

STUDY OF SOME BIVALVE DIVERSITY FROM PUJARITOLA DAM, DIST. GONDIA MAHARASHTRA (INDIA)**G. V. Ade¹ and P. M. Makode²**¹Assist. Prof., Dept. of Zoology, Shankarlal Agrawal Science College Salekasa, Dist. Gondia, Maharashtra.²Assoc. Prof. and Head, Dept. of Zoology, Shri. Dr. R. G. Rathod Arts and Science College Murtizapur Dist. Akola, Maharashtra, MS.

gaurithakre2018@gmail.com and pravin_makode@rediffmail.com

ABSTRACT

Molluscs are the vital components of the ecosystem showing great diversity and economic potential as a food source as well in the pearl industry, lime industry, etc. Freshwater bodies play an important role in balancing the ecosystem. The freshwater mollusks flourish in the ecosystem by playing a key role as an unavoidable component of the food chain, keeping water bodies clean. Molluscs gained veterinary and medical importance as carriers of trematodes and spreading diseases among humans and cattle. Gondia district gained importance due to water bodies constituting many lakes, streams, and rivers along with hills and luxuriant vegetation. Study and exploration of malacofauna in the Gondia district are needed as less work has been carried out in this region on molluscs. This paper aims to enlist some bivalve species of Pujaritola dam of Gondia district Maharashtra India. The list includes 05 species of bivalves, belonging to the family Unionidae of 02 genera Lamellidens and Parreysia.

Keywords: Malacofauna, Freshwater molluscs, Lamellidens, Parreysia.

Introduction

Phylum Mollusca is the second largest phylum after Arthropoda involves diverse species and stands as an important invertebrate fauna in the ecosystem (Subba Rao, N. V. 1989). Molluscs inhabit terrestrial as well as aquatic habitats. In aquatic habitats, they are found in both marine and freshwater habitats. Freshwater molluscs also show great diversity and play a vital role in a freshwater environment. The water quality of the water body is enhanced due to the filter-feeding mechanism present in molluscs resulting in the clean and clear water of the water body. Light penetration is good in such clean water providing favorable conditions for the growth of aquatic vegetation and hence more diversity flourishes in the ecosystem where molluscs are in play (Kumar, R et al., 2019). Freshwater molluscs constitute an important part of the food chain in the ecosystem. They include herbivores (feeds on algae and other aquatic flora) as well as carnivores and predators of other invertebrates. Some are scavengers (Sánchez, O et al., 2021). Molluscs have medical and veterinary importance as many of them are the intermediate host of trematodes and act as vectors in the transmission of many diseases in livestock and human (Dey, A. 2007), (Gupta, N. K. et al., 1969), (Grewal, P. S et al., 2003).

Freshwater molluscs have great economic importance as they are used as a food source for humans as well as ducks. Shells are used for manufacturing tools and jewelry (Vaughn, C. C. 2018). Beyond these few freshwater molluscs produce a pearl. In India *Lamellidens marginalis* and *Lamellidens corrianus* produce pearls (Subba Rao, N. V. 1989). Present paper deals with enlisting some freshwater bivalves in Pujaritola Dam of Gondia District Maharashtra.

Review of Literature

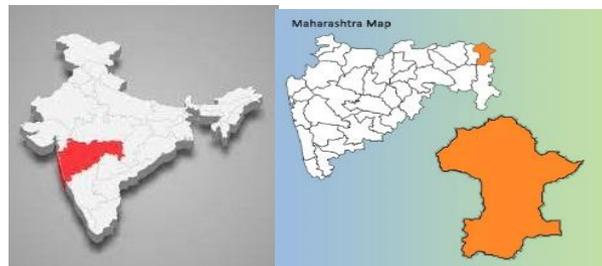
An extensive work is done in various countries throughout the world on diversity, characteristics and importance of malacofauna. Following are some recent articles with view of diversity of mollusks, evaluation of factors affecting survival, diversity richness. Spyra, A., (2017) investigated the relative importance of water chemistry in explaining snail assemblage compositions and species richness in forest ponds of contrasting pH. Patterns in gastropod communities were determined from an analysis in 26 forest ponds of Poland. He found the most diverse gastropod fauna in neutral ponds, whereas the lowest degree of diversity in ponds with the lowest pH. The inventory of land and freshwater mollusks was carried out in some parts of the Andhra Pradesh and Telangana

state of Deccan Peninsula India was carried out by Sajan, S.K et al., (2018), as a part of the faunal inventory of Eastern Ghats by ZSI. They recorded total of 25 species (13 species of land snails belonging to 2 Order 6 families and 12 of freshwater mollusks belonging to 5 order and 8 families). They evaluated threats for the species and suggest conservation strategies. Kamble V. S (2018) studied diversity of freshwater mollusks from drought prone region Sangola of Solapur district of Maharashtra state, India. He recorded 10 species belongs to class gastropods and 09 species from class Bivalvia from this region. Kumar, R et al., (2019) studied malacofauna biodiversity in Morni hills, Panchkula, Haryana. They found molluscan biodiversity of 7 species, 7 Genera and 5 families, namely *Filopaludinabengalensis*, *Melanoides tuberculata*, *Radix luteola*, *Gyraulus ladacensis*, *Indoplanorbis exustus*, *Ariophant interrupta*, *Macrochlamys indica* and observed greater molluscan abundance in Pre monsoon season than post-monsoon. Wagh, G.A et al., (2019) reported and identified total

30 molluscan species from water bodies of Amravati Maharashtra India. Vinarski, M.V et al., (2020) prepared review and studied taxonomy, diversity and biogeography of freshwater Mollusca of the circumpolar Arctic region. They discussed the ways of formation of the Circumpolar malacofauna with evaluation of dispersal, adaptation, and environmental filtering as the faunogenesis factors.

Research Work

a) **Study Area:** The Pujaritola Dam is an earth-fill dam built across the Bagh River near Amgaon of Gondia district in the state of Maharashtra in India. It is situated at 21.21211984° N latitude and 80.4240418° E longitude. Irrigation is the primary purpose behind this dam. This region experiences extreme variations in temperature with very hot summers and very cold winters and has an average relative humidity of 62 percent. The average recorded rainfall is more than 1,200 mm (47 in) in each rainy season (June to September).



Map of India showing Gondia district



Map of study area

b) Field visits and sampling

Pujari tola dam was visited from July 2021 to December 2021. During the period of investigation, molluscan samples were collected from the shore of the water body. Photographic data of the site and molluscs was collected for the visual survey method. Samples were collected by hand picking and by using a scoop net. For quantification of malacofauna stratified random quadrant method was used (Christian, A. D. et al., 2005), (Sarwade, A. B et al., 2015). Collected shells were cleaned with water to remove mud and dried. The identification was done based on morphological characters by following the keys given by Subba Rao 1989 Ramkrishna and Dey 2005; Dey, 2007.

Result

Some of the bivalve species collected from the study area are enlisted below.

Class	Order	Family	Genus	Species
Bivalvia	Unionida	Unionidae	Lamellidens	<i>Marginalis</i>
				<i>Consobrinus</i>
				<i>Corrianus</i>
		Unionidae	Parreysia	<i>Khadakvaslaensis</i>
				<i>Corrugata</i>

***Lamellidens marginalis* (Lamarck, 1819)**

Characters: Shell oblong-ovate, thin, very smooth, periostracum blackish brown and shining, light brown border along the ventral margin, posterior side broad, roundedly angular, produced, wing very narrow, dorsal margin a little curved, anterior side short and narrow, ventral margin slightly contracted in the middle, hinge with two cardinals in right valve, lower better developed, a single lateral and trace of second one, left valve with one feebly developed cardinal, two curved lateral teeth (Subba Rao, N. V.1989).

***Lamellidens consobrinus* (Lea, 1859)**

Characters: Shell rhomboidal, thick, umbones more inflated than in *L. marginalis*, dorsal margin curved, and obliquely truncate, posterior side obtusely angled, anterior side rounded, left valve with two ragged cardinals, anterior large and more developed (Subba Rao, N. V.1989).

***Lamellidens corrianus* (Lea, 1834)**

Characters: Shell elongate, elliptical; umbo slightly inflated periostracum smooth and dark brown; dorsal margin almost straight and long; cardinals two in each valve (Subba Rao, N. V.1989).

***Parreysia (Radiatula) khadakvaslaensis* (Ray 1966)**

Characters: Exhibits variation in shape and color. Shell thick tumid, fine sculpture on umbonal region, also vertically sculptured, sculpture appears to be a little more pronounced. Posterior side broader than anterior, umbo almost at the Centre of the dorsal margin. Shells are inflated, elongated, posterior end pointed (Subba Rao, N. V.1989).

***Parreysia corrugata* (Mueller 1774)**

Characters: Shell green, elliptic to oval, scarcely inequilateral, smooth, umbones prominent, sculptured with somewhat radiating, oblique, linear ridges, ventral margin Convex, lunule well marked, cardinal teeth strong, not lamellar (Subba Rao, N. V.1989). Percentage composition of the above-mentioned bivalves during the study period in Pujaritola dam showed that *Lamellidens corrianus* is the most abundant species with 32.78% followed by *Lamellidens marginalis* 26.22, *Lamellidens consobrinus* 24.59%, *Parreysia khadakvaslaensis* 12.29%, *Parreysia corrugata* 4.12%.

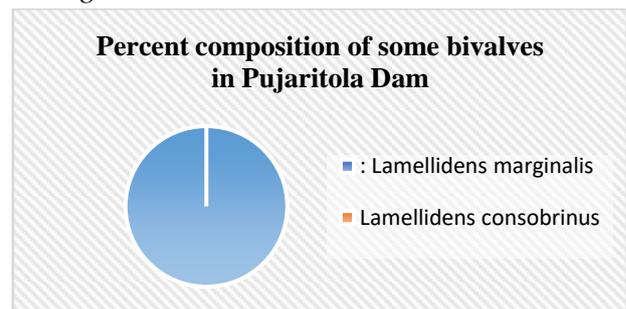


Table 2. Images of bivalve samples			
Sr. No.	Name of Species	Dorsal View	Ventral View
1	<i>Lamellidens marginalis</i>		
2	<i>Lamellidens consobrinus</i>		
3	<i>Lamellidens corrianus</i>		
4	<i>Parreysia (Radiatula) khadakvaslaensis</i>		
5	<i>Parreysia corrugata</i>		

Conclusion

During the survey of malacofauna in the mentioned study region, several molluscan samples were collected. This research paper emphasizes on enlisting some bivalves among malacofauna in Pujaritola Dam of Gondia district Maharashtra India. This survey for

malacofauna is the first time in this region. Further extensive surveys will be carried out to explore more malacofauna and further research will be continued on distribution patterns, habitats, seasonal occurrence, and abundance shown by molluscs in this region.

References

1. Christian, A. D., & Harris, J. L. (2005). Development and assessment of a sampling design for mussel assemblages in large streams. *The American midland naturalist*, 153(2), 284-292.
2. Cummings, K. S., Jones, H. A., & Lopes-Lima, M. (2016). Rapid bioassessment methods for freshwater molluscs. *Core Standardized MethodS*, 186, 1-23.
3. Dey, A. (2007). Handbook on Indian freshwater molluscs. AICOPTAX--Mollusca, Zoological Survey of India.
4. Gondia Gazetteer (2021). Database of Gondia District redirected from official website of Gondia District (M.S.), India, www.gondia.nic.in.
5. Grewal, P. S., Grewal, S. K., Tan, L., & Adams, B. (2003). Parasitism of molluscs by nematodes: types of associations and evolutionary trends. *Journal of Nematology*, 35(2), 146.
6. Gupta, N. K., & Taneja, S. K. (1969). Four already known cercariae from fresh-water molluscs of Chandigarh and Patiala. *Research Bulletin of the Panjab University of Science*, 19(3/4), 413-422.
7. Kamble, V. S. (2018). Study of Diversity of Fresh water Molluscs from Drought Prone Region Sangola, District Solapur (MS), India. *Journal of Emerging Technologies and innovative Research*, 5(8).
8. Kumar, R., & Maansi, W. M. (2019). Molluscan Biodiversity and its seasonal fluctuations in Teekar Taal, Haryana. *Indian International Journal of Research-Granthalayah*, 7(1), 169-178.
9. Ng, T. H., Jeratthitikul, E., Sutcharit, C., Chhuoy, S., Pin, K., Pholyotha, A., ... & Ngor, P. B. (2020). Annotated checklist of freshwater molluscs from the largest freshwater lake in Southeast Asia. *ZooKeys*, 958, 107.
10. Sajjan, S. K., Tripathy, B., & Biswas, T. (2018). Species inventory of land and freshwater Molluscs from Andhra Pradesh and Telangana states of India. *Records of the Zoological Survey of India*, 118(2), 141-155.
11. Sánchez, O., Robla, J., & Arias, A. (2021). Annotated and Updated Checklist of Land and Freshwater Molluscs from Asturias (Northern Spain) with Emphasis on Parasite Transmitters and Exotic Species. *Diversity*, 13(9), 415.
12. Sarwade, A. B., Pati, S. K., & Kamble, N. A. (2015). Diversity of molluscan fauna from freshwater bodies of Sangli district: A comprehensive study in relation to environmental variables. *International Journal of Pharmaceutical Sciences and Research*, 6(8), 3563.
13. Spyra, A. (2017). Acidic, neutral and alkaline forest ponds as a landscape element affecting the biodiversity of freshwater snails. *The Science of Nature*, 104(9), 1-12.
14. Subba Rao, N. V. (1989). Handbook, freshwater molluscs of India.
15. Vaughn, C. C. (2018). Ecosystem services provided by freshwater mussels. *Hydrobiologia*, 810(1), 15-27.
16. Vinarski, M. V., Bolotov, I. N., Aksenova, O. V., Babushkin, E. S., Besspalaya, Y. V., Makhrov, A. A., ... & Vikhrev, I. V. (2021). Freshwater Mollusca of the Circumpolar Arctic: a review on their taxonomy, diversity and biogeography. *Hydrobiologia*, 848(12), 2891-2918.
17. Wagh, G. A., Qurashi, H. A., & Patil, S. (2019). A Brief Note on Molluscan Diversity From Water Bodies of Amravati MS India. *Bioscience Biotechnology Research Communications*, 12(3), 814-819.
18. Waghmare, P. K., Rao, K. R., & Shaikh, T. A. (2012). A correlation between freshwater molluscan diversity with Bhima River pollution near Pandharpur, Maharashtra, India. *Trends in Life Sciences*, 1(3), 38-42.

PREPARATION AND CHARACTERIZATION OF Ni⁺⁺ and Cu⁺⁺ METAL IONS CHELATES WITH HETEROCYCLIC MOLECULES

Bhagat S.M.

Dept. Chemistry, I.C.S. College of Art's, Comm. and Science, Khed. Dist.- Ratnagiri(MH)

ABSTRACT

The transition Metal ion chelates of Cr⁺³, Mn⁺² is synthesized by using 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones and characterized by different analytical procedure and spectral study. These metal ion chelates are insoluble in common organic solvents. Infrared spectrum showed the bonding through azomethazine N and ring N.

Keywords -metal ions chelates, benzothiazolyl Hydrazones

Introduction

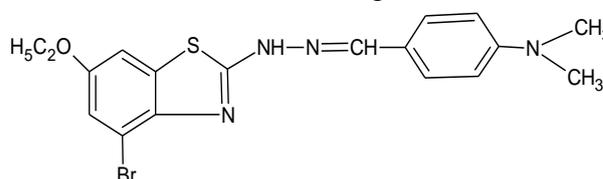
The coordination chemistry of hydrazones is an intensive area of study and numerous metal complexes of these ligand have been investigated¹. The development of the field of bioinorganic chemistry has increased the interest in Schiff base complexes, since it has been recognized that many of these complexes may serve as models for biologically important species²⁻⁴. The hydrazones metal complexes have found application in various process like sensor, medicine, nonlinear optics etc. they are well known for their metal binding ability and exhibit interesting coordinating behavior with transition metal ion^{5,6}. Coordination compound derived from aryl hydrazones have been reported because of their anti-tuberculosis, antimicrobial and corrosion inhibitor⁷⁻⁹. Hydrazones have been drawing much attention from coordination chemistry to transition metal¹⁰. In the context of the above application we have tried to the synthesis and characterization of transition metal complexes of 2-(4'-dimethyl amino phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones. Prepared complexes were dried and the physical and chemical properties were recorded. Analysis of the complexes and different spectral studies like I.R., Electronic spectra of the complex were used for find out the donor site of the ligand.

Synthesis of ligand

Preparation of 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones from 4-bromo-6-ethoxy benzothiazolyl hydrazones.

To the ethanolic solution of 4-bromo-6-ethoxy benzothiazolyl was added in ethanolic solution of 4-dimethylaminobenzaldehyde. The mixture was refluxed on water bath for two hours. Obtained solid is cooled filtered, washed with ethanol and recrystallized from hot benzene.

Structure of ligand.



2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones
Physical parameter-

Synthesis of complexes

Synthesis of Ni⁺² metal complex with 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones 150 ml of 0.2 M solution of 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones were prepared in alcohol and 100 ml of 0.1 M solution of NiCl₂ prepared in alcohol. These two solution were mixed in 500 ml flask, the pH is maintained up to 6.5 by addition of buffer solution. The reaction mixture is were refluxed for one hour. precipitate is obtained, it is digested after cooling it is filtered through Buckner funnel. The precipitate is purified by washing with ether, the complex were dried by keeping it in oven. The product was packed into sample bottle.

Synthesis of copper complex

copper chloride and ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones were dissolved

separately in ethanol so as to prepare 0.1 molar solution with constant stirring. A clear solution of copper chloride was mixed in ligand solution in 1:2 proportion and pH is adjusted to 6.5 with buffer solution and refluxed on water bath for one hour and allowed to cool. The contents were digested for one hour and filtered. Pale green colored solid is obtained it washed with ethanol and dried and stored in bottle.

Physical parameter and elemental analysis.

Decomposition point was determined with the help of melting point apparatus by open capillary methods. M:L ratio was determined by heating known weight of complex in platinum crucible. Metal ion percentage in a complex is determined by E.D.T.A. titration method. Chloride is estimated by Mohr's method.

Physical parameter and analytical data of the Ni(II), Cu(II) complexes and ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones (MAPBEBTH). Are given in table no. 1. metal ligand ratio and empirical formula were assigned on the basis of T.G.A. measurement and elemental analysis is given in table no.5.2.

Characterization of complexes

spectrophotometer at range 200-800 nm by using D.M.S.O. solvent at P.G. department of chemistry Shivaji University Kolhapur. I.R. spectra of ligand were recorded at Yeshwant Mahavidyala Nanded and I.R. spectra of complexes are recorded at PERKIN ELMER spectrum-100/79720 by KBr platelate method at Shivaji University Kolhapur. Thermo gravimetric analysis (T.G./D.T.A.) measurement are recorded on thermo gravimetric analyzer on TA model S.T.D-2960 at Shivaji University Kolhapur in Nitrogen atmosphere .XRD pattern of the complexes recorded on PW-3719/1710 Philips –Holland spectrometer at Shivaji University Kolhapur and E.S.R. is recorded at IIT, pawai, Mumbai.

Result and discussion

The complexes of Ni(II), Cu(II), are prepared with the ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones (MAPBEBTH). This complexes are colored. These complexes are soluble in D.M.S.O. but insoluble in water, alcohol, chloroform, and D.M.F. Decomposition point of complexes are in the range of 240-300°C . It suggest that they have good thermal stability at room temperature

Table.1: physical property of (MAPBEBTH) metal complexes.

Complex	color	D.P.	Yield%	%Cl
[Ni(MAPBEBTH) ₂] Cl ₂ H ₂ O	Pale green	263-267	68	7.200
[Cu(MAPBEBTH)Cl H ₂ O] Cl.	Sky blue	252-257	73	12.418

Table.2: Percent C,H,N and metal ion in HMPBMBTH metalcomplex

compound	M.wt	Empirical formula	%C	%H	%N	%M
MAPBEBTH	419.20	C ₁₈ H ₁₉ N ₄ BrSO	51.576	4.532	13.365	-
[Ni(MAPBEBTH) ₂] Cl ₂ H ₂ O	986.11	C ₃₆ H ₄₀ Cl ₂ Ni ₈ S ₂ Br ₂ O ₃	43.850	4.056	11.357	5.953
[Cu(MAPBEBTH)Cl H ₂ O] Cl.	571.74	C ₁₈ H ₂₁ Cl ₂ Ni ₄ SBrO ₂	37.791	3.672	9.794	11.113

U.V. Spectroscopy

U.V. and visible spectra of complexes and ligand recorded on U.V. SHIMADZU UV3600 spectrophotometer at range 200-800 nm by using D.M.S.O. solvent at P.G. department of chemistry Shivaji University Kolhapur.

The ligand 2-(4'-dimethylamion phenyl)-4-bromo-6-ethoxy benzothiazolyl hydrazones has exhibited one characteristic maxima in U.V.

region at 246 nm where in [Ni(MAPBEBTH)₂] Cl₂ H₂O complex it is shifted at 258 nm and in complex [Cu(MAPBEBTH)Cl H₂O] Cl. Band is observed at 266 nm this shifting of band is due to the complex formation.

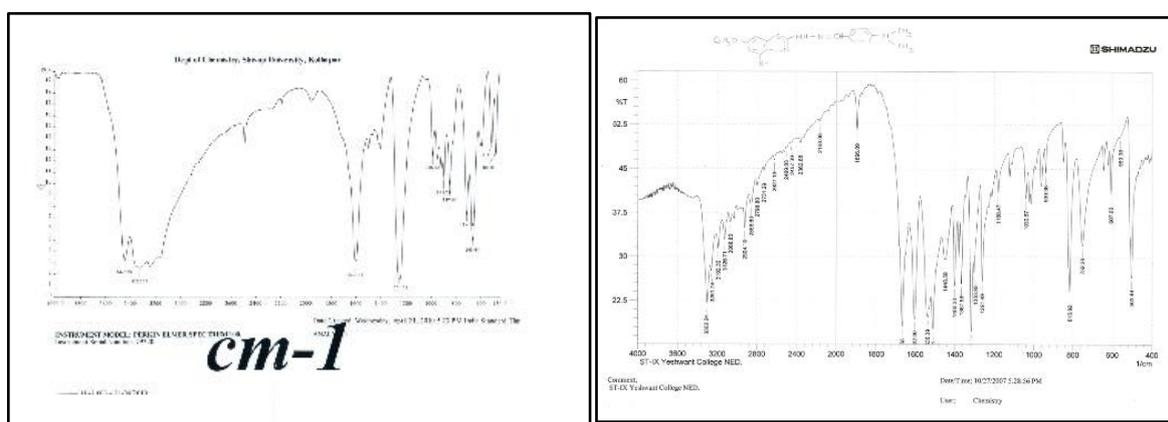
I.R. spectra

A sharp strong band is observed in I.R. spectra of ligand at 1665 in ligand it is due to the C=N

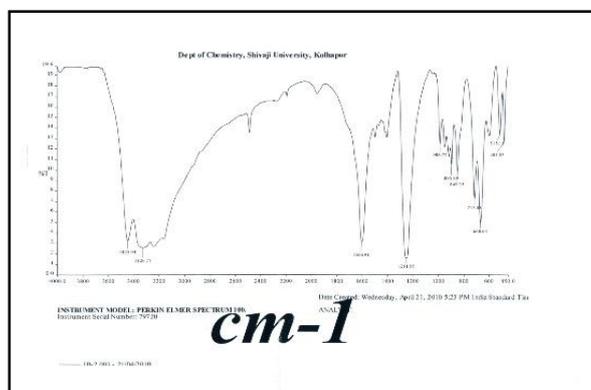
of thiazole ring nitrogen. This band is shifted in Ni^{+2} complex as well as in Cu^{+2} complex. In Ni^{+2} complex it is observed at 1645 and in Cu^{+2} complex it is observed at 1606 this shifting of band in both complexes it indicate that the Nitrogen of thiazole ring is involve in the complex formation. Another band is observed at 1602 in ligand. This band is support to the presence of C=N (azomethazine) group in ligand. This band is shifted in Ni^{+2} and Cu^{+2} complexes. The band is observed in Ni^{+2} complex at 1590 where in Cu^{+2} complex it is observed at 1510. This shifting of band indicate that the azomethazine nitrogen involve in the complex formation.

One band is observed at 3302 in ligand it may be due to the presence of N-H group. This band is also observed in Ni^{+2} and Cu^{+2} complexes it is evidence that the N-H group is not involve in the complex formation. In Cu^{+2} complex one band is observed at 3606 which is absent in ligand and in Ni^{+2} complex. it indicate that the water molecule is coordinate with metal.

Another one band is observed in both complexes but absent in ligand. In Ni^{+2} complex it is observed at 481 where as in Cu^{+2} complex it is observed at 468 it indicate that there is a formation of M-L bond.



Thus the ligand act as a bidentate. It coordinate through azomethazine, Nitrogen of thiazole ring.



*I.R. Spectra of Ligand MAPBEBTH. I.R. Spectra of $[\text{Ni}(\text{MAPBEBTH})_2] \text{Cl}_2 \cdot \text{H}_2\text{O}$
I.R. Spectra of $[\text{Cu}(\text{MAPBEBTH})\text{Cl} \cdot \text{H}_2\text{O}] \text{Cl}$*

Electron spin Resonance Spectroscopy

The X-band E.S.R. spectrum of the powder Ni(II) and Cu (II) complexes was recorded at room temperature. The calculated values of Ni(II) is g_{\parallel} , g_{\perp} , g_{avg} , and G are 2.18171, 2.08286, 2.11581, 4.26457 respectively. And Cu(II) is g_{\parallel} , g_{\perp} , g_{avg} , and G are 2.21932, 2.06947, 2.11942, 4.288792 respectively. The values are typical for one unpaired electron in an orbital of mostly d_{xy} character. If g_{\parallel} value is less than 2.3 the compound is covalent and g_{\parallel} value is greater than 2.3 then it is ionic. Present values indicate that the complexes are covalent. G value is greater than 4 it indicate that the ligand is weak field ligand.

Thermal analysis

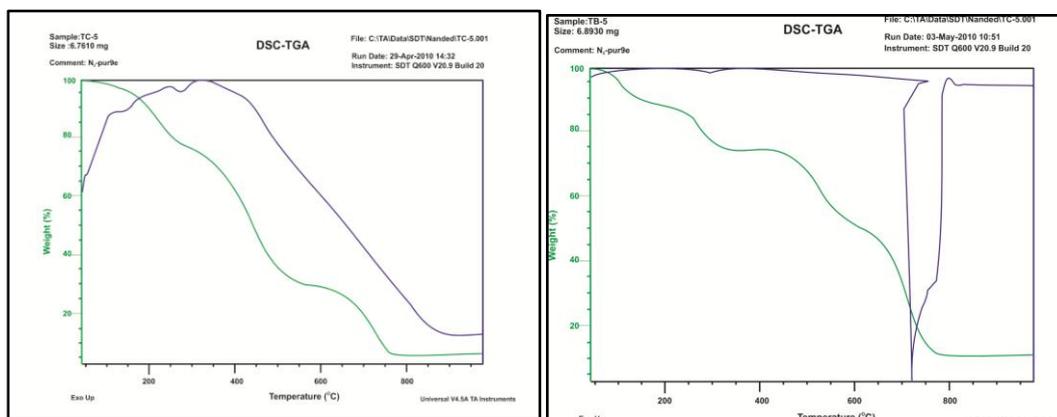
Results of TG analysis were used to determine the nature of water molecules present and decomposition pattern of the complexes. Lattice water molecules were lost in the 70-110 °C temperature range while coordinate water molecules were eliminated at relatively high temperature range of 150-240 °C. complete decomposition of ligand occur at about 800 °C and observed residue corresponds to respective metal oxide.

Present losses of material as obtained from TGA curve are good agreement with calculated percent loss in mass. Thermo gravimetric

results coincide well with DTA peaks. TGA/DTA scans are depicted in fig.

TGA/DTA of $[\text{Ni}(\text{MAPBEBTH})_2] \text{Cl}_2 \cdot \text{H}_2\text{O}$ shows five peak of decomposition. The first peak is observed at the temperature range 50-130°C and 9.023% loss of mass is observed. This loss of mass is due to the elimination of lattice chloride and water molecule from the compound. In second peak 18.047% loss is observed in the temperature range 130-280°C. The loss of mass is due to the elimination of two molecule of $\text{N}(\text{CH}_3)$ and ethoxy group form the complex. Third peak is observed in the temperature range 280-430°C and 15.411% mass is lost. This loss in mass is due to the elimination of two benzene ring from the molecule. In the fourth peak 31.228% mass is lost in the temperature range 430-570°C. The loss of mass is due to the elimination of two bromobenzene rings from the complex. Last peak is observed in the temperature range 570-760°C. In this peak 20.277% mass is lost. This loss in weight is due to the elimination of thiazole ring part and its substituent chain $\text{NH}-\text{N}=\text{CH}$. From the temperature 760°C curve of graph show constant value. It indicate that remaining mass is of metal oxide. Calculated value are coincide with observed value.

TGA/DTA $[\text{Cu}(\text{MAPBEBTH})\text{Cl} \cdot \text{H}_2\text{O}] \text{Cl}$ complex



TGA/DTA plot of $[\text{Cu}(\text{MAPBEBTH})\text{Cl} \cdot \text{H}_2\text{O}] \text{Cl}$ complex Shows five peaks of decomposition. First peak is observed at temperature range 50-110°C and 6.208% mass is lost. This loss in mass is due to the elimination of lattice chloride from the

complex. In second peak 9.356% mass is lost in the temperature range 110-260°C. This loss in weight is due to the burning of coordinate chloride and water molecule. Observed values are in good agreement with calculated values. Third peak is observed at the temperature range

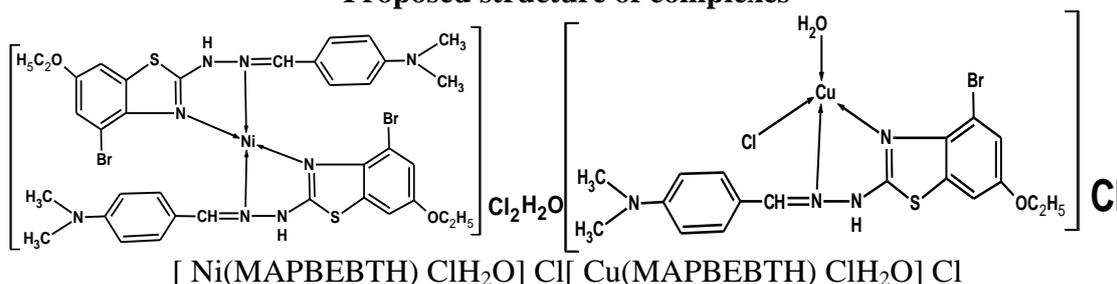
260-490°C . In this temperature range 15.564% weight is lost from the complex compound . this loss of mass is due to the elimination of $N(CH_3)_2$ and OC_2H_5 group from complex. Fourth peak is observed at temperature range 490-620°C and 40.622% weight is lost. This loss in weight is due to the elimination of bromobenzene ring. In last fifth peak 17.488% mass is lost in the temperature range 620-770°C this loss in mass is due to the elimination of thiazole ring part and its substituent chain $NH-N=CH$. From the temperature range 770°C curve of the graph show constant value of weight of complex it indicate that remaining mass is of metal oxide. Observed figures and calculated figures are approximately equal.

Thermal decomposition value of

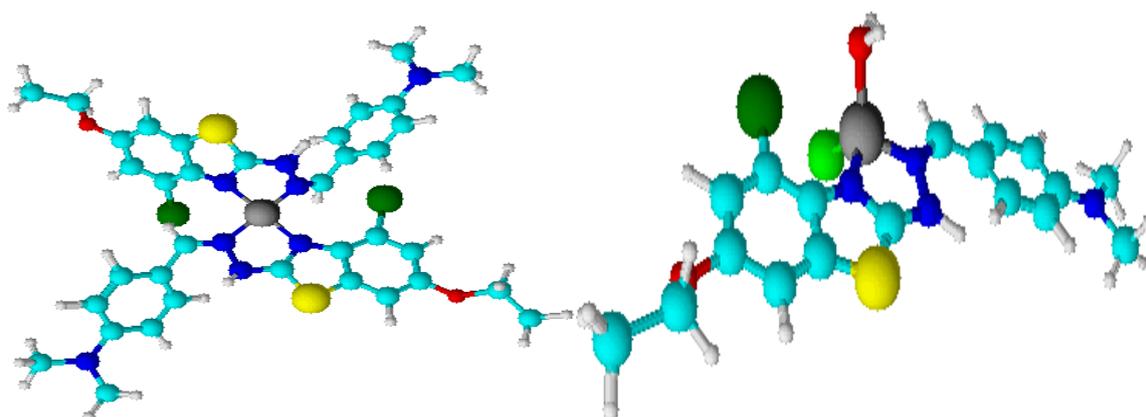
$[Ni(MAPBEBTH)_2] Cl_2 H_2O$ metal complex
 $[Cu(HMPBMBTH)H_2O]Cl$ metal complex

Temp. range °C	% loss	Nature of decomposition
50-130	9.023 (9.087)	Lattice chloride & water molecule
130-280	18.047 (18.022)	$N(CH_3)_2$ & OC_2H_5
280-430	15.411 (15.241)	Two benzene ring
430-570	31.228 (31.385)	Two bromo Benzene ring
5570-760	20.277 (20.262)	Thiazole ring part and substituted chain.
Temp. range °C	% loss	Nature of decomposition
50-110	6.208 (6.069)	Lattice chloride
110-260	9.356 (6.325)	Coordinated chloride & water molecule
2260-490	15.564 (15.495)	$N(CH_3)_2$ & OC_2H_5
490-620	40.223 (40.269)	Two Benzen ring & Br.
620-770	17.488 (17.40)	Thiazole ring and substituted chain.

Proposed structure of complexes



Proposed 3D structure metal complexes



References

1. Sondhi S.M., M.Dinodia. and A. Kumar., Bioorg.Med.Chem.,2006, 14,4657.
2. C. Jayabalkrishnan and K. Natarajan., Rect. Inorg. Met- Org.Chem.,2001.,31,980.
3. Dharmaraj N.P.,Viswanathmurthi and K. Natarajan., 2001., Trans.met.Chem., 26, 105.
4. Jeeworth T., H.L.K. Waall, M.G. Bhowon, D. Ghoorhoo and K. Babooram., Rect. Inorg.Met-org.Chem.,2000, 30,1063.
5. Gudasi K.B., R.V. Shenoy, R.S. Vadavi, A.S. Patil and M. Nethaji., J. Mol.struct., 2006,788(1-3),22-29.
6. Kuriakose M., M.R. Prathapachandra Kurup and E. Suresh., Polyhedron,2007,26(2),2713-2718.
7. A.S. Fouda, G.E. Badr and M.N. El-Haddad., J. Korean Chem. Soc.,2008,2,124.
8. M.A. Ali., M.H. Kabir, M.Nazimuddin, S.M.H. Majumder, M.T.H. Tarafder and M.A.Khair., Indian J. Chem., 1988., 27A., 1064.
9. Feerari M.B.,S. Capacchi, G. Pelosi, G. Refto, P. Tarasconi, R. Alberlini, S. Pinelli and P. Lunghi., Inorg. Chim. Acta., 1999, 286, 134.
10. Mishra D., S. Naskar, A.J. Blake and S. Chattopadhyay. Inorg. Chimica Acta.,2007, 360(7), 2291-2297.
11. Aswar A.S., V.V. Dhande and V.B. Badwaik., Russ. J. Inorg. Chem., 2007,52,1206.
12. Aswar A.S., A.R.Yaul, V.V. Dhande and N.J. Suryawanshi., Polish J. Chem., 2009.,29,556.
13. Mautya M.R. , A. Syamal. Indian J. Chem., 1985, 24A,836.
14. Kumar D., P.K. Gupta and A. Syamal., J. Indian Chem. Soc., 2003., 80,3.
15. Sarika R. Yaul, Amit R. Yaul, Gaurav B. Pethe. And Anand S. Aswar. , Am-Euras. J. Sci., 2009, 4(4),229-234.
16. Aswar. A. S., A. D. Bansod, S.R. Aswale and P. R. Mandlik., Indian J. Chem., 2004., 43A, 1892.
17. Singh P.K. and D.N. Kumar., Spectrochimica Acta., 2006, part A, 64(4), 853-858.

VEGETATION MONITORING METHOD FORENVIRONMENT CONSERVATION**Dr. Ranjan B. Kalbande**

Dept. of Botany, Shri Dr. R. G. Rathod Arts & Science College, Murtizapur, Dist - Akola, MS, India

ABSTRACT

The main objective was mapping and monitoring tree-cover cover of the country is to know the dynamic changes of forest resources in terms of quantity and quality over a period of time so that appropriate planning and management interventions could be developed for their conservation and sustainable utilization. Spatial distribution of resources on maps along with other features will provide information for planning and implementation and utilization of these resources in a sustainable manner. In this present research works on the satellite images and digital aerial photography that can be processed for visualization of terrain conditions in Digital mode, which were generated from a variety of resources. A digital elevation model can be used to closely examine various terrain attributes, their influence on the movement of soil and nutrients, as well as the resulting effect on forest, plant, and wildlife productivity and distribution.

Keywords: GPS, GIS, MIS, DSS, Digital aerial photography, Vegetation Monitoring, Geospatial Data

Introduction

The application of IT tools technology to biodiversity information. It thus deals with the information capture, storage, provision, retrieval, and analysis, populations, and taxa and their interaction. It covers the information generated by the fields of systematics including population biology, behavioral sciences. Biodiversity Informatics is considered a part of environmental informatics Biodiversity Informatics will provide the skeleton for a generalized scientific information infrastructure in biology. Biodiversity Informatics is to provide a sound information management infrastructure for biodiversity and Global Change research.

