the media, etc. Sports may also develop environmental activists. People who can devote their voices to environmental issues and are personable, well-spoken, and enthusiastic are needed for the Ambassador's programme(Matthee, 2017).

Corporate Social Responsibility (CSR) and Environmental Sustainability

The idea of corporate social responsibility (CSR) has gained widespread attention and a fresh resonance in the world economy. The emergence of globalisation and international trade, which has been reflected in greater company complexity and new demands for better transparency and corporate citizenship, has led to an increase in interest in CSR in recent years. Furthermore, despite the fact that governments have historically been solely responsible for improving the living standards of the populace, society's needs now outpace what governments can provide. In this setting, the importance of business in society is coming under more and more scrutiny, and forward-thinking companies are looking for ways to stand out by participating in CSR(Jamali & Mirshak, 2006).Environmental management practises are being adopted by organisations, which shows that businesses are becoming more aware of their impact on the environment and are adopting management practises to mitigate or reduce that impact. The natural environment is also becoming more and more recognised as a pillar of CSR(Babiak & Trendafilova, 2011).Speaking of the health, sports, and physical education sectors, many large firms use CSR tactics to increase environmental awareness. Making preparations enables them to have a significant impact on society by raising environmental awareness.

CSR incentives are intricate, involving the interaction of numerous corporate and societal variables. The desire for legitimacy and the potential strategic or competitive gains that these kinds of actions could offer are two crucial factors that drive environmental practises in professional sport. We understand that professional sport organisations' efforts

alone won't be enough to address environmental issues and challenges, but corporations working with other stakeholders will be crucial in finding solutions to the world's environmental issues(Babiak & Trendafilova, 2011).

Environmental sustainability initiatives and the encouragement of sport organisations to pursue recognized performance results can both be brought about by a mixture of social, functional, and political forces. These sustainability efforts can take many different forms, but they most frequently take the shape of operational procedures and formalisation through governance structures.Sport organisations' environmental operations can be changed by sports fans and communities. Sport professionals are capable of anticipating market trends and reacting to new pressures from various parties for example fans, community members(Todaro et al., 2022).

While studying about the environmental sustainability and awareness few questions arise such as How can we ensure that visitors enjoy themselves while minimising their carbon footprints? What level of environmental understanding is required of the audience to accomplish this goal?How can we merge several ministries' environmental sustainability policies?How can athletic event attendees enjoy the protected natural areas while they are there, and how can these preserved natural areas accommodate the enormous number of visitors?How can visitors be accountable for the welfare of the community?

To fulfil the objectives of promoting values and the relevant skills about important issues so that stakeholders can acquire an ecological literacy, environmental education requires deliberate strategic planning(Saito, 2016).

Some internationally played sport and their impact on environment.

1. Skiing: The impacts of pollution on the environment worsen as the world's population increases. Despite the fact that skiing itself may not be hazardous for the environment, ski facilities and other skiing-related elements may.It's conceivable that some deforestation will take place in the quest to build the ideal ski resort. Skiing has a negative effect on hilly areas because trees must be cut down to make room for skiers and ski lifts. The absence of trees has an impact on the environment as well as the creatures who inhabit there. Skiing negatively impacts the ecosystem in this regard.Skiing may be environmentally damaging for a number of intriguing reasons, including the resorts' daily usage of water. Because of global warming, artificial snow must be created to top off the snowpack. This procedure uses a large amount of water daily, which is obtained by these resorts from local lakes and rivers(Simmance, 2022).

   The excellent thing is that a lot of resorts are making an effort by including renewable energy sources like windmills and solar panels to complement the energy they consume.

2. Golf: Golf is typically regarded as a "outdoorsy" sport in comparison to other sports. Courses are frequently built in stunning natural settings, including as in the valley of beautiful mountains, in picturesque deserts, or with amazing ocean vistas, providing players the chance to spend some time outside. However, they frequently have no positive impact on the environment. In truth, golf courses have an outrageously negative influence on the ecosystem, both during construction and thereafter.For instance, extensive land removal is necessary to build a golf course, which frequently results in deforestation. The Seattle Journal of Environmental Law claims that it is not uncommon for developers to completely destroy ecosystems. Additionally, a lot of greenhouse gases are released by heavy equipment when it clears this land. Waterways nearby may potentially be impacted("As You Would Imagine, the Environmental Impact of a Golf Course Is Sky-High", 2022).Massive amounts of water and chemicals are needed to keep the grass green and deter pests, which also harms native habitats.The Audubon Cooperative Sanctuary Program (ACSP) for Golf Courses works to protect and conserve water for nearby bodies of water,

maintain ecosystems, and protect the local flora and animals through educational and environmental activities.

3. Baseball: A baseball's use and disposal are both environmentally benign. Even Nevertheless, industry has the potential to be more environmentally friendly. Alternatives that are more environmentally friendly would be for companies to invest in an environmentally friendly production method that uses fewer resources and produces less waste and pollution.The majority of the elements used to make a baseball are recyclable or biodegradable; it is the production processes itself that are harmful to the environment("Environmental Impact of a Baseball", 2022).

Conclusion

From the current generation of sports fanatics, a new generation of environmentalists may be forming. The observations demonstrate how the environment is impacted, what issues come up during event planning, and what needs to be done to preserve and safeguard it. The environmental sustainability has been a subject of numerous debates, according to a review of the literature. However, many organisations and clubs today are utilising CSR tools and are conscious of the need to identify and implement changes for society and the environment.

In order to educate people about environmental sustainability through sport and with the incorporation of new tactics comparable to the findings, future studies should thoroughly study each individual component and question that arises.

Baseball pitches, golf courses, ski slopes, and a variety of other sporting venues and organisations ought to do everything in their power to minimise their negative effects on the environment, and we ought to endeavour to protect the original habitats.

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MAHUA (MADHUCA INDICA)FOUND IN YAVATMAL (DIST) MAHARASHTRA(INDIA) AS A SOURCE OF BIODIESEL FOR SUSTAINABLE DEVELOPMENT OF ENVIRONMENT

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DESIGNED FOR SUSTAINABILITY

Every fuel we use has a carbon footprint. bio-based materials are helping to reduce it and to meet sustainability targets when we develop and upgrade products.

ABSTRACT

The Mahua trees are indigenous to India. If the seeds fallen are collected, and oil is extracted at village level expellers, few million tons of oil will be available for lighting lamps in rural area. In some countries, Mahua oil is considered edible as it is used only for preparing ghee, but in our country it has been considered as non-edible oil. Growing Mahua trees would also help in protecting the environment and benefit the farmers as well. It is the best substitute for kerosene. Since these are spread over a large area, collection of seeds for Biodiesel manufacture is not viable. A compact plantation can support a Biodiesel plant. The oil has not yet found any significant commercial application. But due to increase in awareness and growth in research in this area the Mahua can be developed as the alternative source of fuel by replacing diesel. In the present study attempt has been made to study the scope of Mahua in India.

Keywords: *Mahua, Biodiesel, Viscosity, Oilseed, plantation, extraction, commercial application*

Introduction:

Nowadays destructing habitats directly affects the economic, political, and social process of world countries as its unfavorable effects on people' s life are obvious.

Conserving the environment and the regional habitats has become the serious concern of governments, environmentalists, and those service and educational institutes involved in this matter.

Industry sector in this regard can be considered as an important element, as it can have a remarkable role in promoting life standards and this, in turn, has many good effects on the environment.

The current consumption of diesel in India is about 40 million tonnes (MT) (40% of the total consumption of petroleum in the country) and is expected to reach 65 million tonnes (MT) by 2011-12, whereas the domestic production of crude oil and natural gas will be less as compared to the demands. There is huge gap between the demand and sup- ply which is presently met by imports, resulting in heavy burden of foreign exchange on the country. Production of biodiesel from oil and ethanol from sugar based resources are considered as the best substitute of diesel and gasoline respectively in the country. The waste and degraded land after reclamation can be used to grow the resource, produce oil and its conversion to biodiesel. Biodiesel' s are mono alkyl ester of long chain fatty acids of vege- table oil or animal fats either from plant or animal. The biodiesel, when mixed with diesel up to 20% requires very little or no mod- ification in internal combustion engines and brings substantial reduction in the emission of unburned hydro- carbon by 30%, carbon monoxide by 20% and particulate matters by 25% with no sulphur. The biodiesel has nearly 10% more oxygen which facili- tates the complete combustion and enhances the cetane number.

1. **CULTIVATION OF OIL SEED PLANT IN INDIA** Depending on climate and soil conditions, different na- tions are looking for different vegetable oils as substitute of diesel fuel: soybean oil in USA, rapeseed and sun- flower oils in Europe, palm oil in south East Asia and coconut oil in Philippines. In India, According to the estimates, the annual ethanol demand is expected to rise to 4.0 Mt in the case of 2020-low scenario and to 23.1 Mt in the case of 2020-high scenario from 0.15 Mt in

2005 and the currently negligible annual biodiesel demand is likely increase to 12.7 and 33.5 Mt, respectively in the cases of 2020-low **considering 20% blends of biodiesel with diesel.**

MAHUA SEEDS

Mahua seeds are collected during May to July. During a bumper season a person can collect up to 15 kg of tori per day. Local tribal extracts 200 ml of oil from 1kg of seed. Oil is usually kept for domestic consumption. In market they sell seeds at Rs 50/- per kg. The seeds should be de-shelled by pressing and then dried to get the kernel. The amount of oil extracted is 20-30 % of weight of kernels when crushed in ghanis, 34-37 % in expellers and 40-43% when extracted

Fre sh ma hua oil from properly stored seeds is yellow in color with an unpleasant taste. Commercial oil is generally greenish yel-

2. DETAILS OF CONSTITUENTS AND QUALITY CHARACTERISTICS

Mahua oil is obtained from the kernel of mahua seed (Madhuca Indica) and contains 50-55% oil. The unrefined but filtered crude mahua oil is greenish yellow in color. The oil itself contains a number of fatty acids similar to those in cooking oils such as oleic acid, linoleic acid, stearic acid and palmitic acid. The fatty acid profile and character-istics of mahua oil is given in **Table1**. The quality of oil ex-

tracted from the seeds, depends largely on the conditions under which they have been stored. Even under the best conditions the concentration of fatty acid increases. The oil from fresh seeds has an acid value as low as 3.5 while the value for oil obtained from old and badly stored seeds may be as high as 60. Mahua oil has 21% free fatty acids (FFA) [5, 4].

This tree is well distributed in India, especially in the moist deciduous forests. Madhya Pradesh along with Orissa ac- counts for nearly 80 % of Mahua trees in India. As per vari- ous estimates, the undivided state has 3 to 5 million trees of Mahua. Mahua tree can be found in forests, revenue, and private land; more in the latter two. Two types of this tree are found in South India. In Andhra Pradesh, the trees have a spread out canopy and the leaves are broad and oval in shape. The fruits have a hard outer rind and are not edible. The trees in Karnataka are tall and reach a height of 20-25 feet. The leaves are oblong in shape and the terminal leaves are pink in color. The fruits resemble sapota fruits and are edible [16].

2.1 PHONOLOGY AND SILVICULTURE

Flowering of Mahua occurs in February- April. The fruits ripen in June- July and fall off soon after ripening. A large evergreen tree with numerous branches, the fleshy cream colored sweet petals fall soon after flowers open out. Dur- ing the flowering season, large quantities of petals are col- lected. The season for collecting Mahua flowers is short and in absence of organized harvesting, a considerable portion of the crop is lost during monsoon. The tree has a short bole and round spreading crown. The bark is nearly

2.2 AVAILABILITY AND SPREAD

smooth, grey or brown with vertical cracks. The tree starts

giving flowers and fruits between the 10th and 15th year after planting. An average size tree yields about 50-100 kg of flower in a season that lasts around a month. It is said that low rainfall in the previous year adversely affects flower production. One Mahua tree has an annual average yield of 62.5 kg of flower and 59 kg of gully as per the study. It has been observed that good flowering in Mahua occurs every alternate year or once in every three years. The reason for this is said to be fluctuations in rainfall, temperature and other climatic factors. According to a group of

people,major causes for poor flowering is seen due to the damage caused to the tree while beating it with bamboo for tori collection [5, 4, 6].

2.3 COLLECTION AND PROCESSING

Mahua seed is collected during May to July. In this season when Mahua tree flowers more, seed production is low. The villagers go to forests early in morning to collect fruits using bamboo sticks (or hand pick) to pluck the fruits. Dur- ing a bumper season a person can collect up to 15 kg of tori per day. Local tribal use their indigenous knowledge for extraction of oil from seed. 250 ml of oil is extracted from 1 kg of seed. Oil is usually kept for domestic consumption. In the market they sell at Rs 8/- a kg. After collection of fruits, the seeds are separated from them and tribal people use the pulp for their food. After removal of pulp, seeds are washed and soaked in water for 3 days so that the seed coat softens. Thereafter the covering is removed either one at a time or many together by crushing the seeds through grind stones by applying minimum pressure. The seeds should be de-shelled by pressing and then dried to get the kernel. The amount of oil extracted depends on the effi- ciency of the equipment employed for crushing; it is 20-30% of the weight of kernels when crushed in ganas 34-37% in expellers and 40-43% when extracted by solvents. Fresh Mahua oil from properly stored seeds is yellow in color with unpleasant taste. Commercial oil is generally greenish yellow in colour with an offensive odour and disagreeable taste. Groups can set up advance dealing, directly with the oil expellers, if they are located nearby. Indigenous meth- ods for oil expelling could be utilized and gully oil may be sold to soap manufacturers after vacuum purification. Ma- hua gully is prone to fungal attack if not preserved proper- ly. It is kept in an airtight earthen pot with its mouth sealed or in baskets with wet mud and leaf coating. Mouth of the basket is covered with mahul or palas leaves. This indige- nous technique is useful for storing the guli for sufficiently longer time before onset of monsoons [4, 6,7].

3. CHARACTERIZATION OF MAHUA OIL

The important physical and chemical properties of mahua oil are determined as per Indian standard (IS) methods in Bangalore Test House. It is observed that the properties like density, flash point, fire point and viscosity of mahua oil is high and calorific value is lower as compared with diesel. **Table 2** shows the comparison of properties of crude ma- hua oil with diesel. Tests for determination of density, cal- orific value and viscosity of mahua oil are carried at Banga- lore Test House Bangalore. Tests for flash point and fire point are carried out using Able' s apparatus. The compari- son shows higher density, viscosity, flash and fire point but, lower calorific value of mahua oil. Density of mahua oil under test is 0.904 g/ml, lower than that of diesel. Vis- cosity of oil is 38.86 Centistokes, higher than that of diesel. Flash point and fire point of oil is 2200C and 2340C respec- tively. Calorific value of oil under test is 37,735 KJ/Kg, which is in the range of 86% of that of diesel. Cetane num- ber of mahua oil under test is less than that of diesel.

Properties	Diesel	Raw Mahua
Density (kg/m3) at300C	862	904
Specific gravity at 400C	0.828	0.904
K.V.(cSt) at 400C	4.4	38.86
Calorific Value (KJ/kg)	43910	37735
Flash point (0C)	73	220
Fire Point (0C)	76	234

3.1 REQUIRED CHARACTERISTICS OF VEGETA-BLE OIL AS FUEL

Vegetable oils provide diesel engine performance similar to that obtained with diesel oil as per the experiments carried out by the research teams. The following are the important characteristics of good vegetable fuels required to substi- tute diesel oil [3].

• Ignition quality: Satisfactory diesel combustion de- mands self-ignition of the fuel as it is sprayed near the TDC into the hot, swirling compressed cylinder gas. Long ignition delay is not acceptable as it leads to

knocking. Therefore, cetane number of the substitute fuel should be high enough, i.e., in between 40 to 60.

• Viscosity: Too low viscosity can lead to excessive inter- nal pump leakage whereas high viscosity can increase system pressure to unacceptable levels and will affect injection during the spray atomization.

• Heating value: Although, the diesel combustion system can accept wide variations in heating value, practical systems are most suitable when calorific value of fuel is high. This helps to reduce the quantity handled and to maximize equipment operating range. It is always de- sirable for vegetable fuels to have calorific value nearer to diesel oil.

• Pour Point, Cloud Point and Flash Point: The first two properties are important for cold weather operation.

SUITABILITY AND PROBLEMS OF MAHUA OIL AS FUEL

.3.2 EFFECT OF TEMPERATURE ON VISCOSITY OF MAHUA OIL AND BLENDS WITH DIESEL

Figure shows the variation of viscosity of diesel, mahua oil (MO 100) and its blends with diesel at 20 % (MO20), 40

% (MO 40), 60% (MO 60), and 80% (MO 80) with tempera- ture. Viscosity of mahua oil and its blends decreases with

SUITABILITY

The Mahua (vegetable) oil has some properties, which makes replacement of diesel fuel. Cetane number of mahua oil is generally in the higher range of diesel fuel. Heat con- tent of vegetable oils are nearly 90 % that of diesel fuel. Long chain saturated, unbranched hydrocarbons are espe- cially suitable for conventional diesel fuel. The long, un- branched hydrocarbon chains in the fatty acids meet this requirement.

3.3 **PROBLEMS**

The problems involved with vegetable oils can be listed as below

• Diesel fuel has a chain of 11-13 carbon, and fresh vegeta- ble oil has a chain of about 18. To burn in an engine, the chain needs to be broken down to be similar in length to diesel The high viscosity and the polyunsaturated nature of the oils In complete combustion but characterized by nozzle cok- ing, engine deposits, lube oil dilution, ring sticking, scuff- ing of the cylinder liners, injection nozzle failure and lub- ricant failure due to polymerization of the vegetable oil. To a lesser extent, operational problems, unreliable igni- tion and misfire, and degraded thermal efficiency.

Neat vegetable oils are reported to cause engine depos- its. Attempting to solve these problems by using methyl esters (Biodiesel) cause operational problems at low temperatures. Furthermore, problems related to com- bustion and emissions remains to be solved.

Both cloud and pour points of esters are significantly higher than those for diesel fuel. These high values may cause problems during cold weather.

4. **CONCLUSIONS**:

By using mahua oil as a fuel in future we can reduce pollution which is caused due to diesel and petrol ,in future this may be abig approach towards sustainable development of environment.

The general morphology of the mahua oil, its availability and combustion characteristics like density, viscosity, flash point and fire point, and calorific value are determined.

The concept of sustainable development is the intellectual, democratic, reasonable, and human connection among three elements of human, resources (environment), and technology. If human and his green and environmental insights are the dominant agents of this process, we can expect a promising future for catching sustainable development owning to mass participations, responsible organizations, and public and specialized trainings.

We are the civilians of a biological-social environment with agriculture livelihood, so the concept of sustainable development is joined with the concept of "sustainable agriculture". Any developmental or constructive project in countries like Iran, if does not focus on shares

of future generations, safety and stability of environment, and the human aspect of this case, it will be an anti-development project which is found to be destructive and polluting.
Achieving the important and remarkable objectives of sustainable development requires involving the well-informed and interested groups in this process, enjoying all kinds of individual and group training, and asking help from international observer organizations such as: UN, FAO, and WHO.

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NANOCOMPOSITE SYNTHESIS AND SPECTROSCOPIC CHARACTERIZATION OF POLYANILINE DOPED WITH TIN OXIDE (SNO_2)

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1. Introduction:

In recent years, there has been developing interest in research on conducting polymer nanostructures. Conducting polymers show different promising applications in various fields, for example in transistors, sensors, actuators/ muscles, [1-2]. The composite of the segments in a polymer composite outcomes in interesting mechanical and thermal properties that are infeasible to be accomplished with any material.

Considering conducting polymers, most incredible solidness was observed in polyaniline in its doped, de-doped form. It has may applications like anticorrosion coatings, [3], synthetic detecting, batteries [4], electromagnetic impedance protecting, microelectronics, etc. [5-6], Polymer composites have improved optoelectronic properties due to the expansion of fillers. Polymerization of polyaniline-graphene oxide nanocomposites showed enhanced electrical conductivity of 9.2 S/cm [7]. The conductivity of SnO_2/PANI nanocomposites is found to be 1.75×10^{-1}S/cm by some researchers [8]. Maximum conductivity of PANI/SnO_2 nanocomposite was found to be 6.4×10^{-3} s/cm at 9 wt%. Liu *et al* [9] prepared TiO_2/PANI solar cells. The composite of (SnO_2/PANI) was found electrically responsive to humidity in a closed chamber.

In the present work, nanoparticles of polyaniline and polyaniline-SnO_2 nanocomposites are prepared by chemical oxidative polymerization method. Their structural characterization is done by scanning electron microscopy technique and x-ray diffraction technique. We are getting crystalline nature of the nanocomposite with agglomeration of crystals over polymer and nanosized particles in nanocomposite. Spectroscopic characterization of crystals is done using FTIR spectroscopy. In FTIR investigation, the peaks of PANI-SnO_2 nanocomposite shows a modification of the spectra of the polyaniline due to embedding SnO_2.

2. Methods and materials:

2.1 Synthesis of Polyaniline (PANI) nanoparticles:

In this process polyaniline nanocomposite was synthesized by chemical oxidative polymerization method [10]. 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, mixture is stirred for 2 hr. Then resulting dark green precipitate of PANI was filtered and washed with HCl and acetone. Obtained precipitate was kept in oven to dry for about 8 hrs. at 50-60 ^{0}C.

2.2 Synthesis of Polyaniline-Tin Oxide Nanocomposite:

In this process polymer composite was synthesized by in-situ chemical oxidative polymerization method [11] for 20 wt. % of SnO_2. SnO_2 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-SnO_2 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 ^{0}C. In this way PANI-SnO_2 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.

3.3 Fourier transform infrared spectroscopy

:(FTIR) is the most widely used method for characterizing the molecular structure of polymers, because it provides a lot of information. The FTIR study of, Pure PANI and PANI–SnO_2 nanocomposites was studied on a BRUKER FTIR IR spectrophotometer in the range 500 to 4000 cm^{-1} at room temperature (303 K).

4. Result and discussion:

4.1 Scanning Electron Microscopy:

The surface morphology of PANI and PANI-SnO_2 (25 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.

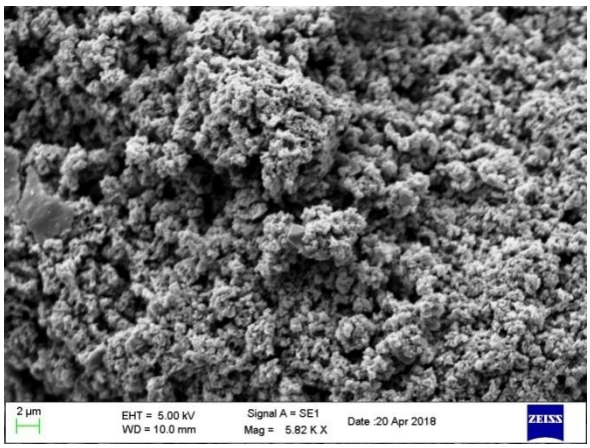
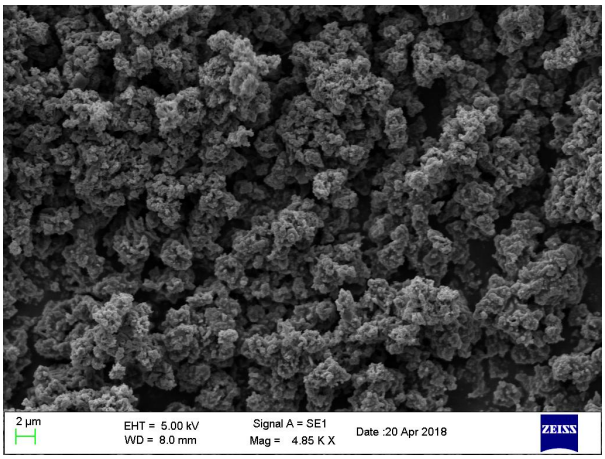


Fig. Pure PANI



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.

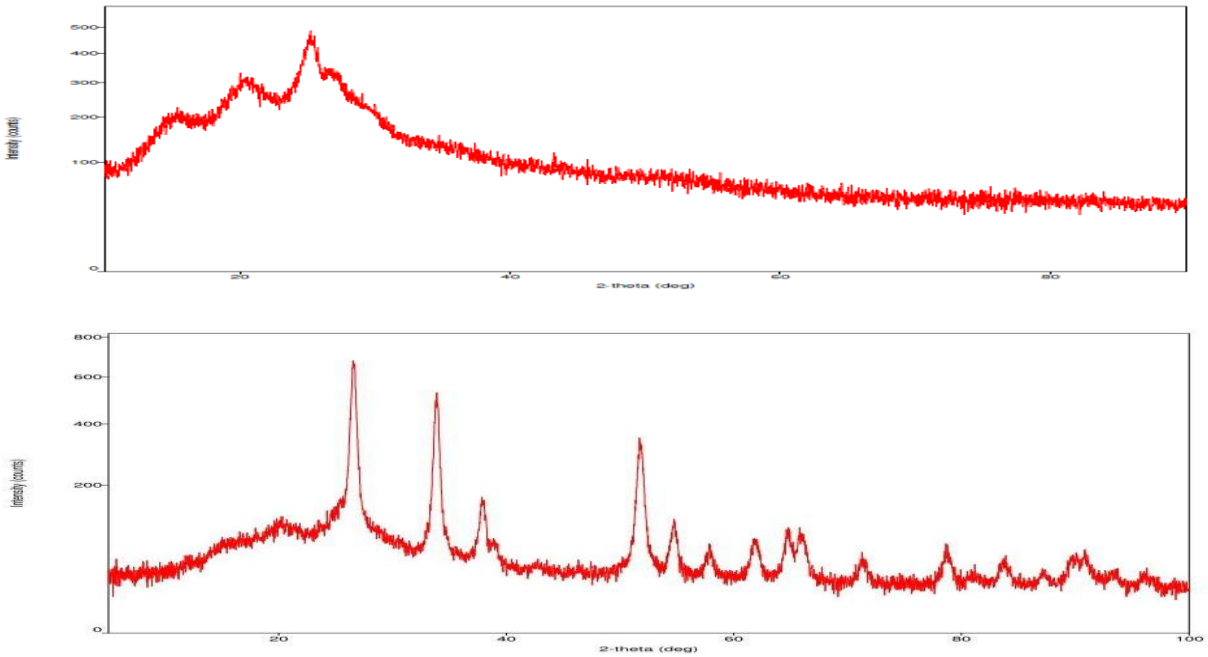
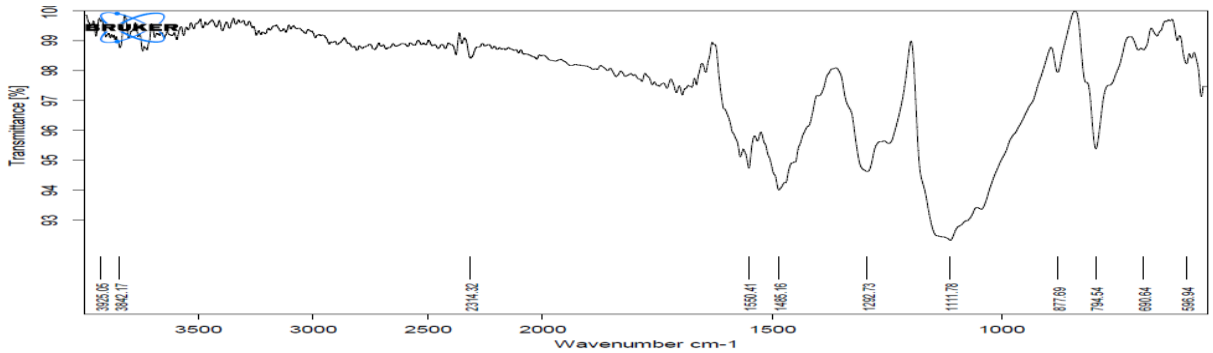


Fig. XRD pattern of Pure PANI and PANI-SnO_2 nanocomposite

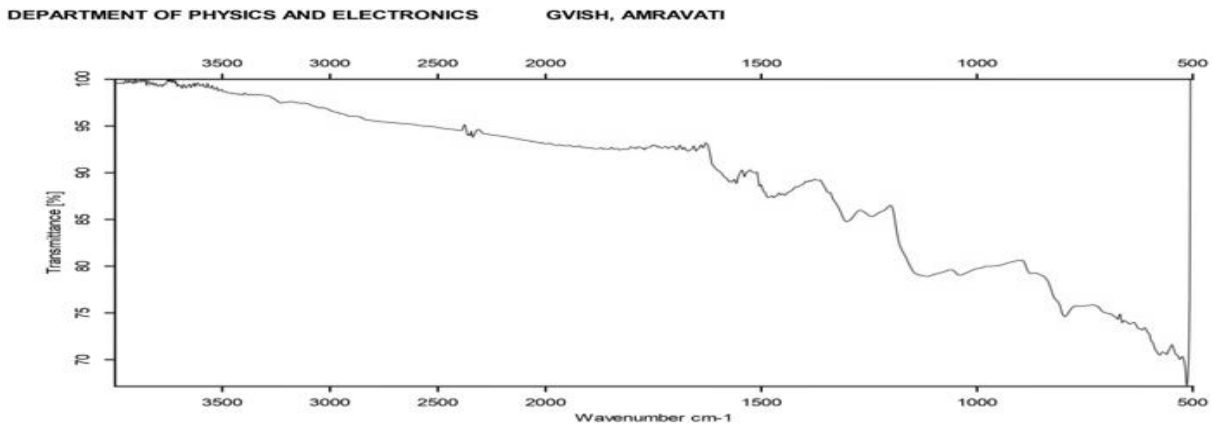
The crystallite size can be determined using Debye Scherrer formula and found as 40 nm. The XRD-pattern of PANI-SnO_2 shows sharp diffraction peaks at 26°, 34°, 51° which confirms the presence of SnO_2 nanoparticles are highly crystalline and can be indexed as (110), (101) and (211) planes of SnO_2. 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 **Fourier Transform Infrared Spectroscopy(FTIR)**

An infrared spectra of pure Polyaniline and PANI doped with 25 wt. % of Tin Oxide (SnO_2) is shown in figure below. The spectral studies of the synthesised polymer composite films show number of absorption peaks. From FTIR spectra of all synthesised samples, it is observed that basic nature of the polymer composite is same. An attempt is made to explain the structure of PANI-SnO_2 nanocomposite film with the help of infrared spectra.



(a) FTIR spectra of Pure Polyaniline



(b) FTIR spectra of Polyaniline doped with 25 weight % of SnO_2 nanocomposite

The infrared spectra of pure PANI and PANI doped with 25 wt. % of Tin Oxide (SnO_2) shows the different absorption bands these values are listed in table below.

Table : Vibrational frequencies from FTIR spectra for Polyaniline polymer doped with Tin Oxide (SnO_2)

SnO_2 wt. %	Position of absorption maxima (cm^{-1})										
PANI	596.94	690.64	794.54	877.59	1111.78	1292.73	1485.16	1550.41	2314.32	-	3842.17
PANI + 25% SnO_2	516.6	574.7	798.8	865.2	1122.5	1247.6	1396.6	1562.64	2350.6	3237.5	3775.5

FTIR spectra of SnO_2, polyaniline and PANI-SnO_2 nanocomposite are displayed in Figure. The peaks of PANI-SnO_2 nanocomposite is a modification of the spectra of the polyaniline due to embedding SnO_2 .This approves the SnO_2 polymerization and formation of core-shell model. Table includes the bonds corresponding to each wave number. Similar bands have been observed by others but at shifted wave numbers [16].

FTIR spectrum of PANI shows all important absorption peaks 1550, 1485, 1292, 1111, and 877 cm^{-1}. The peaks at 1550 and 1485 cm^{-1} are assigned to C–C ring asymmetric and symmetric stretching vibrations. The peaks at 1292 cm^{-1} correspond to N–H and C–C bending vibrations. The bands at 1111 and 877 cm^{-1} can be attributed to the in-plane and out-of-plane C–H bending, respectively. The corresponding peaks PANI/ SnO_2 appear at shifted position. The spectrum of the PANI/SnO_2 exhibits some new peaks which shows interaction between PANI and tin oxide. The peak at 3227 cm^{-1} could be attributed to N–H stretching and peak at 1562 $cm^{-1}$to C-N bending vibration of quinoid rings and peaks associated with 1396 cm^{-1}could be attributed to C-N stretching vibrations associated with benzenoid ring [17]. Peak at wave number 1122 cm^{-1} is considered to be due to N-Q-N stretching. The peak at the wave number 798 cm^{-1} is attributed to C–H out of plane bending vibrations. These peaks are slightly shifted with respect to their normal positions for pure PANI [16] due to the presence of tin oxide in the PANI matrix It shows two absorption peaks at 574 cm^{-1} which are assigned to the stretching vibration frequency of Sn-O-Sn in SnO_2[18].

3. Conclusion:

SEM micrograph shows the partly crystalline behaviour as well as amorphous morphology of Polyaniline doped with Zinc Oxide (SnO_2). Nanoparticles formed are not of homogeneous size. Agglomeration of the crystals were seen. These materials are polycrystalline in nature. The surface morphology changes severely from

rough to smooth. Also the addition of SnO_2 shows further drastic improvement of surface morphology of polymer composite. The average size of the particles PANI and PANI-SnO_2 nanocomposite are found to be range between 200-550 nm, and 100-250 nm respectively.

From the X-Ray diffraction technique it was observed that Polyaniline doped with SnO2 indicating the partly crystalline and partly amorphous in nature. The sharp peak observed in PANI-SnO_2 nanocompositeis due to the presence of SnO_2 in the nanocomposite. A nanocomposite show greater crystallinity due to the addition of SnO_2 in PANI matrix as compared to pure PANI.

In FTIR investigation, the peaks of PANI-SnO_2 nanocomposite shows a modification of the spectra of the polyaniline due to embedding SnO_2 .This approves the SnO_2 polymerization and formation of core-shell model. The results give the confirmation that there is strong interaction between the PANI and SnO_2 nanoparticles, also the presence of SnO_2 nanoparticles doping with PANI.

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TOXICITY OF EVALUATION OF CADMIUM NITRATE TO FRESHWATER FISH, *CHANNAPUNCTATUS*

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ABSTRACT

Toxicity effects of heavy metal are an important threat to the aquatic environment and its organisms. In the present investigation the acute toxicity of Cadmium nitrate to Channa puncatatus were determined by statistical method suggested by Finney, 1971. Lethal concentration (LC50) for 24, 48, 72 and 96 hours of exposure were found to be 0. 9055, 0.7743, 0.5759 and 0.5213 ppm respectively. A descending value of lethal concentration (LC50) has been found in the different exposure periods.

***Keywords**: Toxicity, LC50, Channa punctatus.*

Introduction

The major objectives of aquatic toxicological studies in laboratory are to identify mechanisms; of toxicity and to predict the safe concentration in the environment (Johnson and Kilburn, 1983) there is a vast literature dealing with toxicity studies and excellent reviews have appeared which attempt to complete and summarize progress in the toxicity of substances to commercially aquatic organisms. The lethal and sublethal toxicity study also occupies an important status in toxicological investigations and provides a sensitive tool for evaluation impact of pollution on aquatic life.

Toxicity studies have played an important role in man's efforts to monitor and modify the effects of his activities on the biota (Bhandare *et al.* 2011). The toxic pollutant affects water quality and feeding, swimming behaviour of fish and also delays the hatching, the maturation period (Atif *et al*., 2005). Fish may absorb metal directly from contaminated water or indirectly from feeding on living organisms in the contaminated water (Javed, 2005). Fishes are relatively sensitive to changes in their surrounding environment. Therefore, fish health may reflect a good indication of the status of the specific aquatic ecosystem (Mokhtar *et al*., 2009). Acute toxicity caused by different toxicant on freshwater fish can evaluate by quantitative parameters like survival and mortality of test animals and sensitivity of different fish species against metal toxicity. Toxicity in fish is the culmination of a series of events involving various physical, chemical and biological processes. LC_{50} is indicator to the level of resistance of population response to metals (Reda, *et al*., 2010). Many studies concerning harmful impacts of metals on fish are associated with individuals' metals, whereas the aquatic organisms are generally exposed to metal mixtures. Some metals can alter the accumulation of the other metals in the body of the fish (Jezierska and Sarnowski, 2002).

The main objective of the present study is to determine the lethal concentration (LC_{50}) of Cadmium nitrate to the freshwater fish, *Channa Punctatus*.

Materials and Methods

Collection of experimental fish:

The fingerlings of the fresh water fish, *Channa punctatus* measuring 12±2 cm and weighing 14± 2 gms were selected procured from the Godavari river at Nanded, The fishes were acclimatized in the laboratory condition for two weeks.

Preparation of stock solution:

One gram of Cadmium nitrate was dissolved in 1Liter of distilled water and used as the stock solution for preparing different concentrations of Cadmium chloride in rearing water. It was stored in a clean standard flask at room temperature in the laboratory.

Lethal concentration (LC_{50}):

The acute toxic effect was determined as lethal concentration (LC_{50}) 96 hours values of Cadmium nitrate was calculated following

probit analysis (Finney, 1971 and Hamilton *et al*., 1977). The physicochemical characteristics of the normal water were analyzed as per standard procedures (APHA, 1998). The physicochemical charactestics of water are depicted in Table.no.1. Every experiment procedure was repeated 5 times at the selected heavy metal concentrations, every time noting the number of fish killed at each concentration up to 96 hours and the mean value was taken. These values were taken to determine LC_{50} values for 24, 48, 72 and 96 hours.

Statistical method:

This method makes use of probit analysis. The percent mortalities obtained were converted to probit kills by using regression equation according to Finney (1971). The regression equation Y = a + bx was used regression equation.

Results

Control group: In the present investigation in control group no death of fish were found during the period of experiment.

Experimental group: The Lc_{50} values for 24, 48, 72 and 96 hrs. for the Cadmium nitrate were calculated by probit analysis. In bioassay test Lc_{50} of Cadmium nitrate were analyzed values for 24, 48 72 and 96 hours were 0.90, 0.77, 0.57 and 0.52 ppm respectively. The values are represented in table no. 1 to 4and physico-chemical characterstic of water to used in bioassay test are represemnted in table no. 5.

Discussion

Toxicants to make the water become toxic and disturb to the normal life of aquatic organisms showed effects of pollution on fish showed by Lawrence and Hemingway (2003). Abdullah *et.al*. (2007) determined the 96 hr LC_{50} and lethal toxicity of iron, zinc, lead, nickel and manganese to three age groups of, *Labeo rohita*. The fish were significantly sensitive to nickel, followed by that of lead, zinc, iron and manganese. The 90 days fish showed significantly higher tolerance against all the metals than that of 60 and 30 day fish. Shukla *et. al*. (2007) determined 96 hr LC_{50} of zinc, cadmium and copper for *Channa punctatus*as 18.62, 11.80 and 0.56 mgL-1, respectively. Domingues, *et.al*. (2010) investigated the sensitivity of chromium (VI) to the embryos and adult zebra fish and reported that the 96 hr LC_{50}145.70 and 39.40 mgL-1values for eggs and adults respectively. Eggs showed less sensitivity than the adults. However, sensitivity was much more responsive to larvae than in adult. The present study was initiated to find the susceptibility of the *Channa punctatus* to exposed to heavy metal like cadmium nitrate. Lethal concentration (LC_{50}) of cadmium nitrate to *Channa punctatus* for 24, 48, 72 and 96 h of exposure are 0.90, 0.77, 0.57 and 0.52 ppm respectively. Reetu Bhanot and Swarndeep Singh Hundal(2019) studied on acute toxic effects of untreated sewage water in *Labeo rohita* (Hamilton 1822) observed that the acute toxicity test was conducted for 96 hrs to determine LC_{50} of the untreated sewage water using five concentrations viz. 10%, 25%, 50%, 75% and 100%. Selvam, *et.al.* (2014) studied on the acute toxicity of aluminium chloride to *Labeo rohita* calculated *by* the method of Finney, 1971. They reported that the Lethal concentration (LC_{50}) for 24, 48, 72 and 96 hours of exposure were found to be 44, 39.5, 36 and 32.5 ppm respectively. Ashvani Kumar (2017) Studied on carbonyhl toxicity to the freshwater fish *Channa punctatus* and observed that the LC_{50} value of carbaryl was calculated 10.05mg/l for various time periods 24, 48, 72 and 96 hrs. Mohit Tiwari *et.al* (2011) working on toxicity of heavy metal cadmium to freshwater fish *Channa punctatus* and observed that the LC_{50} values, estimated with 95% confidence level were found to be: 26.88 (21.69-71.68), 18.76 (17.13-20.81), 16.70 (14.77-17.96) and 14.95 (13.13-15.88) mg l-1 for dissolved metal concentrations, at 24, 48, 72 and 96 h exposure durations respectively. Mehwish Faheem and Khalid Parvez Lone (2017):working on the exposure to bisphenol-A in the freshwater fish, *Ctenopharyngodon idella* and Fishes were exposed to a sublethal concentration of BPA (1/2 LC50) for 14 days 3.2 ppm. Neha Pandey *et. al* (2018) Studied on toxicity of orient Paper Mill Effluent on *Tilipia* and observed that the LC_{50} values of the prepared concentration for 24, 48, 72 and 96 hrs were found at 11, 10.6, 10.2 and 9.6% respectively. In the present study the results are

similar to above references which shows that as time period increases level of toxicity decreases means time period and toxicity are inversely proportional to each other.