Review of Literature

Kagan (2006) has shed light on challenges and opportunities for applying biodiversity information to management and conservation. Information on vascular plant taxonomy, as addressed by global biodiversity information facility and key partners, serves as an example of current efforts to integrate information. In addition, intensive or public policy need to promote the use of standards, the long-term maintenance of data sets, the maintenance of institutions for maintaining and distributing information, and more careful use of limited resources. Lertlum and Murai (1995) carried out computer assisted monitoring of vegetation using multi-resolution satellite and geospatial

data. The authors approach was object oriented, a relatively new method in computing, was an attempt to improve modeling of the real world. In their view previous modeling approaches were more record oriented, essentially to close to computers, this new Pedigram was a frame work for generating models closer to the real world features. The ideal would seem to be providing an isomorphy that was direct correspondence, between real world entities and their computer representation.

Lobo (2008) analyzed the results of the best comparative study of the performance of different modeling techniques, which used pseudo-absence data selected at random. He provided an example of variation in model accuracy depending on the type of absence information used, showing that good model predictions depend most critically on better biological data. This research work was study of the relative performance of different modeling techniques. Comparing the reliability of 16 techniques, and 226 species from six world regions, the author validated the predicted distributions with "independent" and reliable species presence / absence data that was withheld from model building.

Joshi *et al.*, (2004) explored the potential of multi-temporal IRS-ID WiFs (Wide Field Sensor) data for characterization of tropical forest in Central India. As the WiFS has red (R) and near infrared (NIR) band that was sensitive to vegetation. In the present study the forest cover of the central highland was

accounted as 34.68% whereas the FSI reports 34.84 % forest cover. However, the WiFS product provided additional information on forest types, Viz., tropical moist deciduous, dry deciduous and mixed deciduous. The WiFS derived forest maps could be very useful as input to biogeochemical models that require timely estimates of forest area and type.

Rawat *et al.*, (2008) have shed light on monitoring and mapping India's forest and tree cover through Remote Sensing. Forests are ecological as well as socio-economic resource. These have to be managed judiciously not only for environmental protection and other services but also for various products and industrial raw materials. This requires periodic monitoring of the forest cover of the country for effective planning and sustainable development. The main objective of forest survey of India in mapping and monitoring forest and tree cover of the country is to know the dynamic changes of forest resources in terms of quantity and quality over a period of time so that appropriate planning and management interventions could be developed for their conservation and sustainable utilization.

Schneider *et al.*, (1998) described a tool developed for panoramically surveying the contents of the collection: the Herbarium Specimen Browser. They created WWW tools for botanists and botanically interested nonspecialist to explore aspect of botanical datasets, mainly relating to geographic distribution of various plant groups.

Roderic and Page (2008) focused on challenges of linking data and the role of shared identifiers. A major challenge facing biodiversity informatics is integrating data stored in widely distributed databases. Initial efforts have relied on taxonomic names but have limitations as identifier, being neither stable nor globally unique, and the pace of molecular taxonomic and phylogenetic research means that a lot of information in public sequence databases is not linked to formal taxonomic names.

Materials & Methods

Trees were coded, tagged, and labeled with unique tree code. The tree height was measured. The height and girth data was collected which is important criteria for

evaluation of research site in relation to number of tree species, genera, and families. The collected data was the classified according to scientific parameters. Then data was entered into an MS-Excel spreadsheet and then it was transformed into graphic form. The dataset and databases are useful as management information system (MIS) in decision making. This modern day technical facility was fully utilized for the study of biodiversity in trees species of compartment 1016.

Using Internet Technologies Internet explorer software was used. Actual topographic locations of vegetation-spot potential from the satellite photographic images were studied. A total of 12 different sites, aerial photographs were taken. Here, MS-Access software was used to store the data of tree species. Database tools like query, forms, and reports were applied for analysis, handling, processing and managing the data. Database software was the best alternative to the conventional methods for handling huge/large amount of data or information in user friendly manner with sufficient security system. Photographic data and information was provided in the form of CDROM's. Image specimen's sets of the tree species showed digital images with their external characteristics. CDROM was the secured information which could be widely spread through Internet and portable electronics devices.

Trees were coded, tagged, and labeled with unique tree code. The tree height was measured with the help of bamboo by doing feet wise marking on it, and in case of very tall and tallest trees the height was measured by climbing on tree if necessary. The data was entered into an MS-Excel spreadsheet and then it was transformed into graphic form.

Observations & Results

The study was carried out with the help of computer and Internet. The satellite maps were downloaded to understand the area broadly. Present study explored the current trees status of the study site. During monitoring study the area was highlighted properly and visually labeled. Many satellite photographs of different views of the research area were prepared and studied. This data was useful for identify the forest category as tropical dry deciduous type.

The satellite map indicated small visual patches of forest vegetation cover comprising dense forest, open forest and non forest areas which were well labeled showing thereby the topographic situation of the area.

These are the usage of new technology in monitoring forest cover which describes relationship in between real world and its computer representation. Aerial digital satellite maps provided accurate and real picture of geographical distribution of the compartment 1016. This was achieved by using software MS-Internet Explorer (Web browser), Adobe ImageReady CS, Adobe Photoshop CS, and Corel Graphics suite 11. The satellite maps were prepared with the support of Google Earth Maps searching tool. This software's were used to visualize captured data and to zoom it many more times.

The main objective was mapping and monitoring tree-cover cover. of the country is to know the dynamic changes of forest resources in terms of quantity and quality over a period of time so that appropriate planning and management interventions could be developed for their conservation and sustainable utilization. Spatial distribution of resources on maps along with other features will provide information for planning and implementation and utilization of these resources in a sustainable manner.

Discussion

The Specimen Browser System was developed for easy access; all the specimen images were stored in the directory and subdirectory in listing format which were further linked with the data table using hyperlink option; just by single click on it, the system could be operated and implemented in a very simple way. The herbarium, bark specimens along with field maps were linked to the table. The specimen browser provided specified image and table data in its desirable form rapidly. Schneider *et al.*, (1998) pursued the more specific project of transferring the field information into electronic form. Specimens collected within Texas were used by the Specimen Browser. For each of those, the following items have been recorded: accession number and source

herbarium, collector's name, a collector-specific number for the specimen, data of collection, country of collection, and scientific name. Future revisions to the Specimens to be used as they were entered; future data-gathering passes were anticipated to input data from annotations and images of the plants themselves. Cotter and Bauldock (2000) assumes that information technology provides us tools to digitize information and store it in accessible systems; discover and retrieve data pertinent to the issue at hand; analyze data from diverse distributed databases input and promote interactions among colleagues through collaboratoria, internet-based communication facilities which enable discussions, document development and revision, and decision making in real time. In view of Kagan (2006) Biodiversity informatics has to provide consensus reference system in structural features (e.g. in database design) and content definitions (controlled vocabularies, i.e., list of applicable terms). Taxon based information system (or system using taxon names) must find ways to map individual taxon concept reliably. Information on vascular plant taxonomy, as addressed by global biodiversity information facility and key partners, serves as an example of current efforts to integrate information of the plant biodiversity. Aerial satellite monitoring method helps to understand better the complexity of the forest. The main intension of using this digital image processing system was to provide current status of forest with its potentially important data for monitoring, planning, conservation and management of the forest. Lertlum and Murai (1995) illustrated the use of objected-oriented data model to handle the integration problem of multi-resolution, multi-temporal data sets by defining an object oriented data model that could handle multi-resolution, multi temporal remote sensing GIS data sets. A semi-automated classification procedure was adopted by Meyera *et al.*, (1996) for identification of forest species from digitized large-scale, colour-infrared aerial photographs to simulate imagery from future sensors with high spatial resolution capability.

References

1. Dhore MA, Joshi PA. 1988. Flora of Melghat Tiger Reserve. Directorate, Project Tiger Melghat, Paratwada – 444805, Maharashtra (India) 1-248.
2. Hajra A, Rawat GS, Tiwari AK. 2002. Population Structure of the Corridor Forest Between Rajaji and Corbett National Parks, Uttaranchal, India. *Indian Journal of Forestry*. 25(3): 310-318.
3. Hargreaves P. 2006. Vegetative Morphology for Species Identification of Tropical Trees: Family Distribution. *Cernea, Lavras* 12(1): 1-7.
4. Hedge V, Chandran MDS, Gadgil M. 1998. Variation in Bark Thickness in a Tropical Forest Community of Western Ghats in India. *Functional Ecology* 12:313-318.
5. Hock B, Payn T, Stevens P, Dunningham A. 2003. A Digital Plantation Forest for Research and the Demonstration of Spatial Modeling. The 15th Annual Colloquium of the Spatial Information Research Centre University of Otago, Dunedin, New Zealand.
6. Kagan JS. 2006. Biodiversity Informatics: Challenges and Opportunities for Applying Biodiversity Information to Management and Conservation. *Northwestern Naturalist* 87:80-85.
7. Kharwal G, Rawat YS, Pangtey YS. 2007. Distribution Characteristics of the Tree Species in Central Himalaya, India. *International Journal of Botany* 3(2): 226-228.
8. Lertlum S, Murai S. 1995. Computer Assisted Monitoring of Vegetation Using Multi-Resolution Satellite and Geospatial Data. From <http://www.aars-acrs.org/acrs/proceedings.ACRS1995/Papers/PS295-1.htm>
9. Lobo JM. 2008. More Complex Distribution Models or More Representative Data? *Biodiversity Informatics* pp.14-19.
10. Meyera P, Staenzb K, Ittena KI. 1996. Semi-automated procedures for Tree Species Identification in high Spatial Resolution data from Digitized Colour Infrared-Aerial Photography. Published by Elsevier Science B.V. 51 5-16.
11. Moss IS. 2007. The Design of Forest Inventories and Monitoring for Biological Conservation. Paper Presented at the “Monitoring the effectiveness of Biological Conservation” Conference, 2-4-November 2004, Richmond, BC. From <http://www.forrex.org/events/mebc/papers.html>.
12. Musavi A, Mathur PK, Qureshi Q, Sawarkar VB. 2006. Mapping of Biotic Pressure and its Impact on Prey Densities in Melghat Tiger Reserve, Maharashtra. *International Journal of Ecology and Environmental Sciences* 32(4): 327-343.

ESTIMATION OF SOME PHENOLIC COMPOUNDS FROM ARGYREIA NERVOSA BURM.F. (SAMUDRASOKA)**Poonam R. Gulhane**Department of Botany, Shri Dr. R.G. Rathod Arts & Science college Murtizapur, Dist. Akola
poonamrgulhane21@gmail.com**ABSTRACT**

The present study was undertaken to find out phenolic compound content and pigments of leaves of *Argyrea nervosa*. Collection of plant material were done from Melghat forest region, Dist.- Amravati, Maharashtra. *Argyrea nervosa* is perennial climbing herb, it is commonly known as Samudrasoka in Marathi and Elephant Creeper, woolly morning Glory in English. Its whole plant, leaves, roots, fruits and seed used in traditional medicine. *Argyrea nervosa* is widely used as Antiphlogistic, emollient, antifertility, skin diseases, chronic ulcers, treatment of ringworm, and diabetics. Plants were identified with the help of the standard floras. 1gm of were leaves used for determination of Phenolic compounds. Phenolic compound act as antioxidant. Antioxidants have been reported to prevent oxidative damage caused by free radical. Estimation of total phenol, quinones, flavonols and tannins were done.

Keywords: *Argyrea nervosa* (Samudrasoka), Phenolic compounds, Spectrophotometer.

Introduction

The folk medicines in various countries gave rise to traditional system of medicines. Most of our disabilities, disorders and diseases have come to us from our ancestors as part of evolutionary package. Every human community was conscious of the burden of diseases & developed its own Medical System which may define as the pattern of social institution and cultural tradition that evolves from deliberate behaviors to enhance health. (Khan, and Khanum., 2005).

Argyrea nervosa is an important source of several phytochemical compounds like tannin, resins, flavonol, saponins, carbohydrate, amber colored resin, sterols. Economically it is used as folklore medicine as well as ornamental purpose. An ever increasing demand for herbal medicines due to its safety and less side effective has led to usage of medicinal plants worldwide (Kumar et al., 2016).

A variety of plant secondary metabolites have been reported to act as antioxidants and amongst them phenolic compounds from a major group. There are several reports on the contribution of phenolic compounds to the antioxidant potential of different plant species (Cai et al., 2004). Flavonoids are naturally occurring phenolic compound which largely include anthoxanthins

(flavones, flavonols, flavanones, flavanols, chalcones and isoflavones), anthocyanins,

leucoanthins and flavonoidal alkaloid (Houghton, 2002). *Argyrea nervosa* whole plant parts was used as medicine they contain important compounds like 1-triacontanol, Et-caffeate, penniclavine, isolysergic acid amide, caffeic acid, n-triacontanol, which are useful as aphrodisiac, immunomodulators, hepatoprotective, anti-inflammatory, anticonvulsant. (Meher Ashutosh et al., 2011)

Materials and Methods**Plant material*****Argyrea nervosa* (Burm.F.)**

A genus belonging to Convolvulaceae family, extensive twiners; stem densely white tomentose, 8-10 m long, terete, with milky juice. Leaves broadly ovate to orbicular, 10-30×6-25 cm or more, deeply cordate at base, entire, obtuse, acute or shortly cuspidate, persistently white tomentose beneath; petioles 5-15cm long.

Flowers in subcapitate cymes; peduncles stout, 6-15 cm long, white tomentose, bract ovate-lanceolate, upto 5cm long, long acuminate, pubescent on the back; pedicels very short, calyx white tomentose outside; sepals oblong elliptic, 1.5cm long, obtuse.

Corolla tubular funnel shaped, 5-6cm long, pink purple, pubescent on mid-petaline bands outside. Stamens included; filaments pilose at base. Fruits globose, 1.5-2cm diam., apiculate, brown. Seeds 2-4, subglobose, black.

Flowers and fruits- August to December

Uses

Whole plant used for stomach complaints, sores on foot, small pox, dysentery, antifertility, antirheumatic, antifungal. It is also during recanalisation in vasectomies. Leaves used for antiphlogistic, emollient, externally for skin diseases. (Malhotra,1996).Roots used

as appetitiser, anemia, brain tonic, cardiotoxic, diabetes, digestive, rheumatism, in gonorrhoea and disease of nervous system. (Dravyaguna and Das, 2003). Seeds and fruits used for treatment of anorexia, diabetes and various skin diseases and also shows significant hypotensive and spasmolytic activity. (Malhotra, 1996).



Argyreia nervosa (Burn. F.)

Preparation of Plant material

Fresh leaves were collected and the dried in sunlight. After them powdered with mechanical grinder and stored in airtight container. samples were powdered separately. 1gm each of samples were taken for estimation of Phenolic compounds grm/ μ gm.

Methods

Estimation of Phenolics such as Total phenol, Bound phenol, Orthodihydric phenol, Quinones, Flavonols, Lignin and Tannins were done according to the methods prescribed by Thimmaiah (1999), which are given below.

Estimation of Total Phenols

1gm of sample was grind with the help of mortar Pestle with 10 ml of 80% ethanol. The homogenate was centrifuged for 20 minutes

at 10,000 rpm. Supernatant was collected. Supernatant was Evaporate to dryness.

Then after dryness residue was taken and make up the volume with 5ml distilled water. 1 ml aliquate was Pippette out in test tube, and volume make up 3 ml with distilled water. To it 0.5 ml of Folin- Ciocalteu reagent was added. After 3 minutes, 2 ml of 20% Na_2CO_3 solution was added into each tube.

Mixed thoroughly and tubes was kept in boiling water for 1 minute, then allowed to Cool and absorbance at 650 nm was measured against reagent blank.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of catechol. (Thimmaiah S. R. 1999)

Estimation of Quinones

1gm sample was grind with the help of mortar and pestle with using chilled phosphate buffer (5ml for each gm of tissue). The supernatant was collected by

Centrifugation for 30 minutes this was used as enzyme extract. 3ml of buffer, 3ml of standard catechol and 1.5 ml of enzyme extract was pipette in a test tube. It was shaken gently and incubated in water bath. 4ml of TCA (Trichloro acetic acid) reagent (without ascorbic acid) to one and 4ml of TCA reagent (with ascorbic acid) was added. Precipitate was filtered. Absorbance was measured at 400 nm against a reagent bank lacking only extract.

Standard curve was prepared using different concentrations (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1 ml) of working standard catechol. (Thimmaiah S. R. 1999)

Estimation of Flavonols

1gm sample was grind with the help of mortar and pestle with 10ml of ethanol and the supernatant was collected by centrifugation for 20 minutes. The supernatant was evaporated to dryness; then the residue was dissolved in 5 ml distilled water. 1ml of extract was pipette out into 25ml conical flask and 1 ml of distilled water was added.

Then 4ml of vanillin reagent was added from a burette rapidly within 10-15 sec to flask A and 4ml of 70% H₂SO₄ to flask B.

A blank was prepared in flask C containing 4 ml of vanillin reagent and 2ml of distill water. Shaken the both flasks A and B in a water bath at the temperature below 35⁰C. Keeping the flasks at room temperature for exactly 15min. Absorbance was measured flask A, B and C at 500 nm against 47% H₂SO₄ (flask D). The absorbance of the flasks B and C from that of A. The flavonol content was calculated using a standard curve prepared from phlorogucinol or kaempferol (100 µg/ml). (Thimmaiah S. R. 1999)

Estimation of Tannins

Vanillin hydrochloride method was used.

1 gm of sample was mixed in 10ml methanol after 20-28 hrs. centrifuged and supernatant

was collected .pipette out 1ml supernatant into test tube and quickly 5ml of vanillin hydrochloride reagent was added and mixed. After 20 min absorbance was read at 500nm. A reagent blank was prepared with vanillin hydrochloride reagent alone. A catechin standard graph was prepared from working standard (100µg/ml) of catechin and amount of tannins was calculated. (Thimmaiah S. R. 1999)

Estimation of Lignins

Spectrophotometric Method

1 gm of sample was taken and moisten with distilled water and grind with the help of mortar and pestle with ether. Ether was used for getting extract free from chlorophyll pigment and centrifuged it for 5 min and decant the supernatant. The sediment was washed with distilled water, recentrifuge and discard the supernatant. Repeat washings twice. Adding 2ml of NaOH to the residue and extract was kept at 70-80°C for 12-16 hrs. Cooled, 0.45 ml of 2NHCL was added and pH was adjust to 7 or 8 with NaOH. The volume was make up with 3 ml distilled water and centrifuge for 5 min and supernatant was collected. To 0.8 ml of extract was taken and adding 0.8 ml of 0.1 M sodium phosphate buffer, was used to maintain pH 7.0. Another aliquot of 0.8 ml extract was taken and adding 0.8 ml of 0.1 N NaOH (pH 12.3) and the absorbance was measured at 245 and 350 nm against reagent blank lacking only extract. The amount of lignin was calculated by a difference between A₂₄₅ and A₃₅₀ (Thimmaiah, S.R.1999). A standard curve is the plot obtained by plotting concentration of a given standard along X- axis and the corresponding absorbance values along Y- axis on a graph sheet resulting a straight line which passes through the origin. It is used to quantify the amount of a given compound present in an unknown sample whose absorbance value is matched against that of standard along Y-axis and a corresponding concentration could be read off along X-axis. . (Thimmaiah S. R. 1999)

Result and Discussion

Table 1: Estimation of Phenolics

Sr.No	Name of plant and part used for estimation	Total Phenol		Flavonol		Quinone		Tannin	
		Absorbance (650nm)	850µgm/gm	Absorbance (500nm)	0.33µgm/gm	Absorbance (400nm)	380µgm/gm	Absorbance (500nm)	260µgm/gm
1	<i>Argyria nervosa</i> (leaves)								

Sr.No	Name of plant and part used for estimation	Total Phenol		Flavonol		Quinone		Tannin	
		Absorbance (650nm)	850µgm/gm	Absorbance (500nm)	0.33µgm/gm	Absorbance (400nm)	380µgm/gm	Absorbance (500nm)	260µgm/gm
1	<i>Argyria nervosa</i> (leaves)								

Table 2: Estimation of Phenolics

Sr.No	Name of plant and part used for estimation	Orthodihydric Phenol		Bound phenol		Quinone		lignin	
		Absorbance (515nm)	3500µgm/gm	Absorbance (290nm)	16,400µgm/gm	Absorbance (400nm)	380µgm/gm	Absorbance (350nm)	0.06µgm/gm
1	<i>Argyria nervosa</i> (leaves)								

Highest amount of Bound phenol in leaves of *Argyria nervosa* (16,400µgm/gm) and orthodihydric phenol (3500µgm/gm) was observed and total phenol(850 µgm/gm) and while lowest content of lignin in leaves (0.06µgm/gm). However there is significant amount of quinone was found (380µgm/gm).

Phenolic compounds and flavonoids have been reported to be associated with antioxidative action in biological systems, acting as scavengers of singlet Oxygen and free radicals. (Rice-Evans *et al.*,1997). The nitric oxide scavenging activity of flavonoids and phenolic compounds are known (Kim H. *et al.*, 2002). Phenols are present in food, they may have an impact on health and most are known to have an antioxidant activity. (Demitrios 2006) .

Phenols and polyphenolic compounds such as flavonoids are widely found in plant sources and they have been shown to possess significant antioxidant activities (Van Acker S. *et al.*, 1996). *Argyria nervosa* leaves used by

tribal peoples as local stimulant and prevent conception. In Assam ,Bihar the leaves are eaten as vegetable. The leaves are emollient and vesicant. They used in treatment of ringworm,itch, eczema and internally to cure boils swellings etc. (Krishnaveni A.,Santh RT.2009).

Conclusion

This study reveals that the leaves of *Argyria nervosa* found in throughout the india . *Argyria nervosa* leaves contain rich total phenol, quinone and tannin, flavonoids and pigments which are known to possess good source of antioxidant ,anticancer activity and anti-inflammatory, antibacterial, anti obesity, antiviral activity. The reported phytochemical studies support its traditional uses and may prove to be useful for clinical evaluation. The use of natural antioxidants has been promoted because of the concerns on the safety against synthetic drugs

References

- Li, Y., Trush, M. A. (1994). Reactive oxygen dependent DNA damage resulting from the oxidation of phenolic compounds by a copper redox cycle. *Cancer Research* 54:1895-1898.
- Cook, T. (1967) (RPr.): Flora of presidency of Bombay. Botanical survey of India, Calcutta. Vol.I. and Vol.II.
- Cai Y., Luo Q., Sun M., Corke H. (2004). Antioxidant activity and phenolic compounds of 112 traditional Chinese medicinal plants associated with anticancer. *Life Science*.74: 2157-2184.
- Thimmaiah .S.R.(1999). Standard Methods of Biochemical Analysis .Kalyani Publishers. New Delhi.
- Dhore, M.A. (1986). Flora of Amravati District with special Reference to the Distribution of Tree Species, Amravati University, Amravati
- Houghton, P. J. (2002). Chromatography of the chromone and flavonoid alkaloids. *J. of Chromatography* 967. pp. 75-84.
- Re, R., N. Pellegrini, A., Proregente, A., Pannala, M. Yang and C. Rice Evans. (1999). Antioxidant activity applying an improved ABTS radical cation decolorization assay.
- Velioglu, Y.S., Mazza, G., Gao, L. and B.D. Oomah. (1998). Antioxidant activity and total phenolics in selected fruits, vegetables, and grain products. *J. of Agricultural and Food Chemistry* 46 .pp-4113-4117.
- Demitrios, B. (2006). Sources of natural phenolic antioxidants. *Trends in food science and technology*. 17 (9): 505- 201.
- Edeoga, H. O., Okwu, D. E., Mbaebie, B. O. (2005). Phytochemical constituents of some Nigerian medicinal plants. *Afri. J. Biotechnol.* 4(7): 685-688.
- Kim, H. W., Murakami, A. Nkamura, Y., Ohigashi, H. (2002). Screening of edible Japanese plants for suppressive effects on phorbol ester induced superoxide generation in differentiated HL-60 cells and AS52 cells. *Cancer Lett* 176:716.
- Krishnaveni A., Santh RT. (2009). Pharmacognostical and preliminary phytochemical studies of *Argyrea nervosa* Burm. *Ethnobotanical leaflets* 13:293.
- Chopra, R., N., Nayar, S. L. and Chopra, I.C. (1986). Glossary of Indian medicinal plants including the supplement. Council of Scientific and Industrial Research. New Delhi, India. 20-35.
- Kumar, V., Van Staden, J. (2016). A Review of *Swertia chirayita* (Gentianeaceae) as a traditional medicinal plant. *frontiers in pharmacology* 6,308.
- Khan IA, Khanum, A. (2005). Role of Biotechnology in medicinal and aromatic plants, volume – XII, Hyderabad: Ukaaz Publication.
- Malhotra, S. C. (1996). Pharmacological investigation of certain medicinal plants and compound formulation used in Ayurveda and Siddha. Vol.1. New Delhi. Central council for research in Ayurveda and Siddha.
- vasanthi, H.R., Mukherjee, S. Ray, D., Jayachandran, K.S.P., Lekli, I., Das, D.K. (2010). Protective role of air potato (*Dioscorea bulbifera* L.) of yam family in myocardial ischemic reperfusion injury. *Food and function* 1,278-283.
- Urones, J. D., Basabe, P., Lithgow, A. M., Marcos, I. S., Jimenez, A., Diez, D., Gomez, A., White, A. J. P., Williams, D. J., Simmonds, M. S. J., Blaney, W. M. (1995). New antifeedant neo-clerodane triol. Semisyn-thesis and antifeedant activity of neo-clerodane diterpenoids. *Tetrahedron*. 51. 2117-2128.
- Su, L., Zhu, J.H., and Cheng, L. B. (2003). Experimental pathological study of subacute intoxication by *Dioscorea bulbifera* L. *Fa Yi Xue Za Zhi* 19.81-83.
- Rice Evans, C. A., Miller, N.J, Bolwell, P. G., Bramley, P.M. and Pridham, J. B. (1995). The relative antioxidant activities of plant derived polyphenolic Flavonoids. *Free Radical Research*. 22 : 375-383.
- Mehar Ashutosh., Agrahari Anuj kumar, Padhan Amiya Ranjan (2011). A literature review on *Argyrea nervosa* (Burm.f.) Bojer. *Int. Journal of research in Ayurveda & Pharmacy*. 2(5)1501-1504.

BIOSPHERE AND ENVIRONMENT, THE GOLDEN VIEWS OF DR. AMBEDKAR**Dr. Sandip B. Dongare**

Art-Commerce College Yeoda, Tq.Daryapur, Dist. Amravati, MS, India

Introduction

Sometimes it may seem that humans have altered the earth beyond repair. But our planet is an incredible system in which energy, water, carbon and so much else flow and nurtures life. It is about 4.5 billion years old and has been through enormous changes. We Human beings are part of Nature. What happens in the Biosphere and Environment determines a lot about our survival.

Maintaining the Biosphere & Environment is a matter of Justice, Morality, and Development that is Sustainable & Equitable. Since climate change mitigates Human development and leads to inequalities, exploitations, and Human miseries. It also becomes an issue of Human Rights and Universal Humanitarian values. Our Wisdom must lead us to acknowledge the future of our Generations & Mother Earth. Ambedkarism = Humanism = Dhamma which upholds Karuna i.e.love for all human beings and Maitri i.e.love for all living beings [must] be maintained. It Pledges to a Policy a Biosphere & Environment for the creation of a Climate-Smart World which will be a just, moral, sustainable, humane & enlightened world.

The objective of the research article:-

1) To study and analyze the thoughts of Dr. Ambedkar regarding the biosphere and environment.

Part-I

Golden views of Dr.B.R.Ambedkar: A Humanitarian Philosopher and Environmentalist

1.The prosperity of the agriculturist must depend upon the maintenance of forest belts spread over the country. Without forest belts, a proper degree of rainfall will not be assured and agriculture in India will continue to be the gamble in the rain as it has always been in the past. The Federation would urge more and more forestation of the uncultivable wastelands. (p.393, vol.17, part 1)

2. The attitude of the government in public affairs will be governed by the following principles: It will insist on the maintenance of liberty, equality, and fraternity and will strive for redemption from oppression and exploitation of man by man, of class by class, and nation by nation. (p.387, ibid).

Part – II**Problems & Solutions of Biosphere and Environment Recognized by Ambedkarism:**

1. Current concentrations have reached 380 parts per million (ppm) of Co₂e (carbon dioxide equivalent) exceeding the natural range of the last 65,000 years. In the 21st century, the average global temperature could increase by more than 50C leading to irreversible & devastating climate change that may reverse human development and bring human miseries by:
 - a. reduction in agricultural production and food insecurity;
 - b. increase in water stress and water insecurity;
 - c. rising sea levels and exposure to climate disasters like drought, flood, storms, cyclones, etc.,
 - d. change in ecosystem and bio-diversity leading to extension of some species of flora & fauna; and
 - e. adverse impact on human health by killer diseases like malaria, dengue, and other diseases caused by microorganisms.
2. The urgent action on climate change is to reduce CO₂e gases and maintain the average global temperature rise below 20C than preindustrial temperatures and develop a model of economic & technological growth & development which is ecologically & socially sustainable & equitable by collective international action of the world community – both developed & developing.
3. Many measures like climate-smart development policies, spending ½ a percent

of GDP on climate insurance, veritable energy revolution, and transformation in the management of land use & forests, shifts in lifestyle, innovation in new technologies and judicious use of existing technologies, levying of green tax on actions which harm the environment and a global joint action will have to be adopted for a climate-smart world and securing our mother earth for our future generations. This climate-smart world has to be a just, moral, humane & enlightened world.

4. Global CO₂e emissions by sector: PCCC 2001
 1. Power 26%
 2. Waste & Wastewater 3%
 3. Land-use change and forestry 17%
 4. Agriculture 14%
 5. Industry 19%
 6. Residential and commercial buildings 8%
 7. Transportation 13%
5. We are also entering into an era of uncertainty an age of hyper-future threatening the common destiny of Humankind & Mother earth due to the demiurgic powers of techno science. This will arise due to the invincible development in genetics, microelectronics, bio-electronics, nano-technologies, pico-technologies, and artificial intelligence. The bio/nano & other developing technologies would pose moral, ethical & humane questions like cloning, interbreeding of species creation of supermen viz-a-viz subhumans by genetic

engineering and artificial intelligence, etc. A solution to the above may require:

- (i) Education to all;
- (ii) Ethics (social contract, natural contract, cultural contract & ethical contract);
- (iii) Urban policies and
- (iv) Human rights.

Along with this, it will require the policy of Ambedkarism i.e. Equality, Liberty, Fraternity, Justice, Dhamma.

6. Responsibilities to maintain the biosphere & environment, and deal with climate change require internal efforts extending from the areas of technological, economic, trade, political & legal. It also requires People & Community participation.

These responsibilities must take into account the cross-generation liabilities as a Public Policy.

Part III

The policy of Ambedkarism on Foreign Policy, National Security, And Internal Security The government shall adopt a policy on climate change and Biosphere keeping in view the Principles, Values, Ideals, Aims & Objectives. The above Declaration; Part [I] and [II] for the wellbeing of Human beings, all living beings, and Mother Earth.

Conclusion

The earth will certainly heal but it may take a very long time the best way to start is with everyone doing their part to avoid making the damage any worse.

References

1. Ambedkar Dr.B.R. BAWS Vol.17, Part I, Education Dept., Maharashtra Govt., India, P.393, 387.
 2. UNDP, Human Development Report 2007/08, Fighting Climate Change,
 3. Human Solidarity in a Divided World, Palgrave Macmillan, New York, USA.
 4. World Bank World Development Report 2010, Development and Climate Change, IBRD, Washington DC, USA.
 5. Binder, Jerome (ed.) Keys to The 21st Century, 2001 Berghahn Books, New York, Oxford, UNESCO Pub, Paris.
- courtesy:- Curious kids: the conversation.com

THE STUDY OF THE ROLE AND CHALLENGES OF GREEN MARKETING IN INDIA**Prof. Sunil Ishwar**Shivshakti Arts & Commerce College, Babhulgaon, Dist. Yavatmal, MS.

ABSTRACT

Today the whole world is sitting on the landfill of environmental pollution. Everyone is very concerned about the harm caused by environmental pollution. Considering the concern of every person, traders in India not only expressed their concern about environmental pollution but also started making their products in such a way that they do not harm the environment in any way. Along with this, efforts are being made to make the packaging of many products in India eco-friendly. Along with this, the Government of India is trying to make people aware of the danger of environmental pollution. Traders in India are adding greenery i.e. such green items in their marketing so that people's attention can be attracted to it. This type of marketing is known as green marketing or eco marketing. This type of marketing in India has yielded very good results. Environmental awareness has also increased among the people. People have started taking interest in green marketing. This research paper has been written to study the role and challenges of green marketing in India.

Keywords: Green Goods, Green Marketing, Eco Marketing, Environmental Pollution, Eco Friendly.

Data Collection Method Used for Research

Data for the research paper has been collected from books, websites and newspapers.

Objective of Research

- 1) To study the role of green marketing in India.
- 2) To study the challenges of green marketing in India.
- 3) To find out current scenario of green marketing in India.

Introduction

Green marketing was born between the 1980s and 1990s when industries began to express their concern about increasing environmental pollution. Green markets have become one of the most popular ways of doing business today, given the ever-increasing environmental conditions that have since been impacted by the deteriorating climate change. With the campaign of green marketing, companies of various products show their interest to save the environment and also show their efforts for environmental protection. Green marketing is unique marketing in itself. In this type of marketing, the products are promoted among the people based on their environmental benefits. The main purpose of using the word green is that the products are produced without causing any harm to the environment and the material and packaging of those products are also environmentally friendly. Green marketing

is this type of eco-friendly marketing, where products and services are promoted based on their environmental benefits. Green marketing can also be defined as the marketing of eco-friendly products i.e. eco-friendly products. Which is not harmful to the environment and they are produced using eco-friendly production processes. Green marketing is not just limited to advertising to attract customers, but it includes many important things such as producing eco-friendly products, using sustainable business practices, using eco-friendly packaging, and marketing campaigns. Creating that promotes environmental protection. Due to all these changes, green marketing becomes expensive marketing. Despite this, green marketing can prove to be beneficial for the company and can also provide a competitive edge over the competitors. The reason for this is that in today's era, most people have become very aware of the environment and they are becoming concerned about the damage caused to the environment. That's why such people like to buy eco-friendly products more. Are also ready to pay a little more to buy eco-friendly products. Green marketing is the right choice for marketing for an organization and it also has many benefits.

The Study of the Role and Challenges of Green Marketing in India

The Role of Green Marketing in India

The first and most important benefit of green marketing in India is that the reputation of the company or organization is increasing. Any organization or company needs a good image to earn good profits in the long run. A company not only attracts more and more customers in the market with its positive attitude but also attracts business partners with its increasing credibility. Due to the cost of green marketing, not every company in India can afford to adopt this marketing. Therefore, to take advantage of this, the number of competitors of the company which is moving ahead in the path of green marketing is very less. Choosing an eco-friendly green marketing method may be costly in the beginning but it has proved to be profitable marketing in the long run. The main reason for this is that in the present time more and more people are preferring eco-friendly products and in the coming time the number of such people in India is likely to increase quadruple day by day.

Green marketing in India is opening new market doors for any organization or company. To produce and sell green products, companies have to change the production process of their products, and the materials used in the production have to be changed to make them environmentally friendly. Apart from this, its packaging also has to be made eco-friendly. Greenmarket is a new market with less competition. Where Indian businessmen are getting an opportunity to enter new markets using green marketing.

It costs more to manufacture eco-friendly products in India. For this, the businessman has to keep the rates of his product high. Along with this, it is also necessary to keep in mind that the quality of its product should be very good. With this, people who want to buy eco-friendly materials do not hesitate to pay a little more money. In the beginning, it may take some time to recover the cost of the goods made with an eco-friendly system but after a time businessmen can get ahead of their competitors because people are facing the danger of environmental pollution and prefer to

buy only eco-friendly products. And the number of such people is increasing day by day.

By adopting green marketing, there is a need to make the production process afresh and make changes in the raw material of your product in the form of eco-friendly material, then it allows making Indian product innovation.

You are not only getting the benefit of earning money from green marketing, but you are also earning the benefit of protecting the environment from it. Today you are not only doing human service by protecting the environment and at the same time you are also doing a great job for the coming generations. Green marketing is having a positive impact on the environment and the health of individuals. Due to green marketing in India, people are preferring to buy pure products. Green marketing is minimizing the use of plastic and plastic products. Herbal products are being promoted due to green marketing in India and their popularity is also increasing rapidly. Green marketing has been having an impact on the market as well as it is also affecting agriculture. Farmers are using organic fertilizers instead of chemical fertilizers in the fields. There is no harm to the environment due to the recycling of the goods after use in the green market for packing etc. Measures to control environmental pollution are gaining importance.

The Challenges of Green Marketing in India

Green marketing is a new idea i.e., a new concept in India. People are not able to understand this concept quickly. It will take some time to understand and explain this. When people will come to know about the benefits of this green marketing and the benefits to the environment, then this concept will start becoming popular among the people and only then the benefits of green marketing will start getting. The kind of recyclable and renewable materials that green products require are very expensive. Not every company or product manufacturer can use it. Green marketing is not getting full support from established industries. People are not ready to pay the cost of more expenditure on green marketing. Most of the people of India are more attracted to foreign products. Research

and development of green marketing i.e., research and development require huge investment. The production of herbal products is not given importance by most companies. People in India are unaware of the importance of green marketing and people do not even want to know about it because they do not care about environmental pollution. Water purification technology i.e., water treatment technology is also expensive. There is a big problem with people ignoring green marketing.

Conclusion

Green marketing takes time to set up. Recycling is one of the best strategies to impact the cost of green marketing. Many big companies adopt this strategy and they are successful today. Not only this, but these companies also have a good reputation among the customers. For green marketing, the company should pay special attention to its packaging. In today's time when most people order goods online. In this, companies should use eco-friendly packaging. This will reduce the use of carbon-emitting plastics and

packaging made of plastic. Those doing green marketing will have to make efforts differently from those doing other businesses. They also have to take some risks among the customers. All kinds of information will have to be given between them. At the same time, to build your credibility, you have to be completely honest and also adopt transparency in each of your strategies. Green marketing includes a wide range of activities, including product modification, production process changes, packaging changes, as well as modifying advertising. Green marketing refers to the process of selling products and/or services based on their environmental benefits. Such a product or service may itself be environmentally friendly or may be produced and/or packaged in an environmentally friendly manner. With green marketing, we can make our earth healthy and beautiful. If we do not adopt green marketing, then we will not be able to provide a safe place to live neither for ourselves nor for the generations to come.

References

1. <https://www.iosrjournals.org/iosr-jbm/papers/ncvbm/volume-1/6.pdf>
2. http://ijrar.com/upload_issue/ijrar_issue_1181.pdf
3. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2794819
4. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2794819
5. http://www.ijarse.com/images/fullpdf/1519813407_NMCOE4077IJARSE.pdf
6. https://www.researchgate.net/publication/316936880_Utility_of_green_marketing_in_India
7. https://ejmcm.com/article_6325_c47db005c100ca3f49936afaabcddec.pdf
8. https://www.ijsr.in/upload/414082048Chapter_19.pdf
9. <https://www.iosrjournals.org/iosr-jbm/papers/Vol15-issue6/J01566773.pdf>
10. <https://www.naukri.com/learning/articles/green-marketing/>
11. http://www.raijmr.com/ijrmp/wp-content/uploads/2017/11/IJRMP_2013_vol01_issue_08_04.pdf
12. <https://ijcrt.org/papers/IJCRT1705193.pdf>
13. https://www.worldwidejournals.com/paripex/recent_issues_pdf/2015/January/January_2015_1421670936__67.pdf
14. <http://www.ijbm.co.in/downloads/vol2-issue1/57.pdf>
15. <https://iranarze.ir/wp-content/uploads/2015/01/GREEN-MARKETING-OPPORTUNITIES-CHALLENGES.pdf>
16. [http://shabdbooks.com/gallery/70-april\(spe%20issue6\)2020.pdf](http://shabdbooks.com/gallery/70-april(spe%20issue6)2020.pdf)
17. http://ijmrr.com/admin/upload_data/journal_Akanksha%20%203dec15mrr.pdf
18. http://www.ijream.in/paper/current_issue/Issue_paper_-5.PDF
19. <https://www.ijirmf.com/wp-content/uploads/2017/03/201703022.pdf>
20. http://indianresearchjournals.com/pdf/IJMF_SMR/2012/September/9.pdf
21. https://www.ripublication.com/ijafst_spl/ijaftsv5n3spl_02.pdf

22. <https://www.ijert.org/research/significances-and-challenges-of-green-marketing-IJERTCONV8IS03033.pdf>
23. <https://www.arcjournals.org/pdfs/ijmsr/v3-i7/15.pdf>
24. <http://www.dynamicpublisher.org/gallery/98-ijsrr-d1354.eb.f.pdf>
25. http://www.ijetsr.com/images/short_pdf/1516294659_739-748-_ISSN8-_arathi.pdf
26. <https://www.allresearchjournal.com/archives/2017/vol3issue3/PartN/3-2-80-336.pdf>
27. <https://mba.mits.ac.in/MIJBR/Role%20of%20Green%20Marketing%20in%20Sustainable%20Development.pdf>
28. [https://www.worldwidejournals.com/indian-journal-of-applied-research-\(IJAR\)/article/green-marketing-challenges-and-best-practices/OTUzNA==/](https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/article/green-marketing-challenges-and-best-practices/OTUzNA==/)
29. <https://www.srcc.edu/system/files/Pg%2067-79%20Suhaskar%20Bhaskar%20Joshi%20C%20Green%20Marketing%20in%20India%20%3B%20Aspects%20C%20Problems%20and%20Prospects.pdf>
30. <https://irejournals.com/formatedpaper/1700093.pdf>
31. <https://garph.co.uk/ijarmss/dec2012/13.pdf>
32. <https://www.xisdjxsu.asia/V16-9-11.pdf>
33. [https://www.ij360mr.com/docs/vol6/ap18\(14\).pdf](https://www.ij360mr.com/docs/vol6/ap18(14).pdf)
34. <http://ignited.in/I/a/109910>
35. http://ijmrr.com/admin/upload_data/journal_Harendra%20chauhan%20%207.pdf
36. https://iul.ac.in/DepartmentalData/Management/JP/P.B_Kamal.pdf
37. <https://ideas.repec.org/a/eco/journ2/2021-01-33.html>

SYNTHESIS AND CHARACTERIZATION OF SOME NOVEL CHALCONE DERIVATIVES AS ANTIBACTERIAL AGENTS**M.W.Bhade^{1*}, C.D.Badnakhe², Heena Khan¹, Dhanshri Chide¹, Diksha Dahake¹ and Namrata Gore¹**¹Dept. of Chemistry, Amolakchand Mahavidyalaya, Yavatmal²Dep.t of Chemistry, Dr. Manorama & Prof. H.S. Pundkar Arts, Commerce & Science College, Balapur, Dist.Akola, MS., India
madhuri.bhade@gmail.com**ABSTRACT**

Literature survey shows that chalcones are valuable starting material for the synthesis of heterocyclic compounds like thiazines, pyrazole, thiazole, isoxazole, pyrimidine, thiamine etc. and shows a very broad spectrum of biological as well as physiological activities. The present study deals with the synthesis of some novel chalcones by treating substituted acetophenones with various substituted aldehydes. All the synthesised molecules were supported by elemental analysis, FT-IR, ¹H-NMR spectral data. The titled compounds were assayed for their antibacterial activity against some plant pathogens; Gram+ve bacteria viz. *Staphylococcus pneumoniae*, *Staphylococcus aureus* and Gram-ve bacteria viz. *Escherichia coli* and *Pseudomonas fluorescens* by using Agar disc diffusion method. The antibacterial activity is very encouraging.

Keywords- chalcones, antibacterial activity, Gram+ve bacteria, Gram-ve bacteria, plant pathogens.

Introduction

Chalcone belong to the flavonoid family which constitutes one of the major classes of naturally occurring heterocyclic compounds. Chalcone is an aromatic enone that forms the central core for a large variety of important biological compounds, which are known collectively as chalcones or chalconoids. Benzylidene acetophenone is the parent member of the chalcone series. The alternative name given to chalcone are phenyl styryl ketone, benzalacetophenone, β -phenylacrylophenone, γ -oxo- α,γ -diphenyl- α -propylene and α -phenyl- β -benzoylethylene. Throughout the ages mankind is dependent on nature, particularly on plants as source of carbohydrates, proteins and fats for food and shelter. In addition, plants are valuable source of a broad range of secondary metabolites, which are used as pharmaceuticals, agrochemicals, flavours, fragrances, colours, bio pesticides and food additives. With the presence of a wide range of secondary metabolites, plants have formed the basis of the traditional medicine systems that have been in existence for phenolic compounds, including tannins and derived poly-phenols and their different derivatives form one major group of phytochemicals. It has been found that in many

plants, flavonoids protect them against their pathogenic bacteria and fungi. Their antioxidant properties, cytostatic effects in tumorigenesis and ability to inhibit a broad spectrum of enzymes have led researchers to regard these compounds as potential anti-carcinogens and cardio protective agents. Chalcones^{1,2,3} belonging to the flavonoid family, are natural and synthetic products that have been reviewed for their wide range of biological activities as antibacterial⁴, anti-microbial⁵, anti-inflammatory⁶, antifungal⁷, anticancer⁸, anti-tumor⁹, analgesic⁹ and antioxidant^{10,11} agents, etc. In addition to their numerous biological¹²⁻¹⁵ activities, chalcones find a pronounced application in synthetic organic chemistry. Application of chalcones in the synthesis of many heterocycles¹⁶ and as intermediate in the synthesis of many pharmaceuticals has been thoroughly explained. Having a varied pharmacological activity¹⁷ and synthetic utility, chalcones are highly attractive molecules because of their simple structure, easy pathway and promising biological activity.

Experimental

Synthesis of Chalcones (1-19):- In a 100ml beaker, substituted acetophenone (0.01mol) and substituted aldehyde (0.01 mol) were

mixed in 40 ml ethanol. Drop wise with continuous stirring 10 ml of NaOH solution (40%) were added in 30 minutes. Further mixing continued for 2-3 hours at room temperature. The mixture become quite

thick. It was kept overnight. It was then neutralised with dilute HCl, the solid thus obtained was filtered, washed well with cold water, dried and recrystallized from rectified spirit.

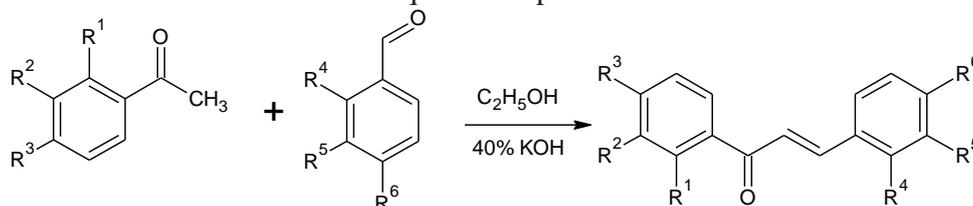


Table 1: Characterization of Synthesised Chalcone derivatives

Comp. No	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	Yield	MPt (°C)
1.	-H	-H	-CH ₃	-Cl	-Cl	-H	76%	143-145
2.	-H	-H	-H	-H	-H	-F	80%	156-158
3.	-OH	-H	-OH	-H	-NO ₂	-H	75%	210-212
4.	-H	-H	-CH ₃	-H	-NO ₂	-H	78%	165-167
5.	-H	-H	-H	-H	-H	-OCH ₃	85%	134-137
6.	-H	-H	-Br	-H	-H	-OH	75%	145-147
7.	-H	-H	-CH ₃	-H	-H	-OCH ₃	82%	160-162
8.	-H	-H	-Br	-H	-H	-H	75%	164-166
9.	-H	-NH ₂	-H	-H	-H	-Cl	78%	165-168
10.	-H	-H	-CH ₃	-H	-H	-OH	85%	143-145
11.	-OH	-H	-OH	-Cl	-Cl	-H	76%	230-233
12.	-H	-H	-CH ₃	-H	-H	-Cl	74%	180-183
13.	-H	-NH ₂	-H	-Cl	-Cl	-H	70%	171-173
14.	-H	-H	-CH ₃	-Cl	-Cl	-H	79%	165-167
15.	-H	-H	-H	-NO ₂	-H	-H	72%	155-158
16.	-H	-CH ₃	-H	-H	-H	-H	86%	143-145
17.	-H	-H	-H	-H	-H	-NO ₂	65%	165-167
18.	-H	-H	-Br	-H	-H	-OCH ₃	87%	171-173
19.	-OH	-H	-OH	-H	-H	-Cl	83%	230-233

All spectral data (IR and ¹H-NMR) of the synthesized compounds are described as follows:

Compound 1: IR (cm⁻¹): 3030 (C-H aromatic), Compound 2: IR: 3083 (C-H aromatic), 1

3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one (1): Pale yellow crystalline solid; IR (KBr ν_{\max})(cm⁻¹):3288cm⁻¹(O-H),1685(C=O),1602 cm⁻¹ (C=C),760 cm⁻¹ (C-Cl).

NMR: δ 7.6(d,1H,C=CH), δ 7.3(d,1H,C=CH), δ 6.7-7.3(m,7H,Ar-H), δ 2.3(s,3H,CH₃),

3-(4-Fluorophenyl)-1-phenylprop-2-en-1-one (2): Yellow crystalline solid;

IR (KBr ν_{\max})(cm⁻¹):1626(C=O), 1048cm(C-F).

NMR: δ 8.6(d,1H,C=CH), δ 8.2(d,1H,C=CH), δ 7.2-8.2(m,9H,Ar-H).

1-(2,4-Dihydroxyphenyl)-3-(3-nitrophenyl)prop-2-en-1-one (3): Brownish crystalline solid;

IR (KBr ν_{\max})(cm⁻¹): 1655cm⁻¹(C=O), 1573 (C=C), 1530 cm⁻¹ (NO₂),1350 cm⁻¹ (NO₂), 1301 cm⁻¹ (C-O).

NMR: δ 12.8(s,2H,OH), δ 7.8(d,1H,C=CH), δ 7.4(d,1H,C=CH), δ 6.7-7.3(m,7H,Ar-H) .

1-(4-Methylphenyl)-3-(3-nitrophenyl)prop-2-en-1-one (4): Brownish yellow crystalline solid;

IR (KBr ν_{\max})(cm⁻¹): 1673 cm⁻¹ (C=C),1530 cm⁻¹ (NO₂),1350 cm⁻¹ (NO₂).

NMR: δ 7.4-7.9(m,8H,Ar-H), δ 7.8(d,1H,C=CH), δ 7.4(d,1H,C=CH), δ 2.7(s,3H,-CH₃).

3-(4-Methoxyphenyl)-1-phenylprop-2-en-1-one (5): Pale yellow crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1654 cm^{-1} (C=O), 1310 cm^{-1} (C-O).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.4-7.9(m,9H,Ar-H), δ 3.9(s,3H,-OCH₃).

1-(4-Bromophenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (6): Pale Yellow crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 3313 cm^{-1} (O-H), 1675 cm^{-1} (C=O), 1673 cm^{-1} (C=C),610 cm^{-1} (C-Br).

NMR: δ 12.1(1H,O-H), δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H).

3-(4-Methoxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one (7): Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H), δ 3.9(s,3H,-OCH₃), δ 2.3(s,3H,-CH₃).

1-(4-Bromophenyl)-3-phenylprop-2-en-1-one (8): Pale yellow crystal

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 610 cm^{-1} (C-Br).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H).

1-(3-Aminophenyl)-3-(4-chlorophenyl)prop-2-en-1-one (9): Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 3400 cm^{-1} (N-H), 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H), δ 4.5(s,2H,-NH).

3-(4-Hydroxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one (10): Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 3400 cm^{-1} (O-H), 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O).

NMR: δ 12.1(1H,O-H), δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H), δ 2.3(s,3H,-CH₃).

3-(2,3-Dichlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one (11): Dark Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 3400 cm^{-1} (O-H), 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 760 cm^{-1} (C-Cl).

NMR: δ 12.1(1H,O-H), δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,6H,Ar-H).

3-(4-Chlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one(12): Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H), δ 2.3(s,3H,-CH₃).

1-(3-Aminophenyl)-3-(2,3-dichlorophenyl)prop-2-en-1-one(13): Brownish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 3400 cm^{-1} (N-H), 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 760 cm^{-1} (C-Cl).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,7H,Ar-H), δ 4.5(s,2H,-NH).

3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one(14): Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 760 cm^{-1} (C-Cl).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,7H,Ar-H), δ 2.3(s,3H,-CH₃).

3-(3-Nitrophenyl)-1-phenylprop-2-en-1-one(15): Dark Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1530 cm^{-1} (NO₂),1350 cm^{-1} (NO₂).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H).

1-(3-Methylphenyl)-3-phenylprop-2-en-1-one(16): Yellowish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H), δ 2.3(s,3H,-CH₃).

3-(4-Nitrophenyl)-1-phenylprop-2-en-1-one(17): Brownish crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1530 cm^{-1} (NO₂),1350 cm^{-1} (NO₂).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H).

1-(4-Bromophenyl)-3-(4-methoxyphenyl)prop-2-en-1-one(18): Pale yellow crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 610 cm^{-1} (C-Br).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H), δ 3.9(s,3H,-OCH₃).

3-(4-Chlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one(19): yellow crystalline solid;

IR (KBr ν_{\max})(cm^{-1}):3400 cm^{-1} (O-H), 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 760 cm^{-1} (C-Cl).

NMR: δ 12.1(2H,O-H), δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,7H,Ar-H).

Antibacterial Assay

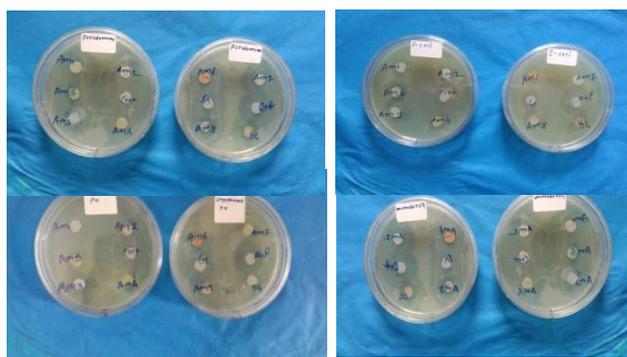
The compounds (I-VII) were screened for their antibacterial activity against Gram+ve bacteria viz. *Staphylococcus pneumoniae*, *Staphylococcus aureus* and Gram-ve bacteria viz. *Escherichia coli* and *Pseudomonas*

fluorescens at conc. of 1000 ppm by using Agar disc diffusion method. Ofloxacin used as a standard and chloroform as solvent control. The zones of inhibition formed were measured in mm and are shown in Table No.2.

Table No.2- Impact of test compounds against plant pathogens

Sample Code	(Gram positive)		(Gram Negative)	
	<i>Staphylococcus pneumoniae</i>	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Pseudomonas fluorescens</i>
1	-	14	21	18
2	-	13	20	17
3	17	12	-	20
4	15	-	-	21
5	-	13	19	18
6	14	20	22	18
7	-	15	18	16
8	-	-	17	22
9	-	18	-	14
10	-	14	20	13
11	13	14	18	15
12	13	15	16	14
13	16	14	13	11
14	13	15	12	13
15	-	14	15	13
16	14	15	-	11
17	15	16	16	16
18	-	-	14	14
19	14	15	13	13
Reference Antibiotic	39 (Ofloxacin)	25 (Ofloxacin)	39 (Ofloxacin)	40 (Ofloxacin)

Diameter of inhibition zone (mm)



Results And Discussion

Most of the test compounds shown remarkable and very encouraging antibacterial activities. A further detailed study in the light of plant pathology is advised.

Acknowledgements

The authors are grateful to Amolakchand Mahavidyalaya, Yavatmal for providing all the necessary facilities to carry out synthetic work. SAIF, VIT Vellore for providing spectral data and Samruddhi Microbial Diagnostic Lab., Amravati, Maharashtra for providing antibacterial activities.

References

1. Nadia A. A Elkanzi, Hajer Hrichi, Ruba A Aloyan, Wassila Derafa, Fatin M Zahou and Rania B Bakr, ACS Omega, 2022,7,32,27769-27786.
2. Sayed Nasir Abbas Bukhari, RSC Adv., 2022, 12, 10307-10320.
3. Puja Jaiswal, Dharam Pal Pathak, Himangini Bansal and Uma Agarwal, Journal of Chemical and Pharmaceutical Research, 2018, 10(4), 160-173.
4. Allaoua Kedjadja, Abdelmalek Bouraiou and Rachid Merdes, International Journal of Organic Chemistry, 2018, 8, 105-114.
5. Thanh-Dao Tran, Thi-Thao-Nhu Nguyen, Tuong-HaDo, Thi-Ngoc-Phuong Huynh, Cat-Dong Tran and Khac-Minh Thai, Molecules 17, 2012,6684-6696.
6. Ishwar Bhat K, Abhishek Kumar, Asian journal of pharmaceutical and clinical research, 9(4),2016, 63-66
7. Deepa Gupta and D. K. Jain' J Adv Pharm Technol Res. 2015, 6(3): 114–117.
8. Visakh Prabhakar , Ranganathan Balasubramanian , Priyanka Sathe , C. Murali Krishna , Aarti Juvekar, International Journal of Tumor Therapy, 2014; 3(1),1-9.
9. Yamali C, Gul HI, Ozgun DO, Sakagam H, Umemura N, Kazaz C and Gul M, Anticancer Agents Med Chem. 2017;17(10):1426-1433.
10. Siham Abdelrahmane Lahsasni, Faeza Hamad Al Korbi and Nabilah Abdel-Aziz Aljaber, Chemistry Central Journal, 2014; 8: 32.
11. Mohana D, Subashini P, Thamizh Thendral M and Syed Shafi, IOSR Journal of Pharmacy and Biological Sciences,13(5-III),2018, 25-28
12. ParveshSingh, AmitAnand and Vipankumar, European Journal of Medicinal Chemistry,85,(6) 2014,758-777
13. Maydt D, De Spirt S, Muschelknautz C, Stahl W, Müller TJ., Xenobiotica, 2013,43(8):711-8
14. Mohammed Al-mamary, Sadik Al-Mikhlaifi and Bushra Jaadan, International Journal Of Chemical and Pharmaceutical Sciences, 2014, June,Vol.5(2).
15. Xiaochao Huang, Rizhen Huang, LingxueLi, Shaohua Gou and HengshanWang, European Journal of Medicinal Chemistry, 132,2017,11-25
16. Muna S. Al-Rawi, Ibn Al-Haitham J. For Pure and Appl. Sci., 2015, 28(1).
17. Ban H Taresh, Scientific Journal of Medical Research, 2022, Vol 6(21),43-46.

PRELIMINARY MORPHOTAXONOMIC STUDY OF SOME GRASSES IN DIGRAS TEHSIL DISTRICT YAVATMAL MAHARASHTRA**A. G. Thakare, P. V. Gadkar, Dr. M. M. Dhore**

Department of Botany, Bapuraoji Butle Arts, Narayanrao Bhat Commerce and Bapusaheb Patil Science College, Digras District Yavatmal, Maharashtra, India

ABSTRACT

The present preliminary documentation of some grass species were carried out in Digras tehsil of District Yavatmal Maharashtra, regarding the morphotaxonomic studies of grasses as an aid to their correct identification, their distribution and uses in the area. The study area has rich floral diversity. From the study area 26 species of grasses were studied with reference to their morphology and economic importance to local people. The grasses play an important role in rural economy of the area. Mainly grasses used as fodder in the area some grasses are used for thatching and for medicinal purpose. There is deterioration of the habitat of grasses due to overgrazing.

Keywords: Morphotaxonomic study, grasses

Introduction

Grasses are one of the largest and most valuable groups of flowering plant consisting of some 645 genera and about 10,000 species. It ranks third in number of genera after Compositae and Orchidaceae and fifth in number of species after the Compositae and Orchidaceae, Leguminosae and Rubiaceae.

A high proportion of the most fertile and productive soils of the world were developed under a vegetation cover grasses. Roots, stolens, rhizomes and litter from the annual replacement of leafy culms are not only soil binders but also are effective soil stabilizers. In both agriculture and range forest areas over utilization have resulted in the loss of vast quantities of top soil by the action of wind and water. Through experience man has learned that perennial grass cover provide the best means of checking surface soil loss and rebuilding depleted soils.

Grasses exceed all other in the importance of its products. It provides food in the form of cereals for man and forage is for most animals. There can be no doubt that cereals and pasture grasses are economically the most important plants in the world and it would be quite impossible to imagine how mankind could continue agriculture without them.

The present preliminary documentation of some grass species were carried out in Digras tehsil of District Yavatmal Maharashtra, regarding the morphotaxonomic studies of grasses as an aid to their correct identification,

their distribution and uses in the area. The study area has rich floral diversity. From the study area 26 species of grasses were studied with reference to their morphology and economic importance to local people. The grasses play an important role in rural economy of the area. Mainly grasses used as fodder in the area some grasses are used for thatching and for medicinal purpose. There is deterioration of the habitat of grasses due to overgrazing.

Study Area

The Digras is a municipal council in Yavatmal district in the state of Maharashtra India. It covers an area of 1135 km. The Digras is surrounded by dense forest areas forest play an important role in our life and economy. Dhawanda and Morna Rivers flow through the Digras. The study area has well demarcated 4 seasons as a hot summer, heavily raining monsoon, a brief autumn and a mild winter. Black cotton soil is abundant in Digras Tahsil. The present study deals exclusively with the information of various grasses species belonging to the Poaceae family this work is helpful to explore biodiversity of grass in the Digras Tahsil. Grasses is a dominant in herbaceous vegetation in terms of number of species in frequently percentage indicating favourable climatic and edaphic factor for agriculture. Grasses provides food and cover for various species of birds and small animals people of that area use grasses for various purposes thatching making brooms making

hearts for animals and shelter. Some gases are used as a medicine and mainly as a fodder for their cattle hence there was a need to study grasses of the area and they are correct identification and distribution in the area.

Materials and Methods

The present study is the outcome of the one year of critical, minute and systematic study of grasses and their uses by the local people of the area. Field trips were carried out in every season and in all the representative locality of the area in the plants of some species were collected from different sites and from different habitat to observe the morphological

differences. Nomenclature of each taxon has been checked under the rules of ICBN.

A map of the area with the important places of collection is given. Detailed morphological study were carried down under the dissecting microscope and different morphological character were observed and their identification was confirmed by Floras like Flora of British India (Hooker 1872 – 1997), Flora of Bombay presidency (Cook 1958), Flora of Marathwada (Naik 1958), Flora of Yavatmal District (BSI) By Karthikeyan and Anand Kumar. Artificial key is generated for genera and species important for botanical research.

Observation

Table 1 The preliminary morphotaxonomic documentation of some grass species (Poaceae) in Digras tehsil

Sr No	Botanical Name	Occurance / Habitat	Diagnostic Characters	Economic Importance
1	<i>Alloteropsis cimicina</i>	Commonly grows on gravelly slope of hills in open grassland as well as in cultivated fields	Culms terete 20 -80cm long nodes glabrous .leaves 2 to 10 cm long covered with bulbous hairs. Blade flat elliptic. Flowers 4-6 digitate ovate, membranous and elliptic	Fodder
2	<i>Apluda mutica</i>	Open grasslands	Routing from the lower nodes much branch in upper part. Leaf blades are flat. Inflorescence panicle simple, racemes.	Fodder
3	<i>Aristida adscensionis</i>	Rare in fields common on mountains slopes.	Culms 36 -70 cm tall, erect internodes length 6.5 to 8.6 cm . Leaf blades glabrous . Pointed tip Small white hairs. Panicle contracted . Spikelets long excluding awns , hairy glumes . Linear and lanceolate.	Fodder
4	<i>Aristida setacea</i>	Frequent on hill slopes along roadsides dry rocky places.	Culms erect 30-450 cm tall . Leaf sheath terete . Ligules a rim of hairs , convolute . Panicle contracted . Spikelets linear to narrowly ovate awned glume membranous	Good soil blinder
5	<i>Arundo donax</i>	Rare in rocks river beds and streams	Height upto 5 metre having long and broad leaves. Internodes hollow having woody rhizomes. Leaves 32-60 cm long 5 cm wide Margins are sharp to touch. Panicle 30 – 60 cm long	Thatching
6	<i>Anthraxon lanceolatus</i>	Frequent growth along roadside and on hill slopes.	Culms terete , erect , 10-100 cm tall . Leaf sheath compressed covered with bulbous hairs . Inflorescence racemes . Racemes 1-7cm long hairy , sessile spikelet . bawned . Margins ciliate and hairy .	Fodder
7	<i>Brachiaria deflexa</i>	Common in waste places in field in near fields	Weak ascending culms . Leaf blades flat rounded to the base . Inflorescence false panicle with triquetrous rachis .	Fodder
8	<i>Brachiaria ramosa</i>	Common in waste places in fields and near fields.	Mostly 10- 70 cm tall , culms angular , ribbed More or less densely hairy . Leaves flat lanceolate . Inflorescence of 3- 25 racemes on an axis with triquetrous rachis.	Fodder
9	<i>Chloris barbata</i>	on mountains slopes.	Grass with flat basal culm. Inflorescence pink and green. Spikelets having 3 awns, spikelets disarticulating above the glumes	Used as a fodder when young.

10	<i>Chloris dolichostachya</i>	Occasionally occur along forest margins growth under shady places	Culms terete , nodes glabrous . Ligule of long hairs ,leaf blades linear , elliptic ,apex narrowed to fine point . Spikes 4-6 ,rachis filiform.	Fodder
11	<i>Cynodon dactylon</i>	Abundant throughout the area ,very common in moist places	Hizomatous, stoloniferous, culms slender, leaves narrow pointed . inflorescence digitate having 4-5 spikes.Spikelets on one side of rachis , having one floret lower glumes thin membranous narrowly oblong .Upper glume similar to lower one lemma is boat shaped	Used as fodder , religious importance
12	<i>Dactyloctenium aegyptium</i>	Common in cultivated fields ,shady places, wet lands	Plant upto 52 cm high ,rooting at lower nodes forming extensive spreading mats leaf blades hispid on both sides. Inflorescence digitate having 4-5 short spikes,Spikes sickle shaped .Rachis extended into pointed tip	Fodder
13	<i>Dichanthium annulatum</i>	Common in grasslands , moist land throughout the near area of fields .	Culm upto 1m tall,nodes hairy . Leaf blades flat or rolled inflorescence having digitate or sub digitate spikes . Having a pair of spikelets pedicelled and sessile . Upper lemma of sessile spikelets with awn 9.5 – 1.6mm long, minute hairy	Fodder
14	<i>Dinebra retroflexa</i>	Very common near bushes and weed of cultivated fields	Up to 50 cm tall . Culms decumbent base ,much branched rooting at nodes ,infrequently erect . Leaves linear , glabrous Inflorescence 6-20 cm long,rachis flattened narrowly winged	Fodder
15	<i>Echinochloa colonum</i>	Common weed of fields and moist lands	Geniculately ascending , rooting at lower nodes. Inflorescence 4-6 cm long composed of racemes arranged on central axis Spikelets ovate elliptic , pubescent and cuspidate , whole of the spikelets disarticulating . Spikelet in pairs , irregularly arranged on the rachis ligule absent .Tip of upper palea reflexed	Fodder
16	<i>Eleusine indica</i>	Common on shady places and near fields	Inflorescence digitate , composed of 2-5 ascending spikes, 6-11 cm long,spikes looks like a closed zipper . Glumes persistent and equal , leaf blades flat or folded.	Fodder
17	<i>Eragrotis minor</i>	Grows in open grasslands and as weed in cultivated fields .	Panicle open and dispersed . Spikelets on long and slender pediceles . Spikelets oblong , leaf blades stiff and narrow fruit caryopsis .	Fodder
18	<i>Eragrotis tenella</i>	Rows in wastelands along roadsides.	Erect or ascending , 10-40 cm tall .Small spikelets at the base of inflorescence and large on the top . Having oval and oblong spikelets on pedicel.	Fodder
19	<i>Eragrotis tremula</i>	Grows along margins of wetlands	Culms tufted , terete , 25- 60 cm long , nodes glabrous .Leaf blade flat ,linear ,rounded ,apex acuminate . Panicle effuse 10-30 cm long ,branches filiform . Fruits caryopsis	Fodder
20	<i>Eragrotis viscosa</i>	Frequent grows along roadsides, waste places and as weed in cultivated fields .	Culms tufted ,terete 10 -20cm tall erect ,nodes glabrous . Leaf blade flat , linear glandular hairs ,apex acuminate. Panicles 5-20 cm long . Spikelets ovate ,elliptic . Fruits caryopsis .	Fodder
21	<i>Eragrotis ciliaris</i>	Common Grows along the sandy soil along with water channels.	Culms tufted, terete , 10-40cm long ascending at base, nodes glabrous . Leaf blade flat ,linear apex acuminate . Panicles compact 2-6 cm long , pedicel very short, spikelets compressed ,fruits caryopsis	Fodder
22	<i>Heteropogon contortus</i>	Abundant on mountains throughout sandy dry soil , clay soil.	Recognized by bunch of twisted awns at tip of inflorescence that get entangled with clothes . Leaf blades auriculate, a few stiff hair at the leaf base . Adaxial surface rough ,some racemes may be spatheolate, the basal sheaths laterally compressed	Fodder

23	<i>Pennisetum pedicellatum</i>	Common along roadsides , in forest .	30-90 cm long. Leaves linear , acuminate, long hairy along margins near base . Inflorescence 8-13 cm , dense many bristles few to many . Spikelets solitary and geminate . fruits caryopsis	Fodder
24	<i>Sacciolepis myosoroides</i>	It is not confined to wet lands but often found in seasonally inundated places marches along water courses.	40-70cm long . Rooting at lower nodes .Leaves 10-20cm long , linear , base rounded . Ligule membrane . Panicle 10-20 cm long cylindrical .Fruits caryopsis .	Fodder
25	<i>Themeda quadrivalvis</i>	A weed roadsides, distributed site Waste areas open Woodlands.	Culms tufted, angular,ribbed .Leaves extremely variable . From hairy to non hairy green to bluish green in colour.Inflorescence is an open panicle with a group of spikelets situated on a long thin subsidiary branches. Fruits large and shiny black.	
26	<i>Vetiveria zizanioides</i>	Commonly growth on wet low lying ground , along banks of streams and rivulet.	Tufted perennial, More than one metre high.Leaf blades keeled at the base Panicles with the whorls of numerous slender racemes Composed of several to many spikelets . A pair of two spikelets pedicelled and sessile . Glumes lanceolate , oblong and coriaceous .	A good fodder when young Roots are aromatic and are the source of vetiver oil.Ingredients in perfumes.

Result, Discussion And Conclusion

The present study documents a total 26 species of grasses have been studied taxonomic point of view . All these grasses have been studied well for their distributions , morphology and uses. (Table 1)

The grass associations in study area can be grouped into two distinct categories

- 1.Grasses from forest region
2. Grasses from the plains .

1.Grasses from forest region : The dominant grasses of forest region of Digras are *Apluda mutica*, *Pennisetum pedicellatum*, *Themeda qaudrivalvis*, *Heteropogon contortus*, *Brachia ramosa*.

2 Grasses from the plains: The plains of the Digras have a few reserve grasslands on which growth of *Heteropogon contortus* , *Dichanthium annulatum* .

The open areas around villages , waste lands and the roadsides shows the growth of *Aristida depressa*, *Aristida redacta* , *Dactyloctenium aegyptium* , *Eragrotis minor* , *Eragrotis ciliaris* , *Setaria viridis* etc. The grasses occurring in cultivated fields are mainly *Aristida deflexa*, *Brachiaria ramosa* , *Anthraxon lanceolatus* , *Chloris dolichostachya* , *Chloris barbata* , *Eragrotis* species *Chrysopogon fulvus* .

Alloteropsis cimicina occur on rocky , moist substrata. Grasses like *Aristida depressa* , *Brachiaria sp.*, *Cynodon dactylon* are very troublesome weeds of the black cotton soils . Much energy and money of the farmers is spent on keeping these weeds in control .

The chief source of grass fodder for farm cattle is in the form the bunds of fields . Such bunds are left all around the fields for growth of grasses .*Dichanthium annulatum* ,*Dinebra retroflexa* , *Pennisetum pedicellatum* , *Sacciolepis myosuroids* ,*Themeda qaudrivalvis* , *Apluda mutica* ,*Chloris dolichostachya* , *Chloris barbata* ,*Cynodon dactylon* , *Dactyloctenium aegyptium* , *Eragrotis ciliaris* , *Eragrotis tenella* , *Heteropogon contortus* commonly grows on these bunds.Usually grasses are of little ornamental value . Some grasses of ornamental value for their foliage and panicles are *Arundo donax* , *Pennisetum pedicellatum* .some of the grasses are used on different occasions found have value in region . The grasses of religious significance include *Cynodon dactylon* , *Saccharum officinarum* ,*Sorghum bicolor* , *Triticum aestivum* and *zea mays* . Some of grasses possess aromatic oil which are or can be used in perfumes or medicines . Aromatic

grasses include *Cymbopogon martinii* and *Vetiveria zizanioides*.

Artificial Key for Grass Species In Digras Tehsil

1. Lemma in articulated; lower glumes shorter than the upper ones . . . *Aristida adscensionis*

2. Lower glumes of sessile spikelets rounded on the back not keeled, spikelets laterally compressed, base of the plant not covered with cataphylls.

Pedicelled spikelets, at least in the upper part of the raceme developed. . . . *Arthraxon lanceolatus*.

3. Spikelets or pairs or cluster of spikelets evenly distant by less than their own length . . . *Brachiaria ramosa*.

4. Spikelets or pairs of spikelets very loosely scattered. . . *Brachiaria deflexa*.

5. Empty lemmas above the floret solitary spikes up to 20.cm long, spreading, spikelets appressed to the rachis, empty lemma reduced to an awn. . . . *Chloris dolichostachya*.

5. Empty lemmas above the floret 2 or 3. . . . *Chloris barbata*.

6. Upper glume of the sessile spikelet keeled, pectinate – ciliate in the lower two – third or three quarters with long golden or golden brown rigid hairs. . . . *Chrysopogon fulvus*.

7. Plant rhizomatous, hairs on lemma not clavellate, ligule a ring on hairs. . . . *Cynodon dactylon*.

8. Lower glumes of the sessile spikelets oblong, obtuse or truncate, median nerve present, ligule longish. . . . *Dichanthium annulatum*.

9. Wild, racemes distant or only the upper ones crowded. . . *Echinochloa colonum*.

10. Spikes slender, nearly glabrous at the base, grains, oblong, obtusely trigonous . . . *Eleusine indica*.

11. Annuals, lemmas ciliate on the keels. . . *Eragrotis ciliaris*.

12. Panicles effuse. . . *Eragrotis tenella*.

15. Stem slender, branches not more than 5 cm long. . . *Eragrotis japonica*.

16. Perennial; shorter grass. . . *Heteropogon contortus*.

17. Inner involucre bristles woolly, lemma dissimilar, the upper one 3 toothed at the apex. . . *Pennisetum pedicellatum*

18. Bristles retrose barbed. . . *Setaria verticillata*.

19. Involucre spikelets less than 6 mm long, awn up to 3.5.cm long, hermaphrodite spikelet solitary or geminate. . . *Themeda quadrivalvis*.