Conclusion

In the present investigation toxicity of cadmium chloride exposed to *Channa puncatatus* also depend on dose, time of exposure, size of fish, as larval form is less sensitive to waste water toxicity as compare to adult. Similar results are reported by the above workers. The 96 hr time period is consider preferable for study as it is considered as an excellent time period for acute toxicity study, in present experiment 96 hr Lc_{50} value is calculated for cadmium nitrate values are 0.52 ppm.

Acknowledgment

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Table No.1 Calculations of regression equation for LC $_{50}$ of Cadmium nitrate to the freshwater fish *Channapuntactus* for 24 hours. (Probit analysis by Finney, D.J., 1971)

Sr.NO.	Conc. In PPm	Log Conc (X)	No.of animal Exposed (N)	No. Of Mortality	% Mortality P =100 r/n	Emperical Probit	Expected Probit (y)	Weighing Coefficient (w)	Weight W= nw	Working Probit (Y)	WX	WY	WX2	WY2	WXY
1	0.6	0.7782	10	1	10	3.7184	3.7	0.33589	3.3589	3.719	2.6138	12.4917	2.0338	46.4566	9.7210
2	0.7	0.8451	10	2	20	4.1584	4.1	0.47144	4.7144	4.159	3.9841	19.6071	3.3665	81.5459	16.5700
3	0.8	0.9031	10	3	30	4.4756	4.4	0.55788	5.5788	4.475	5.0382	24.9651	4.5495	111.7188	22.5460
4	0.9	0.9542	10	5	50	5.0000	5.0	0.63662	6.3662	5.000	6.0746	31.8310	5.7957	159.1550	30.3731
5	1.0	1.0000	10	6	60	5.2533	5.2	0.62742	6.2742	5.252	6.2742	32.9520	6.2742	173.0643	32.9520
6	1.1	1.0414	10	7	70	5.5244	5.5	0.58099	5.8099	5.523	6.0504	32.0880	6.3008	177.2222	33.4165
7	1.2	1.0792	10	9	90	6.2816	6.2	0.37031	3.7031	6.281	3.9963	23.2591	4.3126	146.0906	25.1012
Total									**35.8055**		**34.0316**	**177.194**	**32.6331**	**895.2534**	**170.6798**

$$\overline{X} = \frac{Swx}{Sw} = \frac{34.0316}{35.8085} = 6.9504$$

$$\overline{Y} = \frac{Swy}{Sw} = \frac{177.194}{35.8085} = 4.9487$$

$$b = \frac{Swxy - \left(\overline{X}xSwy\right)}{Swx^2 - \left(\overline{X}xSwx\right)}$$

$$b = \frac{170.6798 - (0.9504x177.194)}{32.6331 - (0.9504x34.0316)}$$

$$= \frac{170.6798 - 168.4051}{32.6331 - 32.3463}$$

$$b = \frac{2.2747}{0.2895}$$

$$b = 7.8573$$

Re *gressionEquation* –

$$y = \overline{y} + b\left(x - \overline{x}\right)$$

$$y = 4.9487 + 7.8573\left(x - 0.9504\right)$$

$$Y = 4.9487 + 7.8573x - 7.4675$$

$$y = (7.8573)x + -2.5188$$

$$y = 5, x = ?$$

$$5 = (7.8573)x + -2.5188$$

$$5 + 2.5188 = (7.8573)$$

$$x = \frac{7.5188}{7.8533}$$

$$Anti\log ofx = 0.9586$$

Lc_{50}for24hours = 0.9055ppm

Table No.2Calculations of regression equation for LC $_{50}$ of Cadmium nitrate to the freshwater fish *Channapuntactus* for 48 hours. (Probit analysis by Finney, D.J., 1971)

Sr.NO.	Conc. In PPm	Log Conc (X)	No.of animal Exposed (N)	No. Of Mortality	% Mortality P =100 r/n	Emperical Probit	Expected Probit (y)	Weighing Coefficient (w)	Weight W= nw	Working Probit (Y)	WX	WY	WX2	WY2	WXY
1	0.5	0.6990	10	1	10	3.7184	3.7	0.33589	3.3589	3.719	2.3478	12.4917	1.6411	46.4566	8.7317
2	0.6	0.7782	10	2	20	4.1554	4.1	0.47144	4.7144	4.159	3.6687	19.6071	2.8545	81.5459	15.2583
3	0.7	0.8451	10	4	40	4.7467	4.7	0.61609	6.1609	4.747	5.2065	29.2427	4.3994	138.9297	24.7156
4	0.8	0.9031	10	6	60	5.2533	5.2	0.62472	6.2472	5.252	5.6662	32.9520	5.1166	173.0643	29.7590
5	0.9	0.9542	10	8	80	5.8416	5.8	0.50260	5.0260	5.841	4.7958	29.3568	4.5756	171.4730	28.0123
6	1.0	1.0000	10	9	90	6.2816	6.2	0.37031	3.7031	6.281	3.701	23.2591	3.7031	146.0906	23.2591
Total									**29.2105**		**25.386**	**146.909**	**22.2903**	**757.5601**	**129.7360**

$$\overline{X} = \frac{Swx}{Sw} = \frac{25.386}{29.2105} = 0.8960$$

$$\overline{Y} = \frac{Swy}{Sw} = \frac{146.909}{29.2105} = 5.0293$$

$$b = \frac{Swxy - \left(\overline{X}xSwy\right)}{Swx^2 - \left(\overline{X}xSwx\right)}$$

$$= \frac{129.7360 - \left(0.8960x146.909\right)}{22.2903 - \left(0.8960x25.386\right)}$$

$$= \frac{129.7360 - 131.6304}{22.2903 - 22.7458} = 4.1589$$

Re *gressionEquation* –

$$y = \overline{y} + b\left(x - \overline{x}\right)$$

$$y = 5.0293 + 4.1589\left(x - 0.8960\right)$$

$$Y = 5.0293 + 4.1589 - 3.7263$$

$$y = 4.1589x + 1.303$$

$$y = 5, x = ?$$

$$5 = 4.1589x + 1.303$$

$$5 - 1.303 = 4.1589x$$

$$= \frac{3.697}{4.1589}$$

$$Anti\log ofx = 0.8889$$

Lc_{50}for48hours = 0.7743ppm

Table No.3 Calculations of regression equation for LC $_{50}$ of Cadmium nitrate to the freshwater fish *Channapuntactus* for 72 hours. (Probit analysis by Finney, D.J., 1971)

Sr.NO.	Conc. In PPm	Log Conc (X)	No.of animal Exposed (N)	No. Of Mortality	% Mortality P =100 r/n	Emperical Probit	Expected Probit (y)	Weighing Coefficient (w)	Weight W= nw	Working Probit (Y)	WX	WY	WX2	WY2	WXY
1	0.4	0.6021	10	1	10	3.7184	3.7	0.33589	3.3589	3.719	2.0223	12.4917	1.2176	46.4566	7.5212
2	0.5	0.699	10	2	20	4.1584	4.1	0.47144	4.7144	4.159	3.2953	19.6071	2.3034	81.5459	13.7054
3	0.6	0.7782	10	4	40	4.7467	4.7	0.61609	6.1609	4.747	4.7944	29.2457	3.7304	138.8297	22.7590
4	0.7	0.8451	10	5	50	5.0000	5	0.63662	6.3662	5.000	5.3800	31.831	4.5461	159.1550	26.9003
5	0.8	0.9031	10	7	70	5.5244	5.5	0.59099	5.9099	5.523	3.2469	32.0880	4.7379	177.2222	28.9787
6	0.9	0.9542	10	9	90	6.2816	6.2	0.37031	3.7031	6.281	3.5334	23.2591	3.3713	146.0906	22.1939
Total									30.2134		22.2723	148.523	19.9067	749.3	122.0585

$$\overline{X} = \frac{Swx}{Sw} = \frac{22.2723}{30.2134} = 0.7371$$

$$\overline{Y} = \frac{Swy}{Sw} = \frac{148.523}{30.2134} = 4.9157$$

$$b = \frac{Swxy - \left(\overline{X}xSwy\right)}{Swx^2 - \left(\overline{X}xSwx\right)}$$

$$b = \frac{122.0585 - (0.7371x148.523)}{19.9067 - (0.7371x22.2723)}$$

$$= \frac{122.0585 - 109.4763}{19.9067 - 16.4169}$$

$$b = \frac{12.5822}{3.4898}$$

$$b = 3.6054$$

Re *gressionEquation* –

$$y = \overline{y} + b\left(x - \overline{x}\right)$$

$$y = 4.9157 + 3.6054\left(x - 0.7371\right)$$

$$Y = 4.9157 + 3.6054x - 2.6575$$

$$y = (3.6054)x + -2.2584$$

$$y = 5, x = ?$$

$$5 = (3.6054)x + 2.2582$$

$$5 - 2.2582 = (3.6054)$$

$$x = \frac{2.7418}{3.6054}$$

$$Anti\log ofx = 0.7604$$

Lc$_{50}$for72hours = 0.5759ppm

Table No.4 Calculations of regression equation for LC $_{50}$ of Cadmium nitrate to the freshwater fish *Channapuntactus* for 96 hours. (Probit analysis by Finney, D.J., 1971)

Sr. NO.	Conc. In PPm	Log Conc (X)	No.of animal Exposed (N)	No. Of Mortality	% Mortality P =100 r/n	Emperical Probit	Expected Probit (y)	Weighing Coefficient (w)	Weight W= nw	Working Probit (Y)	WX	WY	WX2	WY2	WXY
1	0.3	0.4771	10	1	10	3.7184	3.7	0.33589	3.3589	3.719	1.6025	12.4917	0.7644	46.4566	5.9598
2	0.4	0.6021	10	3	30	4.4756	4.4	0.55788	5.5788	4.475	3.3589	24.9651	2.0223	111.7188	15.0315
3	0.5	0.6990	10	4	40	4.7467	4.7	0.61609	6.1609	4.747	4.3064	29.2457	3.0102	138.8297	20.4428
4	0.6	0.7782	10	6	60	5.2533	5.2	0.62742	6.2742	5.252	4.8825	32.9520	3.7990	173.0643	25.6433
5	0.7	0.8451	10	8	80	5.8416	5.8	0.50260	5.0260	5.841	4.2474	29.3568	3.5890	171.4730	24.8094
6	0.8	0.9031	10	9	90	6.2816	6.2	0.37031	3.7031	6.281	3.3442	23.2591	3.0198	146.0906	21.0053
Total									30.1019		21.7419	152.27	16.2047	787.633	112.8921

$$\overline{X} = \frac{Swx}{Sw} = \frac{21.7419}{30.1019} = 0.7222$$

$$\overline{Y} = \frac{Swy}{Sw} = \frac{152.27}{30.1019} = 5.0584$$

$$b = \frac{Swxy - \left(\overline{X}xSwy\right)}{Swx^2 - \left(\overline{X}xSwx\right)}$$

$$b = \frac{112.8921 - \left(0.7222x152.27\right)}{16.2047 - \left(0.7222x21.7419\right)}$$

$$= \frac{112.8921 - 109.9693}{16.2047 - 15.7020}$$

$$b = \frac{2.9228}{0.5027}$$

$$b = 5.8142$$

Re *gressionEquation* –

$$y = \overline{y} + b\left(x - \overline{x}\right)$$

$$y = 5.0854 + 5.8142\left(x - 0.7222\right)$$

$$Y = 5.0293 + 5.8142x - 4.1990$$

$$y = (5.8142)x + 0.8303$$

$$y = 5, x = ?$$

$$5 = (5.8142)x + 0.8303$$

$$5 - 0.8303 = (5.8142)$$

$$x = \frac{4.1697}{5.8142}$$

$$Anti\log ofx = 0.7171$$

Lc_{50}for96hours = 0.5213ppm

Table No. 5 Physico-chemical parameters of water to be used for Acute toxicity test.

Sr. no.	Physico- chemical Parametres	Range
01	pH	7.2 ± 7.4
02	Temperature (oc)	24 ± 4
03	Do (mg/l)	8.0 ± 3.0
04	Hardness of CaCO3 (mg/l)	150 ± 20
05	Chlorides (mg/l)	172.5 ± 0.8
06	Salinity (mg/l)	311.3 ± 0.7

TOXICITY OF CADMIUM CHLORIDE TO FRESHWATER FISH *CHANNAPUNCTATUS* AND ITS EFFECT ON OXYGEN CONSUMPTION

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ABSTRACT

The toxicity of cadmium chloride to the Channapunctatus was determined using statical method for 24, 48, 72 and 96 hr. The lethal concentration (0.57 ppm) and sublethal concentration (0.057 ppm) determinced by probit analysis (Finney, D.J., 1971). In lethal concentration rate of oxygen consumption for 24 hr decreased for 48 hr it was increased and for 72 and 96 hr again decreased. A reduction in oxygen consumption is observed when the fish is exposed to the toxicant.

***Keywords**: Cadmium chloride, Lc50, oxygen consumption, channapunctatus*

Introduction

Fish bioassay experiments, the trophic level connection in aquasystems are indices to determine the acute toxicity and possible effect on oxygen consumption due to the toxicant stress (Laws, 1981; Murty 1986).According to the Prosser and Brown, (1977) the respiratory potential or oxygen consumption of an animal is the important physiological parameters to assess the toxic stress, because it is a valuable indicator of energy expenditure in particular and metabolism in general. A variation in respiration rate is an indicator of stress and is frequently used to evaluate the changes in metabolism under environmental deterioration (Chebbi and David, 2010). Numbers of workers reported that pesticides are indicated to cause respiratory distress or even failure by affecting respiratory centers of the brain or the tissue involved in breathing. Numerous studies such as *Cirrhinusmrigala* (Mushigeri and David, 2003), *Labeorohita* (Patil and David, 2008), *Oreochromismossambicus* (Logaswamy and Remia, 2009), *Ctenopharyngodonidella* (Tilak and SwarnaKumari, 2009); *Oreochromisniloticus* (Barbieri and Ferriera, 2010) and *Cyprinuscarpio* (Singh *et al.*, 2010) reported either increase or decrease their respiration rate in response to variety of pesticides. Hence the analysis of oxygen consumption is one of the methods to assesss the basic damage inflicted on the animal which could either increase or decrease the oxygen uptake. Therefore in the present investigation to study the effect of lethal and sublethal concentrations of Cadmium chloride on oxygen consumption for 00 to 96 hours to the freshwater fish *Channapunctatus*.

Materials and Methods

The fresh water fish *channapunctatus*, measuring from 12 to 14gm were collected from Godavri River at Nanded. Fishes were treated with 0.1% potassiumpermagnet to avoid the dermal infection the fish were then acclimatized to laboratory condition for about 8 days prior to the experimentation the fishes were divided in to two batches“A” and “B”. Batch “A” was maintained as control in “B” batch fishes were exposed to lethal concentration of heavy metal cadmium nitrate. The test fish *channapunctatus* were exposed to lethal concentration of cadmium chloride the rate of oxygen consumption of fishes estimated upto 96 hr. estimation were also made for 0 hr as control group of fishes was also maintained. Oxygen contents for control and exposed fishes were measured by standard Wrinkle’s method as modified and described by (Strickland and Parsons,1965) the oxygen consumption experiment were conducted using respiratory chamber of 320 ml capacity with an air tight rubber stopper with glass which served as an outlet the rubber stopper could be removed to place the animal in chamber. The weighted fishes were place in wrinkle’s chamber and stoppered tightly. Final water sample was collected in similar way as initial water sample after every 24 hr upto96 hr.and amount of dissolved oxygen content of water sample collected at 0, 24,48, 72 and 96 hr was

determined by wrinkle's method.Therespiratory chambered also contain the same medium in which the animals were being exposed minimum 5 observations were made for each cases and the values were expressed to mean standard values.

Results and Discussion

The freshwater fish Channapunctaus observed the changes in the rate of oxygen consumption when exposed to the lethal concentration i.e. 96 hours LC_{50} 0.57 ppm and sublethalconcentraction i.e. $1/10^{th}$ of 96 hours LC_{50} 0.057 ppm of cadium nitrate for 0, 24, 48, 72 and 96 hours.

Control Group:

The rate of oxygen consumption in the control group (A) fish showed at 0 hours 0.50 ml of oxygen/liter/hr/gm/ bodyweight, 0.49 ml of oxygen /liter /hr /gm / body weight at 24 hours, 0.50 ml of oxygen/ liter/ hr/ gm / bodyweight at 48 hours, 48 ml of oxygen/ liter/ hr/ gm /bodyweight at 72 hours and 47 ml of oxygen/ liter/ hr/ gm/ body weight at 96 hours. In control group the oxygen consumption level is decreased in 0, 24, 48, 72 and 96 hours.

Effect of lethal concentration of cadmium nitrate:

The oxygen consumption rate was found 0.45, 0.47, 0.35, and 0.31 ml of oxygen/ liter/ hr/ gm body weight of fish at 24, 42, 72 and 96 hours respectively. In the lethal concentration zero hours the rate of oxygen consumption is decrease and in 24 hours was decreased, 48 hours is slightly increased and it is fall down the rater of consumption in fish at 72 and 96 hours.

Effect of sublethal concentration of cadmium nitrate:

The effect of sublethal concentration on the oxygen consumption rate is increased in 24 hours when compared with the control, 48 hours is slightly increased and fall down at 72 and 96 hours. The values were recorded as 0.46, 0.62, 0.56, and 0.40 ml of oxygen /liter/hr/gm body weight at 24, 48, 72 and 96 hours respectively. All the values are represented in table no. 1 and graphically represented in figure no.1.

Jothinarendiran, N. (*2012)* working *on* effect of dimethoate pesticide on oxygen consumption of the fish, *Channapunctatus*and observed that the amount of oxygen consumption was higher than the control in dimethoate concentrations of 0.15ppm, 0.2ppm, 0.3ppm and 0.6ppm whereas it was lower than the control in the concentration of 0.3ppm during 96 hours of exposure. The values noted were 0.524 $\pm$ 0.03, 0.484 $\pm$ 0.02, 0.0379 $\pm$ 0.05 and 0.0560 $\pm$ 0.05 ml/g/hr in the sub lethal concentration of 0.15 ppm, 0.2 ppm, 0.3 ppm and 0.6 ppm respectively. He stated that the rate of oxygen consumption increased in the lower concentration and decreased in the higher concentration. In the present investigation the effect of cadmium chloride on the freshwater fish *Channapunctatus* showed similar observation.

In the present investigation, the oxygen consumption was gradually decreasing with increasing exposure periods. Number of workers reported that the rate of oxygen consumption was observed in the sublethal concentration of heavy metal at different exposure periods. Dharmalata and Namitha Joshi (2002) reported that the rate of oxygen consumption in turn controls the metabolic activities and changes in respiratory rates have been used as the indicator of the stress in pollutant exposed organisms. Dube and Hosetti (2010) studied on behavior surveillance and oxygen consumption in the freshwater fish *Labeorohita*(Hamilton) exposed to sodium cyanide observed that the oxygen consumption rate in 1/3rd (11.62% and -4.52%) and 1/5th (9.11% and -2.82%) sublethal concentrations. They reported that the fish under sublethal concentration were found to be under stress but not fatal. Sandhya M. Sonawane (2015) studied on the toxicity effects of heavy metals (copper sulphate, mercuric chloride and cadmium chloride) on oxygen consumption of *Lamellidensmarginalis* and reported that the after acute and chronic treatment it was found that there was a decrease in oxygen consumption. She stated that it was affected most by $HgCl_2$ and was followed by $CuSO_4$ and $CdCl_2$. Lokhande M.V. (2017) while working on oxygen consumption of *Rasboradaniconius* exposed to dimethoate and

reported that the oxygen consumption of fish clearly shows that the rate of consumption increases in the control group in throughout the study period at different exposure. In the lethal and sublethal concentration the rates of oxygen consumption is increases in the 48 and 72 hours and suddenly falls down in 72 hours and slightly decrease in 96 hours.

Dhairyashil V. Ahirrao And Ashwini B. Pawar (2019) working on different concentration of detergent on the *ChannaPunctatus* with 50 ppm, 100 ppm, 150 ppm, 200 ppm of detergent for a time period of 1 hour, the dissolved oxygen content showed a decreasing trend ranging from 9.48 mg/l, 9.23 mg/l, 8.89 mg/l and 8.12 mg/l. They stated that the decreased rate of oxygen consumption in the fish *Channapunctatus* that may be due to direct effect of detergent. Muthukumaravel, K (2021) working on the rates of oxygen consumption in *Chanoschanos* in control were 0.632, 0.641 and 0.638 mL O2/g/h at 10, 20 and 30 days, respectively. The fish exposed to sublethal concentrations, on the other hand, were recorded with relatively low rates of oxygen consumption including 0.580, 0.542 and 0.481mLO2/g/hat 10, 20 and 30days, respectively. They stated that the oxygen consumption rate was decrease gradually with increasing exposure periods.

Conclusion

The rate of oxygen consumption for control and exposed fish were determined by standard winkler's method. It was found that metal cadmium nitrate induce a noticeable alteration in oxygen consumption of fish, *Channapunctatus*on exposed to lethal concentration of cadmium nitrate compare with normal group of fish. It is concluded that the Cadmium nitrate affects the respiratory metabolism of fish because the intimate contact between the gills and metals contaminated water might have affected the respiratory area and may be the decreased oxygen consumption on metal exposure resulting in hypoxic conditions.

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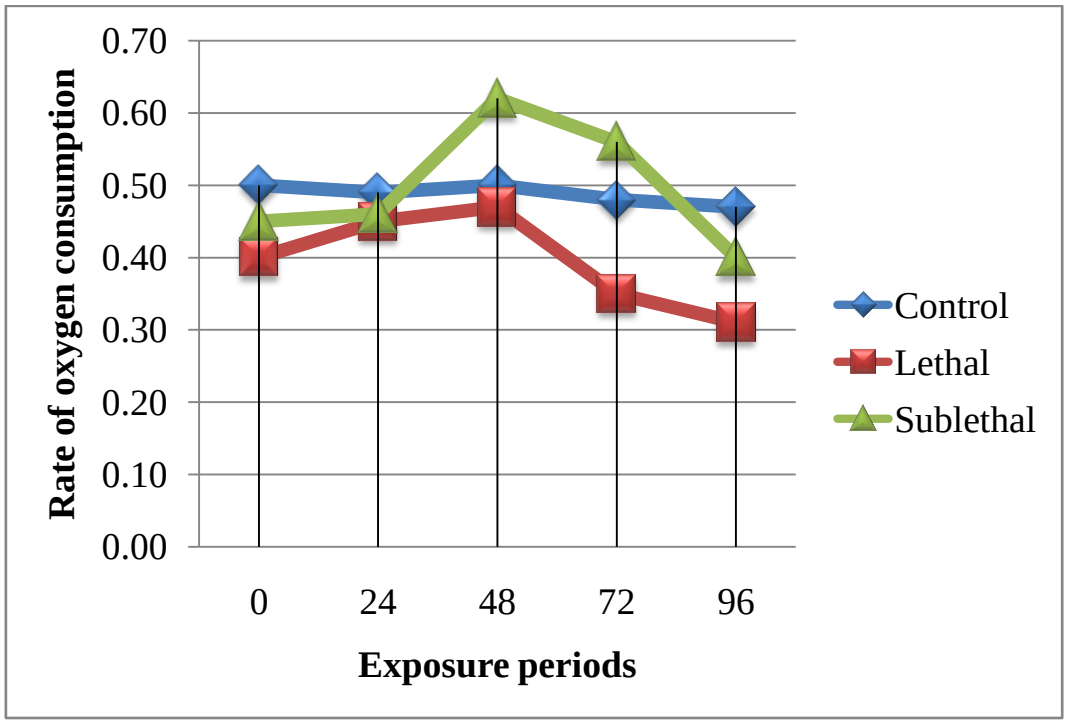
Table no. 1 showing effect of lethal and sublethal concentration of cadmium chloride on oxygen consumption of freshwater fish, *Channapunctatus.*

Sr. No.	Exposure time (in Hours)	Control	Lethal concentration (0.57 ppm)	Sublethal concentration (0.057 ppm)
1	0	0.50	0.40	0.45
2	24	0.49	0.45	0.46
3	48	0.50	0.47	0.62
4	72	0.48	0.35	0.56
5	96	0.47	0.31	0.40

All values are expressed in ml of oxygen /liter/hr/gm body weight of fish.

Fig.No.2 showing effect of lethal and sublethal concentration of cadmium chloride on rate of oxygen consumption of *Channapunctatus.*



AIR POLLUTION: INCREASING THE RISK OF ENVIRONMENTAL RELATED DISEASES

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ABSTRACT

The rising number of air pollutants has made poor breathing and occurrence of health related problem . The causes of air pollution have increase the health related disease .. Air pollution is the contamination of air due to the presence of substances in the atmosphere that are harmful to the health of humans and other living beings, or cause damage to the climate or to materials. The long-term effects of air pollution can cause Cardiovascular related disease ,cancer and damage to the immune, neurological, reproductive, and respiratory systems. In extreme cases, it can even cause death. In addition Air pollution can affect lung development and is implicated in the development of emphysema, asthma, and chronic obstructive pulmonary disease (one type of respiratory Disease which is more common in metro cities) . Major sources include the emission of pollutants, refineries, and petrochemicals, the chemical and fertilizer industries, metallurgical and other industrial plants. Air pollution, is not only of its impact on climate change but also its impact on the health of mankind's due to increasing morbidity and mortality. Air pollution causes respiratory related disease (Asthma) cardiovascular diseases, reproductive and neurological diseases etc. Air pollution can be prevented by advocating the use of public transport and carpooling. It can also be controlled by avoiding wastage of electricity, less use of plastic and increase the awareness in rural and remote areas etc.

***Keywords**: pollution , Diseases, Prevention, Risk factors, environment*

Introduction

Air pollution is contamination of the indoor or outdoor environment by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere (WHO,2022). WHO data show that almost all of the global population (99%) breathe air that exceeds WHO guideline limits and contains high levels of pollutants, with low- and middle-income countries suffering from the highest exposures. Air pollution can cause diseases, allergies, and even death to humans; it can also cause harm to other living organisms such as animals and food crops, and may damage the natural environment (for example, climate change, ozone depletion or habitat degradation) or built environment (Manisalidis, et.al (2020). Air pollution not only adversely impact on environmental related desease but also adversely effects on Climate Changes, Acid rain (containing harmful amounts of nitric and sulfuric acids) , Eutrophication (situation of water body where high concentrations of nutrients such as nitrogen and stimulate blooms of algae), Haze (sunlight encounters tiny pollution particles in the air), Effects on wildlife (Animals can also suffer from health problems) Ozone depletion (Ozone is a gas that occurs both at ground-level and in the Earth's upper atmosphere, known as the stratosphere) and Crop and forest damage too (Air pollution can damage crops and trees). The common symptoms and experience of air pollution are breathing difficulties , Irritation of the eyes, nose, and throat Wheezing, coughing and chest tightness (https://www.mass.gov/doc/health-environmental-effects-of-air-pollution).

Whereas , Environmental disease is a pathologic process having a characteristic set of signs and symptoms that are detrimental to the well-being of the individual and are the consequence of external factors (https://www.sciencedirect.com/topics/medicine-and-dentistry/environmental-disease).

The criteria air pollutants include Nitrogen Dioxide, Carbon Monoxide, Lead, Ozone, Particulate Matter, and Sulfur Dioxide.

Sources of air pollution

Most of the air pollution takes place due to the burning of fossil fuels such as coal, oil, and gasoline to produce energy for electricity or transportation. Industrial emission is another source of air Pollution that affects the air quality more than we can even imagine. Sugar industry, manufacturing goods, chemical, and textiles industries

release a large number of carbon monoxides, carbon dioxide (CO2) and organic compounds which adversely impact of the environment https://www.aqi.in/blog/here-are-the-10-main-causes-of-air-pollution).
The vehicle burns gasoline, it emits the air pollutants. vehicle emits carbon monoxide, hydrocarbons, nitrogen oxide, and particulate matter. In addition , burning of garbage is much more harmful to health and the environment. construction sites and raw materials such as bricks and concrete cause haze and foul air which is hazardous for people specially , asthmatic and respiratory related disease patients. Agricultural activities with, pesticides and fertilizers are the main sources that contaminate the surrounding air and Household products cause indoor air pollution such as paints, cleaners and personal care products. (https://www.aqi.in/blog/here-are-the-10-main-causes-of-air-pollution). The another sources includes, use of plastic and life style of high income pople.

Types of air pollution

There are many different types of air pollutants,

Noxious gases :

1.Noxious gases, which include carbon dioxide, ammonia,methane, chlorofluorocarbons carbon monoxide, nitrogen oxides (NOx), and sulfur oxides (SOx), are components of motor vehicle emissions and byproducts of industrial processes .

2.Organic and inorganic Particulates:

Particulate matter pollution is one of the main sources of the various diseases associated with air pollution. Particulate matter refers to tiny particles, both liquids, and solids, which exist in the air. The particles are so small they can penetrate both the lungs and bloodstream and do considerable damage. and

3. Biological molecules :

Biological molecules may include viruses, bacteria, cat saliva ,animal dander, cockroaches, house dust, mites, and pollen.

Air pollution and disease

Both indoor and outdoor air pollutants harm people and lead to several non communicable diseases .Diseases .Inhaling air induced with pollutants due to the burning of natural gas and fossil fuel reduces heart's ability to pump enough oxygen causing one to suffer from respiratory illness. Industrial pollution poor associated with public health can range from irritation in the eyes and throat to breathing issues, which at times can even lead to chronic illness. The most common diseases caused by air pollution include Cardiovascular disease , stroke, chronic obstructive pulmonary disease (COPD), lung cancer and acute lower respiratory infections in children, Asthma ,neurological disease and many more .There are several diseases responsible for air pollution are as:

1. OBSTRUCTIVE PULMONARY DISEASE (COPD) :

Chronic obstructive pulmonary disease (COPD) is a common lung disease. Air pollution and Smoking are the main cause of Obstructive Pulmonary Disease (COPD) . the symptoms COPD including difficulty in breathing, cough and phlegm production (WHO). The harmful chemicals in smoke can damage the lining of the lungs and airways that causes difficulty of breathing and adversely impact of Lung and Cardiovascular disease. The other risk factors includes exposure to certain gases or fumes in the workplace, Exposure to heavy amounts of secondhand smoke and pollution and Frequent use of a cooking fire without proper ventilation. As per the findings of world health organization Chronic obstructive pulmonary disease (COPD) is the third leading cause of death worldwide, causing 3.23 million deaths in 2019. Nearly 90% of COPD deaths in those under 70 years of age occur in low- and middle-income countries

2. ASTHMA :

The several Researches shows that air pollution can worsen asthma symptoms. A study of young campers with moderate to

severe asthma showed they were 40 percent more likely to have acute asthma episodes on high pollution summer days than on days with average pollution levels (Asthma and allergy foundation of America) Another study found that older adults were more likely to visit the emergency room for breathing problems when summer air pollution was high. Asthma is a major non-communicable disease (NCD), affecting both children and adults, and is the most common chronic disease (WHO). Asthma is a condition in which your airways narrow and swell and may produce extra mucus. This can make breathing difficult and trigger coughing, a whistling sound (wheezing) when you breathe out and shortness of breath (https://www.mayoclinic.org/diseases-conditions/asthma/symptoms-causes).
Asthma affected an estimated 262 million people in 2019 and caused 455 000 deaths (WHO). The most common symptoms of Ashthma are Shortness of breath, Chest tightness or pain, Wheezing when exhaling, which is a common sign of asthma in children,Trouble sleeping caused by shortness of breath, coughing or wheezing and Coughing or wheezing attacks that are worsened by a respiratory virus, such as a cold or the flu (https://www.mayoclinic.org/diseases-conditions/asthma/symptoms-causes/syc-20369653). Nitrogen dioxide is also one of the causes of asthma. Asthma cannot be cured, but good management with inhaled medications can control the disease and enable people with asthma to enjoy a normal, active life.(WHO,2022). Air Pollution is associated with increased asthma prevalence, probably due to multiple lifestyle factors Reducing air pollution tobacco smoke exposure is important for both primary prevention of asthma and disease management.

3.NEUROLOGICAL DISEASE :

Neurological disorders are disorders of nervous system that adversely impact the brain as well as the nerves found throughout the human body including spinal cord. Structural, biochemical or electrical abnormalities in the brain, spinal cord or other nerves can result in a range of symptoms. Air pollution may increase the risk to developing several neurological disorders, including Parkinson's disease, Alzheimer's disease, and other dementias. Alzheimer’s disease and related dementias are a public health challenge for aging populations. the research findings of NIEHS identified a link between air pollution and dementias. The symptoms of Neurological disorders include learning disabilities, muscle weakness, poor coordination, loss of sensation, paralysis, seizures, confusion, pain and altered levels of consciousness and many more.

4.CARDIOVASCULAR DISEASE :

Cardiovascular disease (CVD) is a general term for conditions affecting the heart or blood vessels . It's usually associated with a build-up of fatty deposits inside the arteries (atherosclerosis) and an increased risk of blood clots (https://www.nhs.uk/conditions/cardiovascular-disease/) Cardiovascular disease , is linked with the buildup of calcium or other materials like fat within the coronary artery," This leads to blockages which prevent blood from reaching the heart and other areas of the body. The several research founds that air pollution increasing the risk of blockage of arteries, leading to increased incidences of ischemic heart disease (http://www.who.int/respiratory/copd/causes/en/). Cardiovascular diseases (CVDs) are the leading cause of death globally. An estimated 17.9 million people died from CVDs in 2019, representing 32% of all global deaths. Of these deaths, 85% were due to heart attack and stroke. Most cardiovascular diseases can be prevented by addressing risk factors such as, reduce the air pollution , tobacco use, unhealthy diet and obesity, physical inactivity and harmful use of alcohol. (https://www.who.int/news-room/fact-sheets/detail/cardiovascular-diseases-(cvds).

5.LUNG CANCER

Lung is One of a pair of organs in the chest

that supplies the body with oxygen, and removes carbon dioxide from the body.Lung cancer is a type of cancer that begins in the lungs. Lung cancer is the leading cause of cancer deaths worldwide (https://www.mayoclinic.org/diseases-conditions/lung-cancer/symptoms-causes). Lung cancer is the uncontrolled division of cells within the lungs, and it is associated with air pollutants, especially particulate matter pollution, and secondhand smoke. In 2019, 139,682 people died from lung cancer, or 23% of all cancer deaths. 74,909 of these deaths were among men and 64,773 among women. The lung cancer death in 2019 was 42% higher among men than women (https://www.lung.org/research/trends-in-lung-disease/lung-cancer-trends-brief/lung-cancer-mortality).

Managements of Environmental Diseases Caused by Air Pollution:

There are a several way to reduce the air pollution including, Using public transport is a sure short way of contributing to less air pollution as it provides with less gas and energy, even carpools contribute to it. The energy that the lights take also contribute to air pollution, thus less consumption of electricity can save energy. Use energy saving fluorescent lights to help the environment. recycle and reuse is helpful for air pollution as it helps in reducing pollution emissions. Avoid plastic use(The use of plastic products could be very harmful to the environment as they take a very long time to decompose, due to their material made up of oil.) Reduction of forest fires and smoking, Use of fans instead of Air Conditioner, Use filters for chimneys, Avoid usage of crackers, Avoid using of products with chemicals and Implement a forestation (https://www.aqi.in/blog/10-best-ways-to-reduce-air-pollution/). Air pollution need to implementing smart control strategies, such as instituting emissions standards and creating atmosphere that will reduce emissions. Recently, EPA recommends source control as one of the best strategies to reduce air pollution. Source control involves stopping pollution at its source by doing things like improving the efficiency of industrial processes and using less polluting fuels.

Discussion

Air pollution is linked to an estimated 7 million premature deaths every year. Air pollution and climate change are closely linked. The air pollution increase the risk of Aggravated respiratory related disease such as emphysema, bronchitis and Asthma. Lung damage, even after symptoms such as coughing or a sore throat disappear., chest pain ,Wheezing,dry throat, headache or nausea, Reduced resistance to infections and Increased fatigue. Air pollution is a mix of hazardous substances from both human-made and natural sources.. Air pollution exposure leads to diseases including neurological diseases ,Asthma , heart disease, chronic obstructive pulmonary disease (COPD) and lung cancer. Policies to reduce air pollution, therefore, offer a win-win strategy for both climate and health, lowering the burden of disease attributable to air pollution, as well as contributing to the near- and long-term mitigation of climate change. The diseases caused by air pollution lead to shorter lives and they make those lives unhappier and tougher in the meantime. For these reasons, we should do all we can to reduce air pollution and stop the diseases associated with them.

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ONLINE LEARNING ENVIRONMENT AND ITS CHALLENGES: DECODLNG TEACHERS' PERSPECTIVES

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ABSTRACT

The present'pandemic has opened an avenue for all stakeholders of education, especially for teachers, to think about the alternatives that can be explored to keep educational processes going. The sudden outburst of this situation compelled teachers and students to create, adopt and adapt to online learning environment despite the fact that preparations and infrastructural support for the same were limited. The curriculum and examinations related commitment motivated teachers to complete the teaching learning process in due time. However, the challenges for the teachers to do so were quite immense. This paper focuses on the teachers 'perspectives of online learning environment and its challenges that they came across during online teaching learning process The paper contends that the blended approach of teaching learning may precipitate entranced learning environment for all the stakeholders of education for the beterment of all that may pave way for futuristic educational planning even when the situation gets back to normalcy.

***Keywords**: Online Learning, assessment, challenges, blended learning, education.*

Introduction

The present pandemic has, despite all its threats and disastrous effect on humanity, opened an avenue for all stakeholders of education, especially for teachers, to think about the alternatives that can be explored to keep educational processes going. In spite of the herculean task of copying up with the sudden emergence of this situation all across the globe and preparing themselves to impart education to millions of students, they have been trying their best to do their bit for this cause. The teachers are burning their midnight oil to complete the teaching learning process which has been disrupted due to pandemic that enveloped the population at large so quickly. In lieu of face to face mode of teaching, teachers had to shift to online mode of teaching. This development was so fast that hardly a handful of teachers were having proper preparation to handle this. Maximum teachers are facing the challenges of lacking online teaching experience, early preparation, or support from educational technology teams. But teachers as well as students are trying their best to create, adopt and adapt to online learning environment despite the fact that preparations and infrastructural support for the same are limited.

Comparing the developed world to the developing countries, it has been found that developing countries are facing challenges such as poor internet connectivity, inadequate knowledge on the use of ICT and inefficiency of content development (Aung&Khaing, 2015). For example, delivering content like video, podcasts and other applications is still new to many educators even at the higher level in developing countries. Moreover, when it comes to examination, whole process of online education resorts back to pen paper mode of examination,

1.What are the alternatives that could be thought of, in order to deal with the crisis?

2.Whether the present online education phenomenon is able to reach out and do good to those who are still struggling for their survivals?

3.Can we have creative alternatives of existing assessment and evaluation system?

4.How can some of the discipline specific competencies, like those in language and literature and in Mathematics or in Science, be developed and assessed through online educational processes?

5.Whether e-assessment can replace the conventional assessment system completely?

6.What kind of systematic reforms do we need for aligning curriculum and alternative

assessment system?

7.Where can we situate the coordinates of alternative assessment and evaluation system in the scheme of teaching learning processes?

Online Learning or E- Learning

The advent of Internet has transformed the whole process of learning. Now anyone can leam anything anywhere at any time. In the present scenario. Internet has played the role of a bridge between learners and learning and thanks to a new development called E-leaming. As E-leaming seems to be the panacea for all the learning issues faced by teachers and students during this trying times. Learning, which uses electronic media by using all the facilities of information technology, is termed as E-learning or Online learning. It is the use of information and computer technologies to create learning experiences. It is a tool that makes the teaching-learning process student-centered, innovative, and flexible. Online learning is learning experiences in synchronous or asynchronous environments using electronic devices i.e. mobile phones, laptops, etc. with internet access

Advantages & Disadvantages of Online Learning

Online learning increases child's retention and reduces learning time. Consistent delivery of content is possible with the help of asynchronous self-paced learning. Expert's knowledge is just not only communicated it can be easily captured with knowledge management systems. On-demand availability enables students to complete course or syllabus conveniently at off-hours or from home. Self-pacing reduces stress and increases satisfaction specially in slow learners. Easy availability of reference material too reduces the burden of gathering material. These are the few of many advantages of on line But it does have limitations. No doubt online learning offers flexibility and expediency to

Online Teaching Learning (OTL) - A Need of the Hour

Due to pandemic there has been an overnight shift of normal classrooms into e-classrooms. Institutions which were earlier reluctant to change have to accept and adapt to modem technology. Educators have to shift their entire pedagogical approach to adapt to the new changing situations. As this shift has been the only possible solution to make the teaching learning process going due to uncertainty of reopening of educational institutions. Students, who were initially apprehensive, found attending class online has helped them finish their courses timely and made them confident to appear for online examinations as for many it's their first experience of online class and exams. No doubt online class has established a strong communication and rapport between students and teachers which helped students to avert from all kinds of anxieties they develop during these testing times. Online media can ensure multiple benefits for both students and teachers in supporting teaching and learning (Graham &Misanchuk, 2004). Many learning activities, experiments are hard to perform in real world because of high expense, lack of infrastructure or its feasibility; for example, medical students watching Heart operation or law students

oiciuiig court cases live on YouTubc. But in virtual world all this is possible. According to You & K-ang, 2014, many studies reveal that online courses have been found to be conducive to students who favor self-regulated learning.