References

- Almeida. M. R. 1990. Flora of Maharashtra. Orient Press. Mumbai.
- Altaf. K. and V. J. Nair. 2009 . Flora of Tamil Nadu -Grasses, Botanical Survey Of India, Calcutta .
- Bor. N. L. 1953 . The Grasses Of Burma, Ceylon, India and Pakistan, Pergamon Press. London.
- Cooke. T. 1901 – 1908 (Rpr). The Flora Of The Presidency Of Bombay, Vol. 1 – 3 Botanical Survey Of India. Calcutta .
- Deore. A. N. 2010 . Floristic Survey Of Washim District, Ph.D. Thesis unpublished, Amravati University, Amravati.
- Dhore. M. A. and P. A. Joshi. 1988 . Flora Of Melghat Tiger Reserve, Amravati, Maharashtra
- Dhore. M. M., P. S. Lachure, P. D. Gawande. 2011 . Trees Of Vidarbha. Paygun Prakashan, Amravati.
- Hooker. J. D. 1872 – 1886 . The Flora Of British India. Vol. 1- 7. London.
- Kambale. S. Y. and S. G. Pradhan. 1993. Flora Of Yawatmal District, Botanical Survey Of India, Calcutta.
- Naik. V. N. 1998. Flora Of Marathwada. Vol. 1 & 2. Amrut Prakashan. Aurangabad
- Patunkar. B. W. 1980 . Grasses Of Marathwada, Scientific Publisher. Jodhpur.
- Potdar. G. G., C. B. Salunkhe and S. R. Yadav. 2012. Grasses Of Maharashtra. Shivaji University, Kolhapur.
- Sharma. B. D., S. Karthikeyan and N. P. Singh. 1996 . Flora Of Maharashtra State, Monocotyledons , Botanical Survey Of India, Calcutta.

PSYCHO-SOCIAL DIMENSIONS OF SUSTAINABLE DEVELOPMENT**Dr Savita Digambar Jogdande**Assistant Professor, English in Gopikabai Sitaram Gawande College, Umarkhed
jogdande@gcollege.edu.in**ABSTRACT**

It's our mission to enable a safer and more sustainable ecosystem for people, the environment, and companies. We help society to tackle the risks that are inherent to technological development, including the need to become more sustainable. Our services are embedded in sustainability, helping to establish trust and ensure safety in today and tomorrow's sustainable development. Climate change is the most critical challenge to achieving sustainable development in the coming decades. The psychology of sustainability and sustainable development constitutes a new research area in the field of Sustainability Science.

Keywords: 1. Environmental Challenges 2..Psychology of sustainability 3. Protective factors Risk factors 4. Psycho-social adjustment and well-being

Review of Literature

Countries globally are committing to this goal by charting national movements. At the corporate level, companies are rising to the challenge by committing to measures aligned with the UN Sustainability Development Goals. Sustainability is expected to drive the narrative in business and society in the coming decades.

Research Methodology

The research methodology includes a close reading and analysis of the material written by and on the writer selected for the study. For the collection of secondary sources, a large number of related reference books, research articles, research thesis, periodicals, journals, newspaper articles, and online web-based sources will be used.

Introduction

It contributes to sustainability issues by introducing a psychological perspective and promoting the trans-disciplinary framework at the basis of Sustainability Science. Steadily setting up the psychology of sustainability and sustainable development as a research area, rather than one that only presents sporadic contributions (and often only as theoretical reflections), means recognizing and mixing the worth of psychology and the psychological approach in the construction of processes associated with sustainability and sustainable development.

During the United Nations (UN) Climate

Action Summit in June 2019, UN Leaders announced the urgency of limiting global temperature rise to 1.5°C in response to the global climate crisis. To realize this, UN calls upon the world to attain carbon neutrality before 2050.

Societies and politics are implementing new frame works and regulations in order to achieve national and international greenhouse gas reduction goals, while companies are committed to leverage even more ambitious reduction goals along their specific value chains. This includes their own production processes and facilities but also covers suppliers and external service providers. To enable progress in sustainable development, we partner our customers to fulfil their commitment to employees, customers and environment with a holistic portfolio of corporate sustainability services. Through our services, we aim to inspire trust in the safety of sustainable technologies and boost credibility of processes, products, and systems.

Together with our partners, we offer tailored sustainability solutions for our clients along existing and upcoming regulations and by sharing best practices to facilitate the transition process most efficiently and with lasting impact. This creates certainty and traceability and therefore the necessary independent transparency towards regulators, the internal management and finally towards the general public.

This is mainly significant in terms of environmental sustainability and sustainable

development in relation to the natural environment, as psychological processes are often concerned in environmental decisions and behavior as well as in developing and establishing a culture of sustainability regarding the natural environment. In fact, many of the related decision and behavioral processes are corroborated mostly by internal psychological processes within the individual. Giving the right value to these processes asks that they be studied and understood better. The innovative psychological research perspective comprehend in the psychology of sustainability and sustainable development is essential for that. This perspective could permit one to also advance psychological contributions to the concrete answers to each of the seventeen UN Sustainable Development Goals (United Nations, 2018), which extend to 2030 and which are of vital importance for the world and humanity.

The psychology of sustainability and sustainable development represents new research area in the field of psychology. Answering to sustainability issues introducing psychological contributions means both to enhance the trans-disciplinary perspective and to enlarge the concept of sustainability through this innovative perspective. It also means to overcome a perspective exclusively based on the ecological and socioeconomic environment, thus seeking to improve the quality of life of each human being with and in the environments. This approach overcomes the traditional framework based on the three “Es” (economy, equity, and ecology) and the traditional definition of sustainability centered on “avoiding” something, in terms of exploitation, depletion, and irreversible alteration. It introduces, on the contrary, a new definition based on the “promotion” of something, where the new keywords are enrichment, growth, and flexible change. The psychology of sustainability and sustainable development also introduces a new axis of psychological reflection on what is really sustainable for individuals in particular environments (natural, personal, social, and organizational) and for the environment/environments too. The psychology of sustainability and sustainable

development enhances the sustainability of interpersonal and interpersonal talent as well as of groups and communities, including aspects of reflexivity, meaning, purpose, and flourishing for the sustainability of projects harmonizing the different perspectives in relation to the environment/environments. It asks for a wide and complex vision, from personal careers and life projects to projects regarding natural, social, and organizational environments. Its mission is offering contributions to promote effective and sustainable well-being for individuals and environments from a psychological research perspective.

This section is focused on the innovative contribution that psychology can make to the theme of sustainability and sustainable development. It focuses on both healthy and safe environments, and the promotion of well-being and the quality of life of individuals within and in different environments. Its scope is to offer a framework of the current state-of-the-art of theories, and report research on the new topic of the psychology of sustainability and sustainable development, opening new challenges of research and intervention. Its purpose is to collect and present innovative reflections and results of empirical research on this theme.

The psychology of sustainability and the sustainable development perspective could yield contributions from a preventive perspective, perhaps by implementing research and interventions from a primarily preventative perspective and also from a secondary prevention and tertiary prevention. Focusing on crucial psychological aspects to concretely progress towards sustainability and sustainable development preventative will be another important challenge.

We recognize that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. All countries and all stakeholders, acting in collaborative partnership, will implement this plan. We are resolved to free the human race from the tyranny of poverty and want and to heal and secure our planet. We are determined to take

the bold and transformative steps which are urgently needed to shift the world onto a sustainable and resilient path. As we embark on this collective journey, we pledge that no one will be left behind. The 17 Sustainable Development Goals and 169 targets which we are announcing today demonstrate the scale and ambition of this new universal Agenda. They seek to build on the Millennium Development Goals and complete what these did not achieve. They seek to realize the human rights of all and to achieve gender equality and the empowerment of all women and girls. They are integrated and indivisible and balance the three dimensions of sustainable development: the economic, social and environmental.

The inter-linkages and integrated nature of the SDGs are of crucial importance in ensuring that the purpose of the new Agenda is realized. If we realize our ambitions across the full extent of the Agenda, the lives of all will be profoundly improved and our world will be transformed for the better.

2030 Agenda: A plan of action for people, planet and prosperity

The Goals and targets will stimulate action over the next fifteen years in areas of critical importance for humanity and the planet:

People

We are determined to end poverty and hunger, in all their forms and dimensions, and to ensure that all human beings can fulfil their potential in dignity and equality and in a healthy environment.

Planet

We are determined to protect the planet from degradation, including through sustainable consumption and production, sustainably managing its natural resources and taking urgent action on climate change, so that it can support the needs of the present and future generations.

Prosperity

We are determined to ensure that all human beings can enjoy prosperous and fulfilling lives and that economic, social and technological progress occurs in harmony with nature.

Peace

We are determined to foster peaceful, just and inclusive societies which are free from fear and violence. There can be no sustainable development without peace and no peace without sustainable development.

Partnership

We are determined to mobilize the means required to implement this Agenda through a revitalized Global Partnership for Sustainable Development, based on a spirit of strengthened global solidarity, focused in particular on the needs of the poorest and most vulnerable and with the participation of all countries, all stakeholders and all people.

Commission for Social Development (CSD)

As a preparatory and advisory body of ECOSOC on social development matters, the Commission for Social Development is the only Commission mandated to advise the Council in the fields of social policy development, research in areas affecting social and economic development and policies and programme designed to promote social progress. Consequently, the Commission will provide substantive inputs to thematic reviews of progress on Sustainable Development Goals from social perspectives. Several years ago, proponents of the Sustainable Development (SD) approach identified four levels of impact of sustainable lifestyles (SLS) and actions on people's well being. Accordingly, a sustainable society was presumed to positively affect the ecological, social, economic and political-institutional scenarios in which people live and thrive. More recently, a number of government and social institutions have added a psychological dimension to this list of levels of impact of SD. For these governments and institutions, psychological well being should be a positive consequence of sustainability. An incipient research in environmental psychology reinforces such an idea, demonstrating that people who practice pro-environmental behaviors are happier individuals. Also, psychological restoration (i.e., retrieval from exhausted psychological capabilities and health) is assumed to derive from living in sustainable scenarios. Moreover, sustainability, as

practiced in the form of pro-environmental behaviors, not only is linked to their psychological consequences but also to psychological antecedents of sustainable lifestyles. More than forty years of research have demonstrated that SLS are predicted by affective and cognitive determinants of behavior. In this paper I review studies and views encompassing the psychological dimensions of sustainability. The basic idea is that it is human psychology (i.e., environmentally destructive behaviors and propensities) the main cause of the current ecological crisis; but human behavior is also a paramount solution.

Conclusion

The psychology of sustainability and

sustainable development is thus focused on different environments from the natural environment, the personal environment, the social environment, the organizational environment, and the inter-organizational environment, to the globalized environment and the virtual environment. Opening the black box of psychological processes in the science of sustainability and sustainable development will be the main aim of the new research area distinguishing this section.

Acknowledgement

First of all I want to say thanks almighty God, all respected teachers, friends and my family members who support and guide me time to time.

References

1. Schwartz, S.H. (2005b). psycho-social dimensions of sustainable development. In A. Tamayo & J. B. Porto (Eds.), idem.
2. <https://www.un.org>
3. <https://www.mdpi.com>

THE STUDY OF THE ROLE AND CHALLENGES OF GREEN MARKETING IN INDIA**Prof. Sunil Ishwar**

Shivshakti Arts & Commerce College, Babhulgaon, Dist. Yavatmal, MS.

ABSTRACT

Today the whole world is sitting on the landfill of environmental pollution. Everyone is very concerned about the harm caused by environmental pollution. Considering the concern of every person, traders in India not only expressed their concern about environmental pollution but also started making their products in such a way that they do not harm the environment in any way. Along with this, efforts are being made to make the packaging of many products in India eco-friendly. Along with this, the Government of India is trying to make people aware of the danger of environmental pollution. Traders in India are adding greenery i.e. such green items in their marketing so that people's attention can be attracted to it. This type of marketing is known as green marketing or eco marketing. This type of marketing in India has yielded very good results. Environmental awareness has also increased among the people. People have started taking interest in green marketing. This research paper has been written to study the role and challenges of green marketing in India.

Keywords: Green Goods, Green Marketing, Eco Marketing, Environmental Pollution, Eco Friendly.

Data Collection Method Used for Research:

Data for the research paper has been collected from books, websites and newspapers.

Objective of Research:

- 1) To study the role of green marketing in India.
- 2) To study the challenges of green marketing in India.
- 3) To find out current scenario of green marketing in India.

Introduction

Green marketing was born between the 1980s and 1990s when industries began to express their concern about increasing environmental pollution. Green markets have become one of the most popular ways of doing business today, given the ever-increasing environmental conditions that have since been impacted by the deteriorating climate change. With the campaign of green marketing, companies of various products show their interest to save the environment and also show their efforts for environmental protection. Green marketing is unique marketing in itself. In this type of marketing, the products are promoted among the people based on their environmental benefits. The main purpose of using the word green is that the products are produced without causing any harm to the environment and the material and packaging of those products are also environmentally friendly. Green marketing

is this type of eco-friendly marketing, where products and services are promoted based on their environmental benefits. Green marketing can also be defined as the marketing of eco-friendly products i.e. eco-friendly products. Which is not harmful to the environment and they are produced using eco-friendly production processes. Green marketing is not just limited to advertising to attract customers, but it includes many important things such as producing eco-friendly products, using sustainable business practices, using eco-friendly packaging, and marketing campaigns. Creating that promotes environmental protection. Due to all these changes, green marketing becomes expensive marketing. Despite this, green marketing can prove to be beneficial for the company and can also provide a competitive edge over the competitors. The reason for this is that in today's era, most people have become very aware of the environment and they are becoming concerned about the damage caused to the environment. That's why such people like to buy eco-friendly products more. Are also ready to pay a little more to buy eco-friendly products. Green marketing is the right choice for marketing for an organization and it also has many benefits.

The Study of the Role and Challenges of Green Marketing in India:

The Role of Green Marketing in India:

The first and most important benefit of green marketing in India is that the reputation of the company or organization is increasing. Any organization or company needs a good image to earn good profits in the long run. A company not only attracts more and more customers in the market with its positive attitude but also attracts business partners with its increasing credibility. Due to the cost of green marketing, not every company in India can afford to adopt this marketing. Therefore, to take advantage of this, the number of competitors of the company which is moving ahead in the path of green marketing is very less. Choosing an eco-friendly green marketing method may be costly in the beginning but it has proved to be profitable marketing in the long run. The main reason for this is that in the present time more and more people are preferring eco-friendly products and in the coming time the number of such people in India is likely to increase quadruple day by day.

Green marketing in India is opening new market doors for any organization or company. To produce and sell green products, companies have to change the production process of their products, and the materials used in the production have to be changed to make them environmentally friendly. Apart from this, its packaging also has to be made eco-friendly. Greenmarket is a new market with less competition. Where Indian businessmen are getting an opportunity to enter new markets using green marketing.

It costs more to manufacture eco-friendly products in India. For this, the businessman has to keep the rates of his product high. Along with this, it is also necessary to keep in mind that the quality of its product should be very good. With this, people who want to buy eco-friendly materials do not hesitate to pay a little more money. In the beginning, it may take some time to recover the cost of the goods made with an eco-friendly system but after a time businessmen can get ahead of their competitors because people are facing the danger of environmental pollution and prefer to buy only eco-friendly products. And the

number of such people is increasing day by day.

By adopting green marketing, there is a need to make the production process afresh and make changes in the raw material of your product in the form of eco-friendly material, then it allows making Indian product innovation.

You are not only getting the benefit of earning money from green marketing, but you are also earning the benefit of protecting the environment from it. Today you are not only doing human service by protecting the environment and at the same time you are also doing a great job for the coming generations. Green marketing is having a positive impact on the environment and the health of individuals. Due to green marketing in India, people are preferring to buy pure products. Green marketing is minimizing the use of plastic and plastic products. Herbal products are being promoted due to green marketing in India and their popularity is also increasing rapidly. Green marketing has been having an impact on the market as well as it is also affecting agriculture. Farmers are using organic fertilizers instead of chemical fertilizers in the fields. There is no harm to the environment due to the recycling of the goods after use in the green market for packing etc. Measures to control environmental pollution are gaining importance.

The Challenges of Green Marketing in India

Green marketing is a new idea i.e., a new concept in India. People are not able to understand this concept quickly. It will take some time to understand and explain this. When people will come to know about the benefits of this green marketing and the benefits to the environment, then this concept will start becoming popular among the people and only then the benefits of green marketing will start getting. The kind of recyclable and renewable materials that green products require are very expensive. Not every company or product manufacturer can use it. Green marketing is not getting full support from established industries. People are not ready to pay the cost of more expenditure on green marketing. Most of the people of India are more attracted to foreign products. Research

and development of green marketing i.e., research and development require huge investment. The production of herbal products is not given importance by most companies. People in India are unaware of the importance of green marketing and people do not even want to know about it because they do not care about environmental pollution. Water purification technology i.e., water treatment technology is also expensive. There is a big problem with people ignoring green marketing.

Conclusion

Green marketing takes time to set up. Recycling is one of the best strategies to impact the cost of green marketing. Many big companies adopt this strategy and they are successful today. Not only this, but these companies also have a good reputation among the customers. For green marketing, the company should pay special attention to its packaging. In today's time when most people order goods online. In this, companies should use eco-friendly packaging. This will reduce the use of carbon-emitting plastics and

packaging made of plastic. Those doing green marketing will have to make efforts differently from those doing other businesses. They also have to take some risks among the customers. All kinds of information will have to be given between them. At the same time, to build your credibility, you have to be completely honest and also adopt transparency in each of your strategies. Green marketing includes a wide range of activities, including product modification, production process changes, packaging changes, as well as modifying advertising. Green marketing refers to the process of selling products and/or services based on their environmental benefits. Such a product or service may itself be environmentally friendly or may be produced and/or packaged in an environmentally friendly manner. With green marketing, we can make our earth healthy and beautiful. If we do not adopt green marketing, then we will not be able to provide a safe place to live neither for ourselves nor for the generations to come.

References

1. <https://www.iosrjournals.org/iosr-jbm/papers/ncvbm/volume-1/6.pdf>
2. http://ijrar.com/upload_issue/ijrar_issue_1181.pdf
3. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2794819
4. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2794819
5. http://www.ijarse.com/images/fullpdf/1519813407_NMCOE4077IJARSE.pdf
6. https://www.researchgate.net/publication/316936880_Utility_of_green_marketing_in_India
7. https://ejmcm.com/article_6325_c47db005c100ca3f49936afaabcddec.pdf
8. https://www.ijsr.in/upload/414082048Chapter_19.pdf
9. <https://www.iosrjournals.org/iosr-jbm/papers/Vol15-issue6/J01566773.pdf>
10. <https://www.naukri.com/learning/articles/green-marketing/>
11. http://www.raijmr.com/ijrmp/wp-content/uploads/2017/11/IJRMP_2013_vol01_issue_08_04.pdf
12. <https://ijcrt.org/papers/IJCRT1705193.pdf>
13. https://www.worldwidejournals.com/paripex/recent_issues_pdf/2015/January/January_2015_1421670936_67.pdf
14. <http://www.ijbm.co.in/downloads/vol2-issue1/57.pdf>
15. <https://iranarze.ir/wp-content/uploads/2015/01/GREEN-MARKETING-OPPORTUNITIES-CHALLENGES.pdf>
16. [http://shabdbooks.com/gallery/70-april\(spe%20issue6\)2020.pdf](http://shabdbooks.com/gallery/70-april(spe%20issue6)2020.pdf)
17. http://ijmrr.com/admin/upload_data/journal_Akanksha%20%203dec15mrr.pdf
18. http://www.ijrream.in/paper/current_issue/Issue_paper_-5.PDF
19. <https://www.ijrmf.com/wp-content/uploads/2017/03/201703022.pdf>
20. <http://indianresearchjournals.com/pdf/IJMFSM R/2012/September/9.pdf>
21. https://www.ripublication.com/ijafst_spl/ijafstv5n3spl_02.pdf
22. <https://www.ijert.org/research/significances-and-challenges-of-green-marketing-IJERTCONV8IS03033.pdf>
23. <https://www.arcjournals.org/pdfs/ijmsr/v3-i7/15.pdf>

24. <http://www.dynamicpublisher.org/gallery/98-ijssrr-d1354.eb.f.pdf>
25. http://www.ijetsr.com/images/short_pdf/1516294659_739-748-_ISSN8-_arathi.pdf
26. <https://www.allresearchjournal.com/archives/2017/vol3issue3/PartN/3-2-80-336.pdf>
27. <https://mba.mits.ac.in/MIJBR/Role%20of%20Green%20Marketing%20in%20Sustainable%20Development.pdf>
28. [https://www.worldwidejournals.com/indian-journal-of-applied-research-\(IJAR\)/article/green-marketing-challenges-and-best-practices/OTUzNA==/](https://www.worldwidejournals.com/indian-journal-of-applied-research-(IJAR)/article/green-marketing-challenges-and-best-practices/OTUzNA==/)
29. <https://www.srcc.edu/system/files/Pg%2067-79%20Suhas%20Bhaskar%20Joshi%20C%20Green%20Marketing%20in%20India%20%3B%20Aspects%20C%20Problems%20and%20Prospects.pdf>
30. <https://irejournals.com/formatedpaper/1700093.pdf>
31. <https://garph.co.uk/ijarmss/dec2012/13.pdf>
32. <https://www.xisdxjxsu.asia/V16-9-11.pdf>
33. [https://www.ij360mr.com/docs/vol6/ap18\(14\).pdf](https://www.ij360mr.com/docs/vol6/ap18(14).pdf)
34. <http://ignited.in/I/a/109910>
35. http://ijmrr.com/admin/upload_data/journal_Harendra%20chauhan%20%207.pdf
36. https://iul.ac.in/DepartmentalData/Management/JP/P.B_Kamal.pdf
37. <https://ideas.repec.org/a/eco/journ2/2021-01-33.html>

SOCIO-ECONOMIC STATUS OF FISHERMEN DEPENDENT ON THE LANJUD RESERVOIR, NEAR KHAMGAON BULDHANA(MH)

¹Prajakta N. Bathe, ²G.B. Kale and ³S. A. Tayade

¹Assist.Prof. and Head, Dept of Zoology, Bapumiya Sirajoddin Patel Arts, Commerce and Science College, Pimpalgaon Kale Tq. Jalgaon Jamod Dist. Buldana.

²Assoc. Prof. & Head, Dept of Zoology, G.S. Science, Arts & Commerce College, Khamgaon Dist. Buldana

³Assist.Prof. Art and Commerce College, Warwat Bakal Tq. Sangarpur Dist. Buldhana

prajaktabathe12@gmail.com

ABSTRACT

Present research work was carried out to assess the socio-economic status of 39 fishermen depending on the Lanjud dam situated on the Lendi River near Khamgaon. From Nov 2020 to Dec 2021, a one-year survey of the Lanjud reservoir in the Buldana district of Maharashtra was conducted. During the study it was found that the fishery business is male dominant, the majority of fishermen were found illiterate, the majority of fishermen belonged to the age class 31-45 years, in addition to 27 fishermen employed in other part-time jobs. Along with this study, some other basic amenities status of fishermen was studied. This study revealed that the socioeconomic condition of fishermen in the study area is poor. Government agencies, NGOs, and relevant stakeholders should take the necessary actions to raise the literacy rate and the standard of living.

Keywords: Socio-economic status, Lanjud Dam, Fishery status, Fishermen, community.

Introduction

India has a prosperous variety of fauna and flora due to the presence of rich freshwater habitats and it ranks as one of the world's huge diverse nations. Fisheries play a very huge role in the socioeconomic development of the fishing community. Fish is a rich source of protein supply to the rural community where potentialities for production exist. (Shriparna Saxena, 2012). Despite the fact that India has abundant fishing resources. However, it is not being properly and fully utilized. As a result, there is a fish supply shortage in relation to demand. This could be due to the fishermen being technologically, economically, and socially backward. As a result, the government, cooperatives, and the fishing industry should take appropriate steps to exploit available resources and improve the socioeconomic conditions of fishermen. Community information on various aspects such as income, living costs, fishing gear, boat transport, and marketing infrastructure are termed socioeconomic information. Socioeconomic status is the strongest indicator of people's life (Kitagawa and Hauser, 1973; Marmot *et al.*, 1987). Fresh water from the Lanjud dam is especially used for drinking, domestic and agriculture purposes. But apart

from these, the reservoir is used for catching fish. During the investigation from November 2020 to December 2021, 31 fish species belong to 8 families and 13 orders were recorded from Lanjud dam (Kale & Bathe, 2022). The current work was undertaken with the objective to investigate the socioeconomic status of the fishing community. This socioeconomic study provided a useful tool for better understanding the life condition of fishermen communities in the context of changing environmental and socioeconomic factors affecting their traditional livelihood from the given area.

Study Area:

The Lanjud dam is a Medium Irrigation Project constructed on the Lendi River, 10 km on Khamgaon-Nandura Highway, North-West near Khamgaon Dist. Buldana (MS). It was sanctioned in 1984 and has a catchment area of about 66.96 sq km. The gross storage capacity of the dam is 1.9892 mcm. Its coordinates are 76°-36'-00" longitudinally and 20°-00'-45" latitudinally. The dam has a total length of 1215 m with a height of about 12.55 m. It was mainly constructed to supply water to MIDC Khamgaon, nearby agriculture, and drinking water to the surrounding villages.

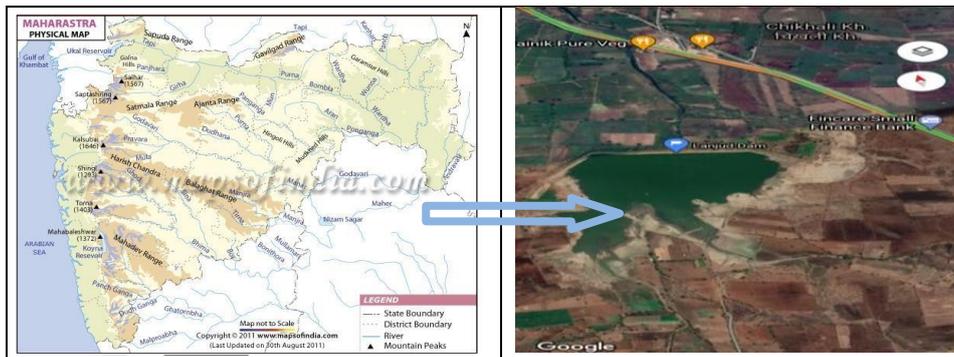


Fig. 1. Geographical location of the research site- The Lanjud dam. (Source-Google Maps)

Material and Methods:

The present study was carried out from Nov 2020 to Dec 2021, among the fishermen engaged in fishing in Lanjud reservoir. 39 individuals from the fishermen’s community were interviewed. To acquire primary data, questionnaires, discussion, observation, and personal interview methods were used. whereas secondary data were obtained from

official documents. The obtained information was accumulated and analyzed by MS Excel. Collected data explain the socio-economic and livelihood condition of fishermen of Lanjud dam.

Result and Discussion:

During the tenure of the socioeconomic study of fishermen, we have found the following data

Table 1: Age distribution of fishermen

Sr. No.	The age group of fishermen (yrs.)	No. of Fishermen	Percentage
1	0-15	-	-
2	16-30	6	15.38
3	31-45	23	58.97
4	46-60	6	15.38
5	61-75	4	10.25

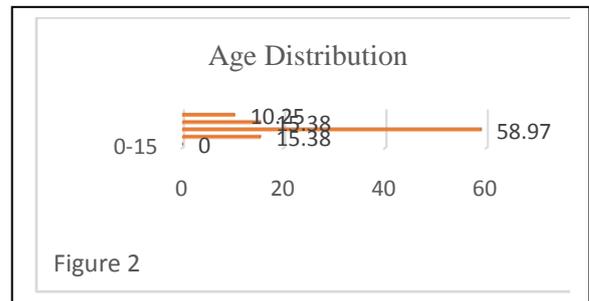


Table 2: Sex distribution of fishermen

Sr. No	Sex	No. of Fishermen	Percentage
1	Female	-	-
2	Male	39	100



Table 3: Marital status of fishermen

Sr. No.	Marital status of fishermen	No. of Fishermen	Percentage
1	Unmarried	2	05.12
2	Married	37	94.87

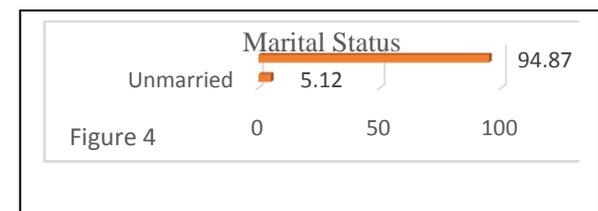


Table 4: Educational status of fishermen

Sr. No.	Educational Qualification	No. of Fishermen	Percentage
1	Illiterate	28	71.79
2	Up to SSC	9	23.07
3	Up to HSC	2	05.12
4	Graduate	-	-



Table 5: Mode of transportation of fishermen

Sr. No	Transportation Facility	No. of Fishermen	Percentage
1	In thermacol boxes	11	28.20
2	In open trays/bags	28	71.79

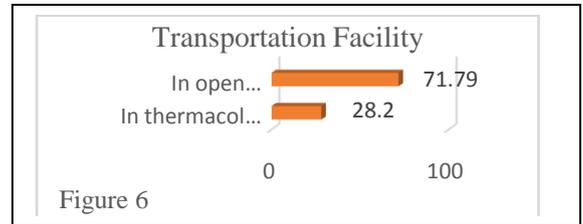


Table 6: Selling point of fishermen

Sr. No.	Selling Point	No. of Fishermen	Percentage
1	Local market	39	100
2	Export	-	-



Table 7: Monthly income of fishermen (Rs.)

Sr. No.	Fishermen's monthly income	No. of Fishermen	Percentage
1	1000-3000	4	10.25
2	3001-6000	20	51.28
3	Above-6000	15	38.46

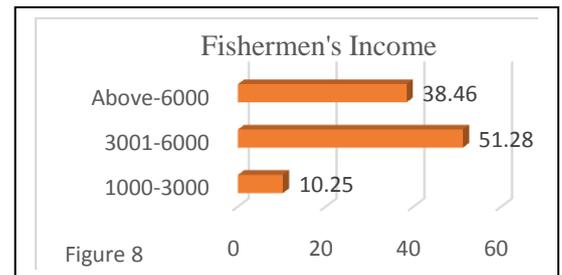


Table 8: Status of accommodation of fishermen

Sr. No.	Housing condition	No. of Fishermen	Percentage
1	Jute, Straw, plant leaves, and soil	9	23.07
2	Tin and wood	20	51.28
3	Brick, wood & tin	7	17.94
4	Brick and cement	3	07.69

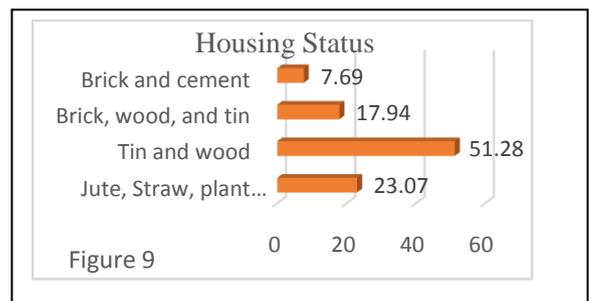


Table 9: Basic amenities status of fishermen

Sr. No.	Electricity and Water supply	No. of Fishermen	Percentage
1	Regular	09	23.07
2	Irregular	30	76.92

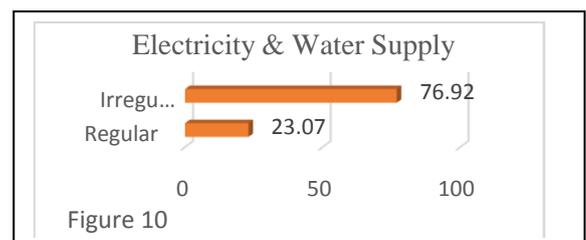


Table 10: Basic amenities status of fishermen

Sr. No.	Fuel facilities for cooking	No. of Fishermen	Percentage
1	Tap Water	8	20.51
2	Tube Well	24	61.53
3	Dam Water	7	17.94

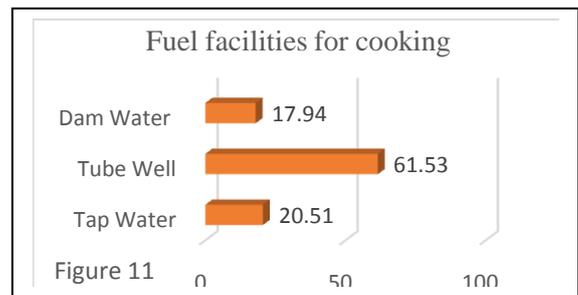


Table 11: Employed in other part-time jobs

Sr. No	Employed in other part-time jobs	No. of Fishermen	Percentage
1	Yes	27	69.23
2	No	12	30.76

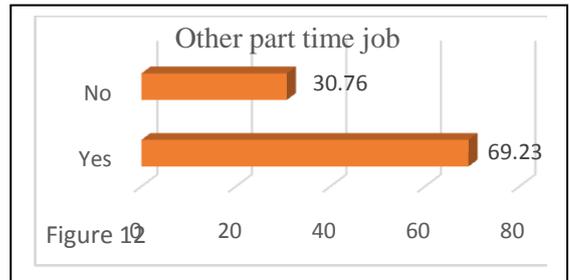
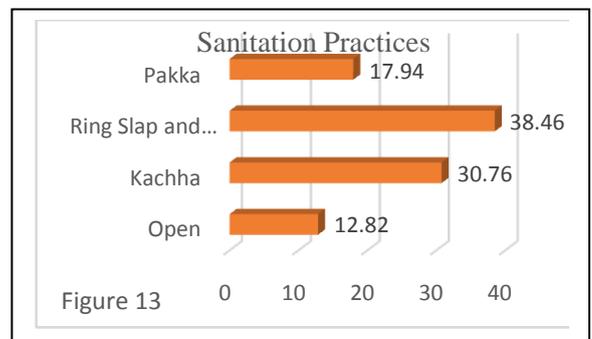


Table 12: Basic amenities status of fishermen

Sr. No.	Sanitation practices	No. of Fishermen	Percentage
1	Open	5	12.82
2	Kachha	12	30.76
3	Ring Slap and Wooden houses	15	38.46
4	Pakka	7	17.94



From the above (Table1) it was concluded that 58.97 percent of fishermen’s age group present between 31-45 yrs., 15.38 percent were present under 30 yrs., whereas 25.63 percent of fishermen’s age group present between 45-75 yrs. So, the middle age group was dominated by fishing. From the present study, it was found that the (Table2)rural area fishery business is male-dominated, and females do not show interest in the fishery. The above study (Table 3) reveals the majority of the respondent were married (94.87%) and the remaining few were unmarried (05.12%). Generally, in rural areas, they may have arranged marriages within close relations. As far as their education is concerned (Table 4) most the of fishermen in the study area were illiterate (71.79%) only a few of them are able to do signatures. Of all the respondents only 23.07% of fishermen were educated up to SSC and only 05.12% up to HSC. In the survey (Table 5) it was found that 71.79% of fishermen don’t have thermacol boxes they transport fish in open trays and bags as soon as

possible after catching and the rest 28.20% transport fish in thermacol boxes with the ice. The selling point (Table 6) for all the fishermen is a local market no fish will be exported out. The average monthly income of the fishermen’s community is very low than the national per capita income (Table 7). 10.25% of respondents had the lowest income between Rs. 1000-3000. 51.28% of respondents had a monthly income between Rs. 3001-6000. 38.46% of respondents came under highest monthly income above Rs. 6000. The nature of the house reflects the fishermen’s social status. During the survey (Table8), it was found that 51.28% of households of fishermen were wooden walls with a tin shed. 23.07% of households were from Jute, Straw, plant leaves, and soil. 17.94% of households were containing brick, wood & tin and very few fishermen (07.69%) were able to make their houses with brick and cement. From the present survey, it was found that (Table9) there was 76.92% of fishermen have irregular electricity and water supply facility, and only

about 23.07% of fishermen had electricity and water supply facility. As far as fuel facility for cooking is concerned (Table 10) 20.51% of respondents used tap water. 61.53% used tube well and 17.94% used dam water. During the study period, it was found (Table 11) that only 30.76% of fishermen solely depended on fishing while the rest 69.23% engaged in other part-time jobs along with fisheries such as agriculture, casual labor, fish vending, businessmen, etc. As the fishermen of the rural area (Table 12) are not conscious of sanitation. In the study period, it was found that 17.94% of toilets were pakka. 38.46% were semi-pakka as it was made up of ring slap and wooden houses. 30.76% were kaccha and

12.82% of the fishermen had no sanitary facilities open.

Conclusion

The present study was conducted to assess the socioeconomic condition of fishermen dependent on the Lanjud dam near Khamgaon Dist. Buldhana. The fishing community of the study area was found very poor and illiterate. Due to illiteracy and non-mechanization of crafts and gears, they are falling behind in fish production. Fishermen also lack technical knowledge of boat operation. The monthly income of fishermen was lower than the national per capita income. Government organizations, non-governmental organizations, and respective organizations or groups should take the necessary steps to assist the community in improving their livelihood.

References

1. Kale, G. B., & Bathe, P. N. (2022). Ichthyofaunal Diversity of Lanjud Reservoir Near Khamgaon in Buldhana District., *International journal of creative research thought* ISSN: 2320-2882, Volume 10 Issue 1.
2. Kitagawa, E. and Hauser, P. (2013). *Differential Mortality in the United States: A Study in Socioeconomic Epidemiology*. Cambridge, MA and London, England: Harvard University Press <https://doi.org/10.4159/harvard.9780674188471>.
3. Marmot, M. G., Kogevinas, M., & Elston, M. A. (1987). Social/economic status and disease. *Annual review of public health*, 8, 111–135. <https://doi.org/10.1146/annurev.pu.08.050187.000551>.
4. Shriparna Saxena, (2012) Study on Socio-Economic Status of Fisherman Community of Upper Lake Bhopal: Preliminary Survey, *International Journal of Science and Research (IJSR)* ISSN (Online): 2319-7064, Volume 3 Issue 8.

A STUDY OF SOME CHEMICAL PARAMETER OF SONALA DAM IN WASHIM DISTRICT OF MAHARASHTRA

Patil P.S.

P.G. and Research Dept. of Zoology

R.A. Arts, Shri M.K. Commerce, Shri S.R. Rathi Science College, Washim, M.S.

patilpradipkumar25@gmail.com

ABSTRACT:

The present study shows analytical report of water quality characteristics of four different sites of Sonala dam, Washim Dist. Maharashtra. During the present study the chemical parameters like Dissolved Oxygen, Carbon dioxide, Carbonate, Bicarbonate, Chloride, Salinity, Total hardness, Calcium hardness and Magnesium hardness were analyzed for a period of four months (November 2020- February 2021). The monsoon and winter season shows diverse regular change in different chemical parameters. The observed chemical status of this water body is reported to be appropriate for the sending on planktonic living beings and fishes. The water of present dam is useful for irrigation domestic use and fish culture.

Key words: chemical parameters, Dissolved Oxygen, Carbon dioxide, Carbonate, Bicarbonate, Chloride, Salinity, Total hardness, Calcium hardness, Magnesium hardness.

Introduction

Water plays a very vital role in human life. It is one of the important components on earth. Water maintains and links all ecosystems on the planet. As nature's most important nutrient, people need water to survive. The role and function of water in ecosystem is to provide the lifeblood of the community. Nearly 71% of earth's surface is covered with water, for most part in oceans and sea. It is a fundamental supplement and plays a key part within human body. Near about 93% of total water present on earth is sea water and only 3% is fresh water. Fresh water is mostly characterized by having low concentration of broken up salts and other total dissolved solids. It includes water in rivers, ponds, low lands, ice sheets, ice caps, streams and indeed underground water i.e., groundwater. In spite of the fact that freshwater particularly avoids sea water and brackish water, it does incorporate mineral rich water such as chalybeate springs.

The cause of water contamination includes a wide extend of chemicals, pathogens as well as physical parameters. The contamination may incorporate natural and organic substances. Lifted a temperature can also leads to contamination. The water contamination is measured by examining water tests such as physical, chemical, organic and inorganic tests. A suitable framework and administration plans are recurred to control water contamination. It

involves wastewater treatment plants, sewage treatment plants and mechanical wastewater treatment plants to secure water bodies from untreated wastewater. The contaminated water supply can cause many health issues. The presence of more concentration of chemicals or its inadequate supply in water leads to congenital diseases like goiter and cancer. Dominic, Chacko, Tom (Oct 2016). Limnology is the study of physical, chemical and biological features of lakes and other freshwater bodies. It covers all inland waters which may be lakes, waterways, streams, ground-waters and wetlands and their numerous diverse perspective. It also incorporates inland salt and brackish waters. One of the most important objectives of limnology is giving rules for water administration and water contamination control. The quality of water affects human health. Water quality is tested using physical and chemical parameters. The physical parameters are pH, alkalinity, salinity, colour, temperature, turbidity, total dissolved solids and electrical conductivity. Whereas chemical parameters are dissolved oxygen, carbonate, bicarbonate, biological oxygen demand, chemical oxygen demand, chloride and total hardness.

Review of literature

Dr. Ujwala P. Mankar (2018) studied on limnological and correlation studies of Sonala dam, Sonala district Washim. It revealed the

water can be safely used for domestic use, irrigation and pisciculture. Mahajan and Pokale (2017) reported the physicochemical analysis of Mohabalalake near Bhadrawati, district Chandrapur, Maharashtra. It observed the physicochemical parameters of three sites of Mohobala lake water varied appreciably and indicated change in relative to seasonal change. Solanke and Dabhade (2016) studied the physicochemical analysis of upper Morna reservoir, Medshi, district Washim, Maharashtra. It concluded the water can be used for domestic use, irrigation and for culturing of fishes. Dominic, Chacko, Tom (2016) analysed the water quality of samples collected from Thevara region, Kerala, India. A.M. Bali (2016) studied chemical parameters of different freshwater bodies in Washim town of Maharashtra. The study revealed that monsoon and winter season shows different fluctuation and water is suitable for planktonic organism and fishing growth and irrigation. Mankar and Bobdey (2015) studied the assessment of water quality of Sonala dam, district Washim, Maharashtra. Pawaiya, Sharma and Khushwah (2014) analysed the physicochemical parameters in Harsi Reservoir Dabra, Gwalior district, Madhya Pradesh indicating that all the physical and chemical parameters in Harsi reservoir were within desirable range. Shukla, Bhadresha, Dr. Jain and Dr. Modi (2013) studied physicochemical analysis of water from various sources. It concluded that potable water is safe to be consumed or used with low risk of immediate or to enough long term harm. Dubey, Tiwari and Ujjainia (2013) studied physicochemical properties of Sahapura Lake, Bhopal and they concluded that all the physicochemical parameters of Sahapura lake are beyond the prescribed limits of WHO and BIS indicating for increasing in pollution of the lake which need control of industrial waste and human activity in the water body. Dhonde and Kulkarni (2012) monitored the hydro-chemical

parameters of drinking water in Kadi river at Nimgaonchoba project in Beed, Maharashtra and they found that all the parameters were within the permissible limits as per WHO and ISI.

Materials and Methods

Description of study area - Sonala is a village near Malegaon taluka in Washim district of Maharashtra, India. It is located 30 km towards North from district headquarters Washim. The main purpose of Sonala dam is irrigation and it is constructed by government of Maharashtra in year 1981. Sonala dam is an earthfill dam on Aranriver. The height of the dam above lowest foundation is 19.6 m (64ft) while length is 1,114 m (3,655ft). The volume content is 698 km³ and gross storage capacity is 20, 270, 00km³.

Four different sampling stations were selected along the periphery of Sonala dam namely Site A, Site B, Site C and Site D. samples collected in early morning hours for four months from November 2020 to February 2021. To analyze physicochemical parameters the samples were collected at the same time from all selected sites following instructions of APHA (1998).

Result and Discussion

In the present study the chemical parameters like Dissolved Oxygen, Carbon dioxide, Carbonate, Bicarbonate, Chloride, Salinity, Total hardness, Calcium hardness and Magnesium hardness were analyzed in four different sites of Sonala Dam of Washim Dist. Maharashtra for a four months (November 2020- February 2021).

Analytical report of water quality characteristics with four month observation of physicochemical parameters of four sampling sites, their mean and standard deviation is given in table no. 1. Whereas monthly variation of physicochemical parameter are shown in table no. 2.

Chemical parameters And sampling site	Site A	Site B	Site C	Site D
DO (mg/L)	3.65± 0.129099445	4.9± 0.141421356	4.65± 0.129099445	4.975± 0.170782513
Carbon dioxide (mg/L)	Absent	Absent	Absent	Absent
Carbonate (mg/L)	18 ± 2.828427125	12 ± 1.632993162	17 ± 154700538	13.5± 2.516611478
Bicarbonate (mg/L)	96 ± 1.632993162	95.5± 1.91485421	93± 2.581988897	88.5± 2.516611478
Chloride (mg/L)	79.7625± 6.788158194	85.08± 10.02677416	95.8525± 9.061086671	104.5575± 12.09288048
Salinity (mg/L)	145.95± 12.20286852	153.55± 18.05482392	125.4925± 82.33629875	141.4925± 94.87316861
Total Hardness (mg/L)	350.5± 7.724420151	348.5± 3.415650255	272± 3.415650255	290± 7.118052168
Calcium Hardness (mg/L)	18.2175± 0.358643277	18.165± 0.271108834	14.125± 0.203715488	17.64± 0.618223261
Magnesium Hardness (mg/L)	80.0225± 3.872323807	80.055± 2.48242489	61.1675± 4.758854029	50.6825± 33.03291729

Table No. 1: Analytical report of water quality characteristics

Chemical parameters	DO	Carbonate	Bicarbonate	Chloride	Salinity	Total Hardness	Calcium Hardness	Magnesium Hardness	CO ₂	
November	SA	3.5	16	94	70.9	128	340	17.85	74.32	Absent
	SB	4.8	10	94	77.99	140.8	350	17.85	76.43	Absent
	SC	4.5	16	90	85.08	153.59	270	13.86	54.08	Absent
	SD	4.8	10	86	92.17	166.39	280	16.8	61.14	Absent
December	SA	3.6	16	96	77.99	140.8	350	18.06	80.99	Absent
	SB	4.8	12	94	77.99	140.8	348	18.06	80.5	Absent
	SC	4.6	16	92	92.77	166.3	272	14.07	62.93	Absent
	SD	4.9	14	88	99.26	179.1	290	17.64	66.45	Absent
January	SA	3.7	18	96	85.08	153.5	354	18.27	81.99	Absent
	SB	4.9	12	96	85.08	153.5	352	18.27	81.43	Absent
	SC	4.7	18	94	99.26	179.1	274	14.28	63.37	Absent
	SD	5	14	88	106.3	210.04	294	17.85	67.38	Absent
February	SA	3.8	22	98	85.08	153.5	358	18.69	82.79	Absent
	SB	5.1	14	98	99.26	179.1	344	18.48	81.86	Absent
	SC	4.8	18	96	106.3	210.04	278	14.29	64.29	Absent
	SD	5.2	16	92	120.5	217.5	296	18.27	67.76	Absent

Table No. 2: Monthly variation of physicochemical parameter

Summary and Conclusion

In the present study, the chemical parameters namely Dissolved Oxygen, Carbon dioxide, Carbonate, Bicarbonate, Chloride, Salinity, Total hardness, Calcium hardness and Magnesium hardness of Sonala Dam were analyzed.

The reveals that maximum value of dissolve oxygen was found on the site D (4.975 ± 0.170782513 mg/L) while minimum value was found on the site A (3.65 ± 0.1290994 mg/L) and carbon dioxide was found to be absent on all Sonala dam.

The maximum value of alkalinity in carbonate was found on the site A (18 ± 2.828427128mg/L) while minimum value was

noted on the site B (12 ± 1.632993162mg/L). Similarly the maximum value of Bicarbonate was found on the site A (96 ± 1.632993162mg/L) while minimum value was reported in site D (88.5 ± 2.516612478mg/L).

The maximum chloride value was recorded on the site D (104.557 ± 12.09288048mg/L) while minimum value was found on the site A (79.7625 ± 6.788158194mg/L). Similarly the maximum value of salinity was recorded on the site B (153.55 ± 18.05482392mg/L) while minimum value was found on the site C (125.4925 ± 82.33629875mg/L).

The maximum total hardness value was recorded on the site A (350 ± 7.724420151 mg/L) while minimum value was recorded on

site C (272 ± 3.415650255 mg/L). Similarly calcium and magnesium hardness, the maximum calcium hardness of value was recorded on the site A (18.217 ± 0.35864327 mg/L) while minimum value was found on the site C (14.125 ± 0.20371488 mg/L) and the maximum magnesium hardness value was found on the site A (80.0225 ± 3.872323807 mg/L) while minimum value was recorded on site D (50.6825 ± 33.032917 mg/L).

The monsoon and winter season shows diverse regular change in different chemical parameters. The observed chemical status of these water bodies are reported to be appropriate for the sending on planktonic living beings and fishes.

The water of present dam is useful for irrigation and fish culture. Dissolve oxygen point out photosynthetic exercise happening into the water whereas supplement like sulfate and nutrients and chloride gives appropriate environment for the biota within the dam in any case advance ponder is needed to affirm

the precise status of water quality of dam. After observation, it was concluded that the water sources may be used safely for both domestic and irrigation purpose. The life in aquatic ecosystem is directly or indirectly dependent on water quality. To improve water quality there should be continuous monitoring of pollution level and maintain the favorable conditions essential for fish survival, growth and reproduction. The absence of free CO₂ attributes to the presence of larger populations of phytoplankton in these area.

Suggestions and recommendations

Sonala dam should be commercially abused for fishes. Fish seeds of financially vital species should be refined in this dam. Don't leave waste material in dam because they pollute the water. Idol immersion in this dam should be banned as the colours used to paint the idols are proven toxic to the biota. Activities like washing animals, clothes, vehicles etc. should be prohibited.

References

1. A.P.H.A., (1998): Standard methods for examination of water and waste water. 20 edition, edited by Lenore S. Clesceri, Arnold E. Greenber and Andrew D. Eaton. Multidisciplinary research journal vol.5 (12):1-12
2. ShuklaDevangee, kinjalbhadresha, Dr. N. K. jain and Dr.H. A. modi (2013): physiochemical analysis of water from various source and their comparative studies IOSR Journal of Environmental Science, Toxicology and food (IOSR JESTET) vol. 5(3):89-92
3. Patil. P.N., D.V.sawant and R.N. Deshmukh (2012): physiochemical parameter for testing of water-A review International Journal of Environmental science vol. 3(3): 1197-1207.
4. Mahajan V.S and S.S pokale (2017):physico- chemical analysis of mohabalaLake near Bhadrawati, District – Chandrapur (MS), India International Journal of Life science vol.5(3): 438-446.
5. Midhun Dominic C.D, shinohacko and Thara tom (2016): Analysis of water quality of samples collected from Thevara Region, Kerala, India. International Journal for research of applied science and Engineering technology (IJRASET) vol. 4 Issue x, pg. 382-388.
6. Gorde S.P and M.V Jadhav (2013): Assessment of water quality parameters: AReview International Journal of engineering Research and application vol. 3 (6):2029-2035
7. Solanke M.R. and D.S. dabhad (2016):physico-chemical analysis of uparmorna reservoir, medshi district- washim, Maharashtra. International recognized
8. Dr. Ujwala P. Mankar (2018):limnological and correlation studies of sonala dam, sonala, district- washim,(MS) International conference on frontiers in life and earth science, vol.5 (1): 62-69
9. A. M. Bali (2016): Analysis of chemical parameters of different freshwater bodies in WashimTown of Maharashtra Indian streams journal vol 6 (5): 1-54
10. Mankar U.P and A.D bobdey (2015): studied the assessment of water quality of sonala dam, district washim, Maharashtra. International journal of researchesIn biosciences, agriculture and technology vol (11), issue (7) nov 2015 pg:363

11. Dabhade, D.S. (2006): limnological studies on lonar crater lake, Maharashtra. PH.D. Thesis submitted to S.G.B. Amaravati University, Amaravati
12. Dhonde M.S. and Kulkarni G.B. (2012): hydro-chemical monitoring of drinking water in kadi river at nimgaonchoba project in beedist, India. *Bioscience discovery*, vol3(1):133-137.
13. Dubey M., Tiwari A.K. and Ujjania N.C. (2013): The study of physico-chemical properties of sahapura Lake, Bhopal (India) *International journal of Advanced Research*, voll (8) 158-164.
14. Pawar S. and vaidya R. (2012): studies on physico-chemical characteristics and level of sewage pollution in krishna river at wai, dist-satara. *Proceeding of International Conference SWRDM*: 129-131
15. Vasanthkumar G., Khatoon B.A. and Manjappa S. (2012): physico-chemical characteristics of Queen lake in Arasikere Karnataka, India. *International journal of pharmacy and life sciences*, vol 3 (11) 2135-2137
16. Mahananda M.TV, Mohanty B.P. and Beers N.R. (2010): physico-chemical analysis of surface and ground water of bargarh district, Orissa, India. *LIRRAS*, vol2 (3):284-295
17. Pawaiya N., Sharma D.K. and Khushwah M.KS (2014): Analysis of physico-chemical parameters in Harsi reservoir Dabra, Gwalior district, Madhya Pradesh. *International journal of innovation and research*, vol 11 (2): 248-258.
18. Shrivastava C.B.L. (1988): A text book of fishery science and indian fisheries. *Kitab Mahal Agencies Allahabad*, Pp. 17-18.

SYNTHESIS AND CHARACTERIZATION OF SOME NOVEL CHALCONE DERIVATIVES AS ANTIBACTERIAL AGENTS**M.W.Bhade^{1*}, C.D.Badnakhe², Heena Khan¹, Dhanshri Chide¹, Diksha Dahake¹ and Namrata Gore¹**

1. Dept. of Chemistry, Amolakchand Mahavidyalaya, Yavatmal

2. Dep.t of Chemistry ,Dr. Manorama & Prof. H.S. Pundkar Arts ,Commerce & Science College, Balapur.

Dist.Akola, MS., India

madhuri.bhade@gmail.com

ABSTRACT

Literature survey shows that chalcones are valuable starting material for the synthesis of heterocyclic compounds like thiazines, pyrazole, thiazole, isoxazole, pyrimidine, thiamine etc. and shows a very broad spectrum of biological as well as physiological activities. The present study deals with the synthesis of some novel chalcones by treating substituted acetophenones with various substituted aldehydes. All the synthesised molecules were supported by elemental analysis, FT-IR, ¹H-NMR spectral data. The titled compounds were assayed for their antibacterial activity against some plant pathogens; Gram+ve bacteria viz. *Staphylococcus pneumoniae*, *Staphylococcus aureus* and Gram-ve bacteria viz. *Escherichia coli* and *Pseudomonas fluorescens* by using Agar disc diffusion method. The antibacterial activity is very encouraging.

Keywords- chalcones, antibacterial activity, Gram+ve bacteria, Gram-ve bacteria, plant pathogens.

Introduction

Chalcone belong to the flavonoid family which constitutes one of the major classes of naturally occurring heterocyclic compounds. Chalcone is an aromatic enone that forms the central core for a large variety of important biological compounds, which are known collectively as chalcones or chalconoids. Benzylidene acetophenone is the parent member of the chalcone series. The alternative name given to chalcone are phenyl styryl ketone, benzalacetophenone, β -phenylacrylophenone, γ -oxo- α,γ -diphenyl- α -propylene and α -phenyl- β -benzoylethylene. Throughout the ages mankind is dependent on nature, particularly on plants as source of carbohydrates, proteins and fats for food and shelter. In addition, plants are valuable source of a broad range of secondary metabolites, which are used as pharmaceuticals, agrochemicals, flavours, fragrances, colours, bio pesticides and food additives. With the presence of a wide range of secondary metabolites, plants have formed the basis of the traditional medicine systems that have been in existence for phenolic compounds, including tannins and derived poly-phenols and their different derivatives form one major group of phytochemicals. It has been found that in many plants, flavonoids protect them against their

pathogenic bacteria and fungi. Their antioxidant properties, cytostatic effects in tumorigenesis and ability to inhibit a broad spectrum of enzymes have led researchers to regard these compounds as potential anti-carcinogens and cardio protective agents. Chalcones^{1,2,3} belonging to the flavonoid family, are natural and synthetic products that have been reviewed for their wide range of biological activities as antibacterial⁴, anti-microbial⁵, anti-inflammatory⁶, antifungal⁷, anticancer⁸, anti-tumor⁹, analgesic⁹ and antioxidant^{10,11} agents, etc. In addition to their numerous biological¹²⁻¹⁵ activities, chalcones find a pronounced application in synthetic organic chemistry. Application of chalcones in the synthesis of many heterocycles¹⁶ and as intermediate in the synthesis of many pharmaceuticals has been thoroughly explained. Having a varied pharmacological activity¹⁷ and synthetic utility, chalcones are highly attractive molecules because of their simple structure, easy pathway and promising biological activity.

Experimental

Synthesis of Chalcones (1-19):- In a 100ml beaker, substituted acetophenone (0.01mol) and substituted aldehyde (0.01 mol) were mixed in 40 ml ethanol. Drop wise with continuous stirring 10 ml of NaOH solution

(40%) were added in 30 minutes. Further mixing continued for 2-3 hours at room temperature. The mixture become quite thick. It was kept overnight. It was then

neutralised with dilute HCl, the solid thus obtained was filtered, washed well with cold water, dried and recrystallized from rectified spirit.

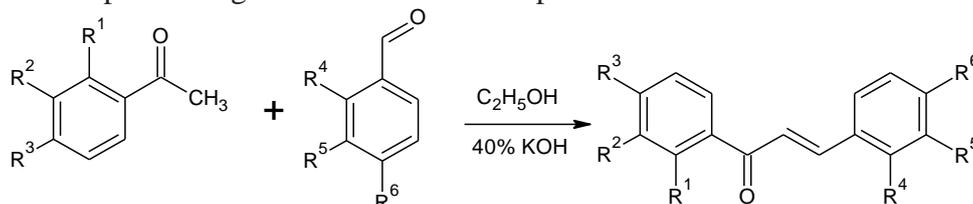


Table 1: Characterization of Synthesised Chalcone derivatives

Comp. No	R ₁	R ₂	R ₃	R ₄	R ₅	R ₆	Yield	MPt (°C)
1.	-H	-H	-CH ₃	-Cl	-Cl	-H	76%	143-145
2.	-H	-H	-H	-H	-H	-F	80%	156-158
3.	-OH	-H	-OH	-H	-NO ₂	-H	75%	210-212
4.	-H	-H	-CH ₃	-H	-NO ₂	-H	78%	165-167
5.	-H	-H	-H	-H	-H	-OCH ₃	85%	134-137
6.	-H	-H	-Br	-H	-H	-OH	75%	145-147
7.	-H	-H	-CH ₃	-H	-H	-OCH ₃	82%	160-162
8.	-H	-H	-Br	-H	-H	-H	75%	164-166
9.	-H	-NH ₂	-H	-H	-H	-Cl	78%	165-168
10.	-H	-H	-CH ₃	-H	-H	-OH	85%	143-145
11.	-OH	-H	-OH	-Cl	-Cl	-H	76%	230-233
12.	-H	-H	-CH ₃	-H	-H	-Cl	74%	180-183
13.	-H	-NH ₂	-H	-Cl	-Cl	-H	70%	171-173
14.	-H	-H	-CH ₃	-Cl	-Cl	-H	79%	165-167
15.	-H	-H	-H	-NO ₂	-H	-H	72%	155-158
16.	-H	-CH ₃	-H	-H	-H	-H	86%	143-145
17.	-H	-H	-H	-H	-H	-NO ₂	65%	165-167
18.	-H	-H	-Br	-H	-H	-OCH ₃	87%	171-173
19.	-OH	-H	-OH	-H	-H	-Cl	83%	230-233

All spectral data (IR and ¹H-NMR) of the synthesized compounds are described as follows:

Compound 1: IR (cm⁻¹): 3030 (C-H aromatic),

Compound 2: IR: 3083 (C-H aromatic), 1

3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one (1): Pale yellow crystalline solid; IR (KBr ν_{\max}) (cm⁻¹): 3288 (O-H), 1685 (C=O), 1602 (C=C), 760 (C-Cl).

NMR: δ 7.6 (d, 1H, C=CH), δ 7.3 (d, 1H, C=CH), δ 6.7-7.3 (m, 7H, Ar-H), δ 2.3 (s, 3H, CH₃).

3-(4-Fluorophenyl)-1-phenylprop-2-en-1-one (2): Yellow crystalline solid; IR (KBr ν_{\max}) (cm⁻¹): 1626 (C=O), 1048 (C-F).

NMR: δ 8.6 (d, 1H, C=CH), δ 8.2 (d, 1H, C=CH), δ 7.2-8.2 (m, 9H, Ar-H).

1-(2,4-Dihydroxyphenyl)-3-(3-nitrophenyl)prop-2-en-1-one (3): Brownish crystalline solid;

IR (KBr ν_{\max}) (cm⁻¹): 1655 (C=O), 1573 (C=C), 1530 (NO₂), 1350 (NO₂), 1301 (C-O).

NMR: δ 12.8 (s, 2H, OH), δ 7.8 (d, 1H, C=CH), δ 7.4 (d, 1H, C=CH), δ 6.7-7.3 (m, 7H, Ar-H).

1-(4-Methylphenyl)-3-(3-nitrophenyl)prop-2-en-1-one (4): Brownish yellow crystalline solid;

IR (KBr ν_{\max}) (cm⁻¹): 1673 (C=C), 1530 (NO₂), 1350 (NO₂).

NMR: δ 7.4-7.9(m,8H,Ar-H),
 δ 7.8(d,1H,C=CH), δ 7.4(d,1H,C=CH),
 δ 2.7(s,3H,-CH₃).

3-(4-Methoxyphenyl)-1-phenylprop-2-en-1-one (5): Pale yellow crystalline solid;
 IR(KBr ν_{\max})(cm⁻¹): 1654 cm⁻¹ (C=O), 1310 cm⁻¹ (C-O).

NMR: δ 8.2(d,1H,C=CH), δ 7.9(d,1H,C=CH),
 δ 7.4-7.9(m,9H,Ar-H), δ 3.9(s,3H,-OCH₃).

1-(4-Bromophenyl)-3-(4-hydroxyphenyl)prop-2-en-1-one (6):Pale Yellow crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 3313cm⁻¹(O-H), 1675cm⁻¹(C=O), 1673 cm⁻¹ (C=C),610 cm⁻¹ (C-Br).

NMR: δ 12.1(1H,O-H), δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H).

3-(4-Methoxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one (7):Yellowish crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1305 cm⁻¹ (C-O).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H),
 δ 3.9(s,3H,-OCH₃), δ 2.3(s,3H,-CH₃).

1-(4-Bromophenyl)-3-phenylprop-2-en-1-one (8): Pale yellow crystal

IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 610 cm⁻¹ (C-Br).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H).

1-(3-Aminophenyl)-3-(4-chlorophenyl)prop-2-en-1-one (9): Yellowish crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 3400cm⁻¹(N-H), 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1305 cm⁻¹ (C-O).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H),
 δ 4.5(s,2H,-NH).

3-(4-Hydroxyphenyl)-1-(4-methylphenyl)prop-2-en-1-one (10):

Yellowish crystalline solid;
 IR(KBr ν_{\max})(cm⁻¹): 3400 cm⁻¹(O-H), 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1305 cm⁻¹ (C-O).

NMR: δ 12.1(1H,O-H), δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H),
 δ 2.3(s,3H,-CH₃).

3-(2,3-Dichlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one (11): Dark Yellowish crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 3400 cm⁻¹(O-H), 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1305 cm⁻¹ (C-O), 760 cm⁻¹ (C-Cl).

NMR: δ 12.1(1H,O-H), δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,6H,Ar-H).

3-(4-Chlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one(12):):

Yellowish crystalline solid;
 IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H),
 δ 2.3(s,3H,-CH₃).

1-(3-Aminophenyl)-3-(2,3-dichlorophenyl)prop-2-en-1-one(13):

Brownish crystalline solid;
 IR(KBr ν_{\max})(cm⁻¹): 3400cm⁻¹(N-H), 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1305 cm⁻¹ (C-O), 760 cm⁻¹ (C-Cl).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,7H,Ar-H),
 δ 4.5(s,2H,-NH).

3-(2,3-Dichlorophenyl)-1-(4-methylphenyl)prop-2-en-1-one(14):

Yellowish crystalline solid;
 IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1305 cm⁻¹ (C-O), 760 cm⁻¹ (C-Cl).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,7H,Ar-H),
 δ 2.3(s,3H,-CH₃).

3-(3-Nitrophenyl)-1-phenylprop-2-en-1-one(15): Dark Yellowish crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1530 cm⁻¹ (NO₂),1350 cm⁻¹ (NO₂).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H).

1-(3-Methylphenyl)-3-phenylprop-2-en-1-one(16): Yellowish crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H),
 δ 2.3(s,3H,-CH₃).

3-(4-Nitrophenyl)-1-phenylprop-2-en-1-one(17): Brownish crystalline solid;

IR(KBr ν_{\max})(cm⁻¹): 1680cm⁻¹(C=O), 1645 cm⁻¹ (C=C), 1530 cm⁻¹ (NO₂),1350 cm⁻¹ (NO₂).

NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,9H,Ar-H).

1-(4-Bromophenyl)-3-(4-methoxyphenyl)prop-2-en-1-one(18):Pale yellow crystalline solid;

IR (KBr ν_{\max})(cm^{-1}): 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 610 cm^{-1} (C-Br).
NMR: δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,8H,Ar-H),
 δ 3.9(s,3H,-OCH₃).

3-(4-Chlorophenyl)-1-(2,4-dihydroxyphenyl)prop-2-en-1-one(19):

yellow crystalline solid;

IR (KBr ν_{\max})(cm^{-1}):3400 cm^{-1} (O-H), 1680 cm^{-1} (C=O), 1645 cm^{-1} (C=C), 1305 cm^{-1} (C-O), 760 cm^{-1} (C-Cl).

NMR: δ 12.1(2H,O-H), δ 8.2(d,1H,C=CH),
 δ 7.9(d,1H,C=CH), δ 7.1-7.9(m,7H,Ar-H).

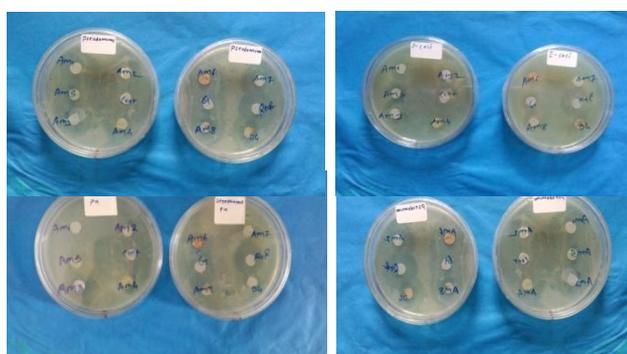
Antibacterial Assay

The compounds (I-VII) were screened for their antibacterial activity against Gram+ve bacteria viz. *Staphylococcus pneumoniae*, *Staphylococcus aureus* and Gram-ve bacteria viz. *Escherichia coli* and *Pseudomonas fluorescens* at conc. of 1000 ppm by using Agar disc diffusion method. Ofloxacin used as a standard and chloroform as solvent control. The zones of inhibition formed were measured in mm and are shown in Table No.2.

Table No.2- Impact of test compounds against plant pathogens

Sample Code	(Gram positive)		(Gram Negative)	
	<i>Staphylococcus pneumoniae</i>	<i>Staphylococcus aureus</i>	<i>Escherichia coli</i>	<i>Pseudomonas fluorescens</i>
1	-	14	21	18
2	-	13	20	17
3	17	12	-	20
4	15	-	-	21
5	-	13	19	18
6	14	20	22	18
7	-	15	18	16
8	-	-	17	22
9	-	18	-	14
10	-	14	20	13
11	13	14	18	15
12	13	15	16	14
13	16	14	13	11
14	13	15	12	13
15	-	14	15	13
16	14	15	-	11
17	15	16	16	16
18	-	-	14	14
19	14	15	13	13
Reference Antibiotic	39 (Ofloxacin)	25 (Ofloxacin)	39 (Ofloxacin)	40 (Ofloxacin)

Diameter of inhibition zone (mm)



Results And Discussion

Most of the test compounds shown remarkable and very encouraging antibacterial activities. A further detailed study in the light of plant pathology is advised.

Acknowledgements

The authors are grateful to Amolakchand Mahavidyalaya, Yavatmal for providing all the necessary facilities to carry out synthetic work. SAIF, VIT Vellore for providing spectral data and Samruddhi Microbial Diagnostic Lab., Amravati, Maharashtra for providing antibacterial activities.

References

- Nadia A. A Elkanzi, Hajer Hrichi, Ruba A Aloyan, Wassila Derafa, Fatin M Zahou and Rania B Bakr, *ACS Omega*, **2022**,7,32,27769-27786.
- Sayed Nasir Abbas Bukhari, *RSC Adv.*, **2022**, 12, 10307-10320.
- Puja Jaiswal, Dharam Pal Pathak, Himangini Bansal and Uma Agarwal, *Journal of Chemical and Pharmaceutical Research*, **2018**, 10(4), 160-173.
- Allaoua Kedjadja, Abdelmalek Bouraiou and Rachid Merdes, *International Journal of Organic Chemistry*, **2018**, 8, 105-114.
- Thanh-Dao Tran, Thi-Thao-Nhu Nguyen, Tuong-HaDo, Thi-Ngoc-Phuong Huynh, Cat-Dong Tran and Khac-Minh Thai, *Molecules* 17, **2012**,6684-6696.
- Ishwar Bhat K, Abhishek Kumar, *Asian journal of pharmaceutical and clinical research*, 9(4),**2016**, 63-66
- Deepa Gupta and D. K. Jain' *J Adv Pharm Technol Res.* **2015**, 6(3): 114–117.
- Visakh Prabhakar , Ranganathan Balasubramanian , Priyanka Sathe , C. Murali Krishna , Aarti Juvekar, *International Journal of Tumor Therapy*, **2014**; 3(1),1-9.
- Yamali C, Gul HI, Ozgun DO, Sakagam H, Umemura N, Kazaz C and Gul M, *Anticancer Agents Med Chem.* **2017**;17(10):1426-1433.
- Siham Abdelrahmane Lahsasni, Faeza Hamad Al Korbi and Nabilah Abdel-Aziz Aljaber, *Chemistry Central Journal*, **2014**; 8: 32.
- Mohana D, Subashini P, Thamizh Thendral M and Syed Shafi, *IOSR Journal of Pharmacy and Biological Sciences*,13(5-III),**2018**, 25-28
- Parvesh Singh, AmitAnand and Vipankumar, *European Journal of Medicinal Chemistry*,85,(6) **2014**,758-777
- Maydt D, De Spirt S, Muschelknautz C, Stahl W, Müller TJ., *Xenobiotica*, **2013**,43(8):711-8
- Mohammed Al-mamary, Sadik Al-Mikhlaifi and Bushra Jaadan, *International Journal Of Chemical and Pharmaceutical Sciences*, **2014**, June,Vol.5(2).
- Xiaochao Huang, Rizhen Huang, LingxueLi, Shaohua Gou and HengshanWang, *European Journal of Medicinal Chemistry*, 132,**2017**,11-25
- Muna S. Al-Rawi, *Ibn Al-Haitham J. For Pure and Appl. Sci.*, **2015**, 28(1).
- Ban H Taresh, *Scientific Journal of Medical Research*, **2022**, Vol 6(21),43-46.

SYNTHESIS, CHARACTERIZATION AND *IN-VITRO* ANALYSIS OF *OCIMUM TENUIFLORUM* AND *CURCUMA LONGA* SILVER NANOPARTICLES AGAINST WOUND INFECTING BACTERIAL PATHOGENS

Rahul More^{1*}, Shubhangi Kale¹, Mahesh Karale¹, Govind Sanap²,
Kailash Sontakke³, Shreyas Mahurkar⁴, Yuvraj Sarnikar⁴, Bhaskar Nikam⁵

¹ Dept. of Microbiology, Dayanand Science College, Latur(MS) India

² Dept. of Zoology, KBD college, Guhagar (MS) India

³ Dept. of Botany, GSG College Umardhed(MS) India

⁴ Dept. of Chemistry, Dayanand Science College, Latur (MS) India

⁵ Dept. of Chemistry, KANM's ACS College, Satana(MS) India

rahulakmore@gmail.com

ABSTRACT

The need of environmental non-toxic synthetic protocol for nanoparticles synthesis leads to developing interest in biological approaches with free from the use of toxic chemicals as by product thus there is an increasing demand for green nanotechnology the present study was carried out synthesis characterization and in-vitro analysis of Ocimum tenuiflorum and Curcuma longa silver nanoparticles against wound infecting bacterial pathogens. Characterization of silver nanoparticles was done by using UV is spectroscopy, FTIR analysis the results showed the Ocimum tenuiflorum and Curcuma longa silver nanoparticles have 8 nm to 15 nm zone observed as compared with the standard streptomycin 24 nm. The result obtained maybe useful in strengthening the standardization of Ocimum tenuiflorum and Curcuma longa for their medicinal use.

Introduction

Nanoparticles can be synthesized using various approaches including chemical physical & biological Although chemical method of synthesis require short Period of time for synthesis of large quantity of nanoparticles this method requires capping agents. for size stabilization of nanoparticles. chemicals used for nanoparticles synthesis and stabilization are toxic lead to non- ecofriendly by product. The need for environmental nontoxic synthetic Protocols for nanoparticle synthesis leads to developing interest in biological approach which free from the use of toxic chemicals as by Product Thus there is an increasing demand for " green nanotechnology "[1]

Metal incorporated nanoparticles have received wide interest in the area of industrial and medicinal applications. Among them, Nobel metals gold, silver, platinum and palladium-based nanoparticles have received much attention due to their unique electrical, optical and electronic as well as catalytic properties. Nanoparticles reveal atom like behaviours due to high surface to volume area and wide gap between valance band and conduction band [2,3]. Silver Nanoparticles have initiated useful interest not only fundamental development in research but also the industrial level owing to

their versatile properties [[4], [5], [6], [7], [8]]. This feature has attracted many researchers to find new methods for their synthesis [9]. A number of physical and chemical methods like reduction in solutions, thermal decomposition of silver compound, microwave assisted and photochemical reactions have been reported by several workers. The most common method for the synthesis of silver nanoparticles is a chemical reduction using inorganic and organic reducing agents such as hydrazine [10], N-dimethylformamide [11], Sodium borohydride [12], poly (ethylene glycol) [13] and surfactant template approach [11,14]. The synthesis of nanoparticles through green routes using microorganisms enzymes and plant extracts were suggested as possible environmentally friendly alternatives to chemical methods. Additionally, these methods were reported to be of cost effective and synthesized particles were found more stable. Several medicinal plants such as Acorus calamus, Alternanthera dentata, Ocimumcanum, Azadirachta indica, Brassica rapa, Coccinia indica, have already been used to synthesize and stabilize metallic NPs, very particularly biogenic AgNPs. In present study aim at first synthesis and characterization of silver

nanoparticles against wound infecting bacterial pathogens

Importance Of Tulsi

The tulsi plant or Indian basil involves a vital place in the Hindu religion. The name “tulsi” denotes “the exceptional one” which is a sweet-smelling plant. It is local to Indian Subcontinent and it is widely spread throughout the Southeast Asian tropics. Tulsi or *Ocimum tenuiflorum* is an aromatic plant belonging to the family Lamiaceae. It is widely used for religious and medicinal purposes, and for its important oil. A large number of the component are present in tulsi leaves, the main constituents of Tulsi are Oleanolic acid, Ursolic acid, Eugenol, Rosmarinic acid, Linalool, Carvacrol, and β caryophyllene, have been used widely for many years in food products, perfumery, dental and other oral products. Phytochemical analysis of the tulsi leaves reveals the presence of saponins, alkaloids, flavonoids, cardiac glycosides, steroids, phenols and tannins in it. It is broadly referred to over the Indian Subcontinent as a therapeutic plant and regularly utilized as a part of Ayurveda, where it is considered as the destroyer of all the doshas. It has an essential part inside the “Vaishnavite tradition of Hinduism”, in which followers do devotion including Tulsi plants.