Research Design: Collection of Data, Analysis of Benefits & Challenges of OTL

Research survey was conducted with the help of "Google forms", for this URL link was posted on WhatsApp of the teachers of Higher Educational Institutes of India through contacts. Due to lockdown, the Google form was considered suitable for the study. A Purposive sampling technique was employed to select the participants as the detailed information about the research questions was needed (Buchanan, 2012). Teachers of higher educational institutes were asked to answer the questions in an online learning situation as they have just

shifted from conventional to online learning. The teachers gave their consent for voluntarily participation before the study began. The intent was to get maximum responses, but 110 teachers of 26 higher educational institutes' responses were returned usable. Questions were based on teachers' perception about online classes, their knowledge of tools, competences, readiness, students' interest and feasibility of online assessment. Based on survey, it was observed that around 50% of the teachers took online classes first time in their life but they were aware of the online tools. However, majority of teachers were enthusiastic to learn new technologies and felt that this shift made them more empowered. But the major challenge they found was lack of band width & connectivity, students' active participation and smooth interaction. Though they have been giving regular assignments and taking online assessments but they were concerned about its feasibility and achievement of predetermined learning goals.

Fig. 1 depicts the benefits and challenges of OTL from the perspectives of teachers as well as students. Online teaching learning is student centric, flexible, can be customized as per the needs of the students. It creates collaborative and interactive learning environment. Teachers can use audios, videos, text, graphics to make their content interesting and engaging. Plenty of online tools are available and many have been launched especially for teachers during this crisis. Though there are many pros of OTL but one has to look into the challenges loo because online teaching learning can't JUST be kepi for emergencies. OTL faces many challenges ranging from teachers' issues to students' issues and content issues. First and foremost, in rural areas internet facilities are not available, moreover people can't afford it and if students use mobile phones then poor signal interrupt connectivity. Poor signal is not only case of rural areas, urban areas too face this problem. It is difficult to develop content which is according to curriculum as well as interesting and engaging. In NEP 2020 online learning has been given huge importance but there are no educational policies which clearly specifies E-Leamingprograms. Though government digital educational initiatives like SWAYAM, e-PG Pathshala, Vidwan, Vidyamitra. One India One Digital Platform, Sakshat, GIAN, Virtual Lab & e-Acharya etc. are trying to fulfill objectives - equity, equality and access of educational policy and has been of great help during this crisis but there is a long road ahead. Lack of standards of e-content development and e-content delivery has to be seriously looked upon. Non serious attitude of students, non-affordability of equipment, digital illiteracy/equity of both teachers as well as students, learning styles of students with their cultural influences, assessment is another biggest challenge - quizzes, self-assessment, discussion, projects, group work all can be done easily via online mode but all students don't have that critical thinking. They need proper guidance and nurturing. In nut shell, it can be said that this new trend demands better technology and dynamic teachers with changed roles.

Conclusion

Despite number of challenges faced by teachers and students during online teaching learning, the joint efforts of all the stake holders have borne the fruit of success by minimizing the loss of students' academic activities during these trying times. But it should be contemplated seriously that online teaching learning is just an emergency remedy or a new pedagogical approach that will enrich and enhance the educational possibilities of all the schools, universities etc: Its affordance and flexible nature can increase the readiness of both students as well as teachers. But it is not easy to do so as there are many issues to contemplate on. Firstly, the considerable amount of investment is needed for getting & maintaining equipment, training the human resources, and developing the online content whicli not only covers curriculum but engages students too. Therefore, an effective and efficieni educational system needs to be developed for imparting education online.

Another challenge is the quality ofe-leamingprogrammes Secondly, students are struggling for their survival so how this online education will reach to them? Digital equity is must as students can lose learning opportunities due to lack of internet facility or digital tools. To reduce digital divide efforts should be taken by schools or universities that all students and teachers have access to required resources and apps should be able to work on phones also. A guide should be prepared by academic institutions that can reduce digital illiteracy by guiding students and teachers about usage of various e-learning tools and how to cover curriculum by these technologies. Educational institutions should try to adopt such measures that help in imbibing these skills in their students. Instruction, content, motivation, relationships, and mental health are the five important things that an educator must keep in mind while imparting online education (Martin, 2020). Teachers too need to be well versed in technology and should encourage students towards e-leaming for a positive outcome. The teachers should keep check that quantity, level of difficulty and length of content should match with students online learning readiness. Adjustment in teaching speed for effective delivery and students' concentration is must. Teacher should adopt innovative measures to increase students' participation in class. In nutshell, the teacher should possess skills like pedagogical, instructional, social, communicative, managerial etc. Another major issue is, how can discipline specific competencies be assessed by online educational processes'? Assessing students online is quite difficult, their body language can't be read. It's difficult to monitor them. But there are several online tools like photo math, Zeo zebra for Mathematics. Spring suite for Drag-and drop activity in this text and images is added student's learner's ability to link information and apply knowledge to solve a practical problem can be easily assessed. Online interviews can be conducted to assess student's mastery of specific skills like proficiency in language, music etc. Dialog simulations for training students for real life conversations.)nlme polls for capturing feedbacks, game bases assessment, peer evaluation etc. There is no dearth of inline tools, teachers with their innovative ideas and knowledge of appropriate tool can take online Assessments. Though it is difficult to replace traditional assessment and evaluation system but their creative alternatives can be explored. For smooth functioning of everything, there is a need of systematic •iignment of curriculum, instruction, learning tools and assessment. It will result in efficient and effective daily teaching. It will only be possible if all students get equal opportunity and no digital divide is there. Initiatives from government, educational institutions can be of great help.

The outcomes of such a revelation about the design, teacher presence and assessment in online learning urges for the need of educational change towards more flexible models and practices. Blended Learning a new pedagogical design which is not limited to online teaching learning but a blend of both online and r«.u;c lo face is the future thai will not uniy increase ciJucalionai benefits but pave way for development of higher education. Garrison and Kanuka (2004) argued that thoughtfully designed blended learning can preserve and enhance the 'traditional values' of higher educatiom The goal of such learning is to maximize learning with an enriching experience that can engage and motivate students in productive activities^ In blended learning students complete the theoretical component of the course through online learning which include video lectures, online activities, eBooks, blogs, forums etc. and attend college once or twice per week or as per college format to strengthen the knowledge they gained at home and participate in hands on practice and build connections with their teachers and peers. So, it can be said that blended learning is the pedagogical alternative to deal with the crises of present and future,

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Fig. 1 Analysis of Benefits & Challenges of OTL

Benefits :-	**Challenges :-**
Availability of content & courses	Affordability
Appeal-graphics, animations etc.	Quality Education
Reinforcement	Digital Illiteracy
Immediate Feedback	Lack of personal attention
Flexibility of rime Life	Distractions, Frustration
long learning	Technical Glitches
Cater to huge audience at a time	

INFORMATION LITERACY AWARENESS OF LIBRARIANS' IN COLLEGE LIBRARIES OF YAVATMAL DISTRICT (MAHARASHTRA)

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ABSTRACT

In the twenty first century information literacy has became a crucial issue for the political, economic, social and cultural development in all. countries. Information literacy is a global phenomenon today. It is information gap thai divides the nations and the citizens of a nation into rich and poor. It is information literacy thai helps in bridging the gap(l) The article discusses about the librarians awareness about information literacy in college librarians of Yavatmal District (Mahurashtra). The author conducted a questionnaire survey of college librarians to find out the proportion of librarians awareness about Information literacy.

***Keywords**: IL-lnformation Literacy.*

Introduction

Uhrary is a centre of any academic settings. It is the backbone upon which infrastructure for salubrious atmosphere & strong a deeds are achieved. Classroom teaching provides a glimpse of knowledge, the libraries disseminate ;i wide range of knowledge, which are required to attnin intellectual heights. Real education can only be achieved through the libraries. It has within-power to help a studeni to develop its life long learning ability.

According to Dr. S.R.Ranganathan, father of library science in India, "Libraries are not mere store houses, they are rich springs from wide field of education & culture". College library provides ample opportunities for selfcducation to the student, besides supplementing-the class lectures. Enjoying college library, students might be motivated to play a virtual role in their own education, the college library is one of the means to achieve their goal.

Information Literacy

A seminal event in the development of the concept of information literacy was the establishment ofthe American Library Association's Presidential Committee on Information Literacy whose final report outlined the importance of the concept. The concept of information literacy built upon and expanded the decades-long efforts of librarians to help their users learn about and how to utilize research tools (e.g. periodical indexes) and materials in their own libraries. Librarians wanted users to be able to transfer and apply this knowledge to new environments and to research tools that were new to them. Information literacy expands this efforts beyond libraries and librarians, and focuses on the learner, rather than the teacher

Information literacy is a growing concept. It comprises two common words, which most educated people would understand. Most of the people know that information means interpreted data, news, or facts. Literacy is conventionally the ability to read, but increasingly has become also associated with the ability to understand or to interpret specific phenomena.

Information literacy\is not a new concept in LIS profession, rather an extension of deep rooted user orientation/ user education service. Information literacy- die ability to recognize an information need and then locate, evaluate, and effectively use the needed information - is a basic skill essential to the 2Tst century workplace and home. The concept has its origin in the USA in 1970s and gained a ground with the establishment of the ALA Presidential Committee on Information Literacy (1989).

Definitions

1) According to ALA Presidential Committee on Information Literacy, Final Report, Information Literacy is a set of abilities requiring individuals to "recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information". Chartered Institute of Library and Information Professionals defines "Information Literacy is knowing when and why you need

information, where to find it, and how to evaluate, use and communicate it in an ethical manner".

2) According to a presentation by Town at the first international conference on Information Technology and Information Literacy in Glasgow, in 2002, the SCONUL approach to information literacy can be described as follows: "...information literacy is knowledge rather than simply skill, achieved by education rather than training, created through partnership between professionals and is a lifelong Endeavour that is contextual in field and service access".

Role of Library Professionals

The role and function of a library and information professional in the changing environment can be described as, he must facilitate information use, navigate knowledge systems and information sources. He should consult and advise on information problems and audit the optimal management of information resources. He must translate between the technical system and cultural resources and transform data: and information

flowing between systems. He should have the capability of offering information policy support for organizational strategies and provide resources for information literacy. The library professional emerging role and functions brings closer to the needs of the users and therefore should have the capacity to evaluate the precise requirements of the users.

Objectives & Scope of the study

The objectives of the research was to study the Information liiteracy awareness of Librarians

1. To find out the proportion of librarians about IL awareness in college libraries of Yavatmal district.

2. To study the computer Literacy of Librarians

3. To study the opinion of the staff towards the contribution of I L in libraries.

Method of the study

The author adopted the survey method. 68 questionnaires were circulated among the librarians of senior colleges of Yavatmal district out of which 52 (76.47%) were responded.

Hypothesis

Majority of the librarians are aware about information literacy in libraries

Data Analysis & Interpretation

Table No. I shows that out of 52 respondents only 36.54 % librarians are aware about the concept -Information Literacy,

Table 2 shows that 59.62 % librarians conducting user education program.

Table 3 shows that the computer literacy among the college librarians is 75 %, but only 12 (23.07 %) librarians operate computers ,5.77% librarians do their preparation of presentation of seminar through computers, 11.54 % librarians having access to CD ROM Database and 11.54% librarians use OPAC for Library users.

Table 4 shows the opinion of the staff towards contribution of IL in libraries, in which all the responded librarians (100 %) says that II. generate interest and search & evaluation became easy, 61.53 % librarians says that due to 1L tedious work can be eliminated and save the time.

Table 5 shows that 30.77 % librarians facing problems due to lack of computer literacy

Table 6 shows that 59.62 % librarians facing constraints while conducting IL program.

Conclusion

Majority of librarians in college libraries except few are not aware about information literacy but majority of librarians conducting the user education program. Many librarians are computer literate but very few are using it in practice. The opinion about 1L is very good. Many librarians facing constraints while conducting IL Program.

While concluding IL Program it is strongly felt that our academic libraries have to adopt the Information Literacy policy in order to improve library and library services.

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USE OF ALERTS TOOLS TO UPDATE THE CURRENT CONTENTS IN THE DIGITAL ENVIRONMENT

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ABSTRACT

The article presents the current contents alert tools and discuss on different types of alerts services are: Table of Contents (TOC) alerts, daily/weekly email alerts, saved search alerts and Rich Site Summary (RSS) Feeds. E-alert tools are very important/or researchers. These tools are establishing right information and provide latest information by email. Researcher need to keep up-to-date of knowledge of new area of subject by receiving regular email and get opporiunitiesto know the new research subject. They get scholarly and relevant contents literature from one convenient place through email. Hence, most of the researchers can use alert tools for current information in their research area and will achieve the quality based scholarly work.

***Keywords**: Alerts tool, RSS.*

Introduction

Information is very important for researchers throughout their research activities. It is available in print and electronic forms e.g. databases, electronic journals and electronic books, etc. Researchers need to keep up to date in their subject area. This is era of information communication technology and web technology. Most of the publishers are published their journals in print as well as electronic form on internet. Researchers have availability of various online tools help the current information for researchers in their subject field. They search for scholarly material including books, journal articles, conference papers, chapters, and theses on a wide range of subjects. But, researchers have to face many difficulties to find the right information at right time due to information overload. Hence, an e-alert tool is an effective tool for establishing right contact sand provides latest information and forthcoming articles by email. Various e-alert tools are available online, which are free with a formal registration with the publishers' site. This enables users get the content pages of the journals.

Alerting Services

A current awareness service is also known as alerting services keep up-to-date with the latest research. They send regular automatic updates or alerts, when new information about topic is available. The purpose of a current-awareness service is to inform the researchers about update of their area of interest content/information. During their studies, research and professional working life, they will be expected to keep abreast of the latest developments within their study/work area. Alerting services are free services provided by publishers. Many specialized alert services are also available from within indexes, databases, and electronic journals, which can automatically notify of newly published literature in areas of interest. These services range from emails of a journal's latest table of contents to RSS feeds of customized citation alerts. Alerts are a way of tracking new material that is being published in his/her field, either in traditionally published formats such as books or journal articles, or from sources using newer publishing methods such as blogs. Many databases offer alerting services, which allows researcher to keep up to date with new research in a particular field of study by alerting to new publications. Databases will require creating a personal account before researcher can access these services and make electronic alert services available to users.

Definition

"In general, "alert services" refer to features included with scholarly databases or made available by journal publishers that allow user to be notified by email or text message when something of interest to user has been added to a database or published in a journal. Alert services set up to notify user about newly published resources on a specific topic or when new articles are published in a journal".

Alert Types

Many databases and journals use e-mail alerts and RSS feeds to inform users of new content. With most all alerting services, it is necessary to set up a personal account.

Alert Delivery Methods: Receiving Alerts:- User can receive alerts via email or via an RSS feed.(i)EmaiI **Alerts:** Email is the most common form of delivery or notification for alerts.(ii) **RSS feeds Alerts:** RSS feeds are sometimes used to deliver alerts. To subscribe to an RSS feed, user will need a reader or aggregator. There are different types of alerts services as given:-

A. Table of Contents Alerts (TOC):-
The table of contents of the most current issues of the journal suser specify, when signing up. It alerts automatically sends user the table of contents from a new journal issue and provide a list of articles from forthcoming issues of a particular journal. Many journals provide free tables of contents and sometimes saved search alerts to newly published content. Receive notifications when a new issue of a specific journal has been published.

B. Daily/Weekly Email Alerts - Alerts that notify subscribers of articles matching submitted topics. Alert frequencies vary depending on the publisher's database updates. This may be at various levels:

(i) **Citation Alert:** Citation alerts are generated when new publications cite a particular work. Citation tracking refers to a method of measuring the impact of research studies and/or for identifying leading scholars in a particular discipline based upon a systematic analysis of who has cited a particular study, how often a specific research study has been cited by others, and by exploring what disciplines are represented by those subsequent citations. Researcher can select a list of articles from a database, and each time one these articles is cited in new literature within the database, researcher will be notified. Receive notifications a specific journal article is cited.

(ii) **Database Alerts:** Researcher can save their search strategy and re-run the search in future to find new references that have been added to the database.

(iii) New **Book Published Alerts :** Many publishers, book sellers, and e-book aggregator sites

offer alert options.

(iv) **Journal Website and**AIerts: Many journals offer alerting services.

(v) **Current**News .'Issues affecting researcher areas of interest.

(vi) **Professional** News - Latest developments and guidance affecting researcher profession

(vii) **Research** News - Depth awareness of research in researcher study/work area.

(viii) **Publisher Alerts:Many** publishers allow user to sign up for email or RSS alerts when books and/or journals are published. With these alerts, user will receive information faster than a database alert, but the alerts will be narrower in scope and cover less new titles. Some alerts will also include items still "in press" that are not yet published. Some publishers have Twitter feeds user can subscribe to.

C. Saved Search Alerts:- A search alert allows you to save a custom search within an index or database. The search will run automatically, whenever the database is updated or at the interval researcher specify, and researcher will receive notification of any new material that is found. Construct a search within a resource, save the search strategy, and receive email notifications, when new items are added to that resource that match researcher saved search. Search alerts do not save records; only the search statement. Search alerts are generated for all new articles matching a search you have saved.

D. RSS Feeds :- Many news sites and journal publishers syndicate their content as RSS Feeds.RSS is a format for delivering regularly changing web content. RSS feeds allow user to check one place for all updates and alerts from websites and databases. By retrieving the latest from specific sites of interest, RSS Feeds allow one to stay informed and save time by not - to monitor sites individually. Also, with RSS feeds it is not

necessary to create personal accounts on various sites.

2.0 Need :- Researcher is spending a lot of time to search the relevant information on their subject area, due to information overload, easy access (subscription or Open Access), faster dissemination, increase usage. Hence, there is need an effective tool, which can be save the time of re searchers. There are some points are given as follows: (a) Alert provides information of new area of subject,(b) It gives an opportunities to learn new research subject, (c) It helps to identify useful link about subject.(d) it helps to aware about current relevant literature,(e) It gives researcher to read receiving regular updates from good quality newsletters or bulletins (f) It assist researcher to updates from key journals in related study or work area,(g) Search alerts to ensure that new material is published on topic. Hence, an e-alert tool is very needful and important tool for researchers to establish right contacts and provides latest information. 3.0 Benefits :There are following benefits of content alert services can be especially useful because for researchers in their research field as follows:

(a) Alert search relevant scholarly literature from one convenient place through email.

(b) Know related works, citations, authors, and publications.

(c) Aware researchers keep up with recent developments in any area of research.

(d) Know to identify who seciting publications.

(e) Identifying important scholars in a particular field who have subsequently cited the work.

(f) Save the time.

4.0 Limitations: following limitations are as follows:

(a) Need internet

(b) Aware to operate Information Communication Technology(ICT)

(c) Require email address

5.0 Resources Use E-Alerts Services:-Various Association/ Organisations/ Publishers/Databases are proving TOC. Search. citation alerts Link/ RSS feed.

Table -: 1 Shows Some E- Resources Use E-Alert and RSS Feed Services

S.N.	Association/ Organisations/ Publishers/Databases	AlertsLink/ button
1	Annual Reviews	Email notification
2	Cambridge Journals	Citation alert- New contents alert
3	Amazon Product	Create email alerts
4	American Chemical Society	Search alerts.TOC alert
5	American Institute of Physics	Subscribe to email niert
6	American Medical Association	Get alerts
7	Annual Reviews	RSS feeds
8	Biomed Central	Add to saved searches/sign up for article alert
9	BioOne	Sign up for e-alert
10	Cambridge Journals	Search alert
11	Compendex/INSPEC	Create Alert
12	EBSCO	E-mail Alert link/RSS Search Alert
13	Google Scholar .:'	Cited by
14	Highwire Press	Alerts
15	JSTOR	Alerts
16	Nature Publishing	E-alert Sign up/Topic alert
17	OVID	Set email alerts
18	Project Muse	Email alerts
19	ProQuest	Set up alert. Create RSS feed. alert email
20	PubMed Plus	Create alert
21	Sage Journals	Email alert
22	Scopus	Set citation alert
23	Taylor and Francis Online	Alert me/ TOC email alert/ TOC RSS
24	Web of Science	Create citation alert
25	Wiley Online Library	Get new content alert

Conclusion

Researchers needs to update knowledge in their subject area. They wants to find relevant information. Alerts services can give an opportunity for researcher to aware about recent trends in their field. Using alert tools, researcher receives relevant contents at e-mail. The success of alert tools will be achieved only, when the increase uses of alert tools and the research output by researchers Library and Information Science (LISc) professionals can be raise awareness of alert tools among researchers. They should organising training and orientation programme and support researchers for their research work by using alert tools. However, researchers can use alert

tools to save their time and task in research work.

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PHYTOPLANKTONS OF AMBONA LAKE

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ABSTRACT

The quality of a water body is defined by its physical chemical and biological characteristics. The correlation between different parameters can be employed as an effective index of water quality. Co-efficient correlation is an index of the degree of association of two continuous variables. It is an important statistical tool for indicating the existence or non-existence of an association many be positive (+) or negative (-) between the two variables. During the present study the Co-efficient correlation was studied between physico-chemical parameters and biological parameters. Water temperature shows an inverse relation with dissolved oxygen and positive correlation was noticed with pH, alkalinity and chloride.

Correlation studies between water temperature and phytoplankton indicated negative correlation between water temperature and Euglenophyceae at station C and D in the year 2017-18. Temperature and zooplanktons indicated negative correlation between water temp. and total cladocera and ostracodaexhibitted negative correlation with water temperature at all the stations.

***Key Words**:Phytoplankton,Fish,Physico-chemical Parameters,Ambona Lake.*

Introduction

The demand of freshwater is increasing day by day with increasing population because of agriculture and technology. New technologies in agriculture have developed which are influencing the freshwater directly and indirectly. Many physical and chemical factors affect the growth of planktons which is the natural food for many fishes.(Rahman and Hussain, 2008). The zooplanktons in the freshwater ecosystems play an important role in successful aquaculture management, as they vary from one geographical location to another and lake to lake within the same geographical location even within similar ecological conditions (Boyd 1982), Kuadri and Kanamadi (2008) etc. Chattopadhyay and Banerjee (2007, 2008), worked on seasonal variations of plankton and their relationship with physico-chemical parameters of water in Krishna Sayer Lake, Burdwan, West Bengal.

Materials and Methods

Planktons were collected using plankton net made up of bolting silk cloth. (Trivedy and Goel, 1986). Filtered samples were fixed and preserved by adding Lugol's Iodine. The Sedgwick-Rafter counting cell was used for the plankton counting.

Identification of phytoplanktons was done with the help of keys of APHA and Kodarkar's methodology. For zooplankton identification, the methods described by Sehgal (1983), Battish (1992), Dhanapathi (2000) was used.

Results and Discussion

	WT	Turbidity	Transap.		pH		DO(mg/L)		CO2(mg/L)		Alk.(mg/L)		Chlor.(mg/L)		Nitr..(mg/L)		Chlorophyceae		Bacillariophyceae		Cyanophyceae		Euglenophyceae		Total Phy. Plankt	
WT	1.000	0.275	0.284		0.934	**	-0.784	**	-0.689	*	0.876	**	0.671	*	-0.455		-0.075		-0.419		-0.069		0.093		-0.186	
Turbidity		1.000	-0.260		0.326		-0.127		-0.474		0.329		0.641	*	-0.179		-0.517		-0.362		-0.538		-0.193		-0.514	
Transap.			1.000		0.467		-0.226		0.207		-0.004		-0.369		-0.641	*	0.861	**	0.687	*	0.633	*	0.132		0.834	**
pH					1.000		-0.780	**	-0.617	*	0.799	**	0.599	*	-0.646	*	0.090		-0.225		-0.024		0.144		-0.016	
DO(mg/L)							1.000		0.517		-0.758	**	-0.468		0.531		0.000		0.461		0.105		-0.062		0.163	
CO2(mg/L)									1.000		-0.667	*	-0.841	**	0.335		0.547		0.674	*	0.389		-0.046		0.598	*
Alk.(mg/L)											1.000		0.821	**	-0.124		-0.361		-0.579	*	-0.179		-0.112		-0.437	
Chlor.(mg/L)													1.000		-0.036		-0.723	**	-0.724	**	-0.521		-0.057		-0.744	**
Nitr..(mg/L)															1.000		-0.450		-0.120		-0.068		-0.355		-0.337	
Chlorophyceae																	1.000		0.799	**	0.705		0.263		0.972	**
Bacillariophyceae																			1.000		0.667	*	0.026		0.899	**
Cyanophyceae																					1.000		0.227		0.794	**
Euglenophyceae																							1.000		0.257	
Total Phy. Plankton																									1.000	

A high negative correlation between water temperature and dissolved oxygen were observed during the period of study i.e. from June 2017 to June 2018. As the water temperature decreases the level of dissolved oxygen in the water increases. Bahura (1998), Singh et al. (2002). Temperature showed negative correlation with dissolved oxygen which may be due to more dissolved oxygen holding capacity at low temperature.

During the study period pH shows positive correlation with alkalinity. Salaskar and yeragi (2003), Bahura (1998) observed a positive correlation between pH and alkalinity. Whereas a negative correlation was recorded with dissolved oxygen. Correlation studies between pH and phytoplankton with phytoplankton. At station B pH shows positive correlation with total phytoplankton while it shows negative correlation with total zooplankton.

Correlation studies of transparency and turbidity exhibited a negative correlation with turbidity and positive correlation with water temperature. Significant positive correlation was observed between transparency and total phytoplankton at all the stations during the study period. Among the phytoplanktonschlorophyceae, Bacillariophyceae and Cynaophyceae exhibited a positive correlation with transparency. During the study period dissolved oxygen showed negative correlation with water temperature, pH, alkalinity and chloride. While it shows moderately significant positive correlation with nitrates.

Nitrates did not exhibit any significant correlation with physico-chemical parameters. The correlation studies between nitrates and phytoplankton also did not show any significant to highly significant positive nor negative correlation at all the stations.

Correlation studies between total phytoplanktons exhibited the significant positive correlation with transparency and negative correlation with chlorides. Chlorophyceae was the most dominant group of the total phytoplanktons.

Ambona Lake phytoplankton also show a high density of Chlorophyceae members dominated by spirogyra sp. ,Pediastrum sp., and Euglena sp. which is an indication of organic pollution. Presence of Microcystis and Anabaena, and high alkalinity indicates the trend of the water body towards eutrophication. Palmer (1969) has shown nedesmus, that the genera like Oscillatoria, Microcystis, Navicula, Nitzschia& Euglena are the species found in organically polluted waters supported by Goelet. al; (1986). Similar genera were recorded in the present investigation. Some of the phytoplankton indicating the eutrophic status of the lake encountered during the study is listed below.

Euglena, Oscillatoria, Nitzschia, Navicula, Synedra, Phacus, Melosira, and Anabaena.

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PHOTOLUMINESCENCE OF Y_2O_3:Eu^{3+} AND YVO_4:Eu^{3+} SYNTHESISED BY REACTIONS IN MOLTEN SALTS

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ABSTRACT

A novel method for the synthesis of Eu3+ doped yttria and yttrium vanadate was developed. It is well known that Y2O3: Eu3+ and YVO4: Eu3+ are highly efficient red phosphors for PL, CL and X-ray imaging applications. These phosphors were synthesized by the reactions in molten nitrates; a novel method offering a low temperature synthesis route. The excitation and emission spectra agrees well with the reported data. The white powders with sub-micron size particles were obtained.

***Keywords**: phosphor, photoluminescence, molten salts, yttria, yttrium vanadate.*

Introduction

The production of reliable and reproducible ceramic materials for high technology applications requires strict control over their powder characteristics, which includes chemical homogeneity, low impurity levels, small particle size, narrow size distribution and freedom from agglomeration. A variety of methods e.g. sol-gel, chemical precipitation of precursors in aqueous or organic solutions, thermal decomposition of solutions by spraying technique, high alkaline and hydrothermal precipitation have been proposed for obtaining small, uniform unagglomerated powders. These methods so- called wet chemical methods, have been found to be successful for number of systems. Also self-sustaining combustion synthesis is a simple, inexpensive and quick way of synthesizing various oxide materials in comparison to the wet chemical techniques [1].

Compounds containing rare earths have long been used as phosphors and laser materials because of their sharp, intensely luminescent f-f electronic transitions.In particular, Eu^{3+} has five narrow emission bands corresponding to the $^5D_0 \rightarrow {}^7F_j$ transitions where, j = 0,1,2,3,4. The strongest transition, $^5D_0 \rightarrow {}^7F_2$ occurs at approximately 611 nm, which is a characteristic of red fluorescence of Eu^{3+}. This transition has also been shown to exhibit laser emission under appropriate conditions in Eu^{3+} doped crystals and glasses [2, 3]. It is well known that the europium-doped yttria is highly efficient red phosphor and has its own importance in scintillation, lamp and color TV picture tubes [4]. Yttrium Vanadate YVO_4 has several technological applications; when doped with europium, it forms a highly efficient red phosphor. YVO_4: Eu^{3+} is commonly used in the lighting industry as a color corrector for high-pressure mercury vapor lamps, home lighting, color TV picture tubes and for X-ray imaging [5].

The preparation of these red emitting phosphors is critical and requires special methods such as wet chemical methods. Recently preparation of Eu^{3+} doped yttria and yttrium vanadate was carried out by the alkoxide route and combustion process [6, 7]. Though these processes are efficient, requires expensive chemicals and special equipment. Here we report the preparation of Y_2O_3: Eu^{3+}andYVO_4:Eu^{3+} by the novel method of reactions in molten salts.

The term molten salt refers [8, 9] to the liquid state of compound, which melts to give liquids displaying a degree of ionic properties. Alkali metal nitrates have relatively low melting points (Table:1) whereas even lower melting points are obtained in their eutectic mixtures. A molten salt can behave as a solvent or as a reactant. Thus in a nitrate melt acid-base reactions can occur according to the Lux - Flood formalism [10] whereby an acid is an oxide ion acceptor and a base is an oxide ion donor; nitrate ions are bases in this formalism. Nitrite melts are more basic than nitrate melts whereas addition of Lux-Flood bases such as Na_2O_2, Na_2O and NaOH to a nitrate melt increases its basicity.

The precursors are the inorganic compounds, in

particular sulfates and chlorides that are blended with the alkali metal nitrates or nitrites as a powder mixture before heating to the reaction temperature. Table:1 shows the various eutectic mixtures and corresponding melting points.

Experimental Section

Synthesis of $Y_2O_3:Eu^{3+}$

The precursors used were 2gm Y_2O_3 (99.99 %, Indian Rare Earths Ltd.) and 0.0964 gm Eu_2O_3 (3mole%, 99.99 %, I.R.E. Ltd.). Both were mixed together in a china basin. A small quantity of double distilled water was added and paste was formed. HCl was added drop by drop and mixture was heated slowly under observation at 50^0C till the paste dissolved completely. The solution was further heated till the excess of acid was boiled off. Little quantity of distilled water was again added and slowly evaporated to dryness. The resulting powder was YCl_3: Eu. The chemical reaction is

$$0.97\ Y_2O_3 + 0.03\ Eu_2O_3 + \text{dil. HCl} \rightarrow 2\ Y_{0.97}Cl_3 : Eu_{0.03} + 3H_2O \quad \text{---------- (1)}$$

The eutectic mixture of nitrates, 13.2214 gm $LiNO_3.3H_2O$ (43 mole %) and 14.4081gm KNO_3 (57 mole %) were taken in a china basin and mixture was dried at 40 ^{0}C.The dry chloride YCl_3:Eu was added to this mixture of dried nitrates and thoroughly ground in a china basin. This mixture was then heated in a resistive furnace first at 100^0C for 1h and then with the gradual rise of temperature it was further heated at 425^0C for12 hours. The chemical reaction is

$$2Y_{0.97}Cl_3 :Eu_{0.03} + 0.43\ LiNO_3.3H_2O + 0.57\ KNO_3 \rightarrow Y_{1.94}O_3 : Eu_{0.06} \quad \text{--------- (2)}$$

The mixture was then cooled slowly. A semi convex white solid was formed. With the help of sufficient lukewarm distilled water, the solid was transferred to a glass beaker. Keeping the beaker in an oven at 60 ^{0}C for 10 minutes, the white solid was partly dissolved in water and the fine particles of Y_2O_3: Eu started settling down at the bottom. The precipitated was washed repeatedly by distilled water and then dried. The dried precipitated was then calcinated at 800°C for 2 hour and quenched suddenly at room temperature. Then the final quenched powder was $Y_2O_3:Eu^{3+}$.

Synthesis of $YVO_4:Eu^{3+}$

The precursors used were 2gm Y_2O_3 (99.99%, Indian Rare Earths Ltd), 1.6957 gm V_2O_5 (LobaChem.,GR) and 0.1640 gm Eu_2O_3 (5mol%,99.99%, Indian Rare Earths Ltd.). All the three were mixed together in a china basin. A small quantity of distilled water was added and paste was formed. HCl was added drop by drop and the mixture was heated slowly under observation at 60^0C till the paste dissolved completely. The solution was further heated till the excess of acid was boiled off. Little quantity of distilled water was again added to the mixture and slowly evaporated to dryness. The red brown layer formed on the surface was continuously stirred till it was solidified. Finally it was dried under IR lamp till the red brown $YVOCl_6$:Eu powder was obtained. The chemical reaction is -

$$0.95(0.5Y_2O_3) + 0.05(0.5\ Eu_2O_3) + 0.5V_2O_5 + HCl \rightarrow Y_{0.95}VOCl_6 : Eu_{0.05} + 3H_2O \quad \text{--(3)}$$

The dry oxychloride $YVOCL_6$:Eu as prepared above was added to the eutectic mixture of dried nitrates. $YVO_4:Eu^{3+}$ powder was obtained by adopting the same method as mentioned above for $Y_2O_3:Eu^{3+}$. The chemical reaction is -

$$Y_{0.95}VOCl_6 :Eu_{0.05} + 0.43\ LiNO_3.3H_2O + 0.57\ KNO_3 \rightarrow Y_{0.95}VO_4: Eu_{0.05} \quad \text{---- (4)}$$

Photoluminescence of these phosphors was measured ona Hitachi F-4000 Fluorescence Spectrophotometer with 150w xenon lamp. The same amount of dry powder sample was used in every case. Emission and excitation spectra were recorded using a spectral slit width of 1 nm. The spectra were not corrected for the instrument response.

Results and discussion

Figure 1 shows PL spectra of $Y_2O_3:Eu^{3+}$ phosphor. It consists of a broadband excitation spectrum peaking at 254 nm, monitored at emission wavelength 613 nm. The emission spectrum is sharp peaking at 613 nm at excitation wavelength 254 nm, corresponding to the transition $^5D_0 \rightarrow {}^7F_2$ of Eu^{3+}. The intensity of emission is found to be comparable and

excitation, emission wavelengths matches well with those of reported in literature.

Figure 2 shows typical PL spectra of $YVO_4:Eu^{3+}$ phosphor. The excitation spectrum shows two excitation bands centered at around 254 nm and 315 nm, for emission wavelength monitored at 621 nm. The excitation spectrum showing excitation peak at 254 nm is in good agreement with the standard literature. The emission is in the form of lines around 595 nm and 621 nm (618 and 621 nm) corresponding to the transitions $^5D_0 \rightarrow {}^7F_1$ and $^5D_0 \rightarrow {}^7F_2$ of Eu^{3+} respectively.

The rare earth compounds such as $Y_2O_3:Eu^{3+}$ and $YVO_4:Eu^{3+}$ mainly belong to luminescent materials with individual luminescent center. Luminescence of these materials is due to the transition between 4f energy levels. Because of spin-orbit interaction, the degenerate 4f configuration is split into several energy levels such as 5Dj and 7Fj. The crystal field of host lattice affects the electronic transitions in Eu^{3+} [11, 12]. For $^5D_0$ term, j = 0, so it cannot split (only one energy level). For the term $^7F_2$, j = 2 and 2j+1=5, so it can split into five energy levels (Γ_1, Γ_2,Γ_3, Γ_4, Γ_5). The strongest peak at 613 nm in $Y_2O_3:Eu^{3+}$ phosphor corresponds to the transition $^5D_0 \rightarrow {}^7F_2$ of Eu^{3+}. The intense peak at 621 nm in emission spectrum of $YVO_4:Eu^{3+}$ phosphor corresponds to the transition $^5D_0 \rightarrow {}^7F_2$ because of the effect of crystal field on energy level Γ_5.

This method of reactions in molten salts is a low temperature (about 400^0C) and single step synthesis. There is ease of synthesis. Precursors used are readily available. The sample synthesized is a snow-white powder and particle size varies from sub-micron to nano. Then after frequent washing and calcinations enhances the PL intensity.

Conclusions

The excitation and emission wavelengths in PL spectra of $Y_2O_3:Eu^{3+}$ and YVO_4: Eu^{3+} synthesized by this novel method confirms the formation of desired phase and crystal structure in the compounds by XRD. As phosphors with particles of required size and colour are needed for their use in the display devices and other applications, this method has new horizons in the display industries.

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Table-1 Melting points for alkali metal nitrates and eutectic mixtures.

Metal Nitrate	**Melting point (^{0}C)**
$NaNO_3$	307
KNO_3	334
50 mol% $NaNO_3$-50 mol% KNO_3	220
43 mol% $LiNO_3$- 57 mol% KNO_3	132

Figure:1 PL Excitation and Emission Spectrum of Y_2O_3:Eu^{3+}.

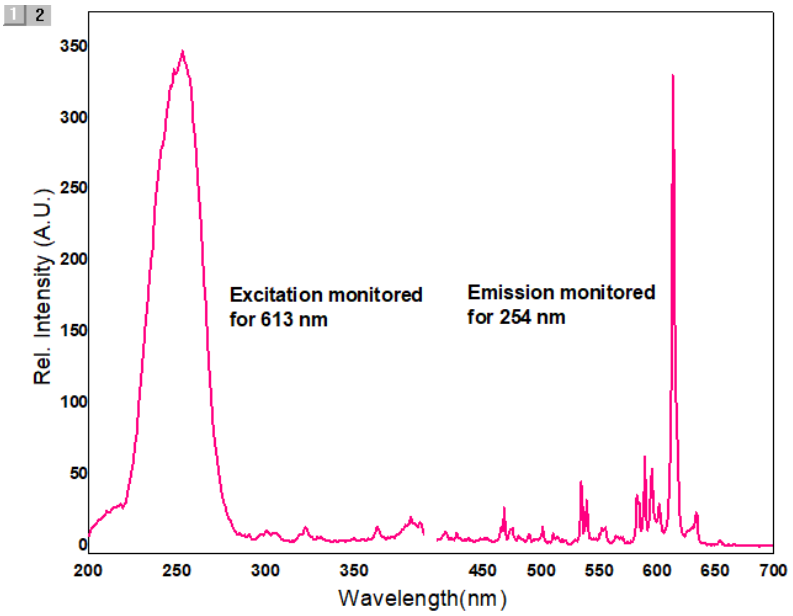
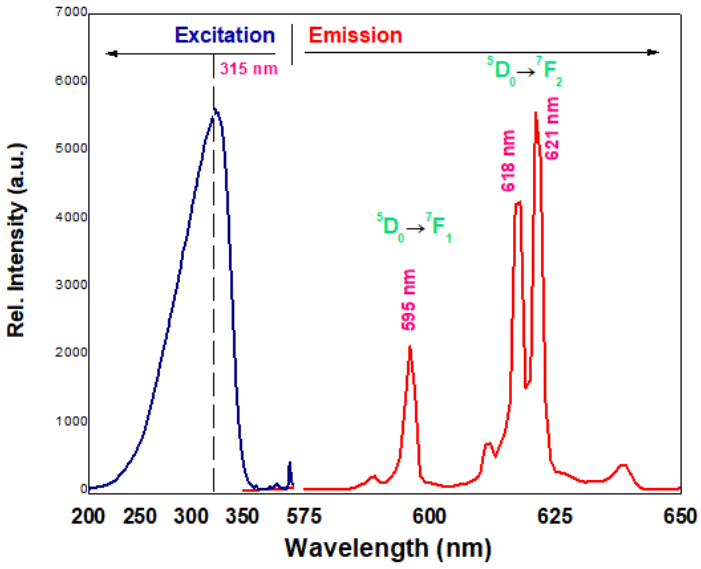


Figure:2 PL Excitation and Emission Spectrum of YVO_4 : Eu^{3+}.



STUDY THE EFFECT OF POP IDOL DIP IN RIVER NEAR UMARKHED AREA

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ABSTRACT

River water parameter increases by Idol immersing activity during festival.

Analysis of water parameter of river before immersing idol and after immersing idol .Parameter like Total hardness ,Temporary Hardness ,permanent Hardness Conductivity alkalinity pH all above parameter are monitoring .Required Step for control like start awareness program in school and college level .Start give training to student for making clay idol .

***Keywords**: Clay Idol ,Water pollution ,Training to student make clay Idol ,Make Artificial dam ,POP ,TDs,Conductivity ,pH ,Total Hardness ,Temporary Hardness ,Paramant Hardness*

Introduction

Today we are all face the water pollution issue and it is very seriously .Due to pollution lot of problem to human as well as all species in earth .Mainly cause of water are some point source in human activity .In this paper discuss point source water pollution .

The Penganga river is a part Pranhita river basin which is part of Godavari river basin. It flows through Buldhana&Washim District & flows through border of Washim&Hingoli District. Then it acts as a boundary between Yavatmal and Nanded districts of Maharashtra. The river flows along State border between Maharashtra &Telangana before converging into Wardhariver near small village called wadha in Wani Tehsil of Yavatmal district. The total length of the river in 676 Km. The main tributaries of the river are Adan, Kas, ArunavatiKayadhu& Pus.

The small Vidarbhariver merged with Painganga river at village Deurwada, Wani, Yavatamal district and Kodsi village, Korpanataluka, Chandrapur district.