Classification



Fig 2. Leaves of *Ocimum tenuiflorum*

Kingdom Plantae
Phylum - Tracheophyta
Class - Magnoliopsida
Order - Lamiales
Family - Lamiaceae
Genus - *Ocimum*
Species - *tenuiflorum*

Importance Of Turmeric

Turmeric (*Curcuma longa*) is a medicinal plant broadly utilized as a part of Ayurveda, Unani and Siddha medicine as a primary treatment for different diseases. It belongs to the family named Zingiberaceae and is one of the essential medicinal plants around the world. Turmeric is used as a food improver (spice), preservative and coloring agent in Asian countries, including China and South East Asia. It is also measured as a promising part of all religious festivals. It is broadly utilized for the treatment of sprains and swelling brought about by injury. Now a day, regular Indian medication uses turmeric powder for the treatment of the biliary issue, anorexia, coryza, cough, diabetic injuries, hepatic issue, and sinusitis. In China, *C. longa* is utilized for diseases related to stomach pain. The coloring standard of turmeric is the main fundamental property of this plant. It contains many bio active components for example, curcumin, turmerone, curcuminoids, turmerone, arturmerone, and zingiberene, that have antioxidant activities. Although recent studies have revealed that turmeric displays an extensive variety of pharmacological impacts, for example, antioxic, antitumor, hepatoprotective, antimutagenic, antiangiogenic, immunomodulatory, antimicrobial, anticancer, and wound healing.

Classification:-



Fig 1. Rhizomes of *Curcuma longa*

Kingdom: Plantae
Phylum - Magnoliophyta
Class - Liliopsida
Order - Zingiberales
Family - Zingiberaceae
Genus - *Curcuma*
Species - *Loga*

Materials And Methods**Materials:****A) Test organisms: -****1) Isolate 1=SKPS1****B) Nutrient Agar :-**

Composition: -	peptone	-10 g
	Sodium chloride	- 05 g
	Beef extract	- 03 g
	Agar	- 20 g
	D/W	- 1000 ml
	pH	- 6.8

C) Muller Hinton Agar: -

Composition: -	Beef Extract	- 2g
	Acid digest casein	- 17.5g
	Starch	- 1.5g
	Agar	- 17g
	D/W	- 1000ml

Methods**Plant Collection**

Ocimum cancum leaves and *Curcuma longa* powder collected from Latur & brought to laboratory in air tight polythene bags for further processing

Pus Sample Collection: -

The pus samples were collected by using a sterile cotton swab the inner Surface of the infected area was swabbed gently. Each swabbed gently each swab was plated onto media

1) Preparation of leaf extract

For the Preparation of leaf extract fresh leaves were collected in a beaker and washed several times with water to remove the dust & finally with double distilled water. 10 g washed leaves were cut into fine pieces & Crushed with the help of pestle in 100ml double distilled water After grinding the aqueous extract was taken in 250 ml beaker & boiled for 10 min 80°C temp. The plant extract allows to cool at RT. & then filtered with Whatman filter paper The filtrate was centrifuge for 20-25 min at 10000PM the supernatant was collected & stored at 4°C. "This filtrate was used as a stabilizing and reducing agents.

To prepare the aqueous extract of turmeric powder, 10 gm of curcumin Powder were weighed & mixed 100ml after that the mixture was boiled for 10 min 80°C temp. & cooled

2) Isolate 2=SKPS2**3) Isolate 3=SKPS3****4) Isolate 4=SKPS4**

down at room Temperature & The exact was then filtered using what man filter paper

Preparation of 1mm silver nitrate solution: -

The conc of 1mM silver nitrate. was prepared by dissolving 0.169-gram AgNO₃ in 1 l deionised water and stored

Green synthesis of silver nanoparticle: -

The Preparation of silver nanoparticles is a single step synthesis 10ml o of tulsi leaf extract, prepared and add to 90 ml silver nitrate solution & the mixture was kept at room temp for 30 min. The colour of the solution turned from light yellow to brown indicating the formation of silver nanoparticles.

A) Analysis of silver nanoparticles by using UV-visible spectrophotometer: -

The bio reduction of silver nitrate [AgNo₃). to Agno's was checked intermittently by UV vi spectroscopy after the dilution of the sample with distilled water an UV-Vis Spectrograph of the agno₃ and nanoparticles was recorded by using a quartz cuvette the UV-vi spectrometer ridings were recorded at wavelength 200-800 nm

B) Analysis of silver nanoparticles FTIR

FTIR spectra of the samples were measured using PerkinElmer spectrum one instrument in this diffuse reflectance mode at a resolution of 4 cm in KBr Pellets Powder samples for the FTIR were prepared similar to Powder diffraction measurement The FTIR spectra of synthesized AgNPs taken were analyzed which

discussed for the Possible functional groups for the formation of nanoparticles

C) Isolation of organism from pus sample: - the pus sample was collected from Government hospital in Latur. For the isolation make nutrient agar on that nutrient agar streak the swab stick on it and incubate it after incubation the microbial colonies are observed. For their colony confirmation or organism confirmation staining and tests are carried out

D) Disk diffusion assay: - The antibacterial activity of AgNPs against the selected wound infected Pathogens was carried

out disk diffusion Susceptibility test method The bacteria strains on the MHA agar Sterile cotton swab each sterilized AgNP's were Spread using sterilized Paper disk AgNP's 30 μ l *Ocimum tenuiflorum* & *Curcuma longa* plant extracts and of Streptomycin as standard Each disk was then placed on the Sterile solidified MHA agar which was Spread with inoculums The plates was kept for diffusion then transferred to the incubator at 37°C for 1 days After incubation the zone around the discs were measured by the zone scale

Results and Discussion

A. Preparation of silver nanoparticles using plant samples.



Fig 3. Green synthesis of silver nanoparticles

B. Bacterial isolates isolated from patients pus sample.



Fig 4. Isolation of organisms from pus sample

C. UV-Visible spectral analysis of selected plant samples

I) UV visible spectra of *Ocimum tenuiflorum* + silver nanoparticles

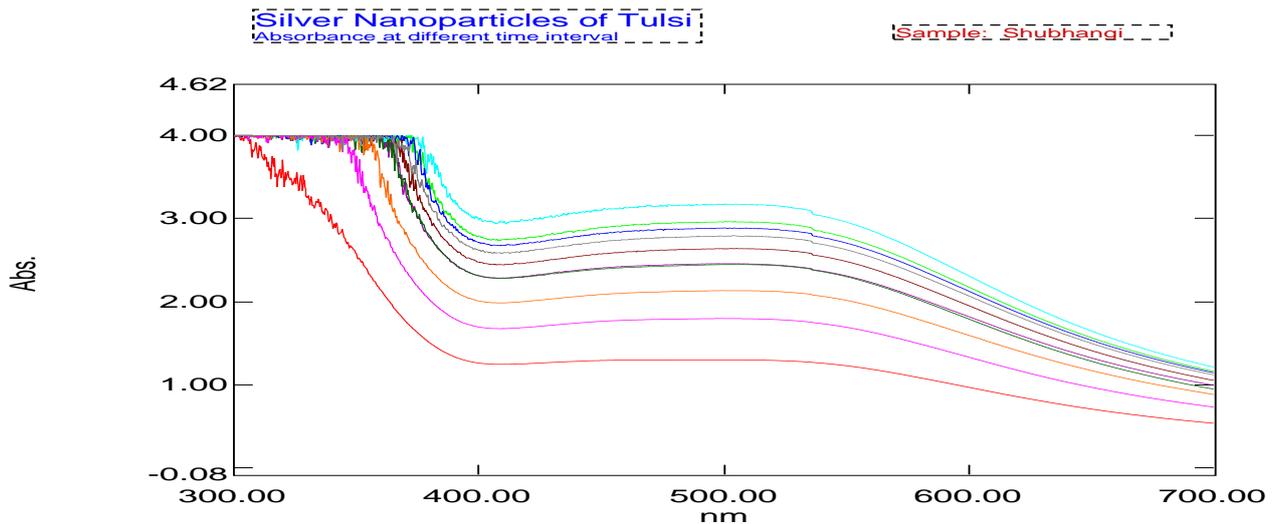


Fig 5. Spectral Graph showing reduction of silver using plant extract.

ii) Uv visible spectra of curcuma longa + silver nanoparticles

Overlay Spectrum Graph Report

05/23/2022 05:03:22 PM

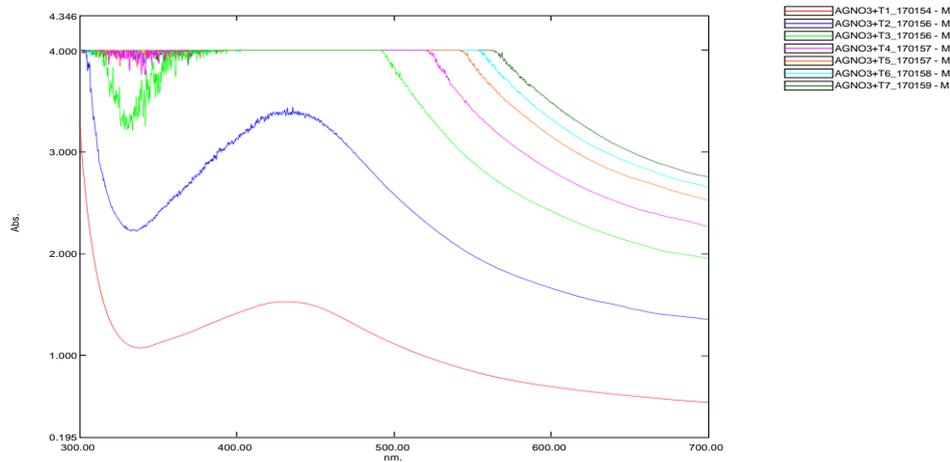


Fig 6. Spectral Graph showing reduction of silver using plant extract.

D. FTIR analysis of selected plant samples

i) FTIR spectra of Ocimum tenuiflorum + silver nanoparticles

Tulsi + AgNO₃ Results:

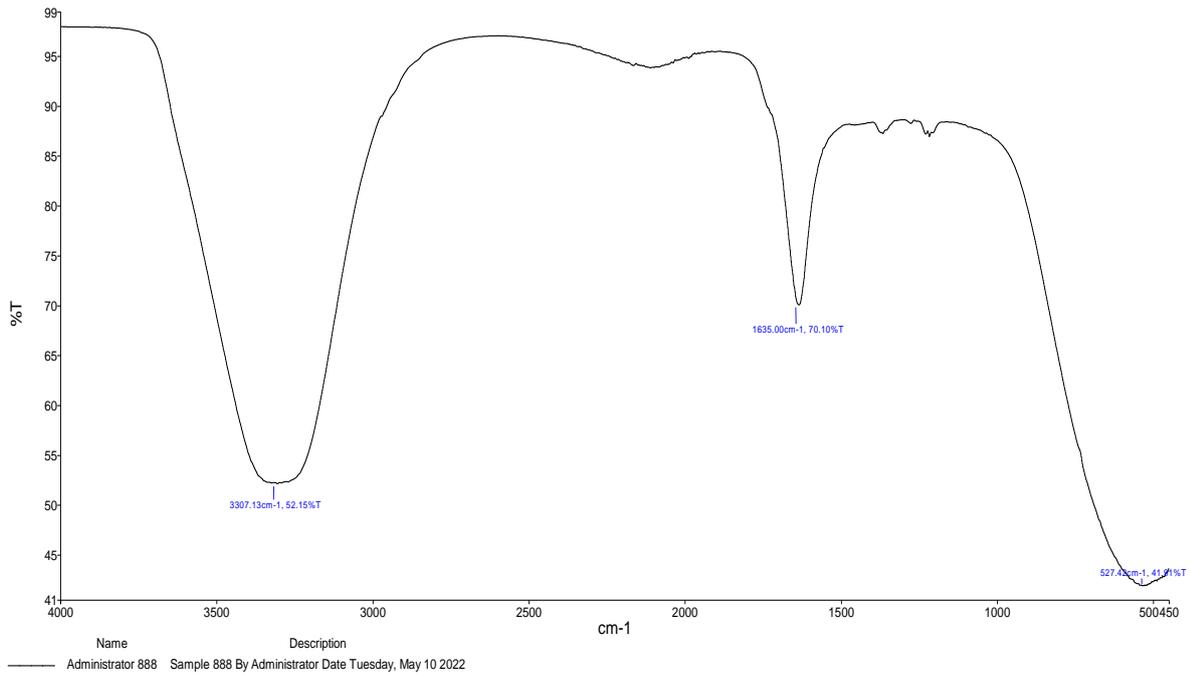
Administrator

10/05/2022

Spectrum Name	Number Of Peaks
Administrator 888	3

Administrator 888 Details:

Peak Number	X (cm-1)	Y (%T)
1	3307.13	52.15
2	1635.00	70.10
3	527.42	41.91

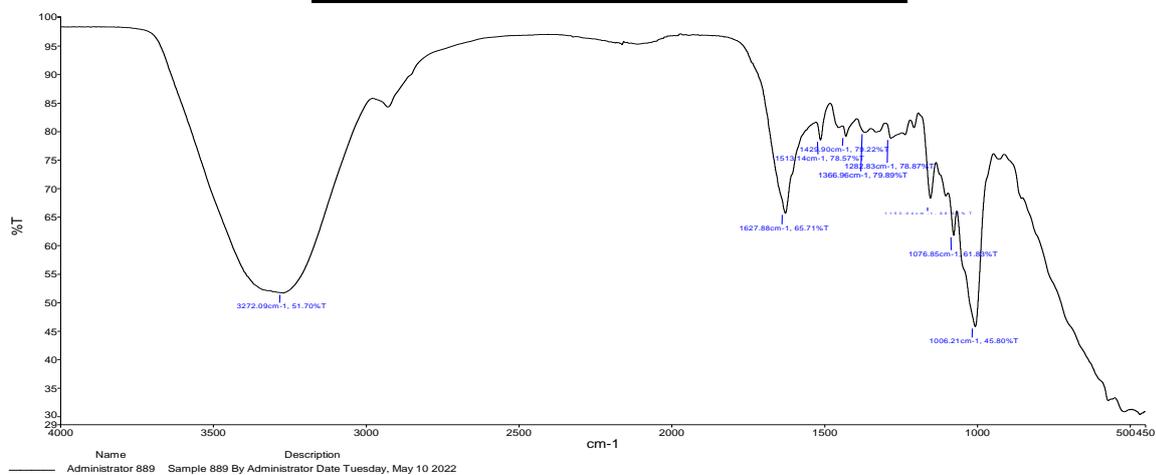


Administrator 888 Spectra:
ii) FTIR spectra of *curcuma longa* +silver nanoparticles
Turmeric + AgNO₃ Results:
Administrator

Spectrum Name	Number Of Peaks
Administrator 889	9

Administrator 889 Details:

Peak Number	X (cm-1)	Y (%T)
1	3272.09	51.70
2	1627.88	65.71
3	1513.14	78.57
4	1429.90	79.22
5	1366.96	79.89
6	1282.83	78.87
7	1153.04	68.35
8	1076.85	61.83
9	1006.21	45.80



Administrator 889 Spectra

E) Morphological characteristics of isolated wound infecting pathogens

ISOLATES	I	II	III	IV
Size	0.4	0.3	0.2	0.6
Colour	Cream	White	Orange	Yellow
Shape	Circular	Round	Circular	Circular
Surface	Smooth	Smooth	Smooth	Rough
Consistency	Sticky	Sticky	Sticky	Sticky
Opacity	opaque	opaque	opaque	Translucent
Elevation	Flat	Flat	Flat	Convex
Margin	Entire	Entire	Entire	Entire
Grams nature	Gram positive	Gram positive	Gram positive	Gram positive

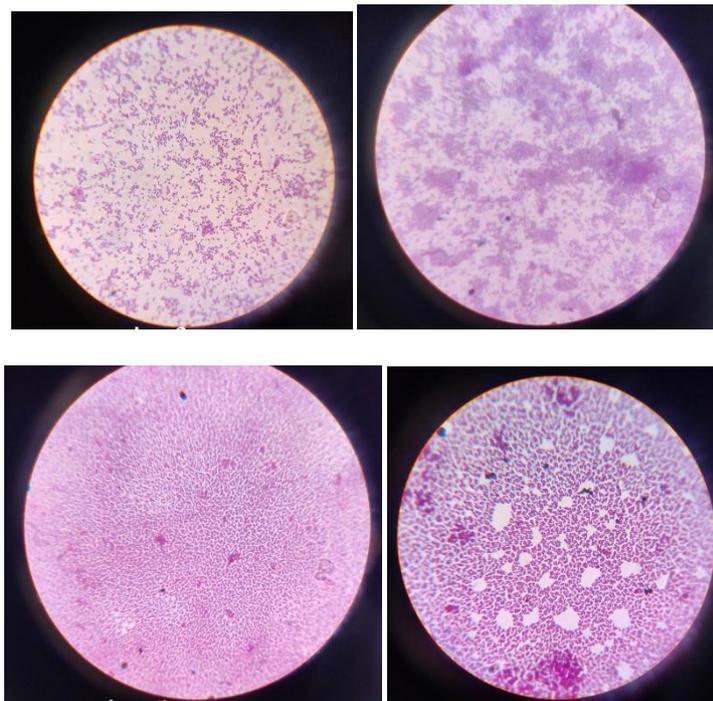


Fig 7. Gram staining photo of isolates



Photographic evidences showing inhibitory effect of silver nanoparticles towards bacterial



isolates isolated from pus samples



Fig 8. Antibacterial activity of synthesized nanoparticles against the selected wound infected pathogens

G) Antibacterial activity of Agno3 +Ocimum tenuiflorum and Agno3 + Curcuma longa

Isolates	I	II	III	IV
Streptomycin	11mm	24 mm	13mm	12mm
Agno3	8mm	10 mm	7mm	16mm
NP1	14mm	15mm	8mm	14mm
NP2	5mm	4mm	14mm	5mm

Discussion

The antibacterial assay performed by disc diffusion method & results are summarized in result showed the *Ocimum tenuiflorum* and *curcuma longa* AgNP's have 8 mm to 15 mm zone of inhibition and standard streptomycin have 24 mm of zone of inhibition was confirmed the zone of inhibition was observed in isolate I II III IV

Conclusion

From observation & result concluded that synthesis of nanoparticle effectively antibacterial activities against isolate I II III IV but the *ocimum tenuiflorum* and *curcuma longa* silver nanoparticles was moderate zone of inhibition than standard streptomycin

References

- Gariama Singhal, Raju bhavesh, Kunal Kasariya, Ashish Rajendea, pal singh "Biosynthesis of sivernanoparticals using ocimum sanctum [tulasi] leaf extract and screening its antimicrobial activity " Journal of Nanopartical 2011 [page number 1-9]
- Dijiken A.V., Meulenkamp E.A., Vanmaekelbergh D., Meijerink A. J. Lumin. 2000; 90:123–128. [Google Scholar]

3. Singhal G., Riju B., Ashish R.S., Rajendra P.S. *Adv. Sci. Eng. Med.* 2012;4:62–66. [Google Scholar]
4. Sotiriou G.A., Pratsinis S.E. Antibacterial activity of nanosilver ions and particles. *Environ. Sci. Technol.* 2010;44(14):5649–5654. [PubMed] [Google Scholar]
5. Lee J., Mahendra S., Alvarez P.J. Nanomaterials in the construction industry: are view of their applications and environmental health and safety considerations. *ACS Nano.* 2010;4(7):3580–3590. [PubMed] [Google Scholar]
6. Kim B., Park C.S., Murayama M., Hochella M.F., Jr. Discovery and characterization of silver sulfide nanoparticles in final sewage sludge products. *Environ. Sci. Technol.* 2010;44(19):7509–7514. [PubMed] [Google Scholar]
7. Mehta A., Sharma M., Kumar A., Basu S. Effect of Au content on the enhanced photocatalytic efficiency of mesoporous Au/TiO₂ nanocomposites in UV and sunlight. *Gold Bull.* 2017;50(1):33–41. [Google Scholar]
8. Mehta A., Mishra A., Sharma M., Singh S., Basu S. Effect of silica/titania ratio on enhanced photooxidation of industrial hazardous materials by microwave treated mesoporous SBA-15/TiO₂ nanocomposites. *J. Nanoparticle Res.* 2016;18(7):209. [Google Scholar]
9. H. A. Salam, R. Siriraj, Venkatesh, Green synthesis and characterization of zinc oxide Nanoparticles from *Ocimum basilicum* L. var. *purpurascens* Benth. -LAMIACEAE leaf extract, *Mater. Lett.*, 10.1016/j.matlet.2014.05.033. [CrossRef]
10. Wu Z.G., Munoz M., Montero O. The synthesis of nickel nanoparticles by hydrazine reduction. *Adv. Powder Technol.* 2010;21(2):165–168. [Google Scholar]
11. Qin Y., Ji X., Jing J., Liu H., Wu H., Yang W. Size control over spherical silvernanoparticles by ascorbic acid reduction. *Colloids Surf., A.* 2010;372(1):172–176. [Google Scholar]
12. Bin Ahmad M., Lim J.J., Shameli K., Ibrahim N.A., Tay M.Y. Synthesis of silvernanoparticles in chitosan: gelatin and chitosan/gelatinbionanocomposites by a chemical reducing agent and their characterization. *Molecules.* 2011;16(9):7237–7248. [PMC free article] [PubMed] [Google Scholar]
13. Vimala K., Mohan Y.M., Sivudu K.S., Varaprasad K., Ravindra S., Reddy N.N., Padma Y., Sreedhar B., MohanaRaju K. Fabrication of porous chitosan films impregnated with silver nanoparticles: a facile approach for superior antibacterial application? *Colloids Surf. B Biointerfaces.* 2010;76(1):248–258. [PubMed] [Google Scholar]
14. Mehta A., Basu S. Controlled photocatalytic hydrolysis of nitrites to amides by mesoporous MnO₂ nanoparticles fabricated by mixed surfactant mediated approach. *J. Photochem. Photobiol. Chem.* 2017; 343:1–6. [Google Scholar]

THE ROLE OF DIGITAL MARKETPLACES (ENVIRONMENT) IN ECONOMIC GROWTH OF A NATION

Prof. Kishor Sonaba Navsagare

Assistant Professor in Commerce, G. S. Gawande College, Umardhed. Distt. Yavatmal

ABSTRACT

In the emerging global economy, e-commerce and e-business have increasingly become a necessary component of business strategy and a strong catalyst for economic development. The integration of information and communications technology (ICT) in business has revolutionized relationships within organizations and those between and among organizations and individuals. Specifically, the use of ICT in business has enhanced productivity, encouraged greater customer participation, and enabled mass customization, besides reducing costs.

Introduction

With developments in the Internet and Web-based technologies, distinctions between traditional markets and the global electronic marketplace-such as business capital size, among others-are gradually being narrowed down. The name of the game is strategic positioning, the ability of a company to determine emerging opportunities and utilize the necessary human capital skills (such as intellectual resources) to make the most of these opportunities through an e-business strategy that is simple, workable and practicable within the context of a global information milieu and new economic environment. With its effect of leveling the playing field, e-commerce coupled with the appropriate strategy and policy approach enables small and medium scale enterprises to compete with large and capital-rich businesses. On another plane, developing countries are given increased access to the global marketplace, where they compete with and complement the more developed economies. Most, if not all, developing countries are already participating in e-commerce, either as sellers or buyers. However, to facilitate e-commerce growth in these countries, the relatively underdeveloped information infrastructure must be improved.

E-Commerce is generally described as businesses and consumers using the Internet to exchange information and buy and sell goods and services. It offers solutions to a variety of market-related problems, including:

- Commerce fragmented by geography,

- A preponderance of complex interactions between businesses that are labor- and information-intensive, and
- Supply chains bloated with excess inventory because of an inability to foresee and plan for the right products.

Electronic exchanges may take place through **digital marketplaces** (also known as net markets, hubs, virtual markets, and butterfly markets), which are Internet or Web-based trading hubs that bring together sellers and buyers. Purchasing also may take place through a company's own internal procurement Web site, where approved sellers display their items or catalogues. Digital marketplaces can be created and hosted (maintained) by either of the parties (buyer or seller) involved in the trading or by a third party who may charge for this service. The beauty of digital marketplaces is that their use and setup is entirely flexible.

Key examples of digital marketplaces include

- A commercial, third-party host provides procurement services to a specific set of suppliers and their customers, for a fee.
- A franchise or trade association provides online procurement services to its members, thereby aggregating their orders from approved suppliers.
- A new market maker offers online information and services to a specific industry, replacing existing distribution channels.
- A large distributor automates processes among several buyers, suppliers or manufacturers.

Digital marketplaces raise revenue through advertising, commissions and lead referrals. Some marketplaces receive a transaction fee from participants. Digital marketplaces are an increasingly important model for modern businesses. Corporate leaders are attracted to their ability to extend customer reach and enhance customer service; simplify the exchange of business-related information; preserve proprietary procedures, relationships and pricing; and aggregate buying power among independent companies, divisions and partners. Tax authorities may face difficulties in performing their compliance tasks when businesses adopt a digital marketplace model, but they should recognize that businesses are making the change for compelling business reasons.

Types of Digital Marketplaces

Digital marketplaces may be oriented toward sellers, buyers or both, and may be based on several business models. A marketplace that brings both buyers and sellers together, and was not created to benefit one or the other, is considered a business-to-business (B2B) exchange market. The role of the B2B market is to improve the functioning of the marketplace by improving the availability of information and reducing transaction costs, thus allowing the laws of supply and demand to determine the optimal process between sellers and buyers. B2B exchange markets are typically owned by entities independent of any seller or buyer group. They require a real-time, bid-ask matching process, market-wide price determination, as well as a settlement and clearing mechanism. B2B exchanges create significant value in market sectors where demand and prices are volatile. These exchanges allow businesses to manage excess supply and peak-load demand.

Models may fall into either of these categories:

- **Vertical Marketplaces** – a focus on a single industry by providing new distribution channels for raw materials, secondary inventory and supplies.
- **Horizontal Marketplaces or e-Business Portals** – hosted by third parties to provide online buying and selling to a set of

identified clients. The value to buyers is the aggregated buying power.

They may also be divided into these two types of models:

1. **Sell-centric markets** exist for the economic benefit of their supplier members. “Sell-centric” markets are formed by one or several large sellers hoping to draw smaller, fragmented buyers. When virtual or Web-based, they create efficient, aggregated distribution channels and provide easier access to untapped buyer groups.

2. **Buy-centric markets** are essentially online procurement portals that exist for the economic benefit of the purchaser. Typically they are formed when a few large customers join forces to purchase from a variety of sellers. They provide an efficient mechanism for aggregating the buying power of otherwise fragmented buyers to achieve improved procurement advantages (i.e., better price, greater access to products, etc.). In this **procurement marketplace**, Web-based procurement technology, or e-Procurement, replaces expensive proprietary networks and electronic data interchange (EDI). A company will establish a procurement marketplace to connect employees directly with suppliers. This streamlines the procurement process and reduces purchasing costs across departments and business units. Buyers interested in maximizing savings will use procurement software and procurement Web sites and ftp sites. There are two basic types of e-Procurement:

a. Production (Direct Spend) – The procurement of production items such as raw materials that are scheduled by production runs and driven by specific design-specifications.

b. Nonproduction (Indirect Spend or Operating Resources) – The procurement of operating resources such as office supplies and commercial services which normally require approval and are catalogue driven. While Digital Marketplaces are in common use today, they still face challenges that may add complexity to the problem of “designing tax into the process”:

- The business models are relatively new and may evolve rapidly.

- Application software and platforms being used are immature.
- There are difficulties with integrating existing customer management, procurement and enterprise applications with digital market solutions.
- Digital marketplaces affect existing customer and supplier relationships (and many tax laws were written specifically for the old model relationships).
- Digital marketplaces affect an organization's logistics.
- Digital marketplaces cross international boundaries, creating foreign exchange issues.

Considerations When Selecting e-Commerce Technology

While businesses can choose from many kinds of custom or packaged software when selecting their e-Commerce technology, they should keep in mind that the technology must do more than create a transaction. It must also provide a history of details to permit the appropriate determination of tax and to permit an audit of those determinations. Remember, *the client still has ultimate responsibility for the integrity of its data*, even if the hosting is provided externally. Businesses need to make sure that their new software, Web sites and portals give full access to taxing authorities, who will need very specific data and data trails that may not

be otherwise required by the transaction. For a detailed discussion of data management from a tax administration perspective, Businesses can include tools in their e-Commerce software and systems to ease the task of determining tax compliance.

These include:

- The use of ID codes, if the records are complex and related to a variety of transactions;
- Tools that make it possible to determine the integrity of archival records; and
- A system that permits efficient sampling.

Conclusion

When corporations purchase end-to-end applications, they should be prepared to spend a significant amount of time and money writing custom code to make enterprise applications work with each other and share common data sources—even across enterprise boundaries. Otherwise, a tax audit trail and data for compliance cannot be seamlessly generated. Given this need, many companies are moving toward **Enterprise Resource Planning (ERP)** systems, which can integrate numerous systems and processes, including financial accounting and reporting, procurement, inventory management, personnel management, and even production management.

References

1. Anita Rosen, *The E-commerce Question and Answer Book* (USA: American Management Association, 2000), 5.
2. MK, Euro Info Correspondence Centre (Belgrade, Serbia), "E-commerce-Factor of Economic Growth;" available from <http://www.eicc.co.yu/newspro/viewnews.cgi?newsstart3end5>; Internet; accessed 25 September 2002.
3. Thomas L. Mesenbourg, *Measuring Electronic Business: Definitions, Underlying Concepts, and Measurement Plans*.
4. Definition adapted and expanded from Emmanuel Lallana, Rudy Quimbo, Zorayda Ruth Andam, *ePrimer: An Introduction to eCommerce* (Philippines: DAI-AGILE, 2000).

GREEN LIBRARY TRENDS AND SUSTAINABLE DEVELOPMENT IN INDIA: A STUDY

Dr. V. S. Pachgade¹ and Dr. S. N. Wagh²

¹Librarian, B.B. Arts, N.B. Commerce & B.P. Science College, Digras, Dist. Yavatmal 445203

²Librarian, Gadge Maharaj Mahavidyalay, Walgaon, Distt. Amravati

vijaypachgade@gmail.com, sanjaynwagh@gmail.com

ABSTRACT

The paper deals with the trends and sustainable development of Green libraries in India. Green library trends emphasize nature conservation, economic and social well-being, physical and mental health, and a sustainable human future. There is no alternative rather than the library, regarded as a social institution to spread messages about green practices. For proper functioning, first of all, the library should transform into a green library. The prime aim of designing the Green library is to minimize the negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of raw construction materials and biodegradable products, conservation of resources (water, energy, paper), and responsible waste disposal (recycling, etc.).

Keyword: Green library, Sustainable library, Green conservation, LEED- India, Green library initiative in India, Green library standard, Green Practices etc.

Introduction

The "Green Library" movement began in the 1990's and gained momentum around 2003. A green library, also known as a sustainable library, is one that is designed, built, maintained, and run with environmental concerns in mind. It is a building that certifies the library as being ecologically friendly. All mortal creatures are working together to make the globe greener by reducing global warming. Green libraries help to the preservation of the earth's natural ecological equilibrium as well as natural treasures. It also enhances the library's daily operations and processes while informing the community about acceptable environmental practices.

With the expansion of modern technology, the lifestyles of human being development are at a rapid speed. The green library or sustainable library is a new perception and it is gaining a reputation among library professionals. It also gives an overview of the green library and the role of the modern librarian to make a green library. Today, in this information age, the entire world faces so many challenges to keep the earth clean and green on various platforms, because of climate change, air pollution, raising sea levels, changing wildlife populations and the overall state of the environment. The tremendous use of technology for making human lives easier and

more comfortable, but on the other hand humans are destroying natural resources and healthy life on the earth. And therefore world organizations are realizing the dangerous effects of their activities and deciding to go green.

Library and Information Science Online Dictionary defines green libraries as "designed to minimize the negative impact on the natural environment and maximize indoor environmental quality by means of careful site selection, use of natural construction materials and biodegradable products, conservation of resources (water, energy, paper), and responsible waste disposal (recycling, etc.)". The article has discussed various aspects of green libraries and their initiatives.

What is Green library?

The green library movement emerged in the early 1990s and it is gaining a reputation in the field of library and information science occupation. The library professionals also trying to develop such a kind of library, that will minimize electricity utilization, be energy efficient and be environment friendly. Though it is not applied completely in library fields still we are in a rising position. There is no need to give extra stress in mind to understand the green library.

The Role of Green Librarian

- Librarian should make constant efforts to encourage green library activities by using diverse online tools like social media.
- The Librarian always ready to work under the Eco-library system and identify those people who are willing to work in this atmosphere.
- Librarian can promote green library tools, techniques to promote others.
- A Librarian can encourage other librarians towards green library by discussion, seminar, and conferences.
- The green librarian's role is most vibrant he is also called as eco librarian because he has to tackle the budgets to support the organizations.
- Use wooden furniture and material because these are bio degradable materials
- Library can use wool brick instead of burnt brick.
- Solar tiles or panel can be used for roof.
- Paper Insulation is also an ultimate trick to make environment friendly building. It is made from newspaper and cardboard which are recyclable. Also it protects wall from fire and insects.
- More and more use of bamboo by replacing steel.
- Rooftop planting can be a good idea.

Importance of Green Library

The conservation of the environment is an essential aspect of our human beings in the modern world, which is influenced by several factors, including the greenhouse effect, ozone depletion, global warming, and carbon dioxide. Because time changes from day to day, our natural resources are finite. We are all responsible for leaving a healthy world to future generations. If the usage of natural resources is not restricted to the point that, future generations cannot exist. People are currently afflicted by natural calamities such as floods and droughts. These have a significant impact on human health and existence. Our government should take action to safeguard the environment in all aspects of life. The relevance of green libraries is also included in the ongoing green system since libraries are the

major hub for information for future generations, and they require significant amounts of electricity, water, and other resources to thrive and create a stable environment.

Features of Green Library

Green libraries are libraries that are ecologically friendly or sustainable. And every green library must have certain qualities, such as the following:

1. Use of natural, recyclable, and locally accessible resources;
2. Using a reflective ceiling and ground;
3. Utilization of insulating windows Upkeep of water, energy, and paper;
4. Reduce consumption by using energy-efficient lighting.
5. Optimized cooling system;
6. Appropriate landscaping both inside and outside the structure;
7. The circulation of clean, wholesome air;
8. Application of ecologically friendly technologies

Elements of Green Library

The 'Green Library Movement,' in general, began in the early 1990's and is slowly gaining traction in the area of library and information science. Many library professionals are working on the notion of a green library, which will utilize natural and regional building materials, use less water and electricity, and use environmentally friendly technology. Though it is still in its infancy, we must realize that a green or sustainable library is one that is ecologically and resource-conscious in its design, construction, rebuilding, operation, or reuse. There are many ways to promote the idea of a green library, including the use of environmentally friendly or recycled and locally available materials, optimal use and maintenance of natural resources, virtual user services, the use of recycled/private crockery in place of paper cups, fair-trade coffee in the library's coffee shop, green events, and carefully choosing library suppliers. These five elements are described below.

- **Site Location:** The library is the throbbing heart of any college, organization, university, or division. It needs to be placed in an area that would motivate individuals

to concentrate on their reading or academic work. When choosing a location, accessibility; including accessibility via public transportation—should be taken into account. The suggestions made for creating green libraries by several agencies and organizations, including LEED, USGBC, and Indian Green Building Council (IGBC), must be taken into account.

- **Water Conservation:** It is among the most crucial commodities required in both households and workplaces. It needs to be treated carefully because it is expensive and uncommon. A library should use proper water management techniques to keep it hygienic, clean, and ecologically friendly. Libraries may conserve water and make the most use of it by using waterless urinals, low-flow fixtures, and rainwater collecting systems, to name a few. The library may also utilize rainfall and sewage water for planting, gardening, and toilet flushing.
- **Energy Efficiency:** Energy usage should be decreased even when it cannot be avoided. There are several methods to preserve it in a library. There can be adequate glass windows, windows that let in natural light, energy-efficient bulbs and lights, and other features in a library. By putting solar panels on the library's roof, even necessary power may be produced using the sun's energy. Additionally, extra energy may be stored and utilized later on when it's needed.
- **Building Materials:** When we think of a green library, the library building is the first thing that comes to mind. In India and other countries, there are several guidelines and requirements for creating green structures out of recyclable and ecologically friendly materials. The Confederation of Indian Industry (CII) subsidiary Indian Green Building Council

(IGBC) offers services such as green building rating schemes, training programs, and certification services. A globally known program called LEED is used to construct highly efficient, green structures that improve the environment. It is crucial to select library resources that cause the least amount of waste and environmental harm.