Generally India is a religious country where festival celebration is very large amount .In common festival like Ganesh Chaturty and Durgapooja ,Idol made by plaster of Paris and synthetic color. For manufacturing of paint (synthetic color) use of various heavy metal and chemical , also use large amount of Gulal And Sindur it contain high toxic metal ion .Other Material like iron ,cloth varnishes and other pastic decorative material

Plaster of paris is white powder mixture of gypsum and basic salt of calcium sulfate with a half molecule of crystallization (CaSO4 ½ H2O) .

After religious worship of god, instead of throwing things any wherethrow it in the river was their beliets. Such as, ash, old

Figurine, etc. After religious activities the idol of god is scattered in the river. So, the riverfront and whole river was polluted Although, after death of human beings, This was the water polluted .

Objective

To monitoring water parameter of deferent river near umarkhedtaluka .

Methodology

This study carried in laboratory ,analysis is do by Classical method and instrumental method .Total Hardness ,temporary and pearmanat hardness ,Alkalanity these parametor analysis done by titramatiric method and TDS ,Conductivity ,pH are check by using instrument .

Result

Parametor	Unit	Sample 1 Water painganga river Before	Sample 3 Water painganga river After Dip Idol	Sample 2 Water Dahagaon Road Before	Sample 4 Water Dahagaon Road After Idol Dip
Total hardness	Mg/lt	384	630	530	755
Temporary Hardness	Mg/lt	115	270	180	235
Parmanat Hardness	Mg/lt	268	360	350	520
Alkalanity Of water CO3	Mg/lt	0.0048	0.0089	0.0032	0.0079
Alkalanity Of water HCO3	Mg/lt	0.0146	0.0342	0.0243	0.0583
TDS	Mg/lt	360	620	540	730
Water Conductivity	µmho	0.55	0.88	0.67	0.93
pH		6.7	9.3	7.3	11.3

Discussion and Step toward Sustainable control of pollution

From the given analysis found some parameter is increases after POP dip in river .parameter like pH is very much affected in sample 4 it goes up to 11.3 , also the colour of water is also change due to large quantity of POP dissolve in running water .

Required Step to Control this point source of pollution

- According to Vedic knowledge we should be prepared Idols should be made from natural materials like clay as described in the holy scripts.
- We use paint of Idol by using water color ,due to clay Idol water color is easily absorb on the clay Idol .
- Avoid the toxic non degradable color use water color are made naturally like turmeric cucumin and other naturally coloring agent .
- We are create awareness to public for worship the clay made idol .
- For Public awareness we are take the computation of making idol in school and college level .Also we gave the expertise help for making idol , As GSG college and NaisargikparyawaranSantha in umarkhed take initiative for this activity but required other for this
- If we provide, make arrangement to easy available of clay idol .

Clay Made idol dip in home

Awarness to student for train to make clay idol

- Clay made Idol is dip in our home in bucket and the clay use for growing the plant in garden .
- Gov take initiative to provide artificial Dam for DipingIdol .
- Avoide the use of plastic thermocole for decorative purpose also reuse the decorative itom and woden use .
- This all help to stop the water pollution river near our Village .

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MOLECULAR INTERACTION IN BINARY LIQUID MIXTURE - AN ULTRASONIC STUDY

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ABSTRACT

The measurement of density and ultrasonic velocity of2- substituted 4,5-diphenyl imidazole with ethanol have be measured in aqueous solution at different concentration and different temperature.The simple physical properties like density and ultrasonic velocity and viscosity are used to explain the molecular interaction in aqueous solution of ethanol. The apparent molar volume, adiabatic compressibility, apparent molar compressibility, acoustical impedance, intermolecular free length,and viscosity relaxation time have been calculated . The result are discussed in the light of solute-solvent interaction and structural effects on the solvent in solution.

Keywords*: Ultrasonic velocity, density, viscosity, adiabatic compressibility,apparent molar volume ,viscosity relaxation time..*

Introduction

General introduction

Ultrasonic method finds extensive application for characterizing aspects of physiochemical behavior such as the nature of molecular interaction in pure liquids as well as liquid mixture [1-5] .The study of the solution properties of liquid mixture consisting of polar as well as non polar components finds application in industrial and technological process. Most of the work on binary mixture is channelized towards the estimation of thermodynamic parameters like adiabatic compressibility, free length etc, and their excess value so as to relate them towards explaining the molecular interaction taking place between the components of the binary mixture.

Further, such studies as a function of concentration are useful in gaining insight into the structure and bonding of associated molecular compound and other molecular processes [5-10]. Ultrasonic velocity measurement have been successfully employed to detect and assess weak and strong molecular interaction present in binary liquid mixture.Result are used to explain the nature of molecular interaction between mixing compound. Further, the experimentally measured ultrasonic velocities at various molar concentration have been compared with theroticallyestimated velocities based on empirical, semi-empirical & statistical models for the binary system.

Further, such a study of molecular interaction between solute molecule and solvent media has got great important in many fields of science including medicinal chemistry, industrial processes, biochemistry etc. The solute-solvent and solvent-solvent interaction can be studied by the measurement of relative viscosity and ultrasonic velocity of an electrolyte in solution. This type of study helps us to understand the structure making and breaking properties of solute. Ultrasonic waves in recent year, have acquired the status of an important probe for the study of structure and properties of matter in basic science ultrasonic parameter are being extensively used to study molecular interaction in pure liquid [3-5], liquid mixture [6-8]and electrolytic solution [9].

Material and Method

Prepration of2- substituted 4,5-diphenyl imidazole by using anisaldehyde.

In a round bottom flask take Benzil (2.1gm),anisaldehyde (1.21 ml) and ammonium reflux the content for 3-5 hrs. After refluxing the reaction mixture the content was kept overnight .Then content was poured in crushed ice .The obtained solid product was filtered and recrystallised by using ethanol. Yield of compound is 2.68 gm and M.P.- 190^0C.

Physical Measurement

Solutions of varying concentration were

prepared on molarity basis from 0.04 stock solution of each complex sample with double distilled water. All the measurements were carried out at 303.15K, 308.15K, 313.15K, and . Density measurements were carried out for different solutions at 303.15K, 308.15K, 313.15K, and using a open capillary density bottle. The ultrasonic velocity in the solutions was measured using an ultrasonic interferometer at a frequency of 2 MHz with an accuracy of ±0.05 %. The relative viscosity was measured using a pre-calibrated Ostwald viscometer.

Methods of calculation

The data of density (ρ), ultrasonic velocity (u) and viscosity (η) has been used to evaluate many acoustical parameters by using the following standard expressions for understanding solute-solvent, solvent-solvent interaction and structural changes.

(i) Adiabatic compressibility:-

$$\beta_s = \frac{1}{\rho_s u_s^2} \text{-------(1)}$$

Where ρ_s = density of solution, u_s = sound velocity solution.

(ii) Intermolecular free length (L_f) :-

$$L_f = K\sqrt{\beta_s} \text{------(2)}$$

Where 'K' is a temperature dependent constant known as Jacobson constant [(m)].

(iii) Specific acoustic impedance (Z):-

$$Z = u_s \rho_s \text{--------(3)}$$

(iv) Molar sound velocity or Rao'sconstant (R) :-

$$R = \left(\frac{M}{\rho_s}\right) \cdot u_s \, 1/3 \text{--------(4)}$$

Where 'M' molar mass of the solution.

(v) Relative association (R_A):-

$$R_A = \left(\frac{d_s}{d_o}\right)\left(\frac{u_o}{u_s}\right)^{1/3} \text{------(5)}$$

Where ρ_o = density of solvent, u_o = velocity of solvent

(vi) Apparent molar volume (Φ_V):-

$$\Phi_V = \left(\frac{1000}{m\rho\rho_o}\right)(\rho_o - \rho) + \left(\frac{M}{\rho_0}\right) \text{----(6)}$$

Where 'm' molarity of solution.

(vii) Apparent molar compressibility (Φ_β):

$$\Phi_\beta = \left(\frac{1000}{m\rho\rho_o}\right) - (\rho_o\beta - \rho\beta_0) + \left(\frac{\beta_0 M}{\rho_0}\right) \text{---(7)}$$

(viii) Viscosity relaxation time :-

$$\Gamma = \frac{4\eta}{3\rho.u^2} \text{----------(8)}$$

(ix) Ultrasonic attenuation :

$$(a/f2) = \frac{8\pi^2\eta}{\rho \times u^2} \text{------(9)}$$

(x) Relative viscosity(η):-

$$\eta_r = \left[\frac{d_s.t_s}{d_w t_w}\right]\eta_w \text{----------(10)}$$

The units of -Density(ρ):k g cm^{-3},Viscosity(η): cp , Ultrasonic velocity (U) : ms^{-1}

Adiabatic compressibility (β_s): cm^2dyne^{-1}, Apparent molar volume (Qv): $cm^{-3}mol^{-1}$,Apparent molar compressibility (Qk): $cm^{-3}mol^{-1}bar^{-1}$, Acoustical Impedance (z): kg. $m^{-2}s^{-1}$Intermolecular free length (L_f): m,Viscosity relaxation time (τ): s

Result & Discussion

Compound In Ethanol

All discussion aredisscuss as shown in Table 1 and Table 2.

Density decrease and ultrasonic velocity and viscosity are also decrease with decrease in concentration of solute. The linear behavior with decrease in velocity with concentration indicates the interaction between unlike molecule, which suggests weak solute-solvent (dipole-dipole) interaction between the component molecules. As density decreases the number of solute particles in the given region decreases [11]. It shows reverse trends in ultrasonic velocity and density with increase in temperature show molecular forces are weakening at high temperature. The increase in ultrasonic velocity is structure making type.

Decrease in concentration of2- substituted 4,5-diphenyl imidazoleresults the linearly decreases in adiabatic compressibility and free length. This trend supports weak solute-

solventinteraction and suggests aggregation of solvent molecules around solute molecules[12,13]. The magnitude of adiabatic compressibilityand free length decreases with increase in temperature, it clearly reveal that interaction become stronger at higher temperature[14]. The specific acoustic impedanceis the parameter related to the elastic properties of the medium. The specificacoustic impedance is the impedance offered to the sound wave by the components of the mixture. In present investigation, specific acoustic impedance decrease with decrease in concentration. This trend further supports that there was no possibility of molecular interaction due to H-bonding between solute-solvents and solvent-solvent molecules which restrict the free flow of sound waves[15]. The specific acoustic impedance is directly proportional to density, ultrasonic velocity and inversely proportional adiabatic compressibility [16].

Molar sound velocity (Rao′s constant) nonlinearlyincrease or decrease with decrease in concentration which indicates that the magnitude of molecular interaction is enhanced in the system,which indicate interaction between solute-solvent molecule decrease. This leads to tight packing of the medium by decrease the molecular interactions[17].

Relative associationis the measure of extent of association of components in the medium. The relative association is depends oneither breaking up of the solvent molecules on addition of solute to it or the solvation of present ions. The relative association non-linearly decreases with decrease in concentration.

The apparent molar compressibility and apparent molar volume decreases with decrease in concentrationwhich indicates interaction between solute-solvent molecules enhanced.

Values are positive due to the compressibility of solvent due to the weak electrostatic force in the vicinity of ions. This trendssupports that the availability of more number of components in a given regions of space. This leads to tight packing of the medium and there by increases the interactions[18].

The viscosity relaxation time is the time required for the excitation energy to appear as translational energy. In present work viscosity relaxation time non-linearly decreases with decrease in molar concentration and decreases with increases in temperature. Where, with increase in temperature, it shows the instantaneous conversion of excitation energy to translational energy. This indicates strong molecular interaction between the solute and solvent molecules, where it show the instantaneous conversion of excitation energy to translational energy[19]. Absorption coefficientdecreaseswithdecrease in concentration and this trend suggest that the extent of complexity decreases with decrease in concentration [20]

Conclusions

From the present investigation experimental values of density, ultrasonic velocity, viscosity and related acoustic parameter values indicate that thermodynamic parameters are sensitive to molecular interactions for ternary liquid mixtures at different concentrations and at varying temperatures. Thus it is conclude that in mixture of studied compound, solute-solvent interaction is existed. Some parameters specially, free length and adiabatic compressibility indicate strong interaction between solute-solvent molecules in the studied systems.

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Table 1: Density (ρ), ultrasonic velocity (u),Viscosity (η), adiabatic compressibility (β_s),apparent molar compressibility (ϕ_β), apparent molar volume (ϕ_V) for Compound IN ethanol at different temperatures.

Conc	ρ g/ml	u m s^{-1}	η Ns/m^{-2}	β_s m^2N^{-1}	Φ_V m^3 mol^{-1}	Φ_β m^2n^{-1}
T=303.15K						
0.04	0.4934	1164.8	1.0929 x 10^{-3}	2.7498	4.9347 x 10^2	4.1067 x 10^3
0.02	0.4929	1161.6	1.0334 x 10^{-3}	2.7375	4.9293 x 10^2	4.0869 x 10^3
0.01	0.4924	1154.1	9.452 x 10^{-4}	2.7050	4.9241 x 10^2	4.0369 x 10^3
0.005	0.4922	1148.4	9.362 x 10^{-4}	2.6794	4.9220 x 10^2	3.9982 x 10^3
T=308.15K						
0.04	0.4917	1147.6	9.303 x 10^{-3}	2.6784	4.9177 x 10^2	3.9955 x 10^3
0.02	0.4897	1144.4	9.244 x 10^{-3}	2.6743	4.8973 x 10^2	3.9839 x 10^3
0.01	0.4894	1142.3	9.107 x 10^{-3}	2.6662	4.8941 x 10^2	3.9710 x 10^3
0.005	0.4890	1141.2	8.889 x 10^{-3}	2.6632	4.8900 x 10^2	3.9655 x 10^3
T=313.15K						
0.04	0.4888	1140.1	8.015 x 10^{-3}	2.6592	4.8887 x 10^2	3.9592 x 10^3
0.02	0.4877	1133.2	7.792 x 10^{-3}	2.6330	4.8773 x 10^2	3.9172 x 10^3
0.01	0.4871	1132.2	7.528 x 10^{-3}	2.6316	4.8711 x 10^2	3.9134 x 10^3
0.005	0.4858	1130.5	7.354 x 10^{-3}	2.6307	4.8580 x 10^2	3.9087 x 10^3

Table 2:.Acoustical Impedance (Z), Intermolecular free length (L_f),viscosity relaxation time (τ),Ultrasonic attenuation ($\propto/f^2$) Rao's constant (R), relative association (R_A),

Conc.	z Ns/m^3	L_f M	τ s	α/f^2	R	R_A
T=303.15K						
0.04	5.747×10^{1}	5.0243×10^{2}	9.7548×10^{-1}	2.7611×10^{2}	838.07	1.1755
0.02	5.725×10^{1}	5.0111×10^{2}	9.1638×10^{-1}	2.5919×10^{2}	836.61	1.1769
0.01	5.682×10^{1}	4.9831×10^{2}	8.2654×10^{-1}	2.3274×10^{2}	832.05	1.1816
0.005	5.652×10^{1}	4.9595×10^{2}	8.1028×10^{-1}	2.2722×10^{2}	828.28	1.1864
T=308.15K						
0.04	5.642×10^{1}	5.0404×10^{2}	8.0323×10^{-1}	2.2555×10^{2}	828.54	1.3128
0.02	5.604×10^{1}	5.0367×10^{2}	7.9046×10^{-1}	2.2315×10^{2}	829.61	1.1965
0.01	5.590×10^{1}	5.0290×10^{2}	7.7542×10^{-1}	2.1877×10^{2}	828.59	1.1973
0.005	5.580×10^{1}	5.0262×10^{2}	7.5478×10^{-1}	2.1309×10^{2}	828.47	1.1963
T=313.15K						
0.04	5.572×10^{1}	5.1040×10^{2}	6.7898×10^{-1}	1.9166×10^{2}	828.01	1.2140
0.02	5.526×10^{1}	5.0787×10^{2}	6.5065×10^{-1}	1.8338×10^{2}	824.86	1.2134
0.01	5.514×10^{1}	5.0774×10^{2}	6.2673×10^{-1}	1.7692×10^{2}	825.15	1.2122
0.005	5.491×10^{1}	5.0765×10^{2}	6.0878×10^{-1}	1.7251×10^{2}	826.11	1.2052

OPTIMIZATION OF PHYSIOCHEMICAL PARAMETER FOR THE BIOSYNTHESIS OF GOLD NANOPARTICLES USING THE AQUEOUS LEAF EXTRACT OF POLYALTHIA LONGIFOLIA (SONNER.)THW. AND ITS CHARACTERIZATION

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ABSTRACT

In this study, the biosynthesis of gold nanoparticles (GNPs) through the reduction of HAuCl4 using aqueous leaf extracts of Polyalthialongifolia (Sonner.) Thw. We also optimized the physical and chemical parameters like Concentration of extract, Incubation time, pH, light and Temperature for biosynthesis of gold nanoparticles. The gold nanoparticles are characterized by UV-Visible Spectroscopy for identification of gold specific peak; Scanning Electron Microscope (SEM) for morphology; X-Ray Diffraction (XRD) for the size and nature of nanoparticles, Fourier Transform Infrared Spectroscopy (FTIR) for identification of functional group, Zeta potential for the stability of nanoparticles and Particle Size Analyzer for average size of nanoparticles.

The optimum concertation of extract 16% v/v and 5% w/v, Incubation time 3 hours, pH is 4, Temperature is 360C and dark condition are best for the synthesis of gold nanoparticles. The surface Plasmon resonance found at 549 nm confirmed the gold nanoparticles synthesis. The spherical sized nanoparticles in the size range of 47–119 nm were confirmed by Scanning Electron Microscope (SEM). The size of the nanoparticles was 14.43 nm by XRD method and average size of particles along with the capping agent is 80.8 nm by using particle size analysis. Fourier Transform Infrared Spectroscopy (FTIR) show that functional group such as OH, C-H, N-H is associated with the GNPs. The phytochemical plays an important role in the nanoparticles synthesis was identified using the Fourier Transform Infrared Spectroscopy (FTIR). The stability of the nanoparticles is very well proved in zeta potential (-.20.6 mV) and The average size of particles along with capping agent for GNP is 80.8 nm.

***Keywords**: Gold nanoparticles, optimization, Scanning Electron Microscope, XRD.*

Introduction

There are two methods for the synthesis of nanoparticles i.e. Bottom-up and top-down methods. In the bottom-up method, ions are used to produce nanoparticles and in the top-down method, bulk materials are used to produce nanosize particles (Eustis et al., 2006). In the top-down method, bulk gold is broken down by ionizing radiation, or arc discharged in water but the stability of these nanoparticles is unclear. So surface stabilizer is used but the size and shape of nanoparticles cannot be controlled in this method

Chemically synthesized gold nanoparticles may change the surface of nanoparticles and sometimes it is not used for biomedical applications (Shankar et al., 2004). Palazzo &Berti (2014) reported that in chemical synthesis, gold nanoparticles may precipitate and then aggregate. Purification is required to remove chemical residues and unreacted chemicals. If a small gold cluster above 5 nm is used for the synthesis of gold nanoparticles it is called seed-mediated synthesis which may produce uniform size and shapes of gold nanoparticles (Yu et al., 2016; Park *et al.*,2007).

In this study we synthesized the gold nanoparticles by using aqueous leaf extract of *Polyalthialongifolia* (Sonner.)Thw.A tall, evergreen treebelonging to family Annonaceae and it isnative of Sri Lanka and India. The mast tree is a tall and evergreen it is cultivated as road side and reported from various states in India.The *P. longifolia*is also called as the Buddha tree. It has unique chemical constituents that destroy cancerous cell lines, such as prostate cancer cells, human leukemia and lung cancer cells. It is also used inulcers,gonorrhea,hyperuricemia,diabetes,liver injury,inflammationand many infectious diseases (Dattatray*et al*., 2021).

For the optimized production of gold nanoparticles, five different concentrations of *Polyalthialongifolia* leaf extract was added

with gold chloride solution in different temperature and time intervals. After the synthesis, the nanoparticles were confirmed by UV–vis spectrophotometry, Scanning Electron Microscopy and the stability of nanoparticles also measured by UV–vis spectroscopy.

Review of literature

Biosynthesis of gold nanoparticles is eco - friendly and without use of toxic, chemicals and is of low maintenance (Ahmad *et al*., 2013; Parveen*et al*., 2016). The plant extracts contain sugars, terpenoids, polyphenols, alkaloids, phenolic acids and proteins, etc. This may act as capping agent as well as reducing agents (Parveen*et al*., 2016). Biosynthesis of nanoparticles can be done by using the extracts of plants, algae (Govindaraju*et al*., 2008; Devidas 2019), bacteria (Kowshik*et al*., 2002), and yeast (Rautaray*et al*., 2003). In our laboratory work on synthesis of nanoparticles such as silver, copper, cobalt ferrite and zinc ferrite nanoparticleswere done various material by different workers. (Kote*et al*., 2015; Kote*et al*., 2014; Kote*et al*., 2016; das *et al*., 2021; das *et al*., 2021; Pawar and Mulani 2021;Pawar and Mulani 2021; Sharma *et al*., 2019; Sharma *et al*., 2020; Sharma *et al*., 2022).

Research work

Materials The *Polyalthialongifolia*. leaves for analysis were collected from School of Life Sciences S.R.T.M University, Nanded, Maharashtra, India. The gold chloride trihydrate (HAuCl4) was procured from Hi Media, Mumbai.

Preparation leaf extracts of*Polyalthialongifolia*

The herbarium was submitted to School of Life Sciences and identified by Dr. R. M. Mulani for authentication. Fresh Leaves were washed with water to remove the dust particles. 0.312, 0.625 1.25 2.5 and 5 grams of *Polyalthialongifolia* leaves cut into small size was taken into 100 ml of conical flask and washed several times with deionized water and boiled for 10 min. Extract was filtered with a Whatmans filter paper and finally filtered with a 0.22 um syringe filter and used for the synthesis of gold nanoparticles.

The percentage of extract volume 1 % 4% 8 % 12 % 16 % and 20 % were added into 1mM HAuCl4 and taking the absorbance ranges from 400 nm to 800 nm during time interval 0, 15, 60, 180 and 360 min. and the pH 2,4,6,7,8, and 10 were adjusted by using the NaOH (1N) or HCl (1N) in 1mM gold chloride trihydrate, similarly temperature **(**4^0C, Room temp,30^0C, 36^0C, 50^0C) and light or dark conditioned is optimized.

Characterization of gold nanoparticles

Preliminary characterization of gold nanoparticles were carried out using UV–vis spectroscopy (SHIMADZU 1800). Gold nanoparticle powder sample was prepared by centrifuging the synthesized gold nanoparticle solution at 12,500 rpm for 20 min and The solid residue layer which contains gold nanoparticles was dispersed in sterile deionized water three times to remove

the attached biological impurities. The pure residue was then dried in an oven overnight at 65°C. The obtained powder was subjected to FT-IR measurement carried out on a SHIMADZU 8400S spectrum-one instrument at a resolution of 4 cm−1 in KBr pellets.

Scanning electron microscopy measurement of synthesized gold nanoparticles using was done*Polyalthialongifolia* leaf extract on HITACHI S-3700N and the powder XRD pattern was recorded using the Powder X-ray Diffractometer (PXRD), Bruker D8, High-Resolution X-ray Diffractometer. FEI Make Quanta 200-3D Dual Beam with EDAX make EDS system were used for EDX for determination the content colloidal solution of gold nanoparticles

Zeta potential is based on the direction and velocity of particles under the control of known electric field. Particle size is based on calculating the time dependent oscillation of dispersion of laser light by the nanoparticles encounter Brownian motion gold colloid solutions were taken in cuvette and particle size and zeta potential were measured (HORIBA model no. SZ-100) (Sujatha and Kannan 2013).

Results and discussion

Synthesis of gold nanoparticles Formation of gold nanoparticles by reduction of aqueous metal ions with plant extract may be easily followed by UV–vis spectroscopy. It is well known that the gold nanoparticles shows ruby red colour (Figure 1) in water. The appearance of blue colour is the characteristics of gold nanoparticles it clearly indicates formation of gold nanoparticles. In case of gold nanoparticles, the narrow surface Plasmon resonanceband occurred at 549 nm as shown in Fig. 4 and our plant extract with heating technique studies shows formation of gold nanoparticles within 3 hours.

Production of optimized gold nanoparticles

The process of optimization of gold nanoparticles was carried out by keeping the gold concentration and volume of plant extract solution as constant and changing time plant extract concentration. Fig. 2 represents UV visible absorption spectra of *Polyalthialongifolia* stabilized gold nanoparticle formed when changing the process variables like concentration of plants extract from lower to higher concentration (0.312 % to –5 %w/v) and (1% to -20% v/v) and time constant. From the absorption spectra it can be seen that plant extract concentration plays an important role in rapid synthesis of nanoparticles. As the leaf extract concentration increases the rate of gold nanoparticles also increases. The incubation period and concentration of extract are the important factors that control the size of nanoparticles.

For the better understanding about the leaf extract *P. longifolia*concentration in the ranges from the 1 % 4 & 8 % 16 % 20 % v/v percentage was used along the time 0, 15, 60, 180 and 300 min were taken. We found the 16 % leaf extract was best as shown in Fig 3 and time 180 min is good for the synthesis of gold nanoparticles (Fig. 3 A-F). Kumari et al., 2016 reported that Gold nanoparticles are produced by the extract of *Trichodermaviride*as the concentration of extract decreases the particle size decreases but there is no change in shape. The size of the particle 104 ± 55nm by using the 50 % of extract while 34 ± 20 nm by using the 10 % of the extract. The rate of reaction increased due to which size of particles increased.

Yasmin et al., 2014 reported that Gold nanoparticles produced by using leaf extract of *Hibiscus rosa-sinensis*in assistant with the microwave heating plant extract concentration play an important role in controlling the size and shape of nanoparticles. As the concentration of extract increases the intensity of absorbance increases and time period is decreases. If the concentration of willow tree bark extract is above and below the optimum level in green synthesis, the surface plasmon resonance was decreased (Bahram&Mohammadzadeh, 2014).

In ourstudy, we have used 1mM solution of gold chloride trihydrate in triplicate and kept it at 4^0 C to 50^0 C. After adding extract to this solution, we measured the absorbance of GNPs., 36^0 C for GNPs (Fig. 4 (C)). Keshavamurthy*et al*., 2018 reported that the optimum temperature for the synthesis of GNPs of aqueous bark extract of *Pterocarpussantalinus*L. is 28^0 C and sharp and broader peaks indicated the monodispersed and polydispersed nature of GNPs, In the synthesis of GNPs using PEG along with 20% HCl in presence of light for 3 hours the color of solution got changed to violet but there is no color change in the absence of light, which indicates that the synthesis of GNPs failed (Sen*et al*., 2011). But in our study we get the maximum synthesis of GNPs in dark condition (Fig. 2 B).

FTIR analysis showed that (Fig. 5) the absorption bands for aqueous leaf extract of *polyanthalongifolia* are 3462 cm^{-1}, 2073 cm^{-1}, 1637 cm^{-1} and 1020 cm^{-1} and among these, characteristic bands for GNPs are 3475 cm^{-1}, 2066 cm^{-1} 1638 cm^{-1} and 1028 cm^{-1} was observed.Absorbance peak at 3475 cm^{-1}can be designated to stretch vibrations of functional groups such as -OH, 2073$cm^{-1}$for C-H stretching hydrogen and 1637 $cm^{-1}$for N=N stretching the similar observation made by (Kaviya*et al.*,2011). Theyalso mentioned functional groups are responsible for the synthesis of gold nanoparticles. GNPs has size in the range of 47-119 nm and shape is

spherical (Fig.6 A and B) by using the SEM. Islam *et al*., 2019 reported that biosynthesized gold nanoparticles of aqueous leaf extract of *Salix alba* L. have the size in the range of 50–80 nm.

By using the Debye-Scherer equation, we got the size 14.43 nm GNPs. Previously, pattern of XRD for GNPs is confirmed by Valsalam*et al*., (2019) using *Musa acuminata*collaflower. Zeta potential (Horiba- Modal No. SZ-100) of gold nanoparticles gives the information about the surface charge and stability of particles, it measures the potential difference between two suspended particles present in the colloidal suspension. The value observed from -20.6 mV for GNPs (Fig. 8). The average size of particles along with capping agent for GNPs is 80.8 nm (Fig.8 A)

Conclusions

Biogenic synthesis of gold nanoparticles are successfully carried out using aqueous leaf extract of *Polyalthialongifolia*The Bioprocess variables such as concentration of leaf extract, pH.light and temperature for the biogenic synthesis of gold nanoparticles are optimized and confirmed by color change form yellow to blue. The synthesized nanoparticles are characterized using UV-visible spectroscopy, Scanning Electron Microscopy (SEM), FTIR, Particle size analyzer, zeta potential. The synthesized gold nanoparticles are spherical shaped in nature. From the XRD analysis, we concluded that the gold nanoparticles are sharp and crystalline. FTIR analysis showed that, phytochemicals are responsible for the reduction of gold nanoparticles. The gold nanoparticles possess negative charge and its stability is confirmed by zeta potential. Phytochemicals may be responsible for stability and acting as a capping agent.

Acknowledgments

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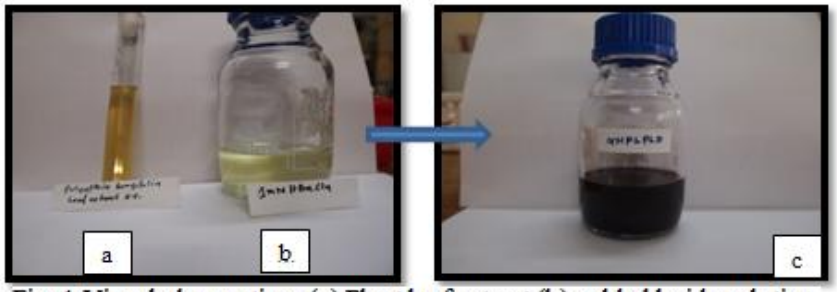

Fig. 1 Visual observations (a) Plant leaf extract (b) gold chloride solution and (c) formation of gold nanoparticles

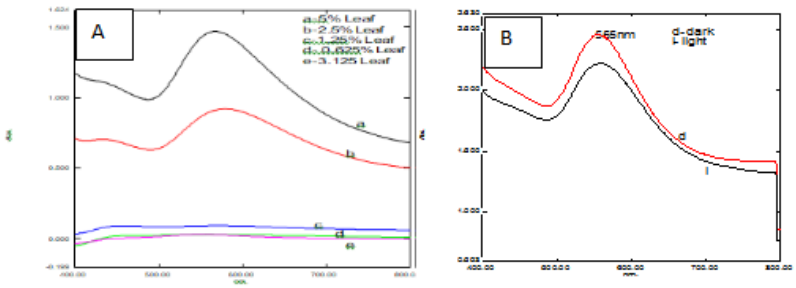

Figure 2 UV–visible spectra of GNP prepared by aqueous leaf extract of *Polyalthia longifolia* with increasing the percentage (A) (a-0.312 %, b-0.625 %, 1.25 %, c- 2.5 %, and 5 % (w/v)) of extract; B Effect of light GNPs

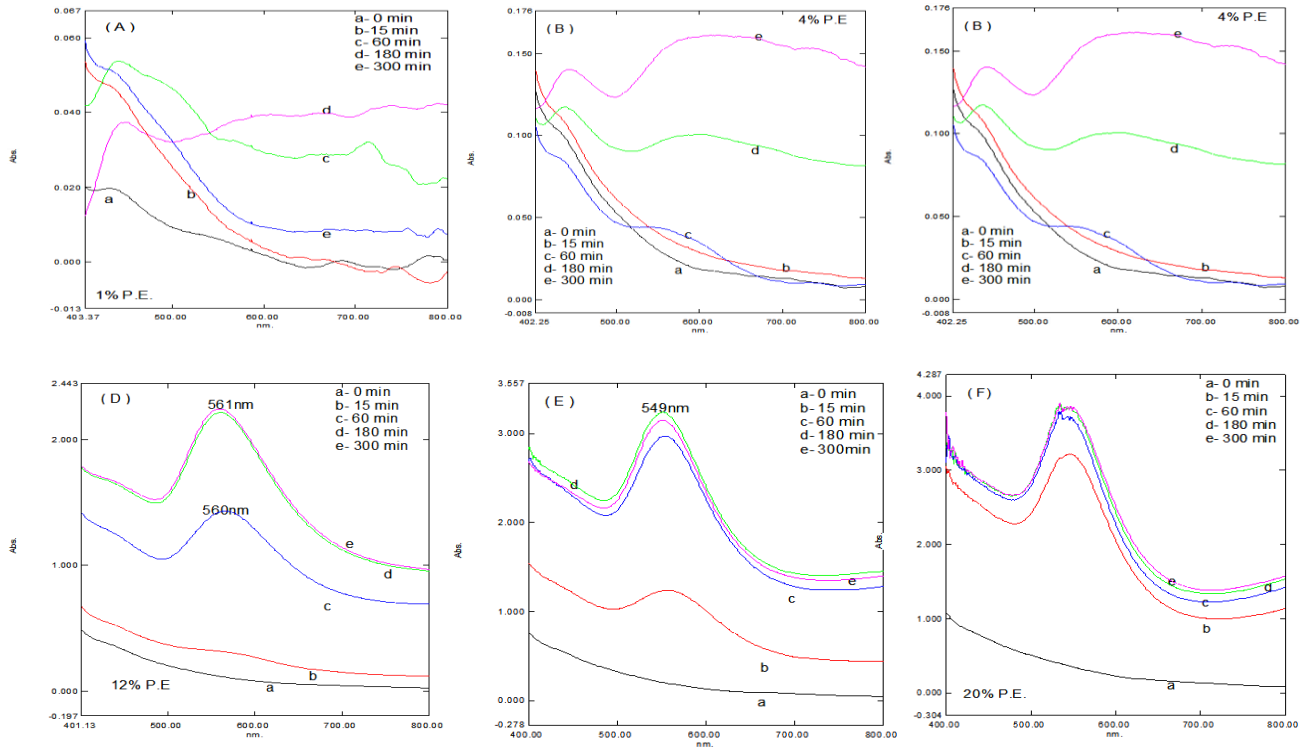

Figure 3 UV–visible spectra of GNP prepared by aqueous leaf extract of *Polyalthialongifolia*. Effect of volume of extract (A: 1%, B: 4%, C: 8%, D: 12%, E: 16%, F: 20%, (v/v)) and time in Min. (a: 0, b: 15, c: 60, d: 180, e: 300).

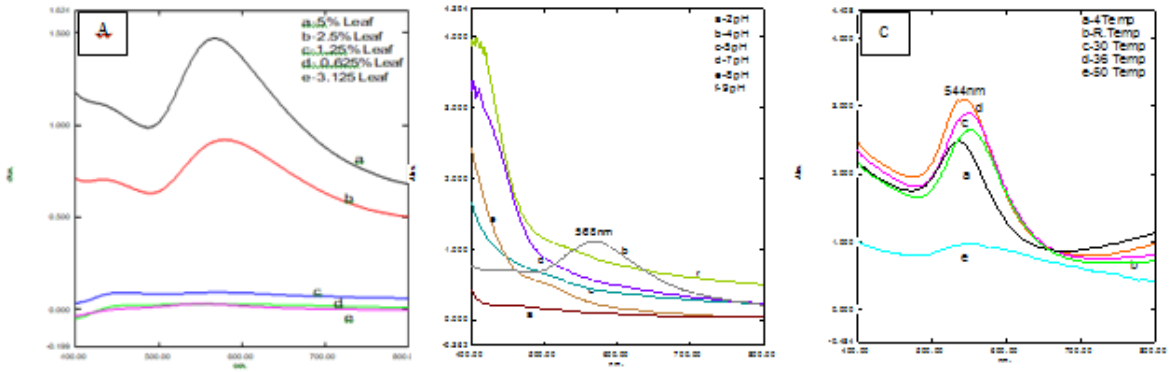

Fig. 4 UV–visible spectra of GNP prepared from water extract of *Polyalthia longifolia* leaf with varying Extract percentage **(A);** Effect of pH (a-2, b-4, c-5, d-7, e-8, f-9) (B).; varying Temperature (a-4^{0}C, b-Room temp, c-30^{0}C, d- 36^{0}C, e- 50^{0}C) (C)

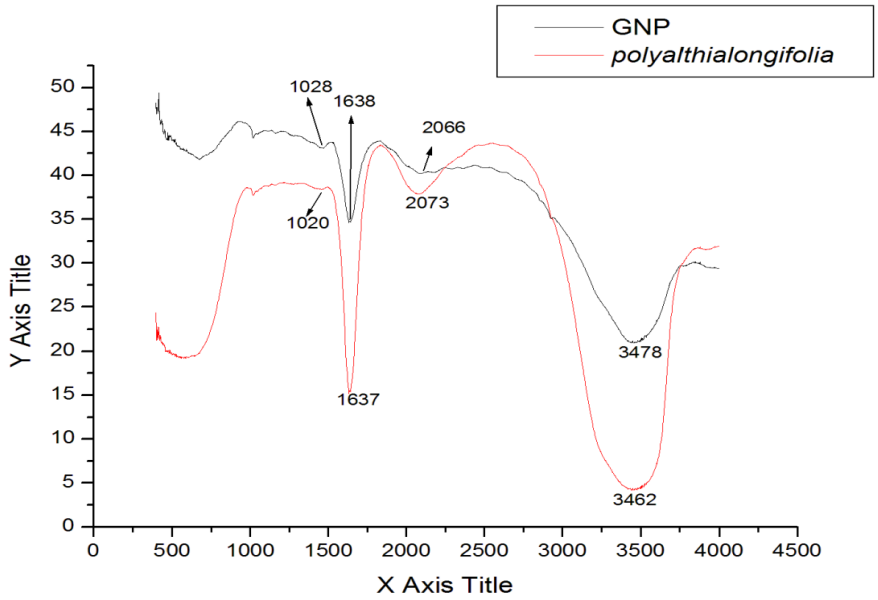

Fig. 5 FTIR analysis of gold nanoparticles synthesized using leaf extract of *Polyalthialongifolia*

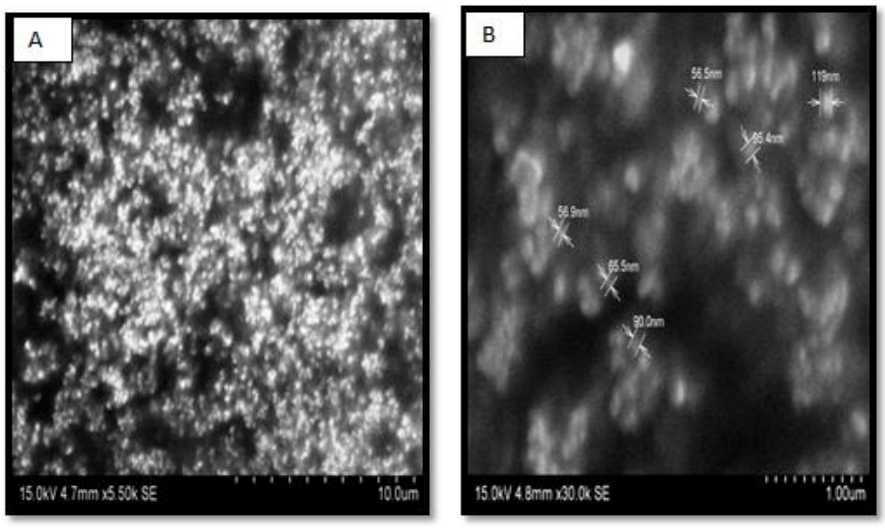

Fig. 6 SEM images of GNP produced from aqueous leaf extract of *Polyalthia longifolia*.

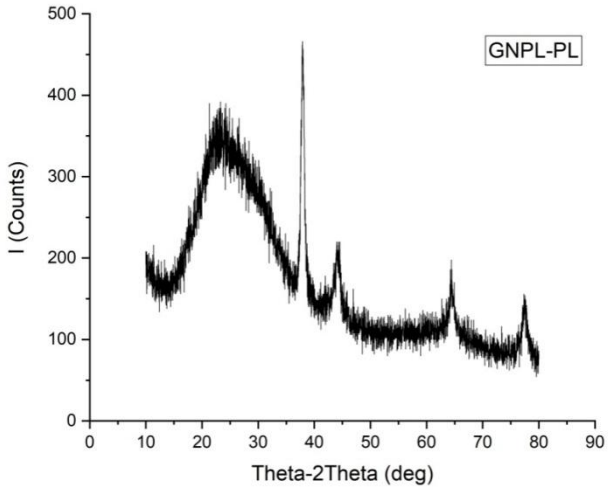

Fig. 7X-ray diffraction patterns of biosynthesized gold nanoparticles produced from aqueous leaf extractof *Polyalthialongifolia*

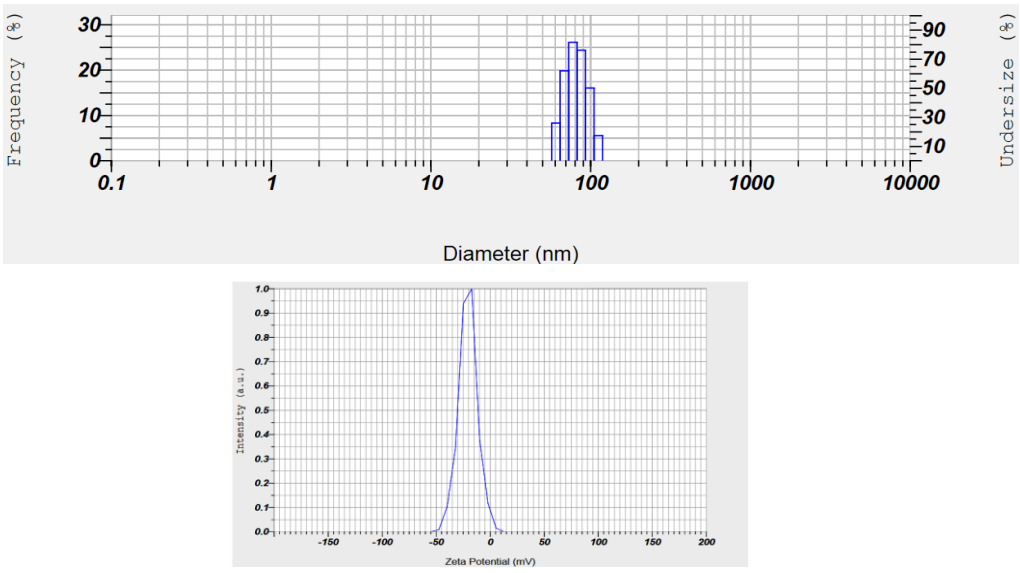

Fig. 8 Particle size analysis (A)&Zeta potential (B) of GNP produced from aqueous leaf extract of *Polyalthialongifolia.*

A REVIEW ON BIOLOGICAL ACTIVITIES AND CHEMICAL SYNTHESIS OF TETRAHYDROPYRIMIDINE

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ABSTRACT

In an organic chemistry, largest families of organic compounds are belongs in the heterocyclic compounds. In ourdaily life important of heterocyclic compounds are of very essential. It has broad range of application in medicinal chemistry andin agrochemicals products.The chemistry of pyrimidines is a blossoming field for the study of their pharmacological uses. Numerous methodsfor the synthesis of 1, 2, 3, 4-tetrahydro pyrimidine as also their diverse reactions offer enormous scope in the field ofmedicinal chemistry. In this review work, I mainly focus such type of heterocycle and their families which has mainutility in medicinal chemistrypharmacological profile of these class of compounds,: There has been considerable interest in the development of novel compounds with antitumor, antiviral, antifolate, anti-inflammatory, anticancer, antitubercular, antiproliferative, antifungal, anti-aggregating , cardiovascular, antihypertensive agents,potent calcium channel blockersHIV gp-120 to CD4 inhibitors,Derivatives of tetrahydropyrimidine have placed a unique position in the medicinal chemistry field. The aims of this review work to the reported tetrahydropyrimidine derivatives withpharmaceuticals activity during the past years.

***Keywords**: Biological activities, Antimicrobial, Antiviral, Antimycobacterial, Anti-inflammatory, Analgesic, Antipox, Anticancer.*

Introduction

Pyrimidines have a long and distinguished history extending from the days of their discovery as importantconstituents of nucleic acids to their current use in the chemotherapy of acquired Immuno Deficiency syndrome (AIDS). The pyrimidine nucleus is embedded in a large number of alkaloids, drugs, antibiotics,agrochemicals and antimicrobial agents[1]The heterocyclic systems constitute privileged substructures and are present in a large number of compounds with remarkable biological activity [2] It is well known that a large number of 3,4-dihidropyrimidines, DHPMs, exhibit wide range ofpharmacological activities such as antitumor[3], antiviral[4], antifolate[5], anti-inflammatory[6], anticancer[7], antitubercular[8], antiproliferative[9], antifungal[10], anti-aggregating[11] and cardiovascular[12] activities Many pyrimidine derivatives with appropriate functional groups have emerged as antihypertensive agents[13-15] andpotent calcium channel blockers[16,17]. In addition, several marine alkaloids containing the dihydropyrimidine core have been found to be potent HIV gp-120 to CD4 inhibitors [18] antifungal, antibacterial activity [19], anti-malarial activity [20]

Development of the Synthesis of Tetrahydropyrimidine

Tetrahydropyrimidine are very omnipotent class of drug due itswide-ranging antimalarial, antibacterial, antifungal,anti-inflammatory, antiviral, antitubercular and finally anti-cancer activity. The development of synthesis of Tetrahydropyrimidine moiety as well as its functionalisation at various positions isstill going on to raise its activity. Generally, these proceduresinvolve harsh condition, various name reaction,multicomponent reaction, multi-step strategy, and use of lewisbase and lewis acid, metal free condition, costly transitionmetal catalyst or in solvent and solvent-free condition. In thisliterature survey, wemainly focus on the different route ofsynthesis part of Tetrahydropyrimidine and functionalisation at itsvarious positions.

In 2017 S.Manimekalani co-workers, syntheses one potmulticomponent tri- and tetra-substituted imidazole usingA mixture of an aromatic aldehyde (10mmol), acetoacetanilide (10mmol), urea (20mmol) and $CuCl_2.2H_2O$ (5mmol) was mixed in an R.B flask and the mixture was magnetically stirred a 70^oC for the time needed to complete the reaction (as monitored by TLC). The initial syrupy reaction mixture solidifies within 25-30 minutes. The solid was poured onto crushed ice, filtered and

recrystallized by using either ethanol or ethyl acetate and petroleum ether [21].

In 2012 ParthiveKantilalChaudhari synthesis of 4-(1-(4-chlorophenyl)-3-phenyl-1H-pyrazol-4-yl)-1,2,3,4-tetrahydro-N-(aryl)-6-methyl-2-oxopyrimidine-5-carboxamide using A mixture of N-(aryl)-3-oxobutanamides(0.01 mol), 1-(4-chlorophenyl)-3-phenyl-1Hpyrazole-4-carbaldehyde (0.01 mol), urea(0.015 mol) and catalytical amount ofconcentrated hydrochloric acid in ethanol (30ml) was heated under reflux condition for 20 to22 hrs. The reaction mixture was kept at roomtemperature for 24 hrs. The product obtainedwas isolated and recrystallized from ethanol [22].

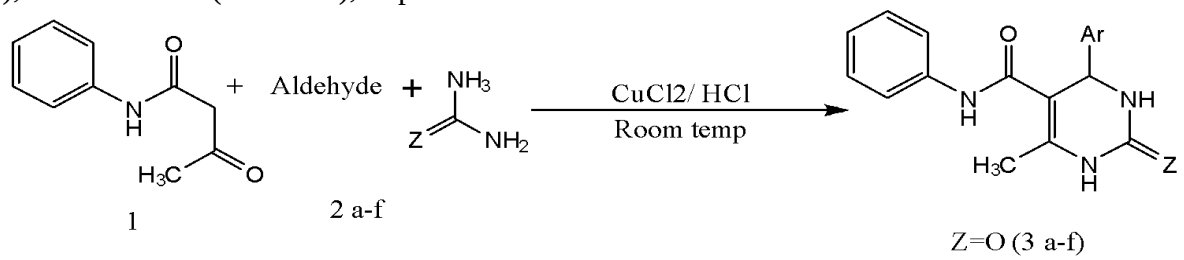
In 2011 Niharika I Singh, Sandip S Kshirsagar and co-workers, Synthesis of [4Substituted Phenyl 5Ethoxy Carbonyl6Methyl] 3,4Dihydropyrimidine- 2(1H)- one by using microwave irradiation to a mixture of urea (0.1mole), substituted aldehydes (0.1mole) and ethylacetoacetate (0.1mole) in ethanol, 4 drops of concentrated reaction was carried out. However, in generality of the methods is limited and mostly required long time and hence, considering theimportance of dihydropyrimidine moiety as pharmacophoricscaffold, therefore we applied the application of microwaveirradiation to the reaction; thus, it has accelerated the rate and yield of product. And, thus using the Biginelli reaction, we carried out the following synthesis 4-subsituted-1,2,3,4-tetrahydropyrimidine derivatives.[23]

In 2017 Kaushikjoshi and HareshRamdeveloped a new modesty for the synthesis N-(2,4- bis (trifluoromethyl)phenyl)-4-(4-substitutedphenyl)-1,2,3,4 tetrahydro-6-methyl-2- oxopyrimidine-5-carboxamide by using To the mixture of N-(2,4-bis(trifluoromethyl)phenyl)-3-oxobutanamide, Different Aromatic aldehyde and urea in ethanol was added few drops of Conc. HCl with stirring for 17 hrs.. After 24 hrs reaction mass pour in water, Insoluble solid was generated, it is pyrimidine derivatives. Then filter and crystallization by ethanol.[24]

In 2014 T. M. Zamaraevaa, T. F. Odegovaa and co-workers synthesise3,4-Dimethyl-6-(4-nitrophenyl)-*N*-phenyl-2-oxo-1,2,3,6-tetrahydropyrimidine-5carboxamide mixture of 0.01 mol of acetoacetanilide, 0.01 molnitrobenzaldehyde, and 0.01 mol of *N*-methylureawasheated at 120–150°C for 10–15 min until gas evolutionceased and the reaction mixture solidified. Aftercooling, the residue was treated with ethanol, filtered,and recrystallized from ethanol.[25]

In 2012 Atul D. Baldev, Kartik B**.** Vyas and Co-workers introduce General procedure for the synthesis of 1,2,3,4-tetrahydro-N-(substitutedphenyl)-6-methyl-2-oxo-4-(4-(phenoxymethyl)phenyl)pyrimidine-5-carboxamide by usingmixture of *N*-(substituted phenyl)-3-oxobutanamides(0.01M), 4-(phenoxy methyl)benzaldehydes (0.01 M), urea (0.015 M) and catalytic amount of conc. hydrochloric acid (HCl) in ethanol (30 ml) was heated under refluxcondition for 8 to 10 hrs. The reaction mixture was kept at room temperature for 24 hrs. The crystalline productobtained and recrystallized from ethanol[26].

In 2018 N. Edayadulla1, S. Anand and T. Shankar, Synthesise by using General procedure for the preparation of 4-(aryl)-6-methyl-2-oxo-N-phenyl-1,2,3,4-tetrahydropyrimidine-5- carboxamides by using A mixture of an heterocyclic aldehyde (0.01 mol), N-phenylacetoacetamide (0.01 mol), urea/thiourea (0.01 mol), cupric chloride (0.01 mol) and 2-3 drops of conc. HCl was ground together to give a syrup under solvent-free condition which was left overnight. The contents were poured into icecold water and the product that separated was filtered, dried and crystallized. All the compounds have been synthesized as per reported procedure[27]



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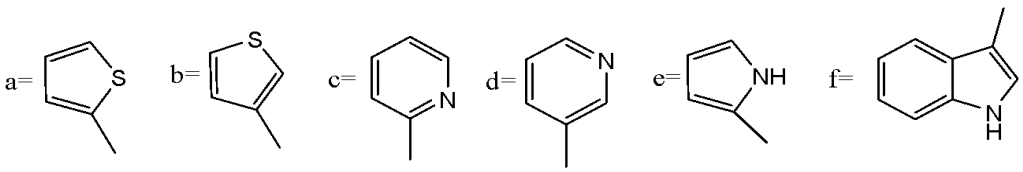
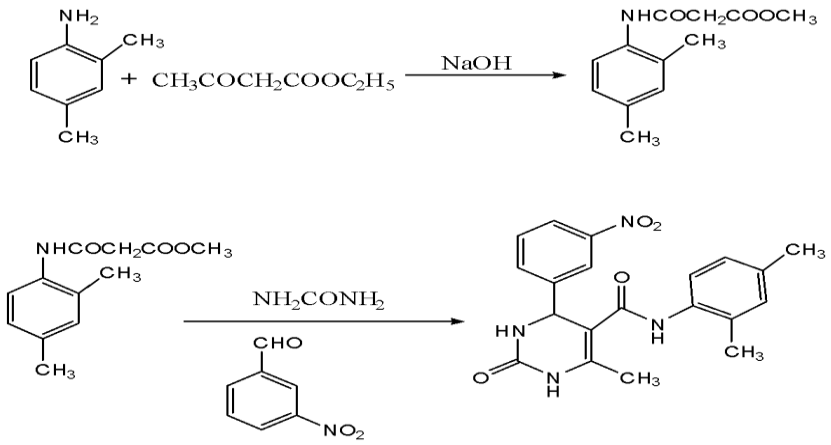


In 2006 S. Naveen · PritiAdlakha and co-workers synthesize N-(2,4-dimethylphenyl)-6-methyl-4-(3-nitrophenyl)-2-oxo-1,2,3,4-tetrahydropyrimidine-5-carboxamide by using the a method A mixture of 2,4-dimethyl aniline (10 mmol, 1.21 g) and ethyl acetoacetate (10 mmol, 1.31 ml) in 10 ml toluene was refluxed in the presence of catalytic amount of sodium hydroxide lye at 120◦C for 15 h. Toluene was distilled out and the resulting reaction mixture was washed with petroleum ether and diethyl ether thrice to obtain a free isolated yellow colored product of N-(2,4-dimethylphenyl)- 3-oxobutanamide. This isolated product was recrystallized from methanol a Mixture of this product (10 mmol, 2.05 g) and m-nitro benzaldehyde (10 mmol, 1.51 g) in methanol (10 ml) containing catalytic. amount of concentrated hydrochloric acid was refluxed for 10 h. The crystalline product separated out which was isolated and recrystallized from DMF and ethanol [28]



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Conclusion

The above mentions information about tetrahydropyrimidine ring containing compounds hasclearly shown that the structurally simple tetrahydropyrimidine moiety plays a significant role in medicinal chemistry and the related research has been being unusually active subjects. A large amount of work has been reported toward tetrahydropyrimidine-based a highly biological activity in medicinal chemistry. Numerous outstanding achievements exposed that tetrahydropyrimidine moiety containing compounds possesswidely potential application as medicinal drugs, pathologic probes and diagnostic agents. In particular, a huge number of tetrahydopyrimidine-based compounds as clinical antibacterial, anticancer, antifungal, antihypertensive, antineuropathic, antiparasitic, antihistaminic agents and so have been successfully expanded, marketed and widely used in the clinic in preventing and treating different types of diseases with high bioavailability, low toxicity, good biocompatibility and curative effects. An expanding attempt from all over the universe has been directly focusing ontetrahydropyrimidine moiety containing compounds for potential clinical application in the diagnosis and treatment of diverse types of diseases. Excitingly, a growing number of derivatives of tetrahydropyrimidine have been becoming scientific drug candidates in actively constant research and developments. All these have powerfully suggested the infinite potentiality application of tetrahydropyrimidine derivatives in the field of medicine.

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RABINDRANATH TAGORE'S - MUKTA-DHARA: A CRITIQUE OF POST-MODERN ECO-HUMAN CONFLICT

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ABSTRACT

Water conflict is a conflict between countries, states, or groups over access to limited and shared water resources. Elements of a water crisis may put pressures on affected parties causing diplomatic tension or outright conflict. The United Nations recognizes that water disputes result from opposing interests of water users, public or private. Water has historically been a source of tension and a factor in conflicts that actually start for other reasons. These Eco-crises can put severe pressure on all water users, whether corporate, government, or individual, leading to tension, social disturbance and possibly aggression. Sometimes, the aggressor can reap a huge advantage of the serious water need of his neighbour for his own benefits intentionally to prove his cultural, economic, and racial supremacy over the other. And if he utilizes science for his vile intentions, humanity will suffer enormously. Rabindranath Tagore deals with this socio-political issue in his play, Muktadhara (The Waterfall), in which he brings forward his humanitarian solution of the fair and equal distribution of the Almighty's eco-gift to all. The present paper attempts to shed some light on these ideals cherished by the celebrated playwright of the country.

***Keywords**: Covid-19, RSPM, Industrial Pollution, Seasonal Variation, Chandrapur.*

Introduction

Mukta-Dhara or *The Waterfall* (1922)is one of the better-known plays of Rabindranath Tagore. He wrote the play immediately after he had a first-hand account of the impact of modern science, technology and machines on the human temperament from his extensive tour of the scientifically advanced countries of Europe and America. There "he saw that the machine was making terrible inroads into the human personality, and ruthless technological power" (Iyengar, 1985: 135). "Tagore, Gandhi and Roy, each in his own way, saw in modern civilization some kind of a Frankenstein's monster which had become a threat to its creator, man" (Ray 114). "In his lecture "Construction Versus Creation," Tagore conceded that Science has conferred blessings. But its potential for destruction outweighs its benefits. Scientific power has brought the world to the edge of a precipice" (The Hindu) and the conflicts arising out of the need and want of water turns a human being into an inhuman machine. This theme dominates *Mukta-Dhara.* Accordingly, K.R.S. Iyengarobserves: "Although it is not heavily underlined, the meaning of the play is clear: Human values are paramount, and to ignore this truth is to canter towards self-destruction" (ibid.).

Water conflict is a conflict between countries, states, or groups over access to limited and shared water resources. Elements of a water crisis may put pressure on affected parties causing diplomatic tension or outright conflict. The United Nations recognizes that water disputes result from opposing interests of water users, public or private. Water has historically been a source of tension and a factor in conflicts that actually start for other reasons. These unintended eco-crises can put severe pressure on all water users, whether corporate, government or individual, leading to tension, social disturbance and possibly aggression. Sometimes, the aggressor can reap a huge advantage of the serious water need of his neighbour for his own benefits intentionally to prove his cultural, economic, and racial supremacy over the other. And if he utilizes science for his vile intentions, humanity will suffer enormously. Rabindranath Tagore deals with this socio-political issue in his play, Muktadhara (The Waterfall), in which he brings forward his humanitarian solution of the fair and equal distribution of the Almighty's eco-gift to all. The present paper attempts to shed some light on these ideals cherished by the celebrated playwright of the country.

Critical Analysis / Exposition

Tagore's play, "*Mukta-Dhara*" is full of mythical allusions and cultural symbols

moulded into the contemporary scenario of the struggle initiated by the cultural differences between orthodoxy and modernity and between man and machine. "The issue of pluralism and cultural conflict occupied Rabindranath Tagore throughout his life" (Ray 101). *Mukta-Dhara*is one such play.

The title of the play takes its name from a mountain spring whose waters rush down the slopes of mountainous land named Uttarakut, 'The Peak of the North', and irrigate the plains of Shiv-Tarai. The peoples of these two places belong to two different races and cultures bonded together by the free and unhindered flow of the Mukta-Dhara stream. However, the Shiv-tarayans have been held in subjection by the King of Uttarakut for quite a while. It is his desire to enforce this subjection of the peoples more effectively. His vile intentions create a serious conflict in the play and demarks the humanity in two halves. Using science and technology as his potent tools, the King with the ingenious help of the Uttarakut engineer, Bibhuti, dams Mukta-dhara with an intention to prevent its waters from reaching Shiv-tarai and keep its people at his mercy. Thereafter, it becomes a struggle for the Shiv-tarayans to fight against this oppression, led by the YuvarajAbhijit of Uttarakut and ably supported by a non-violent, pre-Gandhian ascetic, Dhananjaya. It also becomes a struggle of the Shiv-tarayans to maintain their cultural identity intact and liberate themselves from the tyranny of the Uttarakut King. In a way, this fight against material and spiritual oppression symbolically becomes a fight of the third world countries against the supremacy and aggression of the developed countries to gain control over the limited world resources such as oil and water. That way Tagore anticipates the contemporary world with such issues almost a century earlier.

Right from the opening scene of the play, *Mukta-dhara* alludes to the influence of Indian mythology and culture. It appears like a Cult Myth since the play is associated with the local deity and festivals. The chorus chant at the very beginning refers to the origin of Ganges spring in the lock of Lord Shankara and its myth. The Ganges' most sustained association is with the god Shiva Himself. Like Shiva and the moon on His head, the Ganges—whose life-sustaining waters flow from the realm of the moon—is connected with both life and death. The chant, which later reappears intermittently in the play, hails:

Victory! Lord of Terror, Sankara!

Wreaker of flood-wrath Sankara,

Sankara!

Victory! doubtings pierced,

Victory! bondage shattered,

Masterer He of the Evil, Sankara,

Sankara! (Tagore, 1950 Rpt. 1970: 9).

The myth of this chant of Lord Shiva is as follows:

According to Hindu religion a very famous king Bhagiratha did Tapasya for many years constantly to bring the river Ganga, then residing in the Heavens, down on the Earth, to find salvation for his ancestors, who were cursed by a seer. Therefore, Ganga descended to the Earth through the lock of hair (Jata) of god Shiva to make whole earth pious, fertile and wash out the sins of humans. For Hindus in India, the Ganga is not just a river but a mother, a goddess, a tradition, a culture and much more. (Wikipedia).

Here, through the chant, the playwright intends to project his vision of the might of God Shiva who, according to the Hindu mythology, is the Preserver and Destroyer of the living world. Spring waters, on the other hand, are the life-sustaining force whose floods can be checked by the power of the Lord to preserve the life of the world and keep the world free from worries and tyrannies of the evil. Therefore, in *Mukta-dhara*, the water stream symbolises the life and freedom for the Shiv-tarayans. But the King of Uttarkut wrests away this freedom by using a huge machine to dam the free flow of the Mukta-dhara spring. As a result, the Lord of the Life has to intervene to preserve the bonded life of his devotees in Shiv-tarai. He does it through Prince Abhijit, who in the end, breaks the dam and releases the sacred waters of the spring sacrificing his own life in the process. In

a way, it becomes a victory of the Lord of Terror and Wrecker of Floods over the evil forces of nature as the previously mentioned chant in praise of Lord Shiva suggests.

On the other hand, the region under subjection is named as Shiv-tarai or the plains of Lord Shiva. The very name is mythical and symbolic. It suggests the calm, patient and enduring nature of its people in the manner of the Lord Himself. The Shiv-tarayans are patiently suffering from the atrocities of Uttarakut. They believe that their people were created in the process of Lord Shiva's swallowing of poison after the mythical churning of the ocean. This creation myth as narrated by a Shiv-tarayan in the play, points out:

. . . at the beginning of the world, after churning of the ocean, some drops, of nectar trickled down from the god's cups and fell on the earth. From that earth our Shiv-tarayan ancestor was created. Then the demons licked out the god's discarded cups and threw them into the gutter, and from the broken pieces was made the ancestor of Uttarakut. That is why they are so hard-and faugh! So unclean.(Tagore, 1950 Rpt 1970: 41).

These hard and unclean people from Uttarakut, however, consider their race to be superior to those of Shiv-tarayans. The common folks, the school-master and his wards, of Uttarakut think that 'their (Shiv-tarayans') religion is very bad' and 'they haven't got high-ridged noses' (23). On the contrary, the Shiv-tarayans wonder: "What faces these Uttarakut fellows have! As if the Creator had started moulding a lump of flesh and never had time to finish it!" and "they have no culture whatever. Their so-called scriptures, what is there in them?" (41). It is this physical and cultural difference between the Uttarakut people and the Shiv-tarayans that results in the troubled relationship between the two neighbours. Therefore, to show them their political dominance and to further impoverish Shiv-tarayans, King Ranajit of Uttarakut, by taking the aid of machinery and by using the engineering skills of Bibhuti, dams the free-flowing stream of Mukta-dhara. In his opinion, "one's own folk may be won by affection; outsiders must be held by fear" (17). The damming of the free spring using the giant and horrible looking machine is that weapon by which Ranajit could instil fear in the mind of Shiv-tarayans and, therefore, further suppresses their freedom.

The dam, however, took twenty years for its completion. The cries and protests of the subjugated humanity fell to deaf ears of King Ranajit in his hunger for political dominance and cultural supremacy. In the process, many innocent lives were killed or sacrificed due to the technical errors and misuse of science by the egoistic Bibhuti. Like his King, the proud arrogance ofBibhuti doesn't even hesitate to propagate his feelings of contempt for the poor folks of Shiv-tarai and also of his skills dominating over the power of divinity. He comments: "When a man fights the power of the gods, does he care for the curses of men?" (13). A festival is so arranged to celebrate this 'human victory' over the 'free-flowing nature' to proclaim to the world that the Uttarakut deity of Bhairava has supported them in this giant endeavour to overpower the lowly cultured Shiv-tarayans. In his blind urge to dominate the helpless subjects, King Ranajit so boasts before his protesting son, YuvarajAbhijit as:

Bhairava is Uttarakut's own god. Our victories are His. So Bhairava takes our side, and takes back his own gift. He will pierce Shiv-tarai with his thurst-spear, and fling it before the throne of Uttarakut. (20).

YuvarajAbhijit, on the other hand, is full of love and compassion for the humanity. He loves this Paradise that is why he decides to fight "its demons" (30) but with the spiritual weapons of truth, non-violence and sacrifice. He opens the Nandi Pass road "to save the people of Shiv-tarai from continual famine" (31) which was earlier blocked by the King to prevent them from passing freely, do business and prosper. He also has a special attachment with the Mukta-dhara. As Abhijit himself knows and the King's minister once comments, ". . . he is not of royal birth, but was picked up below the falls of Mukta-dhara" (17). He so thinks it to be his destiny on earth to keep the spring free and keep the humanity vibrant. He comments:

Somewhere or other in the external world, God writes for us the secret mystery of each man's spirit. Mukta-dhara is His word to me, bearing the secret of my inner being. (29).

Yuvaraj also "cannot bear to see a poverty that depends on charity" (32) of its masters. So, he strongly opposes the construction of the dam which was meant to dry out the fields of Shiv-tarai and make them beggars depending entirely on the mercy of Uttarakut. In this conflict, he sides with the just cause of the Shiv-tarayans, much to the chagrin of the people of the Uttarakut and its King, his own Father. The King, in fact, imprisons him for opening the Nandi Pass, for protesting over the construction of the dam and also in fear of his destroying the victory of Uttarakut. Even then, Abhijit's opinions do not change. Steadfastly he comments: "I must pay my debt, the debt of my birth. Mukta-dhara was my nurse. I must set her free" (57).Yuvaraj so escapes from his imprisonment. He then goes to the dam and strikes at one of its weaker points, and breaks the dam to let the imprisoned water flow freely towards Shiv-tarai and towards all the humanity of the world. In this noble cause, however, unfortunately, he gets drawn in the fierce current of the roaring waters of Mukta-dhara. The compassionate Yuvaraj thus sacrifices his own life for the sake of humanity and proves that considerations of humanitarian feelings are more valuable in the world than the inanimate use of and the dominance of scientific machines which turn man inhuman. That way he turns the two different opposing cultures into one, namely, 'humanity'. It is the celebration of human freedom from the oppressions of inhuman use of science.

There is another such an influential character found in *Mukta-dhara*which fights fiercely against the inhuman oppression and subjugation of people for personal power by Uttarakut. In the ascetic, Dhananjaya, the dramatist anticipates and creates Mahatma Gandhi with his ideals of truth, non-violence, religious tolerance, fearless but passive resistance of injustices, and democratic ideals. "Incidentally, Rabindranath was an ardent advocate of non-violence long before Mahatma Gandhi used it as a weapon against British rule in India" (Roy 271). Dhananjaya, in *Mukta-dhara,* uses similar weapons to incite the suppressed but ignorant people of Shiv-tarai against the cultural and material oppression of King Ranajit and Uttarakut. He once says to King Ranajit: "What you seize by violence can never be yours. What you set free is yours for ever" (Tagore, 1950: 47). He also sings: "My only part, the fearless mind, / That puts my boat to sea" (35). In this fearless heart, there is contempt for violence. He advises Ganesh, the quarrelsome Shiv-tarayan, not to retaliate his oppressor, Chandapal, the king's brother-in-law, with violence. Dhananjaya so comments:

Can't you show him what not-beating is? That needs too much strength, I suppose? Beating waves won't stop the storm. But hold your rudder steady, and you win. Strike at the root of violence itself. As soon as you can hold up your head and say that it does not hurt, the roots of violence will be cut. (36).

But the people cannot understand Dhananjaya properly and always try to follow him rather than his ideals which irritates him more than the cruelty of the monarchy. However, this messiah of non-violence does a great job in inculcating a sense of fearlessness in the minds of the Shiv-tarayans to oppose the tyranny and injustice of Uttarakut. The character of Dhananjaya in *Mukta-dhara,*hence, can be called as the mouthpiece of Tagore. Through him the dramatist tries to pinpoint the drawbacks in monarchy. "Tagore is convinced that in a democratic society the king has no right to survive as a king if he loses the confidence of his people" (Agarwal 71). Dhananjaya so advocates democracy for the benefit of Shiv-tarayans. In his opinion, "a king takes his seat on a throne, but a throne does not make a king" (40) and "Kingship is crippled, if it is the king's alone, and not the people's" (39). That way, he tries to unite them and raise them against the tyranny of the monarchy. He also admires Abhijit's courage and humanism and lends his support to his cause spiritually, morally and by uniting the people against their usurper. He is also arrested by the king for such an act. But his backstage support to Abhijit gives Yuvaraj strength to act even

against his father's wishes and liberate the bonded souls of Shiv-tarai in the form of free flowing waters of Mukta-dhara by sacrificing his own precious life. When the delighted Shiv-tarayans come to seek their benevolent Yuvaraj, Dhananjay immortalizes the already drowned son of Mukta-Dhara in these words: ". . . you have found him. He is yours forever now" (76).

Conclusion

Mukta-Dhara,thus, becomes a symbol of freedom and dynamism and Abhijit becomes a symbol of a liberator, a deliverer of common folks from the tyranny of foreign power which reminds us of the great sacrifice by NetajiSubhash Chandra Bose for the liberation of his bonded motherland in later times. Throughthe play, as Amardeep Singh in his web article, "*Rabindranath Tagore, Arundhati Roy and the Eraser of History*", points out: "he warns against the dangers of sectarianism, mindless education and sacrificing humanity at the altar of political expediency, and celebrates life and freedom as the real abode of God" (Singh). Thus, the play, *Muktadhara* (The Waterfall), becomes an eco-friendly, humanitarian solution for the fair and equal distribution of the Almighty's eco-gift to one and all inhabiting this beautiful environment which we term Mother Earth.

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ECOCRITICAL ANALYSIS OF THE NOVEL *LIFE AND TIMES OF MICHAEL K BY J. M. COETZEE*

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ABSTRACT

Environment becomes the crucial topic from the last few decades. Due tocapitalism, modernization, rationalisation and change in cultural outlook man has led to the imbalance of the environment. Colonization and Imperialism encourages Industrialization which destroyed and dismantled forest, polluted water resources, and opens the gates of all the miseries of human being. The novel, Life and Times of Michael K, selected for this study, highlights the environmental concerns, expose human actions, and technological advancement responsible for the degradation of environment. The research work delineates the impact of colonisation, imperialism and oppression, on the environmental destruction, suffering of human and animals, loss of basic rights of humans and animals. The research traces man's relation with nature. It also figures out the marginalisation South African society. Britishers divided the South African society into Apartheid. It segregates human being into whites, blacks and coloured which is against the law of nature.

***Keywords**: Man v/s Nature, Civil War, Coetzee, Life and Times of Michael K.*

Introduction

Environmentalism began to take shape in the second half of the 20th century, in response to perceptions of how environmental damage has become the threat to all lives on earth. Whereas industrial revolution affected the environment, it destroys man and natures relationships. from the ancient time man consider him as a part of nature as he takes all the essentials from the nature and fulfil his basic desires like food, shelter and clothes but, now he has become a tool of commercialisation. As the Britishers came in India for trading and settled and rule the country. They exploited the nature and started industrialization without considering the environmental hazards they expand industrialization with absolute greed for materialism. White in this context says, "Formerly man had been a part of nature, now he was the exploiter of nature". The separation of humanity from nature has a long history. Eco-critics have paid more attention to its' roots in Christian and post-Christian Western culture, because industrial capitalism first appeared in Western Europe and spread by colonialism. The modern cultural practices adopted by the people leads to the deprivation of nature, Howarth states that, "the dogma that culture will always master nature has long directed Western progress, inspiring the wars, invasions, that have crowded the earth and strained its carrying capacity. Ecocritical texts mirror the convoluted relationship between humans and their physical environment. It begins from the belief that direct environmental concern can significantly contribute to the understanding of environmental harms. In the field of literary criticism, attempts have been made to keep focus on environment and defining close affiliation between nature and culture, while analysing literature. Ecocriticism looks at culture as an expression of ecology as Kerridge writes, "It analyse the history of concepts such as 'nature' in an attempt to understand the cultural developments that have led to the present global ecological crisis"

J. M. Coetzee is a white, born on 9th of February at Cape Town in South Africa, is a significant author, he was awarded the Nobel prize for his literature and booker prize for his 'Life and Times of Michel K. In this particular novel 'Life and Times of Michel K, he talks about the life of an individual who fight for freedom tirelessly without rebelling with the colonizers but patiently and constantly fleeing natural environment by escaping from the camps, city life and other burden of the society. taking into consideration the various current issues specifying conditions of his own country in

his respective work. Life and Times of Michael K, is elaborated on the Eco-centric notions. Coetzee describes the issues related to environmental dilapidation, culture, social, identity complex and sees himself as a marginalised subject on an African land. The opening lines of the novel, depicts the marginalisation of a writer in society, which he traces through the protagonist Michael K that, "he had a hare lip". Michael's mother, police-men and other characters in the novel treat Michael as a mere animal. He feels isolated in the society because of treatment he gets from the surroundings. Coetzee is an eco-conscious writer, it is well judged from his earth-centered approach, and his immense concern for minor forms of life. Similarly, the novel, Life and Times of Michael K depicts the story of an oppressed character named, Michael K and his mother Anna K in the city Cape Town, South Africa. The novel describes the civil war torn out in South Africa and martial law was imposed. K and his mother despite taking active participation in the war escape from the city to rural landscape to live a happy and tension free life as Ruskin stated, "we find all men of true feeling delight to escape out modern cities into natural landscape". K's mother wants to go back on her birth place called Prince Albert. The study brings into notice that, Nature plays a vital role in making man happy. He can feel pleasure in the isolation if he is in the lap of the nature.

The work explores that after the death of his mother, Michael K finds, his life entirely purposeless. But later he went for gardening and finds another purpose of his life by making gardening as his hobby as K declares, "Whereas the truth is that I have been a gardener . . . gardeners spend their time with their noses to the ground". K loves his life as a gardener and realises that most other people would not be able to survive as he did. Even, Gordimer asserts in this milieu, "It's better to live on your knees, planting something?". He chooses 'gardening' to make the deserted land of Karoo farm bloom, which gives a glimpse of the real life of Coetzee, who struggles to establish his identity on an alien land. Similarly, K's disfigured lip makes him different from the main stream of the society as Coetzee being a white writer lives on the verge in the society of blacks. With the death of K's mother a period of trouble and regeneration starts in his life. There he lives with minor forms of life with pleasure. These minor forms of life on earth enhance the ecological richness of the novel as Neimneh portrays, "The novel demonstrates a triangular relationship between K, animals, and plants. The interrelationship between history, politics, and ecology makes the novel a critique of the domination of species and the earth". The work traces that due to civil war the country is led to chaos, violence, destruction. Coetzee aptly justifies the title of his novel by depicting the hardships in the life of Michael K by linking it with the images of loss and hope, and constraints K to live on the verge. The research defines although environment nourishes man, but in turn he destructs it. The indication of nurturing of human by nature can be seen in the novel when K, during escape from city and policemen said, "Let darkness fall soon, let the earth swallow me up and protect me". The use of plants and animals imagery has a significant meaning in nature writings. Coetzee knows that these minor forms constitute ecology. But by deconstructing nature, man is affecting himself and bio-diversity. He rarely mentions about the race of K and his mother in the novel, but the treatment they get from police, administration and other people of Cape Town described them as the oppressed members of society and in par with animals. As during the train reservation and to get a permit to leave the city, they waited for a long time in the queue at the station in the rain. At this Anna K whispered in trouble, "I feel like a toad under a stone living here". Later, Anna K falls sick and hospitalized, where Michael K steal s his mother's tea, "gulping it down like a guilty dog". The words like 'toad' and 'gulp' describe the marginality, 'otherness' and loss of rights of both man and animals.

The study explores through Michael K that this earth is a universal phenomenon, and

every creature possess equal rights under the order of Supreme power as explains in text, "began to pull yellow half-grown carrots out of the soft earth. It is God's earth, he thought, I am not a thief". But in the age of modernisation the outlook towards nature changed and it is treated as a material to be consumed. Whereas, Michael K opts gardening as social purpose so that anyone can come and eat from his garden, there people like medical officer encourages him for market gardening. It shows man's basic tendency of insatiable greed to exploit the natural beauty and resources like, "there is good soil in the Peninsula . . . It would be nice to see market gardening". Another clue of insatiable greed and fondness for abundant storage worries man for future despite enjoying his present, as K is depicted eating a goat without pleasure in the text, "What will I do when the goat is consumed". As the idea to make the earth pollution free is a universal and global activity. It is the duty of every human being to keep it hygienic. No one can complete this task alone by his efforts. Similarly, everyone has equal right on nature, it belongs to all, and we are its' products as indicated from conversation between K and his friend Neol, "What we grow is for all of us. We are the children of the earth". Further, Coetzee's views are traced against unnecessary development in the country, and he thinks that it would be a curse for the environment. According to research, it pollutes the natural life, creates Marxist binary class distinction, and makes 'the rich more richer and poor more poorer'. It is depicts through the escaping scene of Michael K from the Cape Town, "By noon they were passing through the ghostly industrial quarter . . . A couple of workmen sitting on a wall . . . in silence". Several other environment conscious intellectuals tried to depict the degrading atmosphere and its consequences in their publications. Mira Behn who joined Mahatma Gandhi in 1927, expresses herself as a devotee of the great ancient Mother Earth, and said that, "the tragedy today is that educated and moneyed classes are altogether out of touch with the vital fundamentals of existence– our Mother Earth". Life and Times of Michael K particularly describes the conditions of Third-World nations where the idea of democracy is in its infancy. The issues have been put up in the form of question in the novel. Coetzee tries to deconstruct the history and portray the condition of the third world countries by visualising the sufferings of the marginal section due to the inner turmoil. Coetzee put forwards the idea that plants and animals have feelings and life like human-beings. They are equally imperative as human beings. The research work marks out this attributes as, "pumpkin leaves pushing through the earth. Tomorrow will be their last day, the day after they will die. I would not be too late to save them". The anthropocentric tendency of a man makes him the real enemy of environment and exploiter of animal rights. He uses animals and birds for his personal needs and for commercial purpose. Coetzee indicates loss of animal rights and cruelty during war, as mentioned in the novel, "K passed the truckload of sheep, packed so tight that some stood on their hind legs". Coetzee's focus on the non-human 'other' depicts his concerns and positive attitude headed for ecology. It seems that he tries to de-center human beings and their tendency to dominate upon 'other', as in the expression of Woodward, "Coetzee has made profound ecological statements about the dualistic thinking of racism, speciesism and their reticulations".

Coetzee also demonstrates brutality instigated on animals in the form of meat eating through K's action, when he dragged a small dead goat into his house for eating and tears it brutally. At one point of time in the novel, it seems that eating of goat is a need of K, because he is dying of hunger. But the way Coetzee expressed, it confirms the barbaric crime done on animals by man as refers, "He slit the belly. He peeled back as much of the skin as he was able but could not cut off the feet and head until, searching in the shed, he found a bow-saw". It reveals not only the indifferent attitude, merciless actions of man, but highlights a sense of pity shown by writer for animals, who himself is

a vegetarian. Coetzee is aware about the rights of non-human 'other', he uses several symbols and metaphors to describe this argument. In his novels "dogs" occupy a special significance as in Life and Times of Michael K dogs are use for sniffing by police men to search K. Coetzee is not only aware about the rights to be devised for animals but he deals with their psychological condition in the times of political distress. Animals are not recognised as 'loved ones' but as unwanted beings or one can say as unwanted things, Pritchard supports the view and says, "Coetzee's investigation of the problem of evil, represented in how humans treat each other, and humanity treats animals" . Though our civilisation has progressed a lot but human beings were part of nature and in the future too they will be a part of it. His rootlessness from nature will lead him to future dangers. Ecofeminism is a sub-concept, considers the Earth as mother and promote ecological wisdom in order to save the earth and female from oppression. It treats both in equal terms.

Conclusion

To conclude in a brief, it is said that Life and Times of Michael K forms an optimistic note of life at the very end. It traces Michael K as an eco-friendly figure and promote 'ecological wisdom' that man can lead his life simple way and doing trivial things. The research work sums up that one can live with earth in order to get rid of from the problems and miseries of daily life. It draws out that man should avoid unnecessary developments, wars, and be one with nature. It suggests to coming generations, to develop a kind of cultural outlook which benefits nature, as novel ends with a metaphor, "He would lower down the shaft deep into the earth, and when he brought it up there would be water in the bowl of the spoon; and in that way, he would say, one can live". This metaphor describes the positive attitude of writer for nature, and outlines that man's needs are limited, and he must put checks on his greed through the medium of novel.

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GREEN COMPUTING: RECENT PRACTICES AND TECHNOLOGIES FOR ICT ENVIRONMENT SUSTAINABILITY

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ABSTRACT

In terms of growing awareness about environmental impact of computing, green technology is gaining increasing importance. With rising energy consumption, global warming and e-waste, the idea of green computing is widely taken into serious consideration by both the government agencies and private companies, as their contribution in good practices for sustainable development. Green computing refers to the practice of environmentally responsible and efficient use of computing resources while maintaining economic viability and improving its performance in eco-friendly way. This paper aims to present main approaches and assumptions of green IT by showing the latest solutions and energy efficient practices in computing industry. In the article author has made a systematic study on several strategies and developments in context to the ICT sustainability as a future asset of growth for modern society. The article focuses on the practices like use, disposal, design and manufacturing as well as on technology based-solutions like electronic products and services e.g. green cloud. The outlook for greener ICT should include using the Internet as a powerful agenda for promotion and education for environmentally aware behaviour and as a useful tool for creating eco-friendly technology.