- **Indoor Air Quality:** Today, having access to clean, breathing air is essential. In the library building, it is very crucial to have a good air supply. In order to provide clean, fresh air and maintain the library's temperature, proper planting is necessary on the nearby campus. Basically, trees give forth lovely air and control how well air conditioners work in the heat. In a hilly environment, the structure should be situated in the sun so that it may grow a bit warmer and use less energy during the winter to heat the rooms and run fans. Additionally, appropriate air circulation and ventilation setups need to be used. A green building is one that is planned so that the air is recycled as opposed to being still.

Conclusion

The idea of a "green library" is crucial for both the user and the actual library. Green Library is either safe or less harmful than everything to our environment; as a result, it is a kind of system. Where, environmental protection and technology coexist to attain sustainability. To create a green library, librarians should consider several aspects. Participate in the green library movement as well. The creation of a green library is supported by several national and international organizations. The government should encourage the creation of green libraries and advise all libraries on how to do this.

References

1. Bhattacharya, A. (2017). Green Library and its utilities in modern day library service: A study. *International Journal of Next Generation Library and Technologies*, 3(3), 1–11.
2. Datta, S. (2015). Green is the New Black: Bringing the Libraries into the Green

- Scene. International Journal of Digital Library Services, 5(3), 59–68. Retrieved September 13, 2022, from <http://www.ijodls.in/uploads/3/6/0/3/3603729/7535.pdf>.
3. Fourie, I. (2012). A call for Libraries to go Green: An Information Behavior Perspective to Draw Interest from 21st Century Librarians. *Library. Hi Tech*, 30, 428-435.
 4. Gupta, S. (2020). Green Library: A Strategic Approach to Environmental Sustainability. *International Journal of Information Studies and Libraries*, 5(2), 82–92.
 5. Ingole, A. R. (2021). Green Library: Concept, Sustainable Development, Features, Importance, Standards and Overview in Indian Scenario. *International Journal of Creative Research Thoughts*, 9(12), 373–385.
 6. Kumar, G. K., Shivakrishna, S. D. and Chikkamanju (2020). Green Libraries for Sustainable Development: An Overview. *Journal of Information and Computational Science*, 10(3), 585–590.
 7. Mahawariya, K. (2019). Transforming Modern Era Libraries into Green Library: A study. *The Journal of Indian Library Association*, 55(2), 1–7.
 8. Soni, G. (2018). Green Library Concept: an overview. *ISST Journal of Advances in Librarianship*, 9(1), 57–61.
 9. Thomas, R. (2017). Green libraries: India Vs International Scenario. *Scholarly Research Journal for Interdisciplinary Studies*, 4(37). <https://doi.org/10.21922/srjis.v4i37.10786>
 10. <https://www.ifla.org/units/environment-sustainability-and-libraries/>
 11. <https://www.ifla.org/ifla-green-library-definition/>
 12. <https://research.un.org/conferences/keynote3>

GREEN ICT APPLICATIONS TOWARDS THE ACHIEVEMENT OF SUSTAINABLE DEVELOPMENT

Miss. T. P. Basule and Miss. P. A. Thakare

Department of Computer Science, S. S. S. K. R. InnaniMahavidyalaya, Karanja lad

ABSTRACT

“Inexperienced ICT” constitutes a new time period in Informatics that describes environmentally sustainable ICT and using ICTs in the interest of the herbal surroundings aiming to sustainable improvement. It encompasses modern ICT gear, e- and m-offerings, and clever technologies in mixture with inexperienced practices and inexperienced conduct both for the ICT industrial sector or the ICT user/citizen that contribute not only to the protection and healing of the surroundings however additionally to the enhancement of the fine of human existence. Data & communiqué technology (ICTs) are often visible as the way to restrict environmental problems and enhance the elements of our lives underneath this context. On the equal time, the manufacturing and use of ICT equipment has its very own dangerous impact at the surroundings. This have a look at offers the that means of “inexperienced ICT” and its significance of adoption.

Introduction

The purpose of this paper is to aid within the expertise of green ICT, its programs, improvements and techniques, and to attract the attention of choice and policy makers in inexperienced ICT. Moreover, the blessings and the improvements in first-rate of life, surroundings, and financial system through green ICT are presented. It's miles vital to keep in mind that ICTs can opposite the cutting-edge scenario and that could constitute a effective vehicle for sustainable improvement. Financial restoration and sustainable improvement are key challenges that every one countries these days face. Over the years, ICTs have been adopted in numerous regions of our lives and paintings, impacting upon our professional and private life, supplying convenience, and enhancements. Moreover, they represent one of the most critical factors of financial increase, productivity, and social improvement. ICTs play an essential position in the financial system transformation system and further they are a critical source of competitiveness for enterprises. But, and regardless of the blessings that ICTs provide, in addition they contribute to environmental troubles, ingesting extraordinary amounts of strength and generating carbon dioxide emissions. In keeping with the literature regarding the environmental impact of ICTs, ICT is taken into consideration part of the worldwide environmental problem and the equal time part of the answer.

Literature Survey

To have a sustainable enterprise isn't always only for the big agencies but is likewise critical for the not unusual humans. Waste assets within the form of electricity, cash, paper and time without delay or in a roundabout way affects now not only people related to it but additionally to the not unusual people. Information technologies were a subject of interest for each instructional researchers and business managers within the closing two many years. Opposition via the data technology has usually been difficult. The contrast between aid-based and traditional thinking is well referred to on this paper [1]. The authors also empirically take a look at the version to discover the relationship among IT infrastructure, IT business revel in, courting infrastructure, and depth of organizational mastering. To do this information is collected via a national mail survey from chief IT executives from 202 production companies and it's far determined that IT infrastructure do now not have any vast impact on competitive advantage however IT business understanding and dating infrastructure do have. Consequently we will say enterprise can survive even if massive infrastructure isn't always available. In fact, so that you can decrease the impact of the excess machines minimum infrastructure have to be used. Displaying the motivations that an organization must have towards the adoption of green Informational generation is nicely explained in

[2]. Motivational idea is carried out on the statistics collected from a survey of 176 organizations and the results shows that the eco-performance and eco-effectiveness motives effect the adoption of:

- Technologies that reduce IT emission and complements the electricity efficiency of IT infrastructure
- Such systems that reduce journey and tour associated emissions
- Such rules and practices that give upward thrust to the product supervising with focus on IT lifecycle from beginning to the cease.

This paper additionally shows that the feel of duty for environment predicts green facts technology regulations and information era for green era, decreased cost, and conservation of strength are fundamental motives for inexperienced information technology. The stress of market forces will result in the principle motive for the final results of the green practices to upward push. While we speak of green computing we think of simply the IT vendors and organizations however green records generation also consists of the conduct and obligations of the records technology customers.[3]explains the perception and conduct of statistics era customers in the inexperienced information technology. Based on the idea of Reasoned action and principle of planned conduct, the paper firstly explains that it's the mindset toward inexperienced facts technology which is taken into consideration as the principle motive in the back of the intentions of the data technology users to exercise inexperienced records technology and secondly, the understood conduct manage closer to the green information technology has maximum impact at the facts technology customers. Commercial enterprise sustainability , firm improvements and of course Informational era has treasured relationship between them and well worth to analyze on however very least studies has been completed up to now on this. The paper on records era-Enabled Innovativeness and inexperienced abilities[4] has analyzed the connection among forms of statistics era sources, businesses green management abilities and innovations. The two varieties of information generation assets as mentioned via

the authors are technological information generation and human data era assets. The statistics is obtained from diverse Spanish corporations and the have a look at of this records resulted within the following consequences.

- The centre functionality is the innovativeness that facilitates the company to expand green control abilities.
- The development of innovative environment is directly motivated with the aid of the deployment of technological information technology and human information technology.
- Data era influences on inexperienced coping with skills thru the progressive abilities.

Prior we've got seen within the papers that Informational era can play critical role toward greener growth and sustainable commercial enterprise however very much less studies suggests the adoption and performance of inexperienced information generation within the enterprise at company degree. The study made by way of [5] investigates the elements that affect the implementation in real and outcomes of carried out green data era in terms of electricity conservation and earnings. This look at is primarily based at the survey performed in India of 293 firms and it is determined that the pinnacle management commitment has amazing impact on the significance of green statistics generation. The implication of inexperienced information generation is highly associated with discounts in IT gadget strength consumption and better profit impact. Every other paper by [6] investigates the numerous additives that has impacted the enterprise agencies in assessing the price of green facts generation. The authors have also proposed a version to expose the relationship among numerous additives and their influences over green data generation. This model may be used by the information era businesses to acquire the goal of environmental sustainability. Environmental issues want should be precedence now not handiest at the end of the product lifecycle however all through the statistics technology machine lifecycle as thoroughly addressed via [7] in his paper. The writer has also noted that simplest

by recycling the printing materials and old hardware objects is now not enough for the growing environmental impact of information technology. Environmental problems have to be taken care during the lifecycle of records device which includes the practices regarding the hardware, software and customers. The authors of this paper has provide you with the revised device improvement lifecycle that considers environmental issues at each level of the lifecycle and additionally proposes additional disposal degree as a formal, very last degree in the existence cycle. Growing environmental issues and ability actions are also discussed. In [8] the idea of small cells throughout the operation of cell community which in twentieth century may be viewed as macro or micro cells however are actually percent cells for insurance and local ability extension can extraordinarily growth the potential of cellular networks. Those small cellular networks have ability to comprehend strength financial savings. Additionally the dense deployment of those cells may be extra electricity green than the traditional architecture. It's been visible that value of energy utilized by the statistics era departments is approximately 50% of the general groups' fee but with green information generation it is expected that it must decrease the value and its effect at the environment and [9] awareness on sustainable records technology is essential issues and identifies the set of principles to manual sustainable design.

What is Environmental Sustainability?

Environmental sustainability is the responsibility to preserve herbal resources and defend global ecosystems to aid health and wellbeing, now and within the future. Because such a lot of decisions that effect the environment aren't felt right away, a key element of environmental sustainability is its ahead-looking nature. In fact, the U.S. Environmental safety organization defines it as "meeting today's needs without compromising the ability of destiny generations to meet their desires."

Environmental Regulations

Requirements for environmental sustainability vary significantly, based totally on neighborhood financial, social and environmental situations. Policies are frequently set on the federal stage. For example, the U.S. Environmental protection organization regulates the whole lot from air pollutants to refrigerants to risky waste control. The EPA units requirements for high-quality of air, water, soil, flora and fauna habitats and carbon emissions, and enforces those standards with financial penalties and criminal action. Kingdom/provincial and nearby governments may additionally create greater stringent tips. For example, cities like Madrid and Paris are beginning to set limits on diesel motors and older, less gasoline efficient fashions of vehicles.

But, studies shows a broader, international set of guidelines or a more commitment from groups themselves may be necessary to attain environmental sustainability. A examine featured in Harvard business review suggests multinational organizations do efficiently limit emissions in which environmental policies are strict, however may additionally emit more in international locations with more lenient recommendations.

Economic Growth and Environmental Sustainability

Organizations actually have a duty to society to put into effect environmentally sustainable practices, but these practices do now not must be at odds with enterprise goals. In reality, environmental sustainability executed proper must align profits with humans and the planet. We now know unrestricted consumption takes a extensive toll on human welfare. As GDP climbs, so too does our strength use, leading to more polluted environments and depleted natural assets. But, that doesn't suggest organizations can't be successful and sustainable. A few boom works in keeping with sustainability. Renewable energy organizations constitute a source of new jobs. Using less power and plastic in manufacturing represents an opportunity to develop income margins. This mind-set calls for an extended-time period outlook and a regard for

environmental impacts in corporate price-advantage analyses, but achieving this alignment is an funding in a destiny economic system in which groups can thrive.

ESG and Environmental Sustainability

The phrases “ESG” (Environmental, Social and Governance) and “sustainability” are used interchangeably, particularly in relation to benchmarking and disclosing data. Sustainability is an umbrella time period for many green concepts and corporate obligation, whilst ESG has emerge as the preferred time period for investors and the capital markets. The enterprise may also have started with sustainability efforts, however it has advanced to consist of ESG practices, overall performance, reporting and relevance to capital possibilities. ESG information facilitates discover risk-adjusted returns. Emphasis on all 3 pillars has aided the shift in how agencies degree and expose their overall performance.

Conclusion

Green ICT is of vital significance for a sustainable monetary development, including Products with a lower environmental impact, approaches treating waste, reuse or recycle, Presenting revolutionary technology and structures to display environmental impact and help.

The social desires of citizens and clients. The domain names where ICT can help are good sized.

Discount of carbon emissions and strength consumption are of the most important Domain names. Similarly critical are issues like reducing waste and maximizing using raw Materials. Collaboration between the exclusive associated sectors is paramount for achieving theseGoals. Green ICT blessings the surroundings by improving power efficiency, loweringGreenhouse gasoline emissions, using less dangerous substances, and inspiring reuse and recycling.We must be legally, ethically, and socially committed to inexperienced our ICT merchandise, Packages, services, and practices.

References

1. Accenture (2008). Data Centre Energy Forecast Report. Final Report, Silicon Valley
2. Leadership Group.
3. Andreopoulou, Z. (2012). Green Informatics: ICT for green and Sustainability. Journal of
4. Agricultural Informatics. Vol. 3, No 2.
5. Andreopoulou, Z.S., B. Manos, N. Polman and D. Viaggi (2011). Agricultural and
6. Environmental Informatics, Governance, and Management: Emerging Research Applications.
7. IGI Global. USA.
8. Asia-Pacific Telecommunity [APT] (2011). APT Report on introduction to green ICT
9. activities. Retrieved from <http://www.apr.int/sites/default/files/>
10. Brodtkin, J. (2009). Data center budgets rising despite economy, survey finds, Network
11. World, available at: www.networkworld.com/news/2009/031309-data-center-budgetsrising.html.
12. html.
13. Department of Communications, Energy and Natural Resources, Ireland (2008). Minister
14. Eamon Ryan TD speaking at the OECD Ministerial Council, Seoul, Korea,
15. Chaize, I. (2008). Sharp increase in the amount of data in the ‘digital universe’, Security
16. Watch, available at: www.securitywatch.co.uk/2008/03/13/sharp-increase-in-the-amount-ofdata-in-the-digital-universe/.
17. in-the-digital-universe/.
18. Department of the Environment, Water, Heritage and the Arts, Australia (2008). Perth Solar
19. City: Fact Sheet, available at: [www.environment.gov.au/settlements/20. /solarcities/perth/pubs/perth.pdf](http://www.environment.gov.au/settlements/20/solarcities/perth/pubs/perth.pdf).

21. European TCO Certification, (2009). European TCO Certification.
22. <http://www.tcodevelopment.com>.
23. Energy Star, (2009). Energy Star. <http://www.eu-energystar.org>.
24. Fernando, P. and Okuda, A. (2009). Green ICT: A cool factor in the wake of multiple melt downs. Retrieved from <http://www.unescap.org/idd/work>
25. <http://www.unescap.org/idd/work>
26. [ing%20papers/IDD_TP_09_10_of_WP_7_2_907.pdf](http://www.unescap.org/idd/work).
27. Gartner Research (2008). Gartner's top predictions for IT organizations and users, 2008 and beyond: Going green and self-healing. Retrieved from <http://www.gartner.com/id=578409>.
28. Green Press Initiative. 2008. Annual Report.
29. Hasson, J. (2009). Data centers: Growth or stagnation? FierceCIO, available at: www.fiercecio.com/story/data-centers-growth-or-stagnation/2009-03-15.
30. www.fiercecio.com/story/data-centers-growth-or-stagnation/2009-03-15.
31. www.fiercecio.com/story/data-centers-growth-or-stagnation/2009-03-15.

WATER POLLUTION : DRINKING WATER ANALYSIS FROM DIFFERENT STATIONS AT SAILU DIST PARBHANI.

P. R. Pande

Dept of Chemistry, Nutan Mahavidyalaya, selu .DistParbhani

Introduction

Water is commodity which is essential for mankind. Human life cannot exist without water for a few days. It is the nature's free gift to human race. It is available in various forms such as river, lakes, streams etc. The importance of water in human life is so much that the development of any city of the world has practically taken place near some source of water supply .The use of water by man, plants and animals is universal. As a matter of fact, every living soul requires water for its survival. It is essential for life health and sanitation. Man can live without food for about one month, but he can hardly survive for three to four days without water. The water covers three quarters of our planet and yet it is said to note that about 70% of the world's survive without clean water. Water pollution is one of the biggest issues facing India right now. As may be evident, untreated sewage is the biggest source of such form of pollution in India. There are other sources of pollution such as runoff from the agricultural sector as well as unregulated units that belong to the small-scale industry. The situation is so serious that perhaps there is no water body in India that is not polluted to some extent or the other. In fact, it is said that almost 80% of the water bodies in India are highly polluted. This is especially applicable of ones that some form or the other of human habitation in their immediate vicinity. Ganga and Yamuna are the most polluted rivers in India.

Need for analysis:

- 1 To ascertain if the supplies maintain the required degree of purity and to find out the extent of any variations which occurs?
2. To ascertain the effect of heavy rainfall or so long continued drought on river waters. To decide that the water obtained from some additional sources or sources of supply will be pure, wholesome, not too hard and free from

the risk of any pollution.

3. To find out the organism responsible for spreading water born diseases.

4. To suggest the best method of purifying, of softening or of preventing action on mains and supply pipes etc.

Water pollution is one of the biggest issues facing India right now. As may be evident, untreated sewage is the biggest source of such form of pollution in India. There are other sources of pollution such as runoff from the agricultural sector as well as unregulated units that belong to the small-scale industry. The situation is so serious that perhaps there is no water body in India that is not polluted to some extent or the other. In fact, it is said that almost 80% of the waterbodies in India are highly polluted. This is especially applicable of ones that some form or the other of human habitation in their immediate vicinity. Ganga and Yamuna are the most polluted rivers in India.

Procedure for sampling:

The process of collecting samples is known as sampling it is very essential to collect a representative sample and preserve it till all the analyses are carried out in sampling sites selection, collection of sample, there handling and preservation are important.

Parameter adapted:

To check the potability of water which is consumed by the people at present in Sailu Analysis was carried out from different areas and from that we can conclude, whether the water is fit for drinking or not. Following are the parameters which are earned out during the analysis of water. They are PH, EMF Acidity, Alkalinity, CO, Chlorides, Residual Chlorine, Hardness and Total solids.

Procedure adapted for each parameter:

1. **PH:**- Ph of water was found out by using buffer solution No.4 and PH meter. Ph meter

should be adjusted to 4 PH and then PH of different samples is to be taken. For most practical purposes, the PH of aqueous solution can be taken as negative logarithm of hydrogen activity, 1-7 acidic, 7-14 increasingly alkaline and 7 is neutral. The PH of neutral water usually lies in the range of 4-8.5

2 Total alkalinity: it is the measure of capacity of the water to neutralize a strong acid. Total alkalinity, carbonates and bicarbonates is estimated by titrating the sample

with a strong acid HCl having normality 0.05 N.

3. Total acidity: It is expressed by normality of the solution which is equal to the number of grams equivalents of acid in one liter of solution.

Acidity can be determined by titrating the sample with a strong base such as NaOH having normality 0.05 N using methyl orange or phenolphthalein as an indicator. If the sample has strong mineral acid and their salts it is titrated using methyl orange as an indicator. This is

collected as methyl orange acidity. If the sample is titrated using phenolphthalein it is phenolphthalein acidity. The resultant value is the total acidity.

4. The CO₂-Which is found in well waters and surface water to a great extent cause corrosion. The CO₂ present in water in excess of carbonates and bicarbonates known as free CO₂, The sample is taken and 2/3 drops of phenolphthalein as an indicator, if colour does not become red then CO₂ is present. The titration is against 0.05 N NaOH till pink colour appears.

5. Chlorides:-It occurs naturally in all types of water. In natural fresh water, however its concentration remains quite low. The most important source of chloride in natural water is the discharge of sewage. In very high concentration it gives a salty taste to the water. Chemicals used are:

Silver nitrate (AgNO₃) 0.01 N

698 gms of AgNO₃ + 100 ml distilled water NaCl 0.011 N

0.5984 gms of NaCl + 1000 ml distilled water

Potassium chromate (K₂Cr₂O₇) 2%

2 gms of potassium chromate + 100 ml distilled water 10 ml of sample is taken and few drops of potassium chromate as an indicator. Titrate

this mixture against AgNO₃, 0.01 N. End point of reaction is yellow to brick red.

6. Dissolved oxygen- The presence of dissolved oxygen is essential to maintain the higher forms of biological life and to keep the proper balance of various populations thus making the water body healthy. The chemical and biochemical processes undergoing in a water body are largely dependent upon the presence of oxygen.

Chemicals and reagents:

Sodium thiosulphate

Manganous chloride solution (Winkler A)- Add 40 gms of manganous chloride to about 25 ml distilled water in a beaker. Transfer this to a volumetric flask and make up to 100 ml with distilled water.

Alkaline potassium iodide reagent (Winkler B)- Dissolve 33 gms of NaOH and 10 gms of KI in 75 ml distilled water. Cool the solution and make up the volume of 100 ml.

Concentrated sulphuric acid

Starch indicator 1%

Oxygen from any given water sample is generally estimated by Winkler method, MnCl₂ when added to a known volume of water containing dissolved oxygen it will be converted into manganous hydroxide, this is dissolved in HCl and made to react with KI so that an equivalent quantity of iodine is then liberated, iodine produces

7. Total solids:- The surface water containing filterable and infilterable solids. For the determination of total solids as a convenient quantity of sample water to be taken is (250 ml) but

if the water is very hard then a 50 ml of sample water will be suitable. The estimation is considered on an unfiltered sample. The water sample should be evaporated in an oven for one hour at 103°C-105°C. The residue after the evaporation subs which are present in given sample of water. Blue colour due to iodization

8. Hardness:- Hardness is calculated as total hardness and permanent hardness. Total hardness:- Take 10 ml of water to be tested,

add one ml of buffer solution and few drops of Erichrome black T as an indicator and titrate with standard EDTA solution until the colour changes from wine red to blue. Permanent hardness-Place 250 ml of sample and boil gently for 20 min: Cool and filter in 250 ml standard flask. Do not wash filter paper Dilute filtrate upto the mark Mix well Pipette out 10 ml of this solution in a conical flask

Results and discussion:

The values of the analysis from chart no. 2. are compared with the values from chart no 1 as these are standard values from these observation it is found that PH of all samples as nearly equal to seven, neutral PH this indicate water is potable. The mean chloride value is 124.78. The accepted value is upto 200, but in the analysis the amount of chlorides was observe negligible.

ENVIRONMENTAL IMPACT OF E-WASTE IN INDIA**Prof. Avinash Ramkrishna Pawar**Department of Commerce, ShriShivaji Arts, Commerce & Science College, Akot
aviaavishka@gmail.com**ABSTRACT**

E-Waste is not an industrial waste or chemical and physical substance but it includes valuable and hazardous supplies equally thus it requires a different method for recycling by which it will not harm environmental and also not to the human health. The process of re-use various components or base materials, that is made with metals called recycling. The problems of recycling includes are short of facilities, the high cost of labor, and strict environmental regulations resulting trend of not to recycle E-waste by some rich countries. Recycling has emerged as a new economic sector for trading, repairing and recuperating resources from unusable devices and converting it into a financially profitable economic activity. The current research paper used the data obtained from 140 citizens of India by using the convenient Sampling method to measure their awareness about e-waste management. Multiple regression tests were used and it was found that the citizens are aware of the e-waste and its management.

Keywords: E-Wastes, E-Wastes Management, India, Sustainability, Awareness

Introduction

There is no separate collection of e-waste in India. Hence, there is no clear data on the quantity generated and disposed of each year. According to Secretariat, RajyaSabha Report (2011) on e-waste, there is no confirmed figures available on how substantial are these trans-boundary e-waste streams. Central Pollution Control Board (CPCB) estimated India's e-waste at 1.47 lakh tonnes. It has further estimated that total 4.34 lakh tones of e-waste were generated in India till the end of the year 2009 and it will surpass the 8 lakh tonnes mark by 2012 (CPCB, 2010). In Indian scenario, the electronically sound 10 states are producing above 2/3 of the e-waste. And thus its management needs more efforts not from the side of the e-waste management agency but from the side of the citizens. Recycling is the main concern and gain importance due to the dumping of the e-waste by other countries for their disposal in India, which is the main cause of change in the environment degradation and now the time has come for improving environment and reducing the main cause of human health risks (Ha et al.2009).

Objectives

The aim of this study is to study the environmental impact of e-waste in India.

Research Methodology**Sources of Information**

This research work is in the form of exploratory and its nature is also descriptive research Study. For conducting this research the information will be gathered from the Primary sources. The first-hand primary data was collected through questionnaires. For this purpose, the views of the respondents engaged in recycling industry form India was selected.

Sample Design

Sample Units: Current study depends upon the citizens of India.

Sampling Technique – Convenient Sampling.

Sample Size – 140.

Hypotheses

H1: There is a significant difference in awareness about hazardous effects of electronic waste in India.

Tools and Techniques of Research

Since the data needed for this research is secondary data as well as primary data. the primary data will be collected by using a questionnaire while a some Secondary data will be taken from the annual report and other reports. To meet the research objective of research Questionnaire was used as an instrument for collecting primary data. Looking at the nature of study the questionnaire will structure and mainly contained questions, which are closed ended? The response will

be recorded and measured by using Nominal Scale and LikerScale.

E-Waste Problem in India

India ranks 177 amongst 180 countries and is amongst the bottom five countries on the Environmental Performance Index 2018, as per a report released at the World Economic Forum 2018. This was linked to poor performance in the environment health policy and deaths due to air pollution categories. Also, India is ranked fifth in the world amongst top e-waste producing countries after the USA, China, Japan, and Germany and recycles less than 2 per cent of the total e-waste it produces annually formally. Since 2018, India generates more than two million tonnes of e-waste annually, and also imports huge amounts of e-waste from other countries around the world. Dumping in open dumpsites is a common sight which gives rise to issues such as groundwater contamination, poor health, and more. The Associated Chambers of Commerce and Industry of India (ASSOCHAM) and KPMG study, Electronic Waste Management in India identified that computer equipment account for almost 70 per cent of e-waste, followed by telecommunication equipment phones (12 per cent), electrical equipment (8 per cent), and medical equipment (7 per cent) with remaining from household e-waste.

E-waste collection, transportation, processing, and recycling is dominated by the informal sector. The sector is well networked and unregulated. Often, all the materials and value that could be potentially recovered is not recovered. In addition, there are serious issues regarding leakages of toxins into the environment and workers' safety and health.

Seelampur in Delhi is the largest e-waste dismantling centre of India. Adults as well as children spend 8–10 hours daily extracting reusable components and precious metals like copper, gold and various functional parts from the devices. E-waste recyclers use processes such as open incineration and acid-leaching. This situation could be improved by creating awareness and improving the infrastructure of recycling units along with the prevalent policies. The majority of the e-waste collected in India is managed by an unorganized sector.

Also, informal channels of recycling/reuse of electronics such as repair shops, used product dealers, e-commerce portal vendors collect a significant proportion of the discarded electronics for reuse and cannibalization of parts and components.

Impact of Recycling E-Waste in Developing World

Almost all e-wastes contain some form of recyclable material, including plastic, glass, and metals; however, due to improper disposal methods and techniques these materials cannot be retrieved for other purposes. If e-waste is dismantled and processed in a crude manner, its toxic constituents can wreak havoc on the human body. Processes such as dismantling components, wet chemical processing, and incineration are used to dispose the waste and result in direct exposure and inhalation of harmful chemicals. Safety equipment such as gloves and face masks are not widely used, and workers often lack the knowledge and experience required to carry out their jobs properly. In addition to this, manual extraction of toxic metals leads to entering of dangerous material in the bloodstream of the individual doing so. The health hazards range from kidney and liver damage to neurological disorders. Recycling of e-waste scrap is polluting the water, soil, and the air. Burning to retrieve metal from wires and cables has led to the emission of brominated and chlorinated dioxins as well as carcinogens which pollute the air and, thereby, cause cancer in humans and animals. Toxic chemicals that have no economic value are simply dumped during the recycling process. These toxic chemicals leach into underground aquifer thereby degrading the local groundwater quality and rendering the water unfit for human consumption as well as agricultural purposes. When e-waste is dumped in landfills, the lead, mercury, cadmium, arsenic, and PCBs make the soil toxic and unfit for agricultural purposes. Very recent studies on recycling of e-waste has pointed towards increasing concentrations of PCBs, dioxins and furans, plasticizers, bisphenol-A (BPA), polycyclic aromatic hydrocarbons (PAH), and heavy metals in the surface soil of the four metro cities of India, that is, New Delhi, Kolkata, Mumbai, and Chennai where e-waste

is being processed by the informal sectors. In those studies, it has been observed that the sites engaged in metal recovery processes are the prime sites for such persistent toxic substances. Studies from the same group also reported that

the persistent organic pollutants produced or released during the recycling process are escaping in the ambient air due to their semi-volatile nature.

Discussions and Result

The result of the data collection is shown as under:

Table 1: Demographics

	Count	Percentage			
15-24	67	59%	Student	66	58%
25-34	23	20%	Employed/service	45	39%
35-above	24	21%	Business	3	3%
Male	75	66%	School Education	14	12%
Female	39	34%	Under Graduate	47	41%
			Post Graduate	53	46%
Single	89	78%			
Married	25	22%			

It can be concluded from table above that Majority of respondents are young belong to 15-25 year age group. Large proportions are male respondents (66 percent) and students studying in school and colleges in respective

UG and PG courses. Hence the sample is composed of young generation student and employed community, therefore the results majorly reflect their perspective towards e-waste effects and its management.

Table 2: Process Adopted When Gadgets Damaged or Become Un-Repairable

Methods	Percentage
1. Keep them athome	17%
2. Sell to recycler	20%
3. Handed over to wastecollector	18%
4. Sell to second handdealer	24%
5. Sell to scrap dealer	9%
6. Put on thestreet	1%
7. Donate to other	11%

Majority of respondents is selling their e-waste to near second-hand dealer, or hand it over to the local waste collector. Even a considerable

percent of respondents keep their e-waste at their home. All these activities further enhance the improper disposal of e-waste in India.

Table 3: Measuring Awareness on E-Waste

	Variable Name
What is e-waste	Aware
Awareness about hazardous effects	Aware
Waste pose a serious threat to the environment	Aware
Aware about volume of electronic waste we generate	Aware
Aware about national or international laws related to e- waste management	Aware
Know any e-waste trader or recycler (in Rajasthan / India)	Aware
Aware of local programs, projects or activities related to electronic waste management	Aware
Most of waste collectors are not aware of its negative effects	Aware

Conclusions

Electronic waste has rapid growth in recent past in India that has become a major issue for global environmental and public health. The processing of Indian Waste Electrical and Electronic Equipment is majorly influenced by unorganized sector without proper recycling facilities. This Continuously growing waste is very complex in nature but also a rich source of metals such as gold, silver, and copper, and its recovery has made unorganized sector to work. Thus, in this paper, we have measured the awareness of the citizens regarding their e-waste management on their own ground. The responses were identified from the field survey and it has found that majority of respondents is selling their e-waste to near second-hand dealer, or hand it over to the local waste collector. Even a considerable percent of respondents keep their e-waste at their home. Respondents seem to be aware of e-waste, and there hazardous effects to health and environment. But they are not aware of the volume of e-waste generated, national and international laws and regulation about e-waste management and even they do not know any e-waste traders and recycler. Respondent agreed that they are not aware about any local program, projects or activities related to electronic waste management. People seldom isolate their e-waste from their household wastes. A large proportion of respondents agreed that they buy new

electronic gadgets even the older ones are still working. But respondent seems to agree with the fact that they are willing to give out electronic waste to trusted e-waste collectors for free if they could ensure the environmentally safe disposal of waste. It can be easily inferred from the given field survey that lack of awareness among citizens and lack of collaboration and link between informal and formal recyclers.

Following Suggestion Can Play an Important Role in Formulating a Community Based E-Waste Management Model

- Informal community groups can be formed to conduct awareness programs at local society level to highlight benefits of e-waste management and its negative consequences for health
- Government guidelines on e-waste may be communicated to make recyclers and customers more responsible
- Facilitation and technical support for setting up formal recycler units.
- Environmental Management Training should be carried out with the informal recycler
- Linking of the informal sector to formal recyclers for collection, segregation, and dismantling.
- Proper incentive plan can be formulated for collection and transport of e-waste to the formal recycler.

References

1. Adrian Covaci, Stuart Harrad, Mohamed A.-E. Abdallah, Nadeem Ali, Robin J. Law, Dorte Herzke, Cynthia A. de Wit, Novel brominated flame retardants: A review of their analysis, environmental fate and behaviour, *Environment International*, 37(2), 2011, 532-556
2. Basel, The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal. Document retrieved 10th of November 2010 from :<http://www.basel.int/text/con-e-rev.doc>, 2009.
3. Brett H. Robinson. E-waste: An assessment of global production and environmental impacts, *Science of The Total Environment*, 408(2), 2009, 183-191.
4. Narayanan, A. Lakshmi, And Daketi Srinivas. "Guidelines For The Formulation Of Indian Code Of Practice For Construction And Demolition Wastes."
5. Sunil Herat, P Agamuthu. E-waste: a problem or an opportunity? Review of issues, challenges and solutions in Asian countries, *Waste Management & Research*, 30(11), 2012, 1113–112.
6. <https://www.teriin.org/article/e-waste-management-india-challenges-and-opportunities>

HUMAN RELATED COMMUNICABLE DISEASES AND HYGIENE IN THE AREA OF UMARKHED TOWN

Sharma S.R

Student of M.Sc-2nd year, Department of Zoology, Gopikabai Sitaram Gawande College, Umarkhed.
Srushti0500@gimail.com

ABSTRACT

The given survey data shows that how to communicable diseases spread in that particular area, which types of communicable diseases are present or spread in that area like covid-19 (coronavirus), Malaria, Typhoid, Tuberculosis, Diarrheal diseases, Influenza (flu). Particular types of communicable diseases are caused due to particular types of causative agent such as bacteria, virus, fungi and protozoa. Some communicable diseases are caused due to environmental changes like snooze, fever, etc. Different types of symptoms are appear in the persons who suffering from one of the communicable diseases. How many persons are suffering from the communicable diseases in the area of umarkhed and how to control it? (1)

Keyword: Communicable diseases, area ,like, types

Introduction

Communicable diseases have been given a high priority in national health programs in different countries because of their high impact on public health so there are different types of communicable diseases are found in Umarkhed area. (5)

1. Covid-19 (corona virus) :- corona virus is communicable disease that recently created a great impact worldwide. It is caused by the SARS-Cov-2 virus. People infected with corona virus get mild to moderated respiratory illness. (3)
It can spread from their mouth or nose when they cough, sneeze, etc. The best way to stay protected is to follow the prescribed norms such as maintaining social distance, washing hands regularly, wearing mask and being self isolated. It is cover by the hospitalization. (3)
2. Malaria :- It is another life – threatening communicable disease caused by parasites that can be transmitted to people by infected ‘Anopheles mosquitoes’ through their bites. (3)
Primary symptoms can include headache, chills or fever. The symptoms might appears 10 to 15 days after the infected mosquito bite. (3)
3. Typhoid – Typhoid is a common communicable disease caused by the bacterium ‘Salmonella typhi’ and spreads through contaminated water or food. (3)

The symptoms includes fatigue, headache, nausea, prolonged fever, abdominal pain, constipation or diarrhea. It is treated by providing antibiotics. (3)

4. Tuberculosis :- Tuberculosis is a communicable disease is caused by ‘Mycobacterium tuberculosis and predominantly affects your lungs. It can spread from infected people through the air when they cough, sneeze or spit. (3)
People with tuberculosis have symptoms like might starts with mild cough, fever, night sweats and weight loss. (3)
It can be treated with antimicrobial drugs and curable (3)
5. Diarrheal diseases :- It is one of the leading causes of death in children under 5 years of age. The diseases can last in an individuals for several day, leaving the body dehydrated and in extreme cases.(3)
Diarrhea occurs due to an infection in the intestinal tract by viral, bacterial and other parasitic organism.
6. Influenza (flu) :- Flu is an illness caused by influenza viruses that are communicated through respiratory droplets and it can affects the throat and respiratory system. (3)
Common flu symptoms include mild to severe fever, sore throat, running nose, headache, fatigue and body ache. (3)
This flu infection is highly common in children compared to adults. (3)

Materials and Methods

In this study content analysis method was used for the interpretation of the data obtained from interviews of few doctor in the Umarched area. (5) (2)

According to the doctors in the last two months the rate of communicable diseases are increases due to pathogens, bacterial infection and viral. Diseases like diarrhea is most common in the large people then tuberculosis is also seen in some patients, 4 to 5 patients are related with the Typhoid.

From the starting of august malarial patients are also increased. Corona virus patients are not seen from these two months and flu is also not seen from two months but one patients are seen before July.

Discussion

The purpose of the present study was investigate the condition of the surviving people for communicable diseases, express it's strength and weakness through it's establishment.

One of the most important strength of network-based health services, trained qualified doctors staff, consequently reporting of the cases of communicable diseases, in addition improved vaccination and medicines at appropriate and

efficient protocol as well as guidelines by WHO.

Results

Interview data, strength and network base, we have to observed the different communicable diseases spread in Umarched from last two months. (4) (2)

Sr.No	Communicable diseases	Rate of patients in Umarched area
A	Covid – 19	0
B	Malaria	15-20
C	Typhoid	4-5
D	Tuberculosis	18
E	Diarrheal diseases	25-30
F	Influenza	1

Conclusion

Although the implementation of the communicable diseases survillance system was huge achievement in the health system of umarched area, however it needs more improvements based on the present situation. (5)

Revision of the rules, restoration and strengthening of the existing structure, the use of modern information and communication technologies. (5).