Keywords*: green computing, power management, sustainability, eco-friendly technology, green cloud*

Introduction

Green computing, the reading and training of effective and environmental computing properties, is currently below the care of not simply ecological officialdoms, however also industries after additional businesses. In current years, firms in the computer production have arise to recognize that successful green is in their greatest attention, together in standings of open dealings and cheap costs. In 1992, the U.S. Environmental Protection Agency launched Energy Star, a volunteer labeling program that is planned to help and identify energy-efficiency in screens, weather controller apparatus, and further machineries. This resulted in the well-known approval of sleep type amongst user electronics. Green Computing is well-defined as the education of planning, business, by means of too organizing of computing procedures in a grouping that decreases their eco-friendly impact. Many IT creators and retailers are constantly investing in designing energy efficient computing devices, falling the use of dangerous materials and inspiring the recyclability of digital devices and paper.

Why Green Computing?

These days almost all streams weather its IT, medicine, transportation, agriculture uses machines which indirectly needs large amount of power and money for its effective running. We have great machines and equipments to achieve our tasks, great appliances with royal looks and features make our lives more striking and smooth. Green computing whose goals are to decrease the use of risky things, maximize energy proficiency during the product's lifetime, and promote the recyclability or biodegradability of defunct products and factory waste. Therefore we use Green Computing for following benefits

1) The Climate Savers Computing Initiative (CSCI) catalog can be used for choosing green products.

2) Organic light-emitting diodes should be used in its place of the regular monitors.

3) Surge guards offer the use of green computing by cutting off the power supply to peripheral devices when the computer is turned off.

4) Contributing your old computers and other peripherals can shrink the rate of e-waste creation.

5) Moreover, those who cannot afford to buy a computer can benefit from such contributions. Through proper removal of computers and its accessories, it is possible

to decrease environmental pollution.

6) It was likely that computers would help reduce paper wastage. However, even today wastage of paper is a severe issue in industries. The easy accessibility of photocopiers and printers is too one of the felons behind unrestricted paper wastage. Think twice before using printers.

Approaches to words the Green Computing

Data centers, which have been appraised for their amazingly high energy demand, are a primary focus for supporters of green computing. Data centers can actually improve their energy and space proficiency through techniques such as storage association and virtualization. Many organizations are opening to eliminate underutilized servers, which results in lower energy usage. The U.S. federal government has set a minimum 10% reduction target for data center energy usage by 2011. Computer virtualization refers to the generalization of computer resources, such as the process of running two or more logical computer systems on one set of physical hardware. The concept initiated with the IBM mainframe operating systems of the 1960s, but was commercialized for x86-compatible computers only in the 1990s. With virtualization, a system administrator could combine several physical systems into virtual machines on one single, powerful system, thereby releasing the original hardware and dropping power and cooling consumption. Several commercial companies and open-source projects now offer software packages to enable a conversion to virtual computing. Intel Corporation and AMD have also built registered virtualization improvements to the x86 instruction set into each of their CPU product lines, in order to enable virtualized computing. Virtual machine can be more easily measured and examined from outside than a physical one, its configuration is also more elastic. This is very useful in kernel development and for teaching operating system courses. Virtual machine can be easily re-located from one physical machine to another as required. For example, a sales person going to a customer can copy a virtual machine with the demonstration software to its laptop, without the necessity to transport the physical computer. At the same time and fault inside a virtual machine does not harm a host system, so there is no risk of breaking down the OS in said laptop.

Recent implementations of Green Computing

A. Blackle: Blackle is a search-engine site powered by Google Search. Blackle came into being based on the concept that when a computer screen is white, presenting an empty word or the Google home , your computer consumes 74W. When the screen is black it consumes only 59W.Based on this theory if everyone switched from Google to Blackle, mother earth would save750MW each year. This was a really good implementation of Green Computing.

B. Sunray thin client: Sun Microsystems is reporting increased customer interest in its Sun Ray, a thin desktop client, as electricity prices climb, according to SubodhBapat, vice president and chief engineer in the Eco Responsibility office at Sun. Thin clients like the Sun Ray consume far less electricity than conventional desktops, he said. A Sun Ray on a desktop consumes 4 to 8 watts of power, because most of the heavy computation is performed by a server. Sun says Sunrays are particularly well suited for cost-sensitive environments such as call centers, education, healthcare, service providers, and finance. PCs have more powerful processors as well as hard drives, something thin clients don't have.

C. The Asus Eee PC and other ultra portables: The "ultra-portable" class of personal computers is characterized by a small size, fairly low power CPU, compact screen, low cost and innovations such as using flash memory for storage rather than hard drives with spinning platters. These factors combine to enable them to run more efficiently and use less power than a standard form factor laptop.

Advantages and Disadvantages of Green Computing

As with other things, green computing also has advantages and disadvantages. Let's see its advantages first.

Advantages

•As green computing emphasizes low energy consumption, it helps reduce fossil fuel utilization and greenhouse gas emissions.

•It aims to lower heat generation from computers and electronic devices to protect the environment.

•It promotes the effective usage of natural resources and their preservation.

•This approach emphasizes the usage of non-toxic substances reduces health hazards.

•Green computing encourages recycling and reusability of materials to reduced electronic waste, hence, lower land pollution.

•It is cost-effective as it involves less energy and cooling needs.

•Implementing green computing makes us responsible for the environment and towards leading a sustainable future.

Challenges

Every concept comes with inherent challenges that people need to overcome. Though green computing seems like a breakthrough, there are problems that companies face while implementing it. Some of the challenges of green computing are:

•Due to a lack of concern and huge market competition, companies resist this change. Consequently, everyone has to suffer the impact. Thought leadership and educating people about the dangers can increase awareness and adapt to eco-friendly ways.

•Frequent technology changes can confuse them to decide on how to proceed.

•The initial cost for implementing green computing is high.

•Less information is available on green computing, and there's a great level of difference in understanding across end-users, professionals, and companies.

•Companies find it difficult to make decisions due to fragmented data. They must put more effort into collecting and analyzing data and conclude that the method they use is environment-friendly yet profitable for their business.

Conclusion

While the presentation along with the wideness of appliance of computer is growing, so as well as our knowledge of the price and insufficiency of the power necessary to command them, since the equipment required to build them in the initial position. on the other hand, as computing development can permit persons and business to accept greener lifestyle and effort style, in the conditions of the ecological contest computing is absolutely common component of the trouble and element of the explanation. throughout extra environmental alert practice (such as more effective power management and shut-down during periods of inactivity), and by adopt active minor control technology, computers can by now be made much more liveliness professionalism. without a doubt, now as we seem reverse and surprise why automobile a decade or two previously used to knock back so much petrol, in a decade's time we will no hesitation be spread out that a usual desktop PC used to gladly assemble roughly sketch 100-200W of power each hour day and night, and at what time accomplish no additional than display a screensaver. The computing production is ready and faraway more capable than approximately any other production when it comes to in front of and respond to express transformation. Environmentally it is not a good quality that generally PCs -- mainly in companies -- have naturally enters a landfill behind just a little years in package. though, this actuality does at least suggest that a well-known state of mind previously exist for equally adapt to and paying funds for fresh computer hardware on a standard starting point. thus, while it take decades to find further force professional cars on the roads, it will confidently single obtain a subject of years to achieve a situation of dealings where most computers are using far-off fewer control

than they unnecessarily garbage these days.

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LIBRARY CONSORTIA IN INDIA AT A GLANCE

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ABSTRACT

ICT is playing a major role in the all round development of society. Recent developments in the technologies have brought changes in the modes and methods of information, storage, retrieval and transmission. The Internet and web technology has open new dimension to the information systems. Internet, www, web 2.0 etc. has brought a major revolution on the library and information centres also to have access to different information sources and disseminate to the users in the era of information explosion. The paper mainly discusses about the importance of UGC-Infonet Digital Library Consortia for the libraries in the digital world.

***Keywords**: Library consortia, E-journals, UGC-Infonet, INFLIBNET, INDEST.*

Introduction

Today consortium has become a buzzword for the libraries of higher educational institutions of the country and the credit goes to the successful functioning of UGC-Infonet and INDEST Consortium. The exact date when first of all the library consortium was introduced is not known but the concept of a consortium in the form of partnership or association has long been an ideology of librarianship (Nfila and Darkp-Ampem: 2002). There is sufficient published literature on the topic, which indicates that the concept is not new, and it refers to Co-operation, coordination and collaboration between, and amongst, libraries for the purpose of sharing information resources (Kopp: 1998). However the usage of the word became popular in 1980s onwards in general and since 2001 in Assam in particular mainly due to the following factors:

♦ Increase in the output in publication or the information explosion made is practically impossible for any library to fulfill the requirements of its clientele alone.

♦ Budget cut has become a universal trend and the unjustified increase in the cost of publication mainly scientific periodicals made the situation worst.

♦ Development of ICT made the transfer of information digitally possible.

♦ More and more information products became available digitally specially through Internet.

♦ Increasing demand for service from customers together with the need to improve inter library loan services and library collection forced the libraries to form such consortia.

E-Resources

An electronic resource is defined as a resource which requires computer access or any electronic product that delivers a collection of data. Currently, libraries are shifting towards new media, namely electronic resources for their collection development so that the demands of users are better fulfilled. E-journals, e-database, e-books, e-magazines, digital library project, electronic exhibition, e-subject guide, e-newsletters, e-white paper, e-conference proceeding etc. are some of types of e-resources. Many of e-resources are available free to anyone over internet access.

Why Consortia

According to SDC report the main reason for the formation of the consortia was perhaps the thinking that consortial approach offers an attractive solution to many outstanding problems of the participating libraries. With the progress in library automation, use of computers in bibliographic processing and database searching gained boost to reduce sharing and consortia formation. Potter has identified two main reasons for the libraries for formation of consortium. The sharing of existing physical resources is the main reason and the purpose of identifying and addressing the common needs arising from developments in information technology as

other. The growing importance of Internet and www, web 2.0 and possibility of offering a variety of electronic resources across the Internet is also a major factor in the formation of consortia. Specially the digital library consortia have came up due to the increasing awareness that the electronic resources are going to play more and more important role, which are summarized below –

♦ an interest in cooperative projects that might benefit all students and faculty of participating libraries.

♦ Providing enhanced library services with an emphasis on access to new electronic resources, bibliographic databases and services offered through Internet, www and web 2.0.

♦ Controlling building costs by providing regional storage facilities.

♦ Expending inter library borrowing which has evolved into providing as many electronic resources as possible at the lowest cost to consortia members

♦ To endure that faculty and students across all consortia members have equal access to electronic resources. ♦ Better sharing of existing resources.

Need of Library

CONSORTIA pricing models of publishers, electronic publishing of scholarly journals for consortia give new opportunities to libraries to provide immediate access to information. Several reasons could be cited to justify the need for consortia:-

a) INFORMATION EXPLOSION: - Due to intensive researches taking place in almost all fields of knowledge, there is a tremendous increase in the generation of information. Information is provided many forms and formats. It is impossible for libraries to attain self- sufficiency .A consortium is in a better position to address and resolve the problems of managing, archiving e-resources.

b) SHRINKING BUDGET : The cost of books and other information sources is increased day by day .Consortia is built up with a view to increasing the purchasing power of the participating institutes in this critical situation of major financial problem faced by libraries and information centers. A consortium enables its member libraries to get the electronic resources at an affordable cost.

c) DIVERSITY OF USER NEEDS: Library users want to have access to the material as soon as possible and many of them want information in online format. The web based electronic resources are proper a means to meet the expectations of users. d) PROFESSIONALIZATION OF LIBRARY SERVICES: The role of library professionals has changed from mere conservator to navigator of knowledge. It has great challenge for libraries to remain at the front line of the profession. The changed role of librarian has enhanced the value of library consortia. e) QUICK ACCESS: Today researchers hope that they should have access to their journal articles in the electronic form because e-resources are cheaper than print source

Advantages of Consortia

Some of the important advantages of the library consortium are as follows:

•Available 24•&7 days.

•Search bibliography / full text of article

•Journal is available much earlier than print.

•Avoids duplication of resources.

•Provides access to wider range of electronic resources at lower cost.

•Helps develop common resources database.

• Optimum utilization of funds.

• Facilities to build up digital libraries.

Disadvantages f Consortia

•Copyright problems and misuse of research material.

•Absence of printed copies of journals.

•Internet access is necessary.

•Combination of essential and non-essential

journals.

• Requires high initial investment in license and information and

•communication technology.

Indian Scene : Consortia Initiatives in India

Some of consortia available in India are:

1. FORSA Consortium

FORSA CONSORTIUM: Forsa stands for Resource sharing in Astronomy and Astrophysics which was established in July 29, 1981 at Raman Research Institute, Bangalore. At present ARIES bose institute, CASA-OU, HRI, IIA, IUCAA, NCRA (TIFR), PRL and SINP are the institute members of FORSA. FORSA has become a member of ICOLC which has over 160 participants from across the world. In 2004, this group extended its membership to physics and mathematics libraries in the country.

2. CSIR Consortium

CeRA CONSORTIUM: CeRA consortium for e resources in agriculture was established in November 2007 to facilitate accessibility of scientific journals to all researchers / teachers in the national agricultural research system by providing access to info.specially access to online journals which is crucial to attain excellence in research &teaching.

3. UGC-INFONET:

The UGC INFONET digital library consortium was formally launched in December, 2003. By honorable A.P.J Abdul Kalam, the President of India. The consortium provides current as well as archival access to more than10500+ core and peerreviewed journals. The consortium has also launched "Associate Membership programme" wherein private universities and other research organizations are welcomed to join the consortium. As of 2017,230 universities, 3000+colleges and 94 technology institutions are accessing resources from the programme.More than 15000 e-journals and 3135000+e-books , 40 resources and 16 databases are available now.

4. N-LIST (National library and information services infrastructure for scholarly content):

N-LIST is jointly executed by the UGC-INFONET digital library consortium INFLIBNET centre and the INDEST-AICTE consortium, IIT Delhi. N-LIST project provides access to e-resources for students, researchers and faculty from colleges. In sep, 2017 3016 govt/ govt aided colleges and 1668 science colleges are accessing resources through N-LIST. More than 6000+ e-journals and 97,000 + e-books are available now.

5.INDEST-AICTE CONSORTIUM:

Indian national digital library in engineering science $ technology is an initiative by Ministry of Human Resource Development (MHRD) It was set up in 2003 by an expert group appointed by the ministry under the chairmanship of Pro.N.Balakrishan. The INDEST-AICTE consortium has three types of members Core members supported by MHRD (65) , AICTE supported members (94) and self-supported members (102).The total number of members in this consortium is now 1235.It provides access to selected electronic journals and database to technical institutions including IIT and IISc(8), NITs,ISM,SLIET and NERIST (23), IISERs and new IITs (13),IIMs (13) and IIT,IIITM and NITIE(8).

6.ERMED CONSORTIUM:

An electronic resource in medicine consortium is an initiative taken by DGHS & MOHFW. Started in 2008, it has 70 state and centrally funded government institutions (including AIMS) selected from 24 states as it members at present. It also subscribes to 1500 current periodicals. It accesses 242 high quality on line e-journals from five leading publishers.

7.DELCON CONSORTIUM:

DBT e-library consortium (Delcon) has been operational since January 2009. Delcon currently includes 16 DBT institutions including ICGEB, NER institutions, BIRAC etc. 1171 journals and a database named

SCOPUS are covered under Delcon.

Conclusion

In this age of information explosion, a consortium is of paramount significance and is nothing short of a boon. A library consortium is a virtual ocean of knowledge and resources. Libraries have to realize that working together can accomplish far more than what they can do individually. Libraries in India should work cooperatively in order to establish library consortia with a view to offering and sharing electronic resources. By working with consortia libraries can find highly effective solution to help them answer the information questions of the users. Major problems the libraries face these days are prices of journals, budget cut, user‟s demands, globalization of education, integration of various disciplines , but apex bodies like UGC, AICTE, CSIR etc. are working as negotiating bodies to provide discounted subscription to consortium of universities, institutions/ colleges.

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MULTIPLE CULTURAL SIGNIFICANCES AND GLOBAL ECOLOGICAL CRISIS

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ABSTRACT

This paper addresses the issues related to the idea of cultural developments that leads to the present-day global ecological crisis which has become so prevalent in last few decades. The various theoretical assumptions involving to the border perspectives on ecocentricism and cultural studies and its relevance with Indian literary and traditional approaches are discussed in this paper. The consequences of the global crisis due to environmental changes lead us to rethink about the factors affecting environmental imbalance causing its degradation, and resultantly ruining the survival of all the species gradually on this planet, including humans. This is the high time to acknowledge the multiple cultural significances to arrive at sustainable common consensus with which the ecological crisis could be combated.

***Keywords**: Environmentalism, Ecological crisis, Indian literary & cultural traditions*.

Introduction

The cultural communities at different historical moments and geographical spaces tried to apprehend and define nature. They have been constantly trying to envision the bondage between humans and natural environment around them. In this process, nature has consistently been attributed with many cultural functions. The ecological thinkers and ecocritics consistently attempts to understand the concept of nature in oder to apprehend the cultural developments and its environmental implications. The array of cultural life in India obviously has been producing various environmental consequences. All these implicit and explicit concepts of nature have been manifested though wide range of cultural practices and artefacts.

Storytelling prominently provided the variety of narrative structures through which we acknowledge the cultural concepts and functions relating to the natural world. The oral as well as the textual traditions of narrations offer a complete and systematic analysis of the universe. It is through stories that we learn about vulnerability of natural world, and its protection from human impacts as well. Not only the age old ancient stories of 'Panchtantra' or 'Jatakkatha', but also the twentieth century writers, story tellers and novelists developed a sense of oneness with the natural world around us. The concept of nature is constantly conceived as a living entity where human characteristics are attributed to them in the form of language, feelings and rationality. The interaction between the human and non-human world has been naturally adopted and emphasised in Indian narrative traditions. The relation between ecology and human beings becomes quite evident when we experience how Nature plays a vital theme in the writings of many literary stalwarts from Rabindranath Tagore, R.K. Narayan, Mulk Raj Anand, RajaRao to Ruskin Bond. Ancient Indian philosophers generated the human value that the fundamental duty of human being as an intelligent living creature is to protect the environment by emphasising its relation with the entire nature. Hence, even today we have models like 'The Forest Man of India' JadavPayeng from Assam who planted and tended trees on sandbar and turned it into 'Molai' forest of thousands of acres and also the another example of SaalumaradaThimmakka who planted and tended thousands of baniyan trees along a forty-five kilometrestrech of highway of Karnataka. Their service to the nature was performed without any formal education. Eco-criticism attempts to seek out the analysis of narratives, the questions of genre, viewpoint and realism about the natural world. Indian ecocritics focus more on many indigenous non-industrial cultures as an alternative to the most destructive forms industrial developments.

Societies at large, and more specifically in

India have distinctive hierarchies which can be linked together with the environmental degradation around us. The exploitation of human beings with the help of these domineering hierarchies within the society creates catastrophe. The US social ecologist and author of the book 'The Ecology of Freedom', Murray Bookchin, while emphasising the connection between ecological and social issues, argues that better treatment of the environment can only come with the abolition of oppressive hierarchies in human society (Bookchin, 1982).

It becomes quite evident to think of the place of nature in Indian traditions. In India, 'Vasundhara' is the concept used for the earth. The origin could be observed in the Sanskrit term 'Vasudha' implying feminine supremacy and the ultimate source of everything in the nature. Nature has always been considered as sacred in India where humans live a participatory life with environment. At the counterpart, nature is being known as 'Mother Earth' in English, an origin of basic resources on this planet. Although the close link between nature and women was first marked recently by Sherry B. Ortner in her influential essay published in 1974, Indian philosophical traditions reflect its supreme status in customary life. In her essay entitled 'Is Female to Male, as Nature Is to Culture?', sought to explain nature in terms of structuralist anthropology. Even after studying diverse cultures, the basic assumption that the presence of women as subordinate to men becomes much prevalent. Ortner discovers the underlying idea that woman is closer to nature (Ortner , 1974). Under a patriarchal society, the dominant forces certainly stand responsible for the connection between the exploitation of women and nature. Indian philosophy conceives sky as father and earth as mother, unlike western counterpart that conceives cultural oppression over nature resembling the patriarchal exploitation.

It is also important to note the burning issue of Female foeticide recently in last twenty-thirty years around us in India causes much of the environmental damage and affected the gender equivalence. Hence, Indian culture and society adopted and propagated the values and beliefs from time-to-time, but the belief of subordination of women has been legitimised the environmental degradation. On the forefront of Ecofeminism, Indian ecofeminist environmental justice campaigner Vandana Shiva points out that women and children are disproportionately vulnerable to environmental hazards in her notable work 'Staying Alive: Women, Ecology and Development'. She also articulates the fact that rural Indian women as the source of crucial insights and vision have initiated processes to arrest the destruction of nature and begin its regeneration. (Shiva, 2016)

The question regarding environmentalist ideas is becoming centre of academic and theoretical discussions on the major role of environment and the global crisis over it during 1970s and 1980s in western world. The term 'ecocriticism' is frequently used to understand the environmental viewpoint on literary and cultural criticism. Literary writings are evaluated with regard to its harmful and helpful effects on the environment. Ecocritics search alternatives to the most destructible form of industrial developments and focus more the linkages between the indigenous non-industrial culture and wider environmental movements. If the industrial culture is organised to fit into the Indian value patterns, this would have been more rewarding experimentation. The new ecocritical canons contain many texts reflecting the environmental values. Many Indian English novelists after independence wrote against the environmental exploitation and set their writings against the oppression by modern industrial and technological developments silently encroaching the cultural spaces. The novels like 'Kanthapura' by Raja Rao, 'Fire on the mountain', 'Voices in the City' by Anita Desai, 'Nectar in the Sieve' by Kamala Markandaya, 'So Many Hungers' by Bhabani Bhattacharya, 'The God of Small Things' by Arundhati Roy, 'A River Runs Again' by Meera Subramanian, 'The Hungry

Tide', 'The Great Derangement' by AmitavGhosh, 'Nature in the City' by HariniNagendra, 'In the Belly of the River' by AmitaBaviskar, 'The Unquiet Woods' by RamchandraGuha, 'Hullabaloo in the Guava Orchard', 'The Inheritance of Loss' by Kiran Desai and many short stories by these writers reflected the ecological concerns and causes behind the cultural shifts leading to environmental degradation in India. The novel 'Animal's People' by IndraSinha discloses the terrible environmental disaster of Bhopal gas explosion and its consequences. This has created a border attempt to bring together the different environmentalisms of rich and poor. The emergence of environmental justice movement collectively throws back light on the efforts of poor communities defending themselves against the dumping of toxic waste, the harmful contamination of their air, water and food, the loss of their land and livelihoods, and the indifference of government, corporations and also the emerging upper middle class. Ecocritics shed light on the questions of castes, class, race, gender, colonialism, post-colonial understanding into the ecocritical evaluation of textual writings and ideas. It also responses to the challenging versions of environmentalism that ignore the aspirations of the poor and seemingly more preoccupied with preservation of wild nature.

The diversity and multiplicity of cultural constructs that focus its attention on nature helps the environmental justice movements. The earliest ecocritical approach has a striking feature of its hostility to the atmosphere of 'theory'. Karl Kroeber argues that ecocriticism was an escape from 'the esoteric abstractness that afflicts current theorising about literature'(Kroeber, 1994). Strongly enough, the constructionist theories place more emphasis on cultural significances of things than on material reality. It seeks attention to nature more as a cultural and ideological construct. As a result it leads to neglect nature as an objective, material and venerable reality. Though on the verge of rapidly changing traditional patterns, Indian belief looks at the cultural significances that do not disregard moral value of nature in daily life. Nature in its transcendental form couldn't be simply conceptualised and rather worshipped in its dualist or non-dualist streams of interpretations. The communities perform their rituals as a part of their embedded ecology (Nagarajan, 2000).

The Anthropocentricism usually held as the root cause of environmental crisis. Anthropocentricism places humanity at the center of everything and considers that the other forms of life as resources to be consumed by human beings. Some environmentalists describe that religions and more specifically christianity propagate anthropocentric approach as it describes man should have dominion over the other creatures of life. In its disagreement with this notion, ecocriticism places ecosystem at the center than humanity. An ecosystem has no center except in entirely spatial sense and helps to collapse the hierarchical notions of center and margin. In many of the Indian writings in English, landscapes do not function merely as setting, background or symbol. In order to determine environmentally oriented work, Lawrence Buell provides an explicit method of few principles to ecocriticism and describes some sense of the environment as a process than as a constant. Buell asserts that human history is implicated in natural history (Buell, 1995).

Pluralistic and multiplicity of narratives on nature are welcomed by some of the postmodernists who are so intent to reject grand narratives in order to confront the material danger. Based on the dialogic principle of Mikhail Bakhtin, Michael J. McDowell conveys his views that postmodern critical theory 'has become so cought up in analysis of language that the physical world is ignored' (McDowell, 1996). Similarly, Patrick D. Murphy described the possible alternatives that of disembodied voice (Murphy, 2010). Many of these theoretical models discussed earlier need to be critically examined and reformulated with the concern of Indian sensibilities and traditions towards nature.

There has been a dire need to consider the ecological crisis on the basis of rationality as well as morality. The western models of understanding and examining the environmental crisis are insufficient without the other viewpoints described in multiple cultures.

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REVIEW ON REPORTS OF THE CURRENT STATUS OF OZONE LAYER DEPLETION FROM DIFFERENT ENVIRONMENTAL ORGANISATIONS

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ABSTRACT

Ozone, the powerful invisible shields of Earth. Ozone absorbs UV radiation from the sun. It reacts readily with many other substances. Ozone layer depletion or ozone hole could have serious effects on human health and the environment. This reduction has largely been driven by the 1987 United Nations Environment Programme (UNEP) Montreal Protocol and other organisations.

***Keywords**: Ozone, depletion, Environmental organisationsetc*

Introduction

Above the Earth's surface, the ozone layer is a region of high ozone concentration in the stratosphere, 15 to 35 kilometres. Ozone is a colourless gas. Chemically, ozone is very active and reacts with many other substances. Ozone is a gas made up of three oxygen atoms (O_3). It occurs naturally in small (trace) amounts in the upper atmosphere (the stratosphere). Ozone protects life on Earth from the Sun's ultraviolet (UV) radiation. When an ozone molecule absorbs UV-B, it comes apart into an oxygen molecule (O2) and a separate oxygen atom (O) then reform the ozone molecule (O3). As well as UV-B, the sun also emits another form of ultraviolet light, UV-C. When UV-C light reaches the stratosphere, it is completely absorbed by oxygen molecules and never reaches the Earth's surface. UV-C splits oxygen molecules into oxygen atoms. These single atoms then react with other oxygen molecules to produce ozone. So, these reactions increase the amount of ozone in the stratosphere.

Ozone is being produced and destroyed all the time. To measure total ozoneDobson Unit (DU) is used. The ozone in a column of air stretching from the surface of the earth to space, and bring all that ozone to standard temperature (0 °Celsius) and pressure (1013.25 millibars), the column would be about 0.3 centimeter thick. Thus, the total ozone would be 0.3 atm-cm. The total ozone column based on SCIAMACHY, GOME or OMI measurements were all delivered in near-real time, but this was stopped on 1 April 2021 (https://www.temis.nl)

Thisdepletionor "ozone hole" is observed from last few decades. During the Southern Hemisphere spring, chemical reactions involving chlorine and bromine cause ozone in the southern polar region to be destroyed rapidly and severely. The area of the ozone depletion is determined from a map of total column ozone. It is calculated from the area on the Earth that is enclosed by a line with a constant value of 220 Dobson Units. The value of 220 Dobson Units is chosen since total ozone values of less than 220 Dobson Units were not found in the historic observations over Antarctica prior to 1979. Also, from direct measurements over Antarctica, a column ozone level of less than 220 Dobson Units is a result of the ozone loss from chlorine and bromine compounds.
(https://ozonewatch.gsfc.nasa.gov/)

Halogens or ozone-depleting substances (ODSs) were used in thousands of products in people's daily lives around the world. Chlorofluorocarbons (CFCs), used in air conditioners, refrigerators, aerosol cans, and in inhalers used by asthma patients. When a CFC molecule reaches the stratosphere, it eventually absorbs UV radiation, causing it to decompose and release its chlorine atoms. One chlorine atom can destroy up to 100,000 ozone molecules. Too many of these chlorine and bromine reactions disrupt the delicate chemical balance that maintains the ozone layer, causing ozone to be destroyed faster than it is created. Other substances like hydrochlorofluorocarbons (HCFCs), halons and methyl bromide also deplete the ozone layer. Car dash boards, electronic appliances cleaned with ozone-depleting solvents,

insulation foams in our houses and office buildings, water boilers and even shoe soles were made using CFCs or HCFCs. Offices, computer facilities, military bases, airplanes and ships extensively used halons for fire protection. A lot of the fruit and vegetables we ate were fumigated by methyl bromide to kill pests. These are the causes the thinning of the ozone layer/hole above Antarctica. The amount of ozone depleting substances in the atmosphere is also sufficient to cause ozone destruction in the Arctic atmosphere. This is not an annual phenomenon because the Arctic stratosphere is usually less isolated and it does not experience very low temperatures for extended period of time which are required for sustaining the ozone destruction.

Review

In the mid-1970s, scientists realised that the ozone layer was threatened by the accumulation of gases containing halogens (chlorine and bromine) in the atmosphere. Then, in the mid-1980s, scientists discovered a "hole" in the ozone layer above. The United Nations Environmental Program's Montreal Protocol signed in September 16, 1987, enforced in 1989, marked as Ozone Day. The Protocol provides a set of practical, actionable tasks to phase out ozone-depleting substances that were universally agreed upon. The Montreal Protocol is a global agreement to protect Earth's ozone layer by phasing out the consumption and the production of most chemicals that deplete it.

The Vienna Convention for the Protection of the Ozone Layer was adopted in 1985 and entered into force in 1988. The members agreed to research and monitor the effects of human activities on the ozone layer and to take concrete action against activities that are likely to have adverse effects on the ozone layer.

The latest World Meteorological Organisation and UN Environment Programme Scientific Assessment on Ozone Depletion, issued in 2018, (https://library.wmo.int) concluded that these measures will lead the ozone layer on the path of recovery and to potential return of the ozone values over Antarctica to pre-1980 levels by 2060.

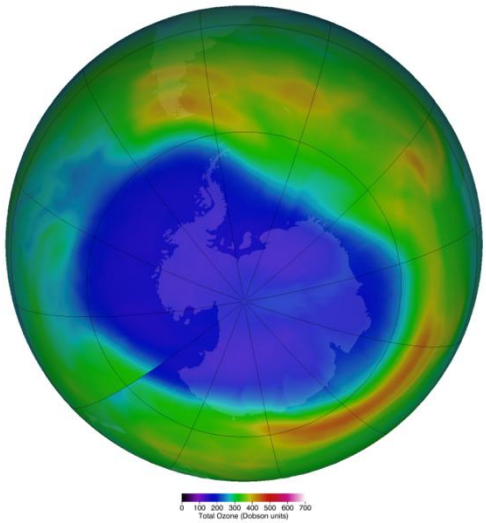
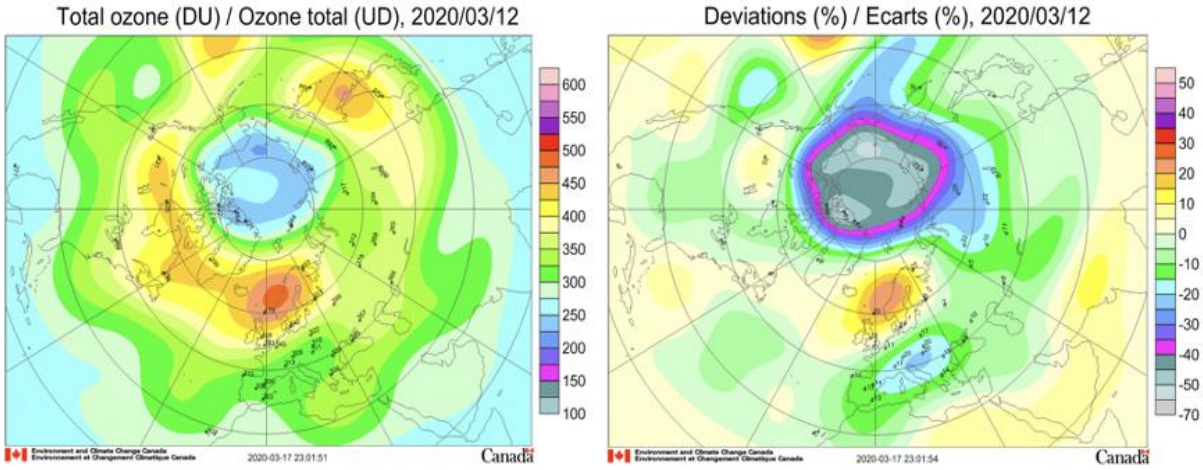


Image: NASA Ozone Watch product based on satellite observations for 12 September 2020. The false-color view of the monthly-averaged total ozone over the Antarctic pole. The blue and purple colors are where there is the least ozone, and the yellows and reds are where there is more ozone. The area of the ozone hole is determined by locations where the total ozone concentration falls below 220 Dobson units.

Specific dynamic conditions in the stratosphere in 2019 led to the smallest Antarctic ozone hole since the ozone hole was first discovered. Upto August 2020, the ozone hole reappeared and is rapidly growing. Its evolution is being monitored by means of satellites and a number of ground-based observing stations of the Global Atmosphere Watch Programme. Those observations are being combined with numerical modelling by different organisations and institutions including NASA, the Copernicus Atmospheric Monitoring Service implemented by the European Centre for Medium-Range Weather Forecasts (ECMWF), Environment and Climate Change Canada, and the Netherlands NationalMeteorological Institute, KNMI to provide near-real time information and analyses on the ozone levels at different parts of the stratosphere, the location and dimensions of the ozone depleted area.



Environment and Climate Change Canada ozone maps for Northern Hemisphere on 12 March 2020 when the stratospheric ozone levels reached their lowest levels

A combination of unusually weak upper atmospheric waves, strong stratospheric polar vortex with consistent very low temperatures for long period of time in the spring of 2020 resulted in an early formation of the record low ozone levels over the Arctic lower stratosphere. (https://public.wmo.int). The full impact of such strong ozone depletion, which would have been even worse if it had not been for the Montreal Protocol, is still being evaluated.

Conclusion

According to the Copernicus Atmosphere Monitoring Service (CAMS), the ozone hole has shown signs of healing since 2000, which is predominantly attributable to phasing out ozone-depleting substances under the Montreal Protocol. At the same time, the extent of the ozone hole is strongly driven by stratospheric temperature, with warmer temperatures leading to a smaller ozone hole, such as in 2019. Not directly attributable to anthropogenic climate change, since greenhouse gases generally have a cooling effect in the stratosphere, while they contribute to global warming in the troposphere. This stratospheric cooling has a positive effect on ozone recovery with the exception of the polar regions its reported by European Environmental Agency and other organisations. The Montreal Protocol is unique in having the flexibility to respond to new scientific information. Since its inception the Protocol has successfully met its objectives, and continues to safeguard the ozone layer today.

Although the use of halons and chlorofluorocarbons (CFCs) has been discontinued, they will remain in the atmosphere for many decades. Even if there were no new emissions, there is still more than enough chlorine and bromine present in the atmosphere to destroy ozone at certain altitudes over Antarctica from August to December. The formation of the ozone hole is still expected to be an annual spring event. Its size and depth are governed to a large degree by the meteorological conditions particular for the year.

“The ozone layer is now healing, safeguarding human and ecosystem health. But the work of the Montreal Protocol is not over. Through the Protocol’s Kigali Amendment, the international community is finding alternatives for coolants that contribute to the growing menace of climate disruption. If fully implemented, the Kigali Amendment can prevent 0.4 degrees Celsius of global warming,” said UN Secretary-General Antonio Guterres.

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ENVIRONMENTAL CONSCIOUSNESS IN HIGHER EDUCATION INSTITUTIONS: AN ANALYTICAL STUDY

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ABSTRACT

Over the past decade the concept of environment gained tremendous importance in the academic sphere. To instill the sense of environmental consciousness in younger generation, higher education system has incessantly introduced courses and organized related programs. In annual system, environment subject was included as a discipline specific paper at graduation level while in CBCS system environment was mandatory in all streams. In New Education Policy (NEP 2020) the significance and understanding of environment has been reiterated in the form of extracurricular and mandatory paper. All such constructive and effective efforts to sensitize students regarding environment issues, higher educational institutes took initiatives to attune themselves with the parameters of NAAC. The objective of the research paper is to set the comparative study of accreditation proformas issued in 2012 and 2017 and to analyze their effectiveness in developing the environmental consciousness in students.

***Keywords**: New Education Policy, National Assessment and Accreditation Council, Higher Education Institutions, consciousness.*

Introduction

Environment refers to the surrounding including abiotic and biotic elements which make the existence of all living organism possible. The extensive application of the word 'environment' is not confined to air, water and soil but it comprises the set of social and cultural values related to a particular place at a specific time. Over the past decade the concept of environment gained tremendous importance in the academic sphere. Various organizations have been set up and summits are held worldwide regularly to take up the cause of environment protection.

To bring about change in the society, younger generation is always made aware and motivated as the bearers of future commitments. Commenting on the role of younger generation, Franklin D. Roosevelt said; "We cannot always build the future for our youth, but we can build our youth for the future". Over last decade, the environment course has been the integral part of the curriculum at graduation level. The main purpose of inclusion of environment paper was to create awareness among students regarding climate change and adopt necessary actions such as energy conservation, rain water harvesting and waste recycling etc.. To instill the sense of environmental consciousness in younger generation, higher education system has incessantly introduced courses and organized related programs. In annual system, environment subject was included as a discipline specific paper at graduation level while in CBCS system environment was mandatory in all streams. In New Education Policy (NEP 2020) the significance and understanding of environment has been reiterated in the form of extracurricular and mandatory paper.

Though the institutions have also displayed sensitivity to such issues but somehow very little change was realized in the attitude and behavior of students towards environment. A survey conducted by The Hindustan Times-MaRS Monitoring and Research Systems Youth Survey 2017 revealed the fact that:

more than 74% of people between the ages of 18 and 25 are not aware of how greenhouse gases cause global warming. Renewable energy is a mystery to 70.9% of the respondents and 63.4% cannot explain why bio-degradable waste is important. Sustainable practices are limited to switching off lights at home and avoiding use of plastic bags as far as possible. (*Hindustan Times*)

Such lack of knowledge among youngsters could be attributed to the fact that environment course was designed merely for learning and the practical aspect seemed to be missing. Though higher educational institutes took

initiatives towards environment issues but just to fulfil the condition of accreditation framework.

The main purpose of introducing the accreditation body is to improve the quality of higher education and ascertain the level of institution based on various parameters. National Assessment and Accreditation Council (NAAC) was established on the recommendations of National Policy on Education (NPE,1986) and the Program of Action (PoA,1992). Since the beginning of accreditation process of Institutions by NAAC, the environment concern has always been the significant part of the of the accreditation framework The main objective of NAAC including environment part was to involve the Higher Education Institutions more intensively and to take up more initiatives at its own level to instil the sense of environmental consciousness in students. The accreditation framework launched in 2012 shows the nature of questions based on environment is somewhat general type that's why hardly any sustainable efforts were made by HEI.The detailed study of questions in both the proformas has led to analyse and conclude that environment concern has always been the considerable part of accreditation framework of institutions. The nature of questions and their allotted marks show the difference in applicability of environment related initiatives by the institutions.

Questions included in 2012 accreditation framework are as follows:

2012 -Criterion VII: Innovations and Best Practices

- Environment Consciousness – 30

1.	Green Audit
2.	Promotion of eco-friendly campus
3.	E-waste management

The revised accreditation framework launched in July 2017 is objective, ICT enabled, scalable, robust and specific. The direct and specific nature of questions has led the institutions to take innovative steps towards environment issue. List of questions included in 2017 accreditation framework is as follows:

2017 -Criterion VII: Institutional Values and Best Practices

- Institutional Values and Social Responsibilities – 50

7.1.2	The Institution has facilities for alternate sources of energy and energy conservation measures- (5) 1.Solar Energy 2.Biogas Plant 3.Wheeling to the Grid 4.Sensor based energy conservation 5.Use of LED bulbs/power efficient equipment
7.1.3	Describe the facilities in the Institution for the management of the following types of degradable and non-degradable waste- (4) 1.Solid waste management 2.Liquid waste management 3. Biomedical waste management 4.E-waste management 5.Waste recycling system 6.Hazardous chemicals and radioactive waste management
7.1.4	Water conservation facilities available in the Institution- (4) 1.Rain water harvesting 2.Borewell/Open well recharge 3.Construction of tanks and bunds 4. Waste water recycling 5.Maintenance of water bodies and distribution system in the campus
7.1.5	Green campus initiative include: (4) 1.Restricted entry of automobiles 2.Use of bicycles /Battery Powered vehicles 3.Pedestrian Friendly Pathways 4.Ban on use of Plastics 5.Landscapping with trees and plants
7.1.6	Quality audits on environment and energy regularly undertaken by the institution and any awards received for green campus initiatives: (5) 1.Green Audit 2.Energy Audit 3.Environment Audit 4.Clean and green campus recognitions/awards 5. Beyond the campus environmental promotion activities

The inclusion of such questions is an effort towards developing the environmental consciousness in students and taking up sustainable steps on the part of the institutions. Though some positive changes have been observed in the attitude and behavior of

students towards environment but to achieve the desired state, the involvement of students must be ensured in all initiatives taken up by the institutions.

Education implies the practical aspect of learning. While defining the difference between learning and education based on the philosophy of Tagore, Sandip Banerjee said that, "We have moved from "IQ to EQ to SQ-only to pronounce the necessity of human understanding in education….To him (Rabindranath Tagore) education should make us feel along with making us think; it should provide knowledge to ensure its applications. Then only the society in itself can be healthier." The implication of such ideas can produce the desired results of policies and positive change can take place in the society regarding environment issues.

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NOVEL SYNTHESIS AND PHYSIOCHEMICAL ASPECT OF SUBSTITUTED-1, 3-THIAZOLES

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ABSTRACT

As a part of systematic investigation of synthesis of compounds. the chlorosubstituted -1,3-thiazoles synthesized from chalcones as starting material and treated with thiourea and phenyl thiourea in alcoholic KOH medium. we get, phenyl-2-hydroxy chlorosubstituted 2-amino-1, 3-thiazoles Purity of compounds monitored by chemical properties, spectral analysis and analytical results,. In present investigation Calvin and Meichior(known as Calvin-Bjerrum) titration technique has been employed. The data obtained by this techniques used to understand the effect on dissociation of OH group, proton-ligand and metal-liganmd stability constants of complexes of newly synthesized chloro-substituted 1,3-thiazoles have been studied. The dissociation and association constants 70% dioxane-water mixture studied with pH-metrically. The deviation between ligand curve and metal-ligand curves indicates the commencement of process of complex formation between ligand and metal ion. The change in colour of complex solution from light yellow to bright yellow between the pH ranges of 3.0 to 12 also indicates the complex formation. The metal-ligand stability constants determined by half-integral method at η=0.5 and 1.5.The values of η estimated by applying Irving-Rossotti expression

***Keywords**: 1,3-thiazoles, proton-ligand and metal- ligand stability.*

Introduction

Thiazole is the five membered ring system which contain two heteroatoms (N & S) placed in the heterocyclic ring at 1,3 position. Thiazoles are very useful units in the field of medicinal chemistry and pharmaceutical chemistry and have been reported to exhibit a variety of biological activities.[1-4]

In the present study, various 5-phenyl-2-substituted amino thiazoles were synthesized from 2-bromo diketones and

It has been well established that the presence of 4-phenyl (2'-hydroxy-3', 5'-dichloro) moieties shows the M-L stability with the transition metal complexes.

Recent studies on complex formation have revealed that the ligand structure plays a critical role in selectivity for metal ions. 4-phenyl-2-imino chloro substituted thiazoles are good complexing agents due to electron donor nitrogen. So far meagre work have been carried out on the stability constants of transition metal complexes with the above moiety.[5,6,7].

It was, therefore, thought of interest to study the chelating complexes of 4-pheyl-2-imino chlorosubstitutedthiazoles under suitable conditions pH metrically.

The solutions of ligands were prepared in 70% DMF water medium. The solutions of NaOH, HNO_3, cobalt nitrate and copper nitrate of (Analytical grade) were used. The metal content in its solution was estimated by standard method[8]. The pH measurements were carried out with 335 Systronics pH meter (accuracy ± 0.1 ^oC. The □ values (pH meter reading) in 70% DMF water mixture were converted to H^+ proposed by Van Uiterts and Hass[8.] The pH meter was calibrated by standard buffer solution (pH 4.00, 7.00, 9.00)

Experimental section

Melting points have been determined in open capillary and are uncorrected. Purity of compound was monitored on silica gel coated TLC plate. The I.R. spectra were recorded on FTIR FTLA 2000 Spectrophotometer in KBrpelates. PMR spectra on spectrometer in $CDCl_3$. U. V. spectra on spectrophotometer (Schimadzu U.V. 1601). The analytical data of compound were highly satisfactory. All the chemicals used were analytical grade. Physical characterization data of all the compounds are given in Table I.

Experimental procedure involves the following three sets of titrations:

1. Free acid titration (HNO_3 x 10^{-2} M), (A)

2. Free acid + ligand titration (ligand 20 x 10^{-4}

M), (A+L)

3. Free acid ligand + metal ion titration (4×10^{-4} M), (A+L+M)

The titrations were carried out with standard NaOH solution (0.12 M) in presence of an inert atmosphere by bubbling a constant flow of nitrogen gas at constant temperature (27 ± 0.5 ^{o}C). The pH were recorded for each addition of 0.2 ml. Ionic strength was kept constant at 0.1 M by adding an appropriate volume of 0.1 M KNO_3 solution.

The following systems were studied:

1. pK values of L_1 and L_2 in 70% DMF water medium at 27^{o}C

2. Log k values of Co(II), Cu(II), with ligands L_1 and L_2 were investigated.

Both ligands are monobasic containing only one –OH group; hence its dissociation is represented as below:

$$HL \rightleftharpoons H^+ + L^-$$

The deviation between acid curves and acid ligand curves started at about pH 2.0; it remained constant up to pH 2.8 and it increased continuously up to pH 12. This induced the dissociation of –OH group, which is present in the ligand part of complex structure. For all system this deviation gradually increases up to pH 11.00 to 12.00, which shows dissociation of –OH group of ligands.

Proton-ligand formation number ($\bar{\eta}_A$)

The proton ligand formation numbers η_A were calculated from acid titration curves (A) and (A +L) by Irving and Rossotti's expression[10]. The pK values were estimated from formation curves (η_A vs. pH) by noting the pH at which η_A = 0.5. The accurate values of pK were determined by half-integral method, which are presented in Table2

2-Hydroxy- 3,5-dichloro acetophenone (1):

2-Hydroxy 5-chloro acetophenone (3gm) was dissolved in acetic acid (5ml). Sodium acetate (3gm) was added to the reaction mixture and then chlorine in acetic acid reagent (40 ml, 7.5 w/v) was added drop wise with stirring. The temperature of the reaction mixture was maintained below 20 °C. The mixture was allowed to stand for 30 minutes. It was poured into water with stirring. A pale yellow solid then obtained was filtered, dried and crystallized from ethanol.

I.R. (KBr): 3068 cm^{-1} (-OH phenolic), 1652 cm^{-1} (>C=O in ketone), 1304 cm^{-1} (-OH bending in phenol), 737 cm^{-1} (C-Cl stretching). **PMR:**δ 2.65; (s, 3H, -CH_3); δ 7.25 -7.63 (m, 2H, ArH); δ 12.71 (s, 1H, Ar-OH). **U. V.:344 nm**

2'-Hydroxy 3, 5-dichloro-4-ethyl chalcone (2a):

2-Hydroxy- 3, 5-dichloro acetophenone (1), (0.1M) was dissolved in ethanol (50 ml), propanaldehyde (0.1M) was added to the above solution and mixture was heated to boiling. Aq. sodium hydroxide solution (40%, 40 ml) was added drop wise with constant stirring. The mixture was stirred mechanically at room temperature for about half an hour and kept for overnight. Then it was acidified by hydrochloric acid solution (50%). The solid separate was filtered, acid washed with sodium bicarbonate (10 %) followed by water. The crude product was crystallized from ethanol acetic acid mixture (2a).

I.R. (KBr): 3068 cm^{-1} (-OH phenolic), 1646 cm^{-1} (>C=O in ketone), 1304 cm^{-1} (-OH bending in phenol) 1559 cm^{-1} (-C-CH=CH asymmetric stretching), 647 cm^{-1} (C-Cl stretching). **PMR:**δ 2.56-2.67 (d, 1H, -CH=CH); δ 7-8 (s, 2H, ArH); δ 12.6 (s, 1H, Ar-OH); **U.V.: 340.5 nm**

1-(2-hydroxy-3', 5'-dichlorophenyl)-2, 3-dibromo-pentan-1-one (3a):

2'-hydroxy-3, 5'-dichlorophenyl-4-ethylchalcone (2a), (0.01M) was suspended in glacial acetic acid reagent (6.4 ml) (25%, w/v) was added drop wise with constant stirring. After complete addition to reagent the reaction mixture was kept at room temperature for about 30 minutes. The solid product separated was filtered and washed with a little petroleum ether to get compound (3a).

I.R (KBr): 3068 (-OH phenolic), 1647 (>C=O stretching); 1304 (OH bending in phenol); 737

(C-Cl stretching); 642 (C-Br stretching). **PMR:** δ 2.67 (d, 3H, -CH_3); δ 7.5 to 7.7 (s, 2H, Ar-H); δ 7.25 (s, CH=CH none conjugated); δ 12.7 (s, 1H, Ar-OH).

UV: 341 nm

1-(ethyl-6,8-dichloroflavone) (4a):

1-(2-Hydroxy-3, 5-dichlorophenyl)-2, 3-dibromo-pentan-1-one (3a) (0.01 mol) was dissolved in ethanol (25 ml.). To this, aqueous KOH solution (25 ml.) was added. The reaction mixture was then refluxed for 1 hour, cooled and diluted with water. The product thus separated was filtered and crystallized from ethanol to get the compound (4a).

1-(2-hydroxy -3, 5-dichlorophenyl) –pentan-1, 3-dione (5a):

1-(Ethyl-6,8-dichloroflavone) (4a), (0.01 mol) was dissolved in ethanol (25 ml.). To this, aqueous KOH solution (25 ml.) was added. The reaction mixture was then refluxed for 1 hour, cooled and diluted with water. The product thus separated was filtered and crystallized from ethanol to get the compound (5a)).

1-(2-hydroxy-3, 5-dichlorophenyl)-2-bromo-pentan -1,3-dione (6a):

1-(2-Hydroxy 3, 5-dichlorophenyl) –pentan-1,3-dione (5a), (0.01 mol) was dissolved in a mixture of ethanol (10 ml) and dioxane (10 ml). To this, calculated amount of liquid bromine (0.5ml) was added. The product was not separated even after standing one hour. It was then diluted with water. It was again washed with water several times and extracted with ether. The solvent was removed under reduced pressure to get the white solid of the compound (6a).

5-(2-hydroxy-3, 5-dichlorophenyl) - 4-(propan-1-one)-2-amino -1, 3-thiazole (7a):

1-(2-hydroxy-3, 5-dichlorophenyl)-2-bromo-pentan -1,3-dione (6a), (0.01 mol) and thiourea (0.01 mol) were dissolved in ethanol (25 ml). To this, aqueous KOH solution (0.02 mol) was added. The reaction mixture was then refluxed for 2.5 hours, cooled and diluted with water and acidified with conc. HCl. The product thus separated was filtered and crystallized from ethanol to get the compound (7a).

I.R (KBr): 3068 (-OH phenolic), 3300 (N-H stretching); 1305 (OH bending in phenol); 1022 (-C-S stretching); 736 (C-Cl stretching). **PMR:** δ 2.70 (s, 1H, -CH_3); δ 6 to 8 (s, Ar-H); δ 6.1 (s, 1H, -NH stretching); δ 12.7 (s, 1H, Ar-OH). **UV: 340 nm**

5-(2-hydroxy-3,5-dichlorophenyl)-4-(propan-1-one)-2-aminophenyl-1,3-thiazole (8a)

A synthesis of (8a) compound was in similar manner as such (7a), instead of thiourea, phenyl thiourea was used.

IR (KBr): 3068 (-OH phenolic stretching); 3300 (-NH stretching); 1305(-OH bending in phenol); 1178 (-CS stretching); 738 (C-Cl stretching). **PMR:**δ 2.7(s, 3H, -CH_3 stretching), δ 7 to δ 8 (s, 1H, Ar-H); δ 6.1 (s, 1H, NH stretching); δ 12.7 (s, 1H, ArOH). **UV:** 341 nm

2'-hydroxy-3,5-dichloro-4-hexylchalcone (2b)

2-hydroxy 3, 5-dichloro acetophenone (1), 0.1M was dissolved in ethanol (50 ml), heptanaldehyde (0.1 M) was added to the above solution and mixture was heated to boiling. Aq. sodium hydroxide solution (40%, 40 ml) was added drop wise with constant stirring. The mixture was stirred mechanically at room temperature for about half an hours and kept for overnight. Then it was acidified by hydrochloric acid solution (50 %). The solid separated was filtered, acid washed with sodium bicarbonate 10% followed by water. The crude product was crystallized from ethanol acetic acid mixture.

IR (KBr): 3068 (-OH phenolic stretching); 2926 (aliphatic C-H stretching); 1646 (>C=O stretching); 1558(-C-CH=CH stretching); 641 (C-Cl stretching). **PMR:** δ 2.6 (s, 3H, -CH=CH); δ 7.4-7.8 (s, 2H, Ar-H); δ 12.7 (s, 1H, Ar-OH). **UV: 342 nm**

1-(2-hydroxy-3, 5-dicholorophenyl)-2,3-dibromo-nonan-1-one (3b):

2'-hydroxy-3',5'-dichlorophenyl-4-hexylchalcone(2b),(0.01M) was suspended in

glacial acetic acid reagent (6.4 ml) (25%, w/v) was added drop wise with constant stirring. After complete addition to reagent the reaction mixture was kept at room temperature for about 30 minutes. The solid product separated was filtered and washed with a little petroleum ether to get compound (3b).

I.R (KBr): 3068 (-OH phenolic); 2857 (aliphatic C-H stretching); 1647 (>C=O stretching aryl ketone); 642 (C-Cl stretching); 604 (C-Br stretching). **PMR:** δ 2.65 (s, 3H, -CH_3); δ 7.2 to 7.6 (m, 2H, Ar-H); δ 12.7 (s, 1H, Ar-OH). UV: **338.5 nm**

1-(hexyl-6,8-dichloroflavone) (4b):

1-(2-Hydroxy-3,5-dichlorophenyl)-2,3-dibromo-nonan-1-one (3b)

(0.01 mol) was dissolved in ethanol (25 ml.). To this, aqueous KOH solution (25 ml.) was added. The reaction mixture was then refluxed for 1 hour, cooled and diluted with water. The product thus separated was filtered and crystallized from ethanol to get the compound (4b).

1-(2-hydroxy 3,5-dichlorophenyl)- nonan-1,3-dione)(5b):

1-(Hexyl-6, 8-dichloroflavone) (4b), (0.01 mol) was dissolved in ethanol (25 ml.). To this, aqueous KOH solution (25 ml.) was added. The reaction mixture was then refluxed for 1 hour, cooled and diluted with water. The product thus separated was filtered and crystallized from ethanol to get the compound (5b).

1-(2-hydroxy-3, 5-dichlorophenyl)-2-bromo-nonan -1,3-dione (6b):

1-(2-Hydroxy 3, 5-dichlorophenyl) -nonan- 1, 3-dione (5b), (0.01 mol) was dissolved in a mixture of ethanol (10 ml) and dioxane (10 ml). To this, calculated amount of liquid bromine (0.5ml) was added. The product was not separated even after standing one hour. It was then diluted with water. It was again washed with water several times and extracted with ether. The solvent was removed under reduced pressure to get the white solid of the compound (6b).

5-(2-hydroxy-3,5-dichlorophenyl)-4-(heptan-1-one) -2-amino- -1,3-thiazole (7b)

1-(2-hydroxy-3, 5-dichlorophenyl)-2-bromo-nonan-1, 3-dione (6b), (0.01 mol) and thiourea(0.01 mol) were dissolved in ethanol (25 ml.). To this, aqueous KOH solution (0.02 mol) was added. The reaction mixture was then refluxed for 2.5 hours, cooled and diluted with water and acidified with conc. HCl. The product thus separated was filtered and crystallized from ethanol to get the compound (7b).

IR (KBr): 3067 (-OH phenolic stretching); 3206 (NH stretching); 2950 (aliphatic C-H stretching); 1304(OH bending in phenol); 1045 (C-S stretching); 696 (C-Cl stretching). **PMR:** δ 2.70 (s, 1H, -CH_3); δ 7 to 8 (s, -ArH); δ 4.7 (s, 1H, NH stretching); δ 12.7 (s, 1H, Ar-OH). **UV:** 341 nm

5-(2-hydroxy-3,5-dichlorophenyl)-4-(heptan-1-one)-2-aminophenyl-1,3-thiazole (8b)

Synthesis of (8b) compound is similar manner as such (7b) instead of thiourea, was used phenyl thiourea.

IR (KBr): 3068 (-OH phenolic stretching); 3200 (NH stretching); 1304(OH bending in phenol); 1173 (C-S stretching); 737 (C-Cl stretching). **PMR:** δ 2.70 (s, 1H, -CH_3); δ 7 to 8 (s, -ArH); δ 4.7 (s, 1H, NH stretching); δ 12.7 (s, 1H, Ar-OH). **UV:** 340 nm

Results and discussion

From the table, it appears that dissociation of these ligands occurred at higher pH. All ligands showed their dissociation in the pH range 9-12. The pK value of $L_1$is found to be greater (i.e., 12) as compared to ligand 2. This may be due to the presence of phenyl ring group as an electron-releasing group that there is reduction in pK values.

The pK values are found decrease in the order ligand L_1>ligand L_2.

Metal ligand stability constant;

The deviation between (acid + ligand) and (acid + ligand+ metal) curves started from pH 2.8 and increased continuously up to pH 12.0. It showed the commencement of complex formation. Intense colouration was observed

which also indicated the formation of complex. The formation curves were constructed between η and pH. The metal ligand stability constants were determined by half-integral method at η= 0.5 and 1.5. The values of η are estimated by applying Irving-Rossotti1 expression[10]. The maximum values of η was obtained at about of K_1 and log K_2 for complexes are calculated and presented in Table 3.

It was observed from Table 3 that log k_1 values are grater than log k_2 values for all metal complexes.

The log k_1 and log k_2 values follow the order as Co (II), Cu (II). It could be seen (Table-3) that log k values follow increasing trend. This may be due to phenyl group as electron releasing group.

It could be seen from data in all the cases that the differences between log k_1 and log k_2 are found to be greater which shows formation of stepwise complex. The value of ratio of log k_1 / log k_2 is positive in all the cases (Table3). The implies that there is no steric hindrance to the addition of secondary ligand molecule.

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Table (1): Characterization data of synthesized new compound

Compound	Molecular Formula	M.P. (°C)	Yield (%)	Rf
1	$C_8H_6O_2Cl_2$	53	75	0.84
2a	$C_{11}H_{10}O_2Cl_2$	98	70	0.83
3a	$C_{11}H_{10}Br_2Cl_2O_2$	75	90	0.75
4a	$C_{10}H_8O_2Cl_2$	142	60	0.80
5a	$C_{11}H_{10}O_3Cl_2$	110	65	0.76
6a	$C_{11}H_9O_3BrCl_2$	78	60	0.78
7a	$C_{18}H_{15}O_2N_2SCl_2$	120	75	0.82
8a	$C_{18}H_{15}O_2N_2SCl_2$	120	75	0.82
2b	$C_{15}H_{18}O_2Cl_2$	103	70	0.86
3b	$C_{15}H_{18}Br_2Cl_2O_2$	52	80	0.75
4b	$C_{14}H_{10}O_2Cl_2$	128	65	0.82
5b	$C_{15}H_{18}O_3Cl_2$	121	70	0.76
6b	$C_{15}H_{17}O_3Br_2Cl_2$	88	55	0.81
7b	$C_{22}H_{23}O_2N_2SCl_2$	138	70	0.83
8b	$C_{22}H_{23}O_2N_2SCl_2$	138	50	0.82

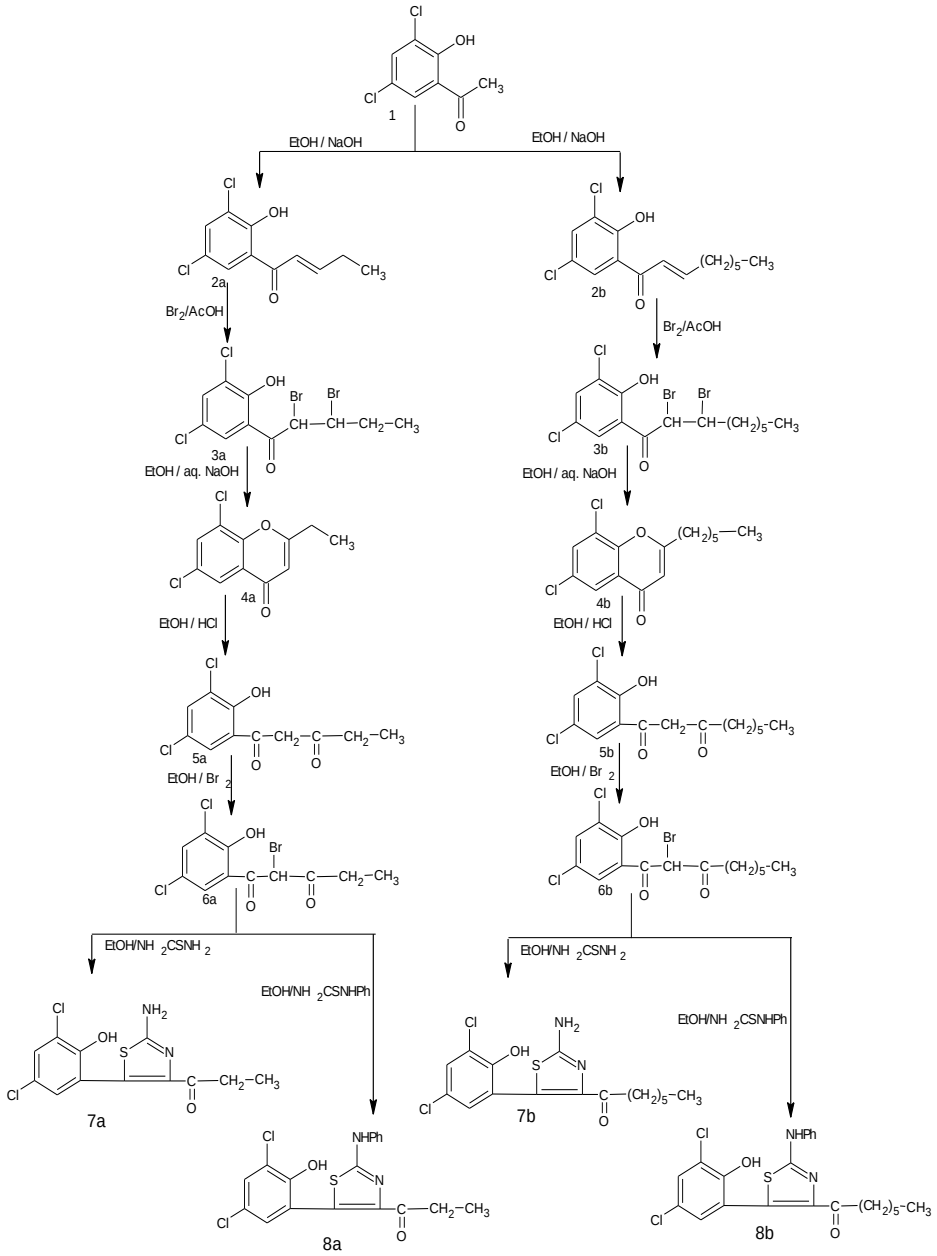

Table 2 :- Determination of proton ligand stability constants (pK) of chloro substituted thiazoles at 0.1M ionic Strength

System	Constant pK
5-(2-hydroxy-3, 5-dichlorophenyl) - 4-(propan-1-one)-2-amino -1, 3-thiazole .	12
5-(2-hydroxy-3,5-dichlorophenyl)-4-(propan-1-one)-2-aminophenyl-1,3-thiazole .	9.8

Table 3 :- Determination of metal-ligand stability constants (log k) of Co (II), Cu (II) complexes with Chloro substituted -1,3 thiazines at 0.12 M ionic Strength.

Systems	metal ligand stability constant(Log k)		Metal ligand stability constant(Half-integral method)	
	Log k_1	log k_2	logk_1-logk_2	log k_1/ logk_2
Co (II)L_1 complex	11.4	6.25	5.15	1.824
Cu (II)L_1 complex	7.99	5.78	2.21	1.382
C0 (II)L_2 complex	10.1	4.75	5.35	2.126
Cu (II)L_2 complex	6.42	4.22	1.90	1.420

NOVEL SYNTHESIS OF ISOXAZOLES AND STUDIED THEIR ANTIBACTERIAL ACTIVITIES

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ABSTRACT

The synthesis, spectral analysis and effect on some crop plants by some 4-Aroylisoxazoles with 3- aroylflavone on treatment with NH2OH.HCl.We got two series while carried out in different aromatic acids. In series, we got 3-(2-hydroxy-3,5-dichlorophenyl)-4-anisoyl-5-(3-nitro phenyl) isoxazole and 3-(2-hydroxy-3,5-dichlorophenyl)-4-benzoyl-5-(3'-nitrophenyl) isoxazole. It has been revealed that, the use of piperidine in DMSO as the solvent in the above reaction influences the rate of the reaction and also the yield of the products.. All these compounds have been analyzed by UV, IR and NMR for structure. The newly synthesized chlorosubstitutedisoxazoles were studied.

***Keywords**: Isoxazole, Horticultural crops, 3- Aroylflavone, Anti bacterial activities.*

Introduction

Isoxazole is a five membered heterocyclic compound containing both oxygen and nitrogen atoms in the 1,3 positions placed in the heterocyclic ring. Many workers have synthesized different Isoxazole[1-7]. Heterocyclic compounds are very useful units in the fields of medicinal and pharmaceutical chemistry and have been reported to exhibit a variety of biological activities [8-13]. 3-aroylflavone on treatment with $NH_2OH.HCl$. It has been revealed that, the use of piperidine in DMSO as the solvent in the above reaction influences the rate of the reaction and also the yield of the products. 3-aroylflavone on treatment with $NH_2OH.HCl$ to gives final product. It has been well focused that, the presence of chlorosubstituted moieties is an important structural feature also, the present work deals with the study of vegetative growth promoting effects of some newly synthesized chlorosubstituted 1,3-Isoxazoles with special reference to horticulture crop.

Experimental

All the glassware's used in the present work were of Pyrex quality. Melting points were determined in open capillary and are uncorrected. Purity of compounds was monitored on silica gel coated TLC plate. The IR spectra were recorded on `Perkin-Elmer 202` Infra red spectrophotometer 1310. The UV-VIS spectra were recorded on Systronics 119 spectrophotometer. The PMR spectra were recorded on Varian Mercury YH - 300 spectrometer in $CDCl_3$.. The analytical data of compounds were highly satisfactory. All the chemicals used were of analytical grade. All the solvents used were purified by standard methods. Physical characterization data of all the compounds are given in Table-1.

The synthetic methods used in present work are given below along with their UV, IR and NMR data.

2-Hydroxyacetophenones (2) :

2-Hydroxy-5-chloroactophenone (2a), m.p.56^oC and 2-hydroxy-3, 5-dichloroacetophenone, (2b), m.p. 53^oC were used as starting materials. The former was prepared by known method while the later was prepared by a new method invented by Rajput et al.

Preparation of 2-hydroxy-3,5-dichloroacetophenone (2b):

2-Hydroxy-5-choloroacetophenone (3g) was dissolved in acetic acid (5ml). Sodium acetate (3g) was added to the reaction mixture and then chlorine in acetic acid reagent (20ml) (7.5 w/v) was added drop wise with stirring. The temperature of the reaction mixture was maintained below 20^{o}c. The mixture was allowed to stand for about 30 minutes. Finally it was poured into water with stirring. The pale yellow solid product thus separated was filtered and crystallized from ethanol, m.p. 53^{o}C yield 1.5g.

IR (KBr): 3040 (-OH phenolic stretching); 1660 (>C=O stretching); 1345 (-OH bending in phenol); 650 (C-Cl stretching).

PMR:δ 2.60 (s, 3H, -ArOCH$_3$); δ 7 to 8 (s,2H, -ArH); δ 12.11 (s, 1H, Ar-OH).

UV: 346nm.

Scheme-1

Preparation of 2-benzoyloxy -3, 5-dichloroacetophenone (3a) :

2-Hydroxy-3,5-dichloroacetophenone (0.04 mol) and benzoyl- chloride (0.05mol) were dissolved in NaOH (10%) (30ml). The reaction mixture was shaken for about half an hour. The product thus separated was filtered, washed with water followed by sodium bicarbonate (10%) washing and then again with water. The solid product was crystallized from ethanol to obtain 2-benzoyloxy-3,5-dichloroacetophenone (3a), m.p.66^{o}C, yield 76%.

IR (KBr): 3040 (-OH phenolic stretching); 1660 (>C=O stretching); 1345 (-OH bending in phenol); 650 (C-Cl stretching).

PMR:δ 2.60 (s, 3H, -ArOCH$_3$); δ 6.8 to 7.64 (m,2H, -ArH); δ 12.7 (s, 1H, Ar-OH).

UV: 346 nm.

Preparation of 1-(2-hydroxy-3,5-dichlorophenyl)-3-phenyl-1,3-propane-dione (4a):

2-Benzoyloxy-3,5-dichloroacetophenone (3a) (0.05 mol) was dissolved in dry pyridine (40ml). The solution was warmed up to 60^{o}C and pulverized KOH (15g) was added slowly with constant stirring. After 4 hours of heating the reaction mixture was acidified by adding ice cold dil. HCl (1:1). The brownish yellow solid product thus separated was filtered, washed with sodium bicarbonate solution (10%) and finally again with water. It was then crystallized from ethanol acetic acid mixture to get 1-(2-hydroxy-3-dichloro-phenyl)-3-phenyl-1,3-propanedione(4a),m.p.110^{o}C yield 75%.

IR (KBr): 3030 (-OH phenolic stretching); 1600 (>C=O stretching); 1170 (-OH bending in phenol); 790 (C-Cl stretching).

PMR:δ 3.60 (s, 3H, -ArOCH$_3$); δ 4.56 (s,2H – due to dione) δ 6.6 (s,6H, -ArH);

δ 12.75 (s, 1H, Ar-OH)

UV: 359 nm.

Preparation of 3-anisoyl-2-(3'-nitrophenyl)-6,8-dichloroflavanone(5a) :

A mixture of 1-(2-hydroxy-3,5-dichlorophenyl)-3-phenyl-1,3 -propanedione (4a) (0.01mol) and 3-nitrobenzaldelyade (0.012 mol) was refluxed in ethanol (25ml) and piperidine (0.5 mol) for 15-20 min. After cooling, the reaction mixture was acidified with dilHCl (1:1) and the product thus separated, was crystallized from ethanol-acetic acid mixture to get the compound (5a), m.p.187^{o}C yield 80%.

IR (KBr): 3070 (-OH phenolic stretching); 1650 (>C=O stretching); 1550 (-NO$_2$ stretching); 758 (C-Cl stretching).

PMR:δ 3.08 (s, 3H, -ArOCH$_3$); δ5.3 (d,1H –CH$_A$-CH): δ5.9 (d,1H –CH-CH$_A$): δ 6.76 to 8.08 (m,10H, -ArH);

UV: 262 nm.

Formation of 3-(2-hydroxy-3,5-dichlorophenyl)-4-anisoyl-5-(3-nitro-phenyl)- isoxazole (6a):

A mixture of 3-anisoyl-2-(3-nitrophenyl)-6,8-dichloroflavone (5a), (0.01 mol) and NH$_2$OH.HCl (0.02 mol) was refluxed in DMSO (20ml) containing a few drops of piperidine (0.5 ml) for about 1.5 hrs. After cooling, the reaction mixture was acidified with dil. HCl (1.1). The product thus separated was filtered, washed first with sodium bicarbonate solution (10%) and then with water. Finally it was crystallized from ethanol-acetic acid mixture to get the compound(6a), m.p. 190^{0}C, yield 65%.

IR (KBr): 3076 (-OH phenolic stretching); 1608 (>C=O stretching); 1365 (>C=N stretching); 810 (C-Cl stretching).

PMR:δ 3.08 (s, 3H, -ArOCH$_3$); δ 6.66 to 8.08 (m,11H, -ArH); δ 10.68 (s, 1H, -ArOH);

UV: 323.2 nm

Scheme-2

Preparation of 2-anisoyloxy-3, 5-dichloroacetophenone (3b) :

2-Hydroxy-3,5-dichloroacetophenone (2b) (0.04mol) and anisic acid (0.05mol) were suspended in dry pyridine (30ml) and to this $POCl_3$ (3ml) was added drop wise with constant stirring and cooling. The reaction mixture was kept for overnight and then worked up by dilution and acidification with ice cold HCl (50%) to neutralize pyridine. The solid product thus obtained was filtered washed with water followed by sodium carbonate (10%) washing and finally again with water. It was crystallized from ethanol to obtain 2-anisoyloxy-3,5-dichloroacetophenone (3b), m.p. 111^oC and yield 74%.

IR (KBr): 3045 (-OH phenolic stretching); 1680 (>C=O stretching); 1365 (-OH bending in phenol); 670 (C-Cl stretching).

PMR:δ 2.65 (s, 3H, -$ArOCH_3$); δ 6 to 7.64 (m,2H, -ArH); δ 12.5 (s, 1H, Ar-OH)

Prepration of 1-(2-hydroxy-3,5-dichlorophenyl)-3-(4'-methoxypehnyl)-1,3-propanedione (4b) :

2-Anisoyloxy-3,5-dichloroacetophenone (3b) (0.05 mol) was dissolved in dry pyridine (40 ml). The solution was warmed at about 60^oC and pulverized KOH (0.15 mol) was added slowly with constant stirring. After 4 hours the reaction mixture was acidified with ice cold dil. HCl (1:1) and processed as described in (4a) to get the compound , 1-(2-hydroxy-3,5-dichlorophenyl)-3-(4'-methoxyphenyl)-1,3-propanedione (4b), m.p. 114^oC, yield 75%.

IR (KBr): 3045 (-OH phenolic stretching); 1650 (>C=O stretching); 1160 (-OH bending in phenol); 760 (C-Cl stretching).

PMR:δ 3.50 (s, 3H, -$ArOCH_3$); δ 4.35 (s,2H – due to dione) δ 6.3 (s,6H, -ArH); δ 12.6 (s, 1H, Ar-OH)

UV: 348 nm

Preparation of 3-benzoyl-2-(3'-nitrophenyl)-6,8-dichloroflavanone(5b):

A mixture of 1-(2-hydroxy-3,5-dichlorophenyl)-3-(4'-methoxy-phenyl)-1,3-propanedione (4b) (0.01mol) and 3-nitrobenzaldenyde (0.012mol) was refluxed in ethanol(25ml) and piperidine (0.5 ml) for 15-20 min. After cooling, the reaction mixture was acidified with dilHCl (1:1) and the product thus separated, was crystallized from ethanol-acetic acid mixture to get the compound (5b) m.p.175^oC yield 78%.

IR (KBr): 3065 (-OH phenolic stretching); 1645 (>C=O stretching); 1535 (-NO_2 stretching); 748 (C-Cl stretching).

PMR:δ 3.06 (s, 3H, -$ArOCH_3$); δ5.8 (d,1H –CH_A-CH): δ5.6 (d,1H –CH-CH_A): δ 6.66 to 8.10 (m,10H, -ArH);

3-(2-hydroxy-3,5-dichlorophenyl)-4-benzoyl-5-(3'-nitrophenyl)-isoxazole(6b):

A mixture of 3-benzoyl-2-(3-nitrophenyl)-6,8-dichloroflavone(6b)(0.01mol) was reflux in DMSO (20 ml) and piperdine for about 1.5 hrs, After cooling, the reaction mixture was acidified with dil. HCl (1.1). The product thus separated was filtered, washed first with sodium bicarbonate solution (10%) and then with water. Finally it was crystallized from ethanol-acetic acid mixture to get the compound (6b),m.p. 198^oC, yield 80%

IR (KBr): 3060 (-OH phenolic stretching); 1610 (>C=O stretching); 1375 (>C=N stretching); 790 (C-Cl stretching).

PMR:δ 3.10 (s, 3H, -$ArOCH_3$); δ 6 to 8. (m,11H, -ArH); δ 11.68 (s, 1H, -ArOH);

Results and Discussion

The compound (3a-6a) and (3b-6b) were studied the antibacterial activities against some human pathogens *S.aureus ,S.typhi ,C.gulkar ,A.niger* Species at 1000 µmgentamycine as a standard.DMF was used as solvent control using agar plate techniques.The zones of inhibition formed were measured in mm and are shown in Table 2. It gives following results. It was observed that,hetero atoms increase the antibacterial activity of compounds from (5a-6a) and (6a-6b).

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Table (1): Characterization data of synthesized new compound

Compound	Molecular Formula	M.P. (^oC)	Yield (%)	Rf
2	$C_8H_6O_2Cl_2$	53	75	0.84
3a	$C_{15}H_{10}O_3Cl_2$	66	76	0.66
4a	$C_{15}H_{10}O_3Cl_2$	110	75	0.71
5a	$C_{23}H_{15}O_6\ NCl_2$	175	68	0.78
6a	$C_{23}H_{14}O_{62}Cl_2$	190	75	0.72
3b	$C_{16}H_{12}O_4Cl_2$	66	76	0.66
4b	$C_{16}H_{12}O_4Cl_2$	114	75	0.81
5b	$C_{22}H_{13}O_5\ NCl_2$	187	80	0.65
6b	$C_{22}H_{12}O_5N_2Cl_2$	198	80	0.64

Table-2Effects of newly synthesized compounds on Human pathogens:

S. N.	Test Compounds	Zones of inhibition (mm) Human Pathogens			
		S. aureus	***S. typhi***	***C. gulkar***	***A. niger***
1	2a	++	++	++	++
2	2b	++	++	+++	++
3	3a	+++	+++	++	++
4	3b	+++	++	++	++
5	4a	++	+++	+++	+++
6	4b	+++	++	+++	+++
7	5a	+++	+++	+++	++++
8	5b	+++	+++	+++	+++
10	6a	++++	++++	++++	++++
11	6b	+++	++++	++++	+++

++++ Very Strongly active range
+++ Strongly active range
++ Moderately active range
+ Weakly active range
- Inactive range

DIVERSITY, POPULATION AND HABITAT USED BY SPIDERS IN COTTON AGRO-ECOSYSTEM

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ABSTRACT

In all 8891 spiders were collected from 14 families, 39 genera and 46 species per acre from Cotton agro-ecosystem by using visual search and pitfall trap method. In the Collection 63.55% specimens were adults and 36.45% spiders collected were immature. Lycosids dominated the collection with 1957 (22.01%) specimens followed by Araneids 1588 (17.86%), Oxyopids 1288 (14.48%), Tetragnathids 989 (11.12%) and then Salticids 929 (10.44%). The species abundance was in the order Araneidae>Salticidae>Theridiidae>Lycosidae. The population of hunters and web builders was 66.67% and 33.32%, showing clear dominance of hunters. Sparrasids were not reported and thomisid spiders were just 0.95% of the total population. 15 new species were recorded (Table-1) which includes Cyclosagossypiata sp. nov., Cyclosamoonduensis(male), Lipocreaepeiroides, Clubionafoliata sp. nov., Schizocosa sp. nov., Oxyopestiengianensis , Myrmarachne sp., Scytodes sp., Scytodes sp., Phoneyusasp.nov., Nesticodesrufipes, Theridion sp. nov. , Theridion sp. nov. , Thomisusokinawensis, Uloboruswalckenaerius. A new genus Phoneyusa (for India) from Theraphosidae was recorded from cotton agro-ecosystem.

***Keywords**: Spider, Cotton fields, agro-ecosystems.*

Introduction

Cotton is one of the most important commercial crops playing key role in economic and social affairs of the world. Although, it is cultivated in more than 80 countries of the world, ten countries viz – USA, China, India, Brazil, Pakistan, Turkey, Mexico, Egypt and Sudan account for nearly 85% of the total production. There are four cultivated species of cotton, viz. *Gossypiumhirsutum*, *G. arboreum*, *G. herbaceum*and *G. barbadense*. India is the only country where all the 4 cultivated species are grown. However, the crop output is affected due to insect pests on them. In India over 160 species of insects and non insects pests have been reported to damage the cotton crop (Agrawal, 1978). Important insect-pests of cotton are American bollworm, pink bollworm, spotted bollworm and spiny bollworm), cutworm (*Agrotis*sp), aphids (*Aphis gossypii*), white fly, red cotton bug, spider mites, cotton jassids and thrips.

Dippenaar-Schoeman*et al.* (1999) studied spiders in South African cotton fields with respect to diversity and abundance (Arachnida: Araneae). **Van den Berg *et al.* (1990) investigated** the effect of pesticides on spiders in South African cotton fields. Spiders are generalist predators that can function as biological control agents within agroecosystems (Moulder and Reichle, 1972; Nyffeler and Benz, 1987; Riechert and Bishop, 1990; Young and Edwards, 1990; Kajak*et al.*, 1991; Kajak, 1997).**Mellet, *et al.* (2006)** investigated the effect of Bt-cotton cultivation on spider populations in Marble Hall, South Africa.According to them neither Bt-cotton nor the application of endosulfan had apparent negative effects on ground or plant dwelling spiders in the field. Spiders should therefore be able to continue playing a role in biological control in Bt-cotton fields. Ghavami*et al.* (2007) investigated the spider fauna of cotton fields in Iran during 2003-2004. The mean populations of spiders in cotton fields from three different places like Thayilpatti, Madathuppatti and Vembakkottai, Virudhunagar district, Tamil Nadu, India were studied by Jeyaparvathy *et al.* (2012). Jeyaparvathi*et al.* (2013) also investigated the biological control potentialof spiders on the selected cotton pests and found that the three species of spiders like(*Peucetiaviridana*, *Oxyopesbirmanicus*and *Peucetialatikae*were predominant inthe cotton fields of Achamthavirthan, Virudhunagar district, Tamil Nadu, India.

Spiders are one of the major predatory groups within the agro-ecosystem, and are intrinsic in maintaining the ecological balance of pest species (Wise, 1993). Their diversity within

this system is therefore important in providing a stable and natural method of pest control. Considering their role in the agro-ecosystem, the present study was undertaken to know the diversity, population structure and habitat use by the spiders in cotton agro-ecosystem from Purna river basin.

Absolutely no work has been done on spider diversity in cotton agro-ecosystem from Vidarbha and Maharashtra. The present study was an effort to make an inventory of spiders along with the details about the microhabitats used by the spiders

Methodology

Study area:

The present work was carried out in agricultural fields from Purna river basin which originates in Pokharni Village 21° 30'N 77° 46'E which is 2 km away from Bhainsdehi (Betul district Madhya Pradesh adjoining Amravati district of Maharashtra).

Rain fall:

The basin receives most of the rainfall from the South-West monsoon during June to September. The weighted mean maximum, minimum and average annual rainfall of the basin during last 10 year were 2599 mm, 654 mm and 1431 mm respectively.

Temperature:

The mean monthly temperature varies from 12.7 ^{o}C during December to 42 ^{o}C in April.

Humidity:

The humidity during winter season is as low as 42% in the month of February and as high as 89% in the month of August.

Wind speed:

The mean daily wind speed is maximum (12.33 km/hr) in the months of June and minimum (4.3 km/hr) in the month of December.

Cropping pattern: The crops are dominated by cotton and orange in the three districts of Vidarbha and banana plantations in Jalgaon district. Hence spider diversity is studied from various cotton fields. This includes both irrigated and non irrigated fields; throughout the basin.

Spider collection:

Todocument a comprehensive inventory of spiders from cotton agro-ecosystemwell established sampling protocols for spider collection were adopted in different selected sampling plots, which included pitfall trap and hand collection.

Pitfall Trapping - Wet pitfall trap method was used to study the ground dwelling spiders. The pitfall traps consisted of a 9 cm wide by 16 cm deep plastic jar, one-third filled with 30% ethyl acetate and a few drops of liquid soap/detergent. The pitfall traps were left open for a period of four days. The distance between two adjacent jars was 1 meter.

Collecting by Hand -

A soft paintbrush was used to gently knock the specimen into a collecting vial. Many a times after observing the spider it was gently pick off by hand. Remains of webs and the curling leaves of plants were examined for any spiders in them and were collected in plastic vials. Many a time's stones were unturned for spiders hiding there. This method of sampling was used to collect the spiders, which were found on the ground, under the litter, mulch etc. Web-building and free-living spiders on the foliage and stems of living or dead shrubs etc. were also collected by hand picking.

Post collection work:

After coming to the laboratory, the spiders were sorted according to the family and thenphotographs were taken by using the camera, then the legs and palps of the spiders were manipulated and made straight by dipping them in warm water and after making their legs straight they were immediately transferred to 70% ethyl alcohol in a petridish. Legs and palps were again made straight and properly oriented. Plastic U- pins were kept on spider legs and palps as weight, so that they are not folded back. All the mature specimens were identified by dissecting their genitalia upto the species level. A help of relevant literature from India and abroad was taken for proper identification. While survey and collection of spiders from cotton fields microhabitat used by

them were noted.

Analysis

Spiders captured by pitfall traps and hand picking methods were pooled for each site for quantitative analysis. Species richness was estimated for each cropping type. Similarity of spider species among different crop zones was examined using the diversity indices including Shannon – weiner index, Simpson index and Margalef richness index. The diversity, richness, and evenness indices for spiders were calculated using the Biodiversity calculator (www. Alyoung.com/labs/biodiversity_calculator. html) .

Voucher specimens are deposited at Arachnology Museum, Forest Training Institute, Chikhaldara.

Observations and Results

In all 8891 spiders were collected from 14 families, 39 genera and 46 species per acre from Cotton agro-ecosystem by using visual search and pitfall trap method (Table No.1). In the Collection 63.55% specimens were adults and 36.45% spiders collected were immature. Lycosids dominated the collection with 1957 (22.01%) specimens followed by Araneids 1588 (17.86%), Oxyopids 1288 (14.48%), Tetragnathids 989 (11.12%) and then Salticids 929 (10.44%). The species abundance was in the order Araneidae>Salticidae>Theridiidae>Lycosidae (Fig.No.1). The population of hunters and web builders was 66.67% and 33.32%, showing clear dominance of hunters. Sparrasids were not reported and thomisid spiders were just 0.95% of the total population.

15 new species were recorded (Table-1) which includes *Cyclosagossypiata*sp. nov., *Cyclosamoonduensis*(male), *Lipocreaepeiroides, Clubionafoliata* sp. nov., *Schizocosa*sp. nov.,*Oxyopestiengianensis* , *Myrmarachne*sp.,*Scytodes*sp., *Scytodes*sp.,*Phoneyusa*sp.nov.,*Nesticodesrufipes, Theridion*sp.nov. ,*Theridion*sp.nov. ,*Thomisusokinawensis, Uloboruswalckenaerius*. A new genus *Phoneyusa*(for India) from Theraphosidae was recorded from cotton agro-ecosystem.

The orb weavers like *Eriovixiaexcelsa, Neosconatheisi,Neosconavigilans,Guizygiellaindica,Leucaugedecorata*and*Tetragnathamandibulata* were seen constructing web of small size depending on the space available and were successful to capture enough prey. The ability of these spiders to construct webs of small sizes with suitable inclination in Cotton agro-ecosystem. Thus the distribution of spiders in Cotton agroecosystem is very typical, vertically stratified so that the crop is protected from all types of pests. The present observation thus supports the earlier observations made by Nyffeler*et al.* (1989); Hayes and Lockley (1990); Van Den Berg *et al.* (1990), Ghafoor (2002) and Bundy (2005). In one study, Dippenaar-Schoeman*et al.* (1999) observed Thomisids as dominant predators in Cotton fields, but in the present study Lycosids were the dominant predators in Cotton-agroecosystem. Thomisids represented only 0.95% population.

While survey and collection of spiders from cotton fields microhabitat used by them were noted and accordingly the detail observation are given in (Table.2).

. Discussion

The present study dealts with the spider diversity in a specific locality like agro-ecosystem, that too in a specific region of Vidarbha that is Purna River Basin. In cotton agro-ecosystem Lycosid population was the highest (22.01%) followed by Araneids (17.86%) and then Oxyopids (14. 48%) and Salticids (10.44%) indicating major population of hunting spiders.

The Shannon index calculated for cotton agro-ecosystem was 4.777. This is confirmed further by calculating Margalef richness index. The Margalef richness index is 5.209 for spider diversity in cotton agro-ecosystem. The R-Squared value calculated for cotton agro-ecosystem is 0.905. In Cotton agro-ecosystem Lycosid rearing can be taken up at priority for pest control.

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Table: 1, Spider species collected (Per acre) from Cotton agro-ecosystem.

Spider Species	Female	Male	Immature	Total
Family : Araneidae Clerck, 1757			671	1588
Cyclosaconfraga (Thorell,1892)	1	0		
Cyclosagossypiata sp. nov.Keswani, 2013	61	0		
Cyclosamoonduensis Tikader,1963	59	34		
Cyclosaspirifera Simon,1889	30	14		
Cyrtophoracitricola (Forsskål,1775) *	55	16		
Eriovixiaexcelsa (Simon,1889)	101	65		
Lariniachloris (Audouin,1826)	79	0		
Lipocreaepeiroides (O. P.-Cambridge,1872)	49	32		
Neosconatheisi (Walckenaer,1841)	189	51		
Neosconavigilans (Blackwall,1865)	55	26		
Family : Clubionidae Wagner,1887			220	560
Clubionafoliatasp. nov.	263	77		
Family : Gnaphosidae Pocock,1898			288	617
Drassodesluridus (O. P.-Cambridge,1874)	99	21		
SergiolussinghiTikader& Gajbe,1976	9	0		
Zelotesshantae Tikader,1982	139	61		
Family : Lycosidae Sundevall,1833			779	1957
***Hippasa*greenalliae** (Blackwall,1867)	102	70		
LycosapoonaensisTikader& Malhotra,1980	436	0		
Pardosapseudoannulata(Bösenberg& Strand,1906)	429	124		
Schizocosasp. nov.	17	0		
Family : Miturgidae Simon, 1886			180	320
***Cheiracanthium*inornatum** O. P.-Cambridge,1874	72	68		
Family : Oecobiidae Blackwall,1862			7	20
Oecobiusputus O. P.-Cambridge,1876	8	5		
Family : Oxyopidae Thorell,1870			366	1288
OxyopespankajiGajbe&Gajbe, 2000	437	173		
OxyopestiengianensisBarrion& Litsinger,1995	235	75		
Peucetialatikae Tikader,1970	0	2		
Family : Salticidae Blackwall,1841			266	929
Hasariusadansoni (Audouin,1826) *	54	45		
Hyllussemicupreus (Simon,1885)	0	95		
Myrmarachnesp.	9	6		
Phintellavittata (C. L. Koch,1846)	117	26		
Plexippuspaykulli (Audouin,1826) *	34	88		
Rheneflavigera (C. L. Koch,1846) *	0	44		
Telamoniadimidiata (Simon,1899)	89	31		
Thyeneimperialis (Rossi,1846) *	13	12		
Family : Scytodidae Blackwall,1864			45	150
Scytodessp.	51	0		
Scytodessp.	54	0		
Family : Tetragnathidae Menge,1866			285	989
Guizygiellaindica (Tikader& Bal,1980)	215	86		
Leucaugedecorata (Blackwall,1864)	200	61		
Tetragnathamandibulata Walckenaer,1841	71	71		
Family : Theraphosidae Thorell,1869			0	2
Phoneyusasp.nov.	1	1		
Family : Theridiidae Sundevall,1833			83	336
ArgyrodesargentatusO. P.-Cambridge,1880	30	24		
Parasteatodamundula (L. Koch,1872)	60	0		
Theridulagonygaster (Simon,1873)	34	0		
Nesticodesrufipes (Lucas,1846) *	19	6		
Theridionsp. nov.	9	0		
Theridion sp. nov.	71	0		
Family : Thomisidae Sundevall,1833			41	85
Indoxysticusminutus (Tikader, 1960) *	21	15		
Thomisusokinawensis Strand,1907	8	0		
Family : Uloboridae Thorell,1869			10	50
Uloboruswalckenaerius Latreille,1806 *	22	18		
14 FAMILIES, 39 GENERA, 46 SPECIES	**4107**	**1543**	**3241**	**8891**

Table: 2, Microhabitat used by spiders in Cotton agro-ecosystem.

Species	Microhabitat used by spiders in Cotton agro-ecosystem
Cyclosaconfraga (Thorell,1892)	Scattered throughout the plant structure
Cyclosagossypiata sp. nov. Keswani,2013	Scattered throughout the plant structure
Cyclosamoonduensis Tikader,1963	Scattered throughout the plant structure
Cyclosaspirifera Simon,1889	Scattered throughout the plant structure
Cyrtophoracitricola (Forsskål,1775) *	In webs towards the periphery
Eriovixiaexcelsa (Simon,1889)	On the web between adjacent plants and branches
Lariniachloris (Audouin,1826)	Scattered throughout the plant structure
Lipocreaepeiroides (O. P.-Cambridge,1872)	Scattered throughout the plant structure
Neosconatheisi (Walckenaer,1841)	On foliage, on the web build between adjacent plants and branches
Neosconavigilans (Blackwall,1865)	On foliage, on the web between plants and branches
Clubionafoliatasp. nov.	Inside curled leaves, on foliage, at the base of cotton fruit, inside open cotton boll
Drassodesluridus (O. P.-Cambridge,1874)	On ground surface, in leaf litter
SergiolussinghiTikader& Gajbe,1976	On ground surface, in leaf litter
Zelotesshantae Tikader,1982	On ground surface, in leaf litter
***Hippasa*greenalliae** (Blackwall,1867)	At the base of plant inside sheet web provided with tunnel
LycosapoonaensisTikader& Malhotra,1980	On ground, soil crevices
Pardosapseudoannulata(Bösenberg& Strand,1906)	On ground, soil crevices
SchizocosaSp.nov.	On ground
***Cheiracanthium*inornatum** O. P.-Cambridge,1874	On foliage, under leaf litter
Oecobiusputus O. P.-Cambridge,1876	On the surface of stones towards the boundry of field
OxyopespankajiGajbe& Gajbe,2000	On foliage, on ground
OxyopestiengianensisBarrion& Litsinger,1995	On foliage, on ground
Peucetialatikae Tikader,1970	On foliage, in grass
Hasariusadansoni (Audouin,1826) *	Among leaf litter, foliage, on ground
Hyllussemicupreus (Simon,1885)	Among leaf litter, foliage, on ground
MyrmarachneSp.	On foliage, ground
Phintellavittata (C. L. Koch,1846)	On foliage, on ground, in leaf litter
Plexippuspaykulli (Audouin,1826) *	On foliage, on ground, among leaf litter
Rheneflavigera (C. L. Koch,1846) *	On foliage, on ground, among leaf litter
Telamoniadimidiata (Simon,1899)	On foliage
Thyeneimperialis (Rossi,1846) *	On foliage, ground, among leaf litter
***Scytodes*Sp.**	Inside dried leaves, on ground
***Scytodes*Sp.**	Inside dried leaves, on ground
Guizygiellaindica (Tikader& Bal,1980)	Inside rolled up leaves, on web between plants and branches
Leucaugedecorata (Blackwall,1864)	Between plants and branches close to the ground
Tetragnathamandibulata Walckenaer,1841	On web between plants and branches near the ground, on the open cotton boll, on the basal branches
Phoneyusasp.nov.	Ground
ArgyrodesargentatusO. P.-Cambridge,1880	Inhabiting webs of *Cyrtophora*
Nesticodesrufipes (Lucas,1846) *	In the webs towards the periphery of field
Parasteatodamundula (L. Koch,1872)	Inside the dried leaf entangled in the web
Theridionsp. nov.	Throughout the cotton plant structure
Theridion sp. nov.	Throughout the cotton plant structure
Theridulagonygaster (Simon,1873)	On foliage
Indoxysticus minutes (Tikader, 1960) *	On foliage
Thomisusokinawensis Strand,1907	On foliage, on flowers
Uloboruswalckenaerius Latreille,1806 *	Underside of the leaf in the middle of the plant

Fig.1, Familywise percent occurrence of spider population per acre of Cotton agro-ecosysten

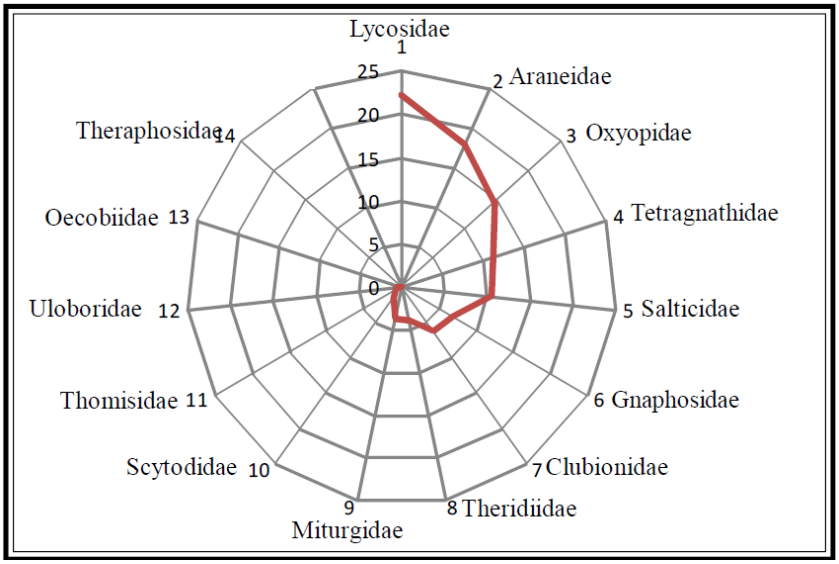
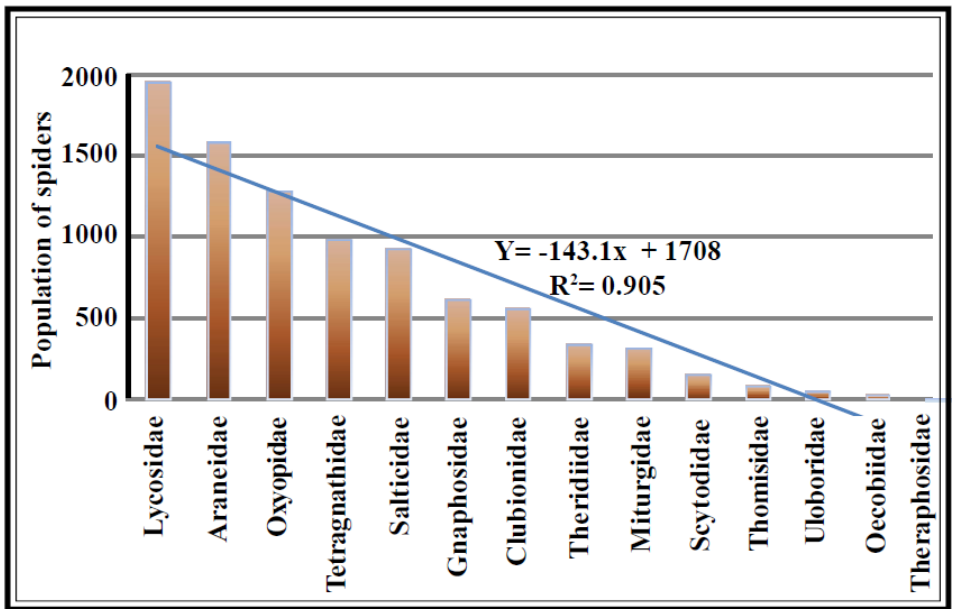


Fig.2, Trendline and Coefficient of Determination (R^2) for the occurrence of spiders in the cotton agro-ecosystem from Purna riverbasin



EFFECT ON GLOBAL WARMING IN INDIAN AGRICULTURE

B. S. Sangram

Introduction

20th century that rising temperature plays an important role towards global warming as compared to precipitation. Researchers have confirmed that crop yield falls by 3% to 5% for every 1°F increase in the temperature. In India, crop production may be divided into two seasons: Kharif andrabi . Present study shows that the crop production is dependent on temperature. Temperature vs. crop production shows a funnel shape for all the seasons. For the lower temperature both the properties are almost linearly correlated. In rabi, at the beginning production show a negative trend with temperature which slowly converts to the positive trend. In kharif that negative trend is not visible. At higher temperatures production increases for both the seasons but with large scattering. The findings may be helpful to study the effect of climate change on the crop production.

Mankind is in need of an equitable standard of living like adequate food, water, energy, safe shelter and a healthy environment for present as well as future generations. But casual acts of human race, such as emission of greenhouse gases by burning fossil fuels and deforestation has increased the earth's average surface temperature, which is defined as global warming. It is proved that the warming on the earth's surface over last 50 years is mostly due to the anthropogenic activities.

Hence, global warming can be considered as the major affecting parameter in changing the earth's climate. Warming of the climate system is observed all over the world. Recent climate changes have shown its impact on natural as well as human systems. Any significant change in climate may affect agriculture at larger scale. Various factors such as increase in temperature change in rainfall pattern, increase of CO2 content in atmosphere, frequency and intensity of extreme weather events may have significant impact in agriculture sector. It is predicted that increase in temperature will show overall negative effects on agriculture in the world.

India has one of the largest and institutionally most complex agricultural research systems in the world. Historically, the Indian agricultural research system is the zenith of a process which started in the 19th century and which resulted in the establishment of the Imperial Council of Agricultural Researchon the recommendation of a Royal Commission on Agriculture in 1929. Since then there was a stupendous evolution of agricultural research in India.

Effect on Indian agriculture global warming may affect agriculture at larger scale.

Methodology

The data sets for the annual mean temperature of India over the period 1990-2013 was taken from India Meteorological Department. Development in the agriculture and allied sectors of India are of interest to a wide spectrum of people across the world. The Directorate of Economics and Statistics of the Department of Agriculture and Cooperation, Government of India publishes "Agricultural Statistics at a Glance 2014" that presents comprehensive information on this sector. All the data sets of food grain production including rabi and kharif were taken from this report.

Agricultural Research in colonial India

The early development of agricultural research in India was associated with the reappearance of famines. This acted as a nasty reminder of the little precedence accorded to agricultural research and development in colonial India.

The provincial agricultural departments could seldom go beyond the collection of

revenue data and famine relief operations. No doubt, experimental farms had been established and in 1884. For conducting experiments the government looked more to agricultural societies than to its own agencies. The society in Calcutta agreed to conduct all experiments in economic products. The Government of Bengal raised its grant from Rs. 2400 to Rs. 6000 per annum. The objectives of Agricultural and Horticultural Society of India were .

The official experimental farms were obsessed with cotton. Mounting pressure from British cotton tycoons had forced the Government of India to initiate a vigorous cotton improvement program. However, the earlier projects of 1840s and 1860s could not be made successful mainly because of insufficient botanical knowledge or the necessary market research. Later, in1890, the association of an expert botanist in cotton experiments was specifically called for. The cultivation and marketing of existing varieties produced a relatively stable and acceptable return to money-lenders and dealers. New and untested varieties involved different methods of cultivations and great labour input, without a higher level of output or profit, and with the risk of severe losses to each of these classes.

Indian Scenario

Like other countries, India has also started experiencing extreme weather events which lead to change the climate. As mentioned earlier, global warming is one of the major affecting parameter to change the climate. In India, it is observed that the annual mean temperature has increased at the rate of 0.42°C.

1) Indian agriculture system is based upon south-west and north-east monsoon. Almost 80% of the total precipitation comes from south-west monsoon in India.

2) Any fluctuations and uncertainties in long range rainfall pattern may affect the agriculture sector and also lead to increase the frequency of droughts and floods at regional scale.

3) A significant increasing trend in rainfall was reported along the west coast, north Andhra Pradesh and North West India.

4) While significant decreasing trend was observed over parts of Gujarat, Madhya Pradesh and adjoining area, Kerala and northeast India.

5) North western region of India gets affected by western disturbances at small scale as such disturbances have impact only on rabi production.

Not only monsoon, but temperature has also shown its effect on agriculture. Extreme maximum and minimum temperature showed an increasing trend in the southern part whereas decreasing trend in the northern part of India . Research studies show that with the increase in temperature, crop productivity is likely to decrease in future . Hence, there is a need to study the dependency of temperature on crop productivity, stability, yield and quality to uplift the country's economy.

Effect of temperature in Indian agriculture

Research studies shows that rise in global surface temperature would affect Indian agriculture. Several climatic factors which affect agriculture productivity are heat waves, high temperature , heavy and prolonged precipitation and excess cold. These factors have positive as well as negative effects on crop production. Almost every year India faces several weather events due to changes in such climatic parameters in various regions which reduces crop yield. Varied nature of such weather events tends to affect the crop growth cycle and plant physiological processes . In India, about 17% of the years during 1901-2010 were reported as drought years, which result into severe impacts on agriculture, water resources, food security, economy and social life in the country. The variation in temperature and precipitation above threshold value may affect photosynthesis and transpiration process in crops. Excess rainfall and flood may leads to physical damage of the crops.

Studies predicted that changing trends in temperature and precipitation will continue to have significant impact on agriculture . A small rise in temperature (1-2°C), especially in the seasonally dry tropical regions would decrease crop yield.

Indian agriculture is divided into two main seasons: Kharif and Rabi based on the monsoon. It is reported that overall temperature rise is likely to be much higher during winter (rabi) rather than in rainy season. Moreover, it is predicted that the mean temperature in India will rise by 0.4-2.0°C in Kharif and 1.1-4.5°C in Rabi by 2070. Decline in agricultural productivity leads to increase food prices at state as well as at country level. Hence,temperature could be one of the significant affecting factor which results into greater instability in agriculture of India.

Conclusion

The average annual temperature shows an increasing trend over India. Present study shows that the crop production depends on temperature. Funnel–like structure is observed for overall production .which signifies their dependency on temperature. At low temperature, tail portion was observed in rabi (wheat) production whereas not in kharif (rice). This shows that rabi production has affected comparatively more than kharif at lower temperature.

At high temperature range, both types of production shows increasing trend. Moreover, in case of high temperature, it has been observed that scattering in production gets increases. Our study confirms the report of IPCC which states that crop production will get affected at high temperature.

Hence, temperature can be one of the significant parameter in crop production studies. At high temperature, prediction of crop production may become difficult as the data points got more scatter. If anyhow, such predictions can be improved further then it may help farmers to make their field planning better, identification of appropriate crop type in particular field, estimation of crop yield and requirement of water for irrigation. In this way, damage to the crops can be minimized and better enhancement in the crop yield can be achieved.

Hence, government needs to adopt such predictions and accordingly reframe their plans and policies which may help agriculture sector to uplift and hence can strengthen our economy. Predictions can be improved further by doing long term analysis as the present study contains data of only 23 years. Present study may be limited to the monsoon dominated region. Similar studies may be done for other regions as well to gain the confidence.

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PHYTOCHEMICAL SCREENINGS OF Hibiscus rosa-sinensis L. FLOWERS EXTRACT IN POLAR AND NON- POLAR SOLVENTS

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ABSTRACT

Hibiscus rosa-sinensis is a plant native to China. It is a shrub widely grown in the tropics as an ornamental plant and has many varieties with different colors of flowers. Red flower varieties are preferred in medicine. Many species of Hibiscus are grown for their attractive flowers or used as landscape shrubs. Hibiscus also has medicinal properties and is part of many herbal teas. The present study performed to explore preliminary secondary metabolites and active biomolecules such as TPC and TFC from flowers of Hibiscus rosa-sinensis. Extraction of flower in different polar and non-polar solvents naked that presence of flavonoids, phenols saponins, tannins and terpenoids.

***Keywords**: secondary metabolites, TPC & TFC.*

Introduction

Hibiscus rosa-sinensis is a plant native to China. It is a shrub widely grown in the tropics as an ornamental plant and has many varieties with different colors of flowers. Red flower varieties are preferred in medicine. The leaves and flowers have healing properties (Kurup et al., 1979; Nadkarni, 1954; Ali and Ansari, 1997). Flowers have been shown to be effective in the treatment of arterial hypertension (Dwivedi et al., 1977) and have significant anti-inflammatory effects (Singh et al., 1982; Sethi et al., 1986). Many species of *Hibiscus* are grown for their attractive flowers or used as landscape shrubs. *Hibiscus* also has medicinal properties and is part of many herbal teas.

The leaves and flowers of *Hibiscus rosa-sinensis* promote hair growth (Adhirajan et al., 2003). It has been reported that plants of the genus Hibiscus have the ability to provide biologically active compounds that act as antioxidants, as well as are cardio protective and are able to prevent the spread of malignant cells. Thus, *Hibiscus* descent as a provider of chemo inhibitory agents deserves additional evaluation. Therefore, *Hibiscus* sp. could be a great natural resource for the development of new drugs and could provide an effective tool for treating cancer and other diseases in the developing world (Maganha et al., 2009). In most of India, traditional people prefer whole herbs, leaves, stalks and roots for various ailments but flowers also play an important role in medicine (Shaikh and Pund 2014)

Material and Methods

Vigorous flowers of Hibiscus rosasinensis were collected throughout flowering season from different locality of Nanded. Plant was taxonomically dissected and all floral characters were described and identified with the help of Flora of Marathwada (Naik, 1998). The herbarium voucher specimen deposited in Herbarium center of Botany PG Department, YeshwantMahavidyalaya, Nanded (MS).

Extraction of Plant Material:

Petals of flowers were shaded dried, seldomly sterilized with $Hgcl_2$ to avoid microbial contamination. Dried biomass of petals coarsely grinded to fine powdered form using a blender (Bosch Pro 1000W Mixer) 100 gm of powdered form of dried biomass were used for extraction in polar solvent Viz., water and methanol and non-polar solvent Viz., chloroform and Hexane solvent, crude extract was concentrated in hot air oven and collected in Eppendorf tube in deep freezer at 4^0C for further bioassay.

Percentage Yield of Crude Extract:

Soxhlet extraction was performed to extract crude bioactive compound from dried biomass of petals of Hibiscus rosasinensis in different solvent as per their polarity Viz., water,

methanol, chloroform and hexane respectively. The percentage yield of crude extract was determined by using formula. Percentage Yield = Final weight of crude extract / initial weight of dry Biomass of sample X 100. The obtained crude extract of the flower was transferred in the Eppendorf tube and stored at 4℃ in the refrigerator for future bioassay.

Phytochemical Screenings:

Preliminary qualitative phytochemical screening was analyzed by using standard protocol (sofowora 1993; Kokate1994; Harborne1998;) with slight modification (Kharat and Shinde 2021)

Phytochemical Tests

1. Test for Flavonoids (Shinoda test): Take 2 to 3 ml plant extract, add few magnesium turnings and a few drops of concentrated hydrochloric acid and boiled for five minutes. Red coloration identifies the presence of flavonoids.

2. Test for Saponins(Frothing/Foam test): Three milliliters (3 mL) of the aqueous solution of the extract were mixed with 10 mL of distilled water in a test-tube. The test-tube was stoppered and shaken vigorously for about 5 minutes, it was allowed to stand for 30 min and observed for honeycomb froth, which was indicative of the presence of saponins.

3. Test for Tannins (Braymer's test): 2 to 3 ml of extract was treated with 10% alcoholic ferric chloride solution and observed for formation of blue or greenish color solution.

4. Test for Terpenoids (Salkowki's test): 2 ml of chloroform was added to 3 ml of each extract followed by a few drops of concentrated H_2SO_4. A reddish-brown precipitate produced immediately indicated the presence of terpenoids.

5. Test for Cardiac glycosides (Keller-Killani test): Add an aliquot of 5 ml of extract and its various fractions (10 mg/ml in methanol) in the sequence of 2ml glacial acetic acid and one drop of $FeCl_3$ solution. Then add concentrated 1ml H_2SO_4 to it. Formation of brown ring at the interface is a confirmative test for the presence of cardiac glycosides.

6. Test for Sterols (Liebermann-Burchardtest): 1 to 2 ml of extract was treated with one to two drops of chloroform, acetic anhydride and concentrated H_2SO_4 and observed for the formation of dark pink or red color.

7. Test for Phlobatannins (Precipitate test): When 2 ml of extract was boiled with 1 ml of 1% aqueous HCl was taken, deposition of a red precipitate is evidence for the presence of phlobatannins.

8. Test for Alkaloids (Mayer's Test): Take one ml of extract plant sample and mix in 8 ml of 1% hydrochloric acid. Gently warm the mixture and then filter. Take 2 ml of the filtrate and treat separately with Mayer's and Dragendorff 's reagents. Observe for the appearance of turbidity or precipitate formation for the positive test of alkaloids.

Preparation of Maeyer's reagent: Dissolve 0.355 g of mercuric chloride in 60 ml of distilled water. Dissolve 5.0 g of potassium iodide in 20 ml of distilled water. Mix both the solutions and volume was raised to 100 ml with distilled water.

Preparation of Dragendorff's reagent: Solution A: Dissolve 1.7 g of basic bismuth nitrate and 20 g of tartaric acid in 80 ml of distilled water. Solution B**:** Dissolve 16 g of potassium iodide in 40 ml of distilled water. Both solutions (A and B) were mixed in 1:1 ratio.

9. Test for Phenols (Ferric chloride test): 1 to 2 ml of plant extracts was treated with aqueous 5% ferric chloride and observed for formation of deep blue or black color.

Quantitative Estimation of Total Phenols Content TPC

The flower extracts were estimated for total phenol content by using Folin- Ciocalteu reagent with Galic acid as standard. The total phenol content was estimated according to method of (Bray and Thorpe, 1954). The oxidizing agent Phosphomolybdate present in the reagent Folin-Ciocalteu reacted with the substrate present in the flower extracts of different solvent produce blue color complex. The reaction mixture contained 1 ml of extract

of plant sample, 2 ml of DW, and 0.5 ml of Folin -ciocalteu reagent add 2 ml of sodium carbonate (20%). Allow reaction mixture for incubation for 1 min in boiling bath and after cooling, the absorbance was measured at 660 nm by using UV-Vis Spectrophotometer against blank reagent. The total no. of phenols was calculated by preparing a calibration curve using different dilutions of Gallic acid (0.5 mg/ml) and the unknown amount of phenolics were estimated as mg/gm of plant samples. The result was determined from the standard curve and was expressed as gallic acid equivalent (GAE) (mg/gm of the extracted compound) (Gacche and Dhole, 2011).

Quantitative Estimation of Total Flavonoids Contents TFC

The individual flower extracts were estimated for total flavonoid content by using the $AlCl_3$ method previously described by Chang et al., (2002). The reaction mixture contained 1 ml of flower extracts, 3 ml methanol, 0.2 ml of 10% of $AlCl_3$, 0.2 ml (1M) of potassium acetate, and 5.6 ml of DW was added. The reaction mixture was incubated for half an hour at room temperatureand absorbance was measured at 415 nm by using UV- Spectrophotometer. Quercetin (0.1mg/ml) was used for preparing the standard curve with serial dilution. The total concentration of flavonoids in individual flower extract was calculated using standard curve and the amount was expressed in quercetin equivalent mg/gm (Gacche and Dhole, 2011).

Results and Discussion

The extracts of *Hibiscus rosa-sinensis*flower were prepared by applying four different solvents. The extract yield and percent extract yield of *Hibiscus rosa-sinensis*flower is presented in (% w/w) Table 1. The maximum percent extract yield of 17.86% w/w recorded in methanol extract of *Hibiscus rosa-sinensis*flower followed by water extract 14.73% w/w and chloroform extract 9.22% w/w. Hexane extract of flower exhibited the least yield (8.44% w/w). Graphical representation of extract yield and precent extract yield of *Hibiscus rosa-sinensis*flower in different solvent is depicted in Figure 1.

In all solvent extracts tested, methanol extract showed the highest concentrations of flavonoids, terpenoids, tannins and phenols content, followed by chloroform extract showed flavonoids, terpenoids and phenols content in high concentration than other contents. Water extract was found to contain flavonoids and phenols in high concentration while saponins and tannins were present in moderate concentration where as phlobatannin and alkaloids were found in low concentration. The terpenoids, glycosides and steroids were not found in water extract. Hexane extract was found to contain terpenoids in high concentration while flavonoids and phenol content were present in moderate concentration, others were found low in concentration whereas tannins, steroids and alkaloids were absent. The results of the qualitative phytochemical analysis showed that Hibiscus rosa-sinensis flower has good source of flavonoids, phenols saponins, tannins and terpenoids (Table 2)

The results of total phenolic content in *Hibiscus rosa-sinensis*flower extracts are shown in Table 33. Our results with the methanol extract showed significantly higher phenolic content in the flower extract of *Hibiscus rosa-sinensis*. The phenolic content in *Hibiscus rosa-sinensis*flower in methanol extract was 0.600 mg/ml followed by water extract 0.526 mg/ml, hexane extract showed 0.456 mg/ml. The chloroform extract exhibited least 0.448 mg/ml phenolic content. Graphical representation of total phenolic content of *Hibiscus rosa-sinensis*flower in different solvent extract is depicted in Figure 2.

The results of total flavonoid content of *Hibiscus rosa-sinensis*flower extract are shown in Table 34. Our results with methanol flower extract in *Hibiscus rosa-sinensis*showed a significant increase in total flavonoid content. Total flavonoid in methanol extract of *Hibiscus rosa-sinensis*flower was highest in all tested solvent extract 0.624 mg/ml followed by water extract 0.568 mg/ml and chloroform extract showed 0.478 mg/ml. The hexane extract exhibited least 0.423 mg/ml flavonoid content. Graphical representation of total flavonoid content of *Hibiscus rosa-sinensis*flower in

different solvent extract is depicted in Figure 2.

When we compared total phenol content with total flavonoid contents in *Hibiscus rosa-sinensis*flower by using water, methanol, chloroform, and hexane extract with standard Gallic acid and Quercetin respectively, it was found that flavonoid content in water, methanol and chloroform extracts was found more on other hand in hexane extract showed least flavonoid content than phenol content.

The values are mean of three experiments± SE. Statistical data shows a significant difference at ($P < 0.002$). SE: Standard Error.

Conclusion

The maximum percent extract yield of 17.86% w/w recorded in methanol extract of *Hibiscus rosa-sinensis*flower followed by water extract 14.73% w/w and chloroform extract 9.22% w/w. The results of the qualitative phytochemical analysis showed that Hibiscus rosa-sinensis flower has good source of flavonoids, phenols saponins, tannins and terpenoids.(Sontakke, K. S., &Shinde, S. L. (2020) When we compared total phenol content with total flavonoid contents in *Hibiscus rosa-sinensis*flower by using water, methanol, chloroform, and hexane extract with standard Gallic acid and Quercetin respectively, it was found that flavonoid content in water, methanol and chloroform extracts was found more on other hand in hexane extract showed least flavonoid content than phenol content.

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Table 1. Percent extract yield of *Hibiscus rosa-sinensis*flower in different solvent.

Sr.No.	Name of Plants	Solvents	Extract Yield (mg/gm)	Percent extract Yield (% w/w)
1	*Hibiscus rosa-sinensis*	Water	2.22±0.04	14.73±0.12
		Methanol	2.71±0.06	17.86±0.10
		Chloroform	1.68±0.14	9.22±0.21
		Hexane	1.50±0.09	8.44±0.12

Table 2.Qualitative phytochemical analysis of *Hibiscus rosa-sinensis*flower in different solvent extract.

Phytochemicals	**Test**	**Solvents**			
		Water	**Methanol**	**Chloroform**	**Hexane**
Flavonoids	Shinoda test	+++	+++	+++	++
Saponins	Frothing	++	++	++	+
Tannins	Braymer's test	++	++	++	-
Terpenoids	Salkowski	--	+++	+++	+++
Glycosides	General Test	-	++	++	+
Steroids	Lieberman-Buchard's	-	+	-	-
Phlobatannin	Precipitate test	+	-	+	+
Alkaloids	Mayer's	+	+++	++	+
Phenol	Ferric chloride	+++	+++	+++	++

Where: - Absent, + Present in low concentration, ++ Present in moderate concentration, +++ Present in high concentration.

Table 3: Total phenol content of *Hibiscus rosa-sinensis*flower (mg/ml).

Sr.No	**Name of Plants**	**Solvents**	**Total phenol content (mg/ml)**
1	*Hibiscus rosa-sinensis*L.	Water	0.526±0.0042
		Methanol	0.600±0.0014
		Chloroform	0.448±0.0083
		Hexane	0.456±0.0035
	Standard Gallic acid	Distilled water	0.995±0.0013

The values are mean of three experiments± SE. Statistical data shows a significant difference at ($P < 0.002$). SE: Standard Error.

Table 4: Total flavonoid content of *Hibiscus rosa-sinensis*flower (mg/ml).

Sr.No	Name of Plants	Solvents	Total flavonoid content (mg/ml)
1	*Hibiscus rosa-sinensis*L.	Water	0.568±0.0047
		Methanol	0.624±0.0086
		Chloroform	0.478±0.0033
		Hexane	0.423±0.0011
	Standard Quercetin	Distilled water	0.755±0.0015

The values are mean of three experiments± SE. Statistical data shows a significant difference at ($P < 0.002$).

SE: Standard Error.

Figure 1. Percent extract yield of *Hibiscus rosa-sinensis*flower in different solvent.

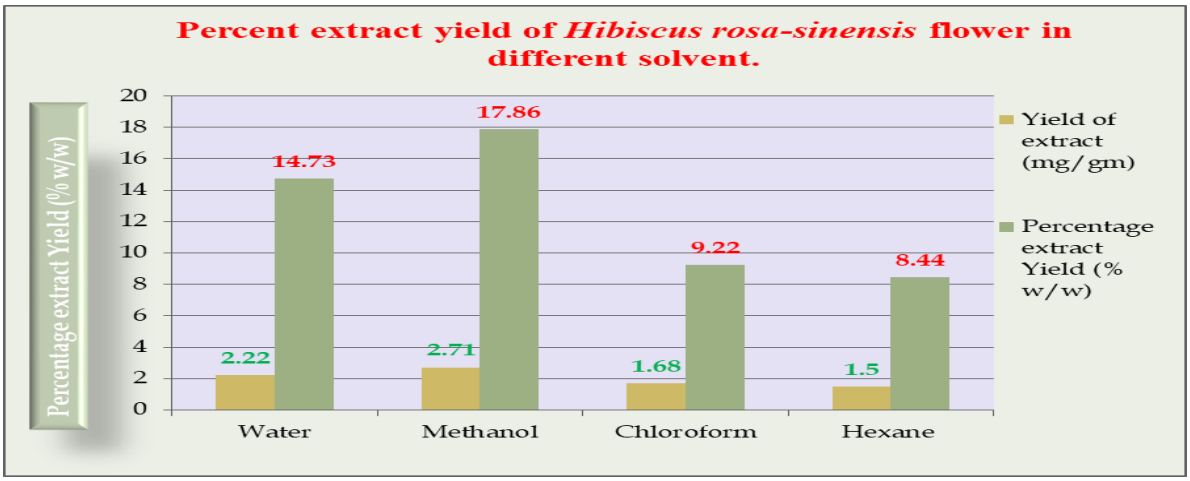

Figure 2: Total phenol and flavonoid content of *Hibiscus rosa-sinensis*flower (mg/ml).