References

- Government hospital record of 2022.
- Rural area record in hospital from July to September in 2022.
- TATA AIG .org web sites.
- Government municipal corporation health record from 2021 to 2022.
- Communicable diseases related paper by R Habibisarvi.
- Dr S. Venkatesh Deputy Director-General National AIDS Control Organization Chandralok Building New Delhi
- Dr Prahlad Kumar Director National Tuberculosis Institute AVALON No.8, Bellary Road Bangalor
- Dr G.S. Sonal Joint Director National Vector Borne Disease Control Programme 22, Sham Nath Marg Delhi-110 054
- Dr Dipali Mukherji Senior Deputy Director General Indian Council of Medical Research Ansari Nagar New Delhi – 110 029
- Dr K. Satyanarayana Senior Deputy Director-General Indian Council of Medical Research Ansari Nagar New Delhi – 110
- Dr G. Balakrish Nair Director National Institute of Cholera and Enteric Diseases P-33, C.I.T. Road Scheme-XM, Beliaghata Kolkata 700 010 Dr P.R. Narayanan Ex-Director of 12. Tuberculosis Research Centre Old 2 New 7 (First Floor) Deivasigamani Road Royepettah Chennai – 600 014

**DISTRIBUTION OF SNAKE SPECIES FROM PUSAD REGION,
MAHARASHTRA, INDIA****Sunil N. Khade & Anil Khade**Department of Zoology, Phulsing Naik Mahavidyalaya, Pusad
Shri. Vitthal Rukmini College, Sawana**ABSTRACT**

The study of snakes like, venomous, semi venomous and Non venomous from different habitat of the Pusad region (Vidarbha), and common species found like Common kukri, Common Wolf snake, Green keelback, Russell's viper, Worm snake, Bamboo pit viper, Common trinket, Indian rat snake, total seventeen species observed survey conduct day time and night time, from study period during July 2019 to August 2020. The study is essential for the enrichment of the individual species survival and will helps to provide information, awareness and conservation of snake species from Pusad Tahasil of Maharashtra state, India

Keywords: Snakes, diversity, Pusad region, Maharashtra.

Introduction

Every year, about 5.4 million snakebites occur worldwide. These cause up to 2.7 million envenomings, almost 138,000 deaths, and 400,000 cases of sequel or disability Various [1,2] Every year, two million snakebites occur in Asia, with India presenting more than 46,000 deaths each year [1,3]. kinds of snakes are existing all over the world by various habitat. It is postulated that there are about 3000 species of terrestrial snakes in the world and they are predominant in the warm climates and lush-green regions of the tropics. About 278 species are found in India out of which 58 species are poisonous [1]. 3000 species of snakes are distributed worldwide. 500 are venomous species 52 venomous species are found in Indian subcontinent [2]. Snake bite is an acute life threatening time limiting medical emergency an occupational hazard often faced by farm laborers and farmers. It is in endemic form all over tropical countries like India. In India there are 2.5 lakhs snake bites out of which 35,000 to 50,000 deaths per year due to snake bite. There are 216 species of snakes identified in India which 52 are known to be poisonous. The dominant families of poisonous snakes in India are Elapidae which is includes common cobra (*Naja naja*), King cobra and common krait (*Bungarus caeruleus*), viperidae includes *Russell's viper* (*Echis carinatus*) (saw scaled or carpet viper) and pit viper and hydrophidae

(Sea snakes) [4]. The present study is essential for conservation of snakes species.

Materials And Methods

The study initially requires well-trained snake rescuers for the observation, it needs courage, self-daring, confidence, and very essential experience and most important is the study of behavior and nature of the snake to be caught. Snake rescue records of survey was made from July 2016 to August 2017, Sampling was done as per the need, request of the local people or stress calls made by residents, for twenty four hrs. Individual species of snakes were located and try to catch by hand, sticks and through pitfall traps in association with drift fences. After catching the snakes, their characteristics, predominant features were observed then noted for taxonomical study, take the photographs and identified up to species level using keys and other publications as per [5], [6],[7],[8]. After the study the captured snakes species were released in the forest/safely area as per the guidelines of wildlife and forest department rescued and released into the proper habitat without harm them.

Results And Discussion

In the present study total sixteen Species sixteen genus of snakes belong to five families were recorded in and around the human habitations of resident people of Pusad Tehsil, it is indicated in the table no I. Out of these rescued species four species were poisonous,

two were semi-venomous and remaining ten was non-venomous. The unavailability of suitable habitat and prey base, snakes have to move outside which leading to such conflicts that sometimes leads to death of a snake.

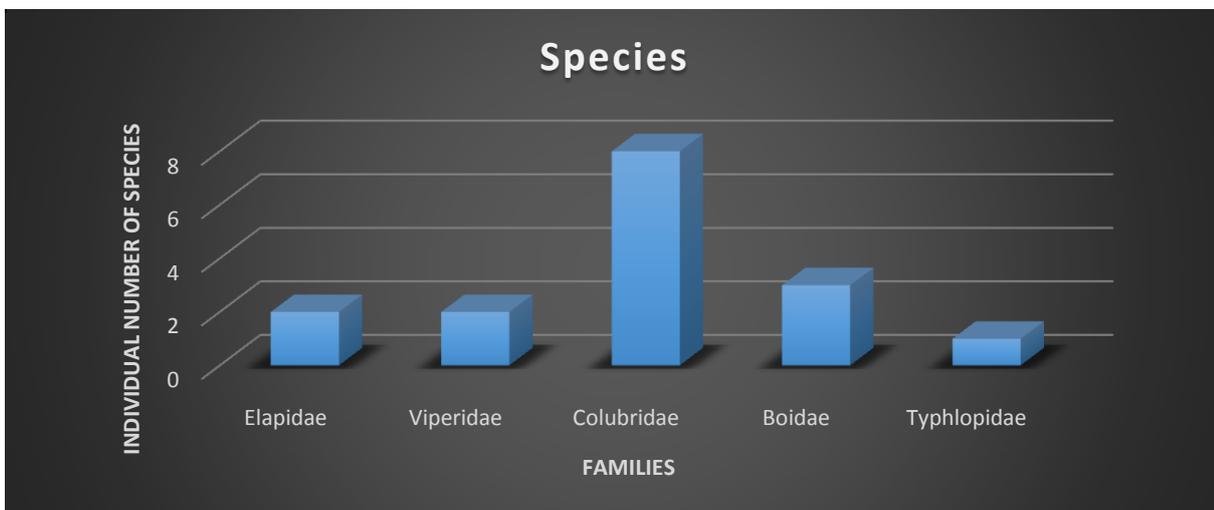
However, some citizen ecofriendly or some stressfully call to expert snake catcher for stressfully call to expert snake catcher for the escape and survival of the species.

Sr. No.	Family	Genus	Species	Common name	Local Name	Nature	Status
1	Elapidae	Naja	naja	Spectacled cobra	Naag	***	C
		Bungarus	caeruleus	Common krait		***	C
2	Viperidae	Daboia	russelii	Russell’s viper	Ghonus	***	C
		Echis	carinatus	Indian saw-scaled viper	Furase	***	C
3	Colubridae	Boiga	trigonata	Common cat snake	Manjarya	**	C
		Ahaetulla	nasuta	Common vine snake	Harantol	**	C
		Ptyas	mucosa	Indian rat snake	Dhaman	*	C
		Coelognathus	helena	Common trinket snake	Taskar	*	C
		Macropisthodon	plumbicol or	Grass snake	-	*	U
		Amphiesma	stolatum	Striped keelback	Iral/Pandhivad	*	R
		Lycodon	aulicus	Common wolf snake	Kawadya	*	C
Xenochrophis	piscator	Checkered keelback water snake		*	C		
4	Boidae	Eryx	johnii	Earth boa/Red sand boa	Mandul	*	C
		Gongylophis	conicus	Common Sand boa		*	C
		Python	morulus	Indian rock python	Ajgar	*	R
5	Typhlopidae	Ramphotyphlops	braminus	Brahminy worm snake		*	U

Table No.I: Diversity of Snakes from Pusad Tehsil, (MS), India (Note1: C- common, U-uncommon, R-rare.) (Note2:Non-venomous=*, Semi-venomous=,Venomous=***)**

Families	Species
Elapidae	2
Viperidae	2
Colubridae	8
Boidae	3
Typhlopidae	1

Table No.2: Species recorded according to families



Graph No.1: Showing number of individuals according to families

Among the non-venomous snakes the rare species reported here as Indian rock python, *Python morulus* and Striped keel back, *Amphiesmastolatumbelongs* from Boidae and *Colubridae* family respectively. The anthropogenic activities, physical development, civilization and mainly the changing environmental conditions, like global warming are affecting the habitat of the animals. Therefore this important part of the ecology conflict against man. In the present investigation abundance of snake fauna rescued opined that snake produced unimaginable fear and anxiety. Right from the cases where earliest man lived, snakes would have caused first kind of poisoning [9]. Present study also observed the stress calls and down to root level at any time calls of the infrastructural development including townships etc. and as such these areas are prone to habitat loss due to which different types of snake including poisonous, semi-poisonous, non-poisonous are being noticed in the residential areas during monsoons and winter seasons. The present studies are an attempt to evaluate the information, occurrence, abundance & species

richness and further assist in the knowledge, awareness and conservation of snake fauna in this region since there is acute paucity of established work and data on this subject till date. Snake bite is an acute life threatening time limiting medical emergency an occupational hazard often faced by farm laborers and farmers. It is in endemic form all over tropical countries like India. In India there are 2.5 lakhs snake bites out of which 35,000 to 50,000 deaths per year due to snake bite and this is because of less information amongst the people.

Conclusion

The present study of snakes species from Pusad region including remote area, having rich diversity and it urgent need to provide correct knowledge regarding snakes especially which are venomous and nonvenomous if they pursue the knowledge, they will not panic themselves and kill the snakes, instead of they will leave them in their natural habitat, unnecessary these species use to killed by people in this way this article help to conserve snakes species for ecosystem which is essential.

References

1. WHO Snakebite Envenoming—Key Facts 2019. Available online: <https://www.who.int/news-room/factsheets/detail/snakebite-envenoming> (accessed on 22 April 2020).
2. Bolon, I.; Durso, A.M.; Mesa, S.B.; Ray, N.; Alcoba, G.; Chappuis, F.; de Castañeda, R.R. Identifying the snake: First scoping review on practices of communities and healthcare providers confronted with snakebite across the world. *PLoS ONE* 2020, 15, e0229989. [CrossRef] [PubMed].
3. Mohapatra, B.; Warrell, D.A.; Suraweera, W.; Bhatia, P.; Dhingra, N.; Jotkar, R.M.; Rodriguez, P.S.; Mishra, K.; Whitaker, R.; Jha, P.; et al. Snakebite mortality in India: A nationally representative mortality survey. *PLoS Negl. Trop. Dis.* 2011, 5, e1018. [CrossRef] [PubMed].
4. Sonali R. Raut¹, Shantaj M. Deshbhratar¹, Jyotsna A. Mahaley², Vijay K. Hile³, Ankita J. Thakur^{PS} and NE Warghat, 2014. Documentation of Road Killed and Rescued Harpatofauna in and Around Amravati City, Maharashtra, *Advances in Applied Science Research*, 5(2):373-381.
5. Punde DP, 2008. Meet the Expert :Management of Snake Bite 9Report APICON , Kochi), Medicine update Volume 18, 2008
6. Deoras PJ, 1965. Snakes of India, National Book Trust (NBT), New Delhi.
7. Government of India dat: pp 107-108 of <http://cbhidghs.nic.in/writereaddata/mainlink/File/Health%20Status%20Indicators.pdf>. 2017
8. Khaire N, 2010. Snakes, Indian Herpetological Society, Pune
9. Daniels JC, 2002. The book of Indian Reptiles and Amphibians, Bombay Natural History Society and Oxford University Press. Mumbai.

10. Whitaker, R. and A. Captain, 2008. Snakes of India. The Field Guide. Draco Books.Chengalpattu, Tamil Nadu, xiv+479.
11. Aengals, R, VM Sathish Kumar and MJ Palot, 2012. Updated Checklist of Indian Reptiles.
12. Lingayat AM and PR Wankhade, 2015. Study of clinical profile complications and outcome in patients of snake bite in pediatric age group,*Healthcare and Biomedical Research*, 03 (03): 203-208

AN EVALUATION OF ENVIRONMENTAL IMPACTS OF ORGANIC FARMING- A REVIEW

Dr. Smita P. Gudadhe

Assistant Professor and Head, Department of Botany, Arvindbabu Deshmukh Mahavidyalaya,
Bharsingi, Dist-Nagpur
smitagudadhe@gmail.com

ABSTRACT

Organic Farming is the farming which uses natural manure for the production of Food crops. In this farming there is no use of chemical fertilizers, pesticides and other harmful chemicals. Therefore the production from the organic field is healthy and safe. The organic field uses organic manure, biological fertilizers, waste from animals and surrounding plants. As everyone is familiar that the conventional method of farming uses chemical fertilizers, pesticides, insecticides and due to use of such hazardous chemicals affects the natural fauna and fauna nearby fields. It also affects Soil fertility, metabolic activities of microbes in the field and the underground water quality. The flora and fauna are the main parts of the environment and any hazardous effects on these parts affect the environment. Therefore it is the need to aware the society for the conservation of environment by applying the natural fertilizers for the production and yield of food crops i.e. organic farming. This paper deals with the differences in conventional and organic methods of farming, hazardous effects of conventional method of farming on environment and the benefits of organic farming for the conservation of biodiversity ultimately to the environment and this study trying to focus the environmental impact of organic farming.

Keywords: *Organic farming, Environmental Impact of organic Farming.*

Introduction

It is stated that "Organic agriculture is a holistic production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasises the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, agronomic, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system." (FAO/WHO Codex Alimentarius Commission, 1999). Organic agriculture is increasingly gaining greater importance and is being recognized by Consumers, Farmers, Environmentalist and Policy Makers, as one of a number of Possible Models for Environmental, Social and Financial Sustainability in agriculture. In this era of changing world and increasing production, the necessity of health is somewhere ignored, which in return causes

many repercussions like soil pollution, environmental pollution, lost of biological diversity, etc. Thus, the rejuvenation of traditional farming in form of organic farming is adding health to environment and nutrition to the food (Anshika, 2020). Organic agriculture is a systems approach to agricultural production that is working towards an environmentally, socially and economically sustainable production. The International Federation of Organic Agriculture Movements (IFOAM) defines organic agriculture as "a whole system approach based upon a set of processes resulting in a sustainable ecosystem, safe food, good nutrition, animal welfare and social justice. Organic production therefore is more than a system of production that includes or excludes certain inputs" (Anon., 2002b). As a method of extinction for pests and weeds, the conventional farming system uses pesticides and insecticides. Oppositely, the farmers operating in the organic system prefer to use birds and some insects that would destroy the insects causing harm. Sometimes, organic farming prefers to destroy the mating season of

pests or even trap them, rather than using any sort of chemicals. The organic farming is considerably ecofriendly practices and important for the conservation of biodiversity. In our modern agricultural system, we have forgotten how to feed the soil; we just feed the plants. If we feed the soil, it is necessary to only compensate for the elements that have been exported with the seed. This

need can, to some extent, be fulfilled by growing plants like soya bean, which are nitrogen fixing. It is possible in such a manner to develop an organic system with extremely low inputs of fertilizers in the soil (Alvares *et al.*, 1999). Therefore there is need to enhance these practices towards the biodiversity conservation.



Fig: The main principles and effects of organic farming (Furtak and Galazka, 2019)

Objectives

This paper attempts to evaluate the environmental impacts of organic agriculture in order to integrate the need of sustainable organic agriculture practices and the specific objectives of this paper were to explore effect of organic farming on environment and how it could contribute in conservation of environment

Methods and Scope

This paper is based on a review of available literature. Data related to Environmental factors, conventional and organic agriculture practices and their impacts on environment need to be discussed and hence information was accessed mainly through web search and it is presented primarily for raising awareness among environmental conservators. It will be helpful to enhance the awareness regarding the

sustainable, stable agricultural practices for the overall betterment of the society.

Environmental Impacts of Organic Farming:

Prohibition on Genetically Modified Plants: During the recent era the researches going on the production of high yield crops through genetic engineering. Commercially Genetically modified plants are used for the fulfillment of the demand of the society. There is the total loss of parent progeny and genetic changes occurs subsequent generations. The use of GMOs within organic systems is prohibited during any stage of organic food production, processing or handling. As the potential impact of GMOs to both the environment and health is not entirely understood, organic agriculture is taking the precautionary approach and choosing to encourage natural biodiversity (<https://www.fao.org/organicag/oa-faq/oa->

faq6/en). The main objective of organic Agricultural is to produce natural and GMO free food production which exactly means to compensate the demand of the society organically.

Improvement in the soil quality: Organic agricultural system does not use any chemical fertilizers and due to that the soil contents remain in their natural conditions. The microbial flora and their metabolic activities also help to maintain the properties of good soil. The techniques of organic farming such as inter-cropping, crop rotations, symbiotic associations of microorganisms, organic fertilizers and minimum tillage improve soil fauna and flora creating more stable systems which also help to control the soil erosion. The nutrients in the soil get increased which enhances the abilities of soil for nutrients and water retention. The length of time that the soil is exposed to erosive forces is decreased, soil biodiversity is increased, and nutrient losses are reduced, helping to maintain and enhance soil productivity.

(<https://www.fao.org/organicag/oa-faq/oa-faq6/en>). The number of Earthworms present in organic systems which benefits in increase in the fertility of soil. The nutrient rich soil also helps in the high yield production of organic foods. It is also one of the fundamental approaches towards the conservation of environment. Organic manures not only supply nutrients to crops and improve the soil texture in drylands but also act as mulches. They protect crops against adverse temperature effects, improve seed germination, increase water retention capacity of the soil and create the right micro-climate for the development of beneficial soil microbes (Sharma, 1991; Reddy, 2010a)

Prevent the groundwater pollution: The extensive use of chemical fertilizers and pesticides in conventional methods of agriculture increase the pollution of groundwater. The quality of groundwater decreases as the increase in application of chemical fertilizers for the production of food crops. As the organic farming banned the use of such pesticides and chemical fertilizers and instead established the stable practices of usage of organic fertilizers like plant and animal

waste, compost etc. and therefore the ground water does not contain the residues of chemicals like in conventional system of agriculture. Better quality water enhances the crop productivity, and also helps to maintain the soil structure. These practices generally have a positive impact on environment.

Positive Effect on air and climate change:-

The atmosphere contains the different types of gases in air and are necessary for the life on the earth. Again it is very necessary to maintain the amount of different gases in air otherwise it will create the adverse effect on every living thing. The various studies stated that compared to conventional method and organic method of farming, the global warming potential of organic farming is considerably very low. Climate change leads to major insecurities for the world food supply, says the FAO. There is ample scientific proof that organic farming can reduce greenhouse gas emissions and is a more resilient approach in a changing climate

(<https://www.natureandmore.com/en/all-about-organic/how-can-organic-farming-benefit-the-climate>). Organic agriculture not only enables agriculture-influenced ecosystems to better adjust to the effects of climate change but also offers potential to reduce the emissions of agricultural greenhouse gases. Organic agriculture contributes to mitigating the greenhouse effect and global warming through its ability to sequester carbon in the soil. Mitigation is a process of reducing Green House Gases (GHGs) which are responsible for change in climate and climatic variability. The main GHGs include methane, nitrous oxide and carbon dioxide. In organic agriculture, soil fertility is maintained mainly through farm internal inputs (organic manures, legume production, wide crop rotations etc.); energy-demanding synthetic fertilizers and plant protection agents are rejected; and there is less or no use of fossil fuel (Khanal, 2009). In order to reduce GHG emissions from the agriculture sector, suggestions by IPCC (2007a) included improving crop and grazing land management to increase soil carbon storage; improving nitrogen fertilizer application techniques to reduce N; and dedicated energy crops to replace fossil fuel use (IPCC, 2007b). It is

already stated that Organic farming holds a big potential in reducing GHG emissions and increasing soil carbon sequestration while sustaining healthy soils and protecting biodiversity and ecosystem functions.

Conservation of Biodiversity: Biodiversity is all the different kinds of life you'll find in one area—the variety of animals, plants, fungi, and even microorganisms like bacteria that make up our natural world. Each of these species and organisms work together in ecosystems, like an intricate web, to maintain balance and support life (<https://www.worldwildlife.org/pages>).

Biodiversity encompasses diversity of life on all levels: species diversity, genetic diversity as well as habitat and ecosystem diversity. A rich biological diversity is essential for preserving natural processes contributing to man's ability to live, such as natural pest regulation, pollination of fruit blossoms by insects, and the decomposition of organic matter into humus (<https://orgprints.org/id/eprint/20247/1/1548-biodiversity.pdf>). Agricultural policies are increasingly promoting ecologically-oriented farming methods that preserve biodiversity and conserve natural resources (FAO, 2002). The combination of beneficial practices in organic farming for climate and biodiversity in a systems-based approach provides synergies with the potential for greater impacts. Agricultural management and biodiversity enhancement is designed to mutually benefit each other. A combination of extensive herbivore systems and diversified organic cropping systems allows ambitious biodiversity protection, while reducing GHG emissions (IFOAMEU_advocacy_organic-benefits-for-climate-and-biodiversity_2022).

Organic agriculture thus improves the pollination of flowering plants in the surrounding environment (Gabriel and Tscharrntke, 2007). The number of studies on organic farming and biodiversity increased significantly in few years and a recent studies on meta-analysis concluded that organic farming produces more biodiversity than other farming systems. The results from meta-analysis suggest that organic farming may enhance local densities of insect predators and soil fauna, possibly with the exception of earthworms and

higher diversity and abundance of natural enemies contributes to pest control on organic farms and also stated that the effects of organic farming on species richness will be larger in intensively managed agricultural landscapes than in small-scale diverse landscapes with many non-crop biotopes (Bengtsson *et al.*, 2005).

Ecological impacts:

According to the Ecology principal of organic farming Organic agriculture should be based on living ecological systems and cycles, work with them, emulate them and help to sustain them. The flora and fauna in organic farming system maintain their lifecycles. There is proper management in their interdependence. It is the fact that many impacts on the environment and ecosystem are mainly relevant within their ecosystem boundaries which require a focus on performance not only per unit product but also per agricultural land area. A comprehensive system approach is needed to address all challenges such as maintaining soil fertility, nutrient recycling and ecosystem contributions. (Muller *et al.*, 2017). Organic agriculture should attain ecological balance through the design of farming systems, establishment of habitats and maintenance of genetic and agricultural diversity. Those who produce, process, trade, or consume organic products should protect and benefit the common environment including landscapes, climate, habitats, biodiversity, air and water (https://agritech.tnau.ac.in/org_farm/orgfarm_principles.html).

Sustainability over the long term. The organic farming and sustainable development practices is the long term process. Organic farming is an environment-friendly, animal and plant-based organic resource that enriches nutrients that are required for crop plants. Organic agriculture is an efficient and promising agricultural approach for environmental sustainability as it provides yield stability, improves soil health, no environmental concerns, organic food and reduction in the use of synthesized fertilizers (<https://www.vedantu.com/commerce/sustainable-development-and-organic-farming>). Organic farming has Many changes observed in the environment are long term,

occurring slowly over time. Organic agriculture considers the medium- and long-term effect of agricultural interventions on the agro-ecosystem. It aims to produce food while establishing an ecological balance to prevent soil fertility or pest problems. Organic agriculture takes a proactive approach as opposed to treating problems after they emerge (<https://www.fao.org/organicag/oa-faq/oa-faq6/en/>). There are gradual improvements in soil structure, reduced water pollution, balanced climatic conditions maintained biodiversity and positive ecological impacts due to the proper method of farming and from the available literature it is observed that more benefits from organic field rather than conventional one.

Conclusion

According to most of the reviewed literature organic farming performs better in terms of biodiversity, soil fertility and air quality, mitigating resource depletion, climate change

mitigation, and groundwater pollution as compared with conventional agriculture. Environmental performance of organic farming is better than the conventional method of agriculture. As per the studies on the impacts on environment of organic farming seems to indicate that there is need to convert the conventional methods in to organic way of production of food crops. The organic farming by reduced use of energy sustain the soil conditions, underground water, environment factors and also the health of plants, animals and human beings by feeding the organic foods which is superior in terms of health and safety. Therefore it is concluded that the organic farming has positive influence on biodiversity, metabolic and biological activities of flora and fauna in the soil, ground water quality, climate change, ecological parameters environment and beneficial as economic point of view. It is certain that these practices are more beneficial for the environment in the long term.

References

- Alvares, C., Shiva, V., Ismail, S., Lakshmi, K.V., Mathen, K. and Bernard, D. (1999) (Eds) *The Organic Farming Reader*, Other India Press, Goa, pp. 84;171.
- Anon, (2002b). IFOAM Norms. IFOAM Basic Standards for Organic Production and Processing. IFOAM. Germany. <http://www.ifoam.org/standard/norms/ibs.pdf>.
- Anshika, (2020) *The Role of Organic Farming In Rural Development, Just Agriculture-A Multidisciplinary E-Newsletter, Vol-1: No-1: 69-72.*
- Bengtsson J., Ahnström J. And Ann-Christin Weibull (2005) The effects of organic agriculture on biodiversity and abundance: a meta-analysis. *Journal of Applied Ecology*. 42: 261–269
- Codex Alimentarius Commission (1999) *What Is Organic Agriculture?* FAO/WHO Codex Alimentarius Commission.
- FAO, (2002). *Organic agriculture, environment and food security*. Environ. Nat. Res. No. 4. FAO Rom
- Furtak K. and Gałazka A. (2019) Effect Of Organic Farming On Soil Microbiological Parameters *Polish Journal Of Soil Science* Vol. Lii/2. (DOI: 10.17951/pjss/2019.52.2.259)
- Gabriel, D., Tschardt, T., (2007) Insect pollinated plants benefit from organic farming. *Agriculture, Ecosystems and Environment* 118: 43-48.
- https://agritech.tnau.ac.in/org_farm/orgfarm_principles.html
- <https://orgprints.org/id/eprint/20247/1/1548-biodiversity.pdf>
- <https://www.fao.org/organicag/oa-faq/oa-faq6/en>
- <https://www.natureandmore.com/en/all-about-organic/how-can-organic-farming-benefit-the-climate>.
- <https://www.vedantu.com/commerce/sustainable-development-and-organic-farming>
- <https://www.worldwildlife.org/pages>
- IFOAMEU_advocacy_organic-benefits-for-climate-and-biodiversity_2022
- IPCC, (2007a) *Third assessment report mitigation* IPCC, Switzerland.

17. IPCC, (2007b) Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change - Summary for Policymakers. Retrieved on Nov 10, 2008 from <http://www.ipcc.ch/pdf/assessment-report/ar4/wg2/ar4-wg2-spm.pdf>
18. Khanal R. C. (2009) Climate Change And Organic Agriculture. *The Journal of Agriculture and Environment*. Vol: 10: 100-110.
19. Muller, A. Christian S. , Nadia El-Hage S., Judith B. , Anne I., Karl-Heinz E. , Pete S., Peter K. Florian L., Matthias S. & Urs Niggli (2017). Strategies for feeding the world more sustainably with organic agriculture. *Nature Communication* 8, 1290.
20. Reddy Suresh, B. (2010a) Soil fertility management in semiarid regions: The socio-cultural, economic and livelihood dimensions of farmers' practices — A case of Andhra Pradesh, unpublished PhD Thesis, Centre for Economic and Social Studies, Dr. B.R. Amedkar University, Hyderabad.
21. Sharma, Pradeep. K. (1991) Methods of conserving moisture in dry lands, *Indian Farming*, 41(4): 21-24.

CLIMATE CHANGES IN COMMERCE EDUCATION

Dr. Rupesh M. Kurhekar

Abasaheb Parvekar Mahavidyalaya, Yavatmal

ABSTRACT

The developing marvel of globalization, progression and privatization has been monstrosly impacting the Commerce Education. Alvin Toffler in his celebrated book "Future Shock" says that, "To help turn away futurestun, we should make a super modern instructive framework and to do this, we should look for our goals, strategieslater on as opposed to past. Training must move into future tense." The Higher Education division in India isextremely tremendous. The part of Higher Education in national improvement is settled. The targets of HigherEducation can be accomplished just through subjective change in the framework. The yield of Commerce Educationought to be multidimensional and with full worldwide aggressiveness. However, we need to understand that theCommerce graduate have absence of viable information. Business instruction is adopting gradually an expertstrategy. Strategy producers and also clients are embracing a more positive approach while taking a gander atbusiness instruction. New specializations educational programs and methodologies are being acquired the tradetraining. The purpose behind this change can be properly comprehended in the event that one takes a gander atchanging business and monetary condition in the nation. The ventures are never again needing mono talented orsingle gifted individual, they expect a prepared, qualified and multi gifted authority who can meet the businessnecessity appropriately.

Introduction

Commerce training had developed to aid the developing desires of business houses. However, over theyears, there was essential shift within the very approach of commerce education; from a professional to a theoretical training. At this juncture there may be a want to redefine the commerce education inside thechangingscenario and make stronger it further. Globalization and Technological fashion have made difficult for businesses to survive within theaggressive world. As a result the importance of Commerce education has been elevated many folds. The School of commerce must play pivotal position in equipping our destiny dynamic managers with the emerging tendencies of Commerce skillsto face the challenges of dynamic business world.

Challenges and Opportunities in Commerce Education

Commerce is considered as one of the most popular career options in India. Commerce education is thebackbone of the business and serial development of the nation. This education stresses on developing the peopleand making effective use of available resources. Commerce education develops the relationship of people withone another. Commerce education covers wide area of business and society. Commerce education provides tothe

business and society that how to use it for the betterment of self and oneself. Commerce education gives tothe people for democratic living, good citizenship and proper utilization of resources. It provides skill orientededucation to students and society.

Challenges

- Global problems in economy, trade and management.
- Foreign Direct Investment role.
- Reforms in Indian and International Economic Sectors.
- Role of World Bank and IMF.
- Export and Import of Trade, Commerce and Industry.
- National and International techniques for stockmarketplace and traders in aggressive markets.
- Government guidelines for mergers and acquisitions.
- Challenges and Strategies in Currency Market in International scenario.

Opportunities

At the undergraduate level, Bachelor of Commerce, a three year full time course. And Master of Commerceat the postgraduate level. After completing course in the field of Commerce, a student can join any privateinstitute or government organization as a specialist in any of the Commerce stream and

they can also pursue professional courses such as Company Secretary, Chartered Accountant, and ICWA. A graduate in Commerce can also opt careers in financial services as a Financial Consultants, Stock Brokers, Merchant Bankers, Budget Consultant, Financial Portfolio Manager, Project Formulation Manager, Tax Consultants. Careers in Management are also available in the field of Personnel Management, Production Management, Financial Management, Marketing Management, and Material Management, other areas of Management such as Hotel Management, Hospital Management, Tourism Management, Event Management, Office Management, Export and Import Management. In the Bank, call for Commerce graduates and post graduates with specialization of Banking. Insurance Companies can also call for Commerce graduates and post graduates with specialization of Insurance. Industrial segment are also call for Commerce graduates and post graduates with specialization of accounting skill including Computer Technology.

Current Trends in Commerce Education

E-Commerce

E-Commerce involves conducting business using modern communication instrument like Internet, Fax, Telephone, E-data interchange, E-payment, Money transfer system. E-Commerce provides multiple benefits to the consumers in the form of availability of goods at lower cost, wider choice and save times.

Online Education

It has become an important mode of education. Since the regular courses in India are getting very expensive and highly competitive, distance and online education is fast developing as an amazing option for the students. E-learning opportunities are immense in India. Even the distance education programs are serving wonderfully. Distance learning can be availed through various types such as interactive CD-ROM programs, Mobile learning programs, Tele courses or Broadcast course via Television or Radio, Postal correspondence programs and many more.

Conclusion

With a growing emphasis on information, global economy, Higher Education was viewed as increasingly essential for the world's population. Information Technology and Mobile Technology is now forcing education sector to change according to the need of the time. The most emerging dimension of the Business and Commerce education in the 21st century is the need for Business School to use technology and make it integral part of course contents. Education now becomes an industry, there is explosion of technologies and knowledge in all sphere. The quality of Commerce Education has become a major marketing issue in the changing environment. As per specialization, a practical training should be provided to the students. By making relevant and practical oriented Commerce Education, we may impact global competitiveness to our students. As a part of the society the social awareness among Commerce students is the emerging need of present time.

References

1. Emerging Trends in Commerce and Management, Santosh Gupta, Published in University News, 2003; 41(05).
2. Recent Trends in Commerce and Management Education, Dr. V.V. Khanzode, Strling Publishers Private Limited, 1990.
3. Issue : I, April to Sept. 4. Kokklki, G. V. (2011). Industry and commerce education – a strength and weakness analysis. Indian Journals.com
5. Rao, S. (1995) - Teaching of commerce – Anmol Publications Pvt. Ltd., New Delhi: 6. Recent Trends in Commerce and Management Education, Dr.V.V.Khanzode, Strling Publishers Private Limited.1990..
5. Business Education in India, V. Gupta and

- K. Gollakota, IBAT Journals of Management. United States, Allen, I.E. and Seaman, 2006.
6. Net Impact, Mission Statement, Electronic Document. 8. <https://www.icats.co.in/opportunities-challenges-success-commerce>.
7. Making the Grade- Online Education in the

FEMALE IDENTITY IN THE NOVELS OF NADEEM ASLAM**Prof. Digambar D. Wankhede**

Dept. of English, Smt. Nankibai Wadhvani Kala Mahavidyalaya Yavatmal

ABSTRACT

Present Research focuses on burning issue of Muslim women in Afghanistan and Pakistan. In the recorded history of civilisation women have been silenced in Pakistani and Afghanistan community. Nadeem Aslam Pakistani born English writer has questioned Muslim women's pathetic, appalling condition of women in Afghanistan and Pakistan. Under the Taliban rule, Women become victim to patriarchal male dominated structure of the society. They are killed, dominated, dehumanized, marginalized and exploited, forced marriage, raped, also they faced psychological and emotional trauma. They have been publicly cursed, bearing, demeaning and degrading images and even stoned to death for violating standard and canons of morality set by the male dominated society. Women are marginalized and exploited under the name of social and cultural taboos. The women like Benazir Bhutto, Sherry Rehman, Fehmida Mirza, Hina Khar, Tehmina Durrani and Malala Yusufzai suffered a lot due to social and political reasons. Religious clerics and preachers are sanctioning "Customary Laws" 'Sharia Laws' in the name of religion. According to Islam women have no rights to violate rules of religion. A Muslim women never be independent and demands equal rights and her identity. But Nadeem Aslam is the champion of women's rights. Female characters of are very active, strong intellect and challenges the Blasphemy, non believers and expresses identity, liberty and individuality and support education and modernity rather than passiveness and set new model for the empowerment of women.

Female Voices in The Maps For Lost Lovers

Female character – **Mahajabin** is revolutionary and rebellious character, prefers education and modernity rather than spending a passive life as a divorce. She is bold and independent enough in her decisions that she doesn't care for her mother's intense opposition. In Pakistani society women are not allowed to have an abortion. "In the end she had induced a miscarriage by taking quinine tablets for a fortnight" (P.156). Mahajabin raises question Pakistani women's miserable condition to her mother. Her mother imposed traditional religious values upon Mahajabin.

Suraya was divorced and searching for temporary husband to get her first husband back.

Her daring act to reveal that fourteen year girl is raped by ma of the feudal family "The confidence of her English life still clinging to the her, Suraya decided to go to the house of the feuding family to reveal the real truth to them and ask them to be compassionate. She was walking into a conflict decades in the making but she thought she could be persuasive." (P.226)

Chanda love affair out of cast, didn't care about her brothers, hypocrite nature and peoples stinking remarks against her who were of the view "O just think how that girl Chanda

Managed to destroy her entire family" (P.372). she was murdering by her brother in the name of honour killing.

Pathetic and merciless cruelties of patriarchal culture and society is seen through a girl refereed as a Muslim girl. She is punished for loving Hindu boy, difference of religion. She is hurried married to a boy from Pakistan and then an old man.

"Pakistani is not just a wife-beating country, it's a wife-murdering one: he could kill you in one of his drunken rages" (P.325)

Female Voices in The Wasted Vigil

Qatrina was non-believer and intellectual, she didn't believe in Islam.

In Islam no one can raise question about the existence of God, no one can suspect Marcus recalls Qatrina's wish of not mentioning God at her funeral "She used to say, she didn't want any mention of God at her funeral". (P.93).

We find traces of Atheism Qatrina once said, if Qatrina reject the Islam cultural ceremony. Under the Taliban rule it is not easy to challenge the Islam culture and religion. "She would have been satisfied with a non-religious ceremony, indifferent to the idea of supreme beings and their holy messengers, but she had agreed on condition that a women perform the rites. We have to help change things" (P.38).

Women have no educational rights in Pakistan and Afghanistan. She support education and opened up library. "Marcus's wife had nailed the books overhead in heresy to the Taliban and they would have burned the books" (P.38).

Female Voices in The Blinds Man's Garden

Female character, **Sofia** is one of the strong and rebellious character who rejects faith in Muslim, and advocates modernity and liberty. "I am no longer a believer" (P.41). She was an unbeliever and an apostate" (P.41). She was a modern woman "She was the new English teacher (P.169). Muslim religion compelled her to wear traditional burka. She felt exclusion at Lohore when she weared traditional Burka and felt exclusion. "She felt a sense of exclusion from the other students, the modern Lohore girls and boys, a few of whom laughed at the way, she dressed and spoke, laugh at her burka" (P.198).

She consider Burka as small place means female oppression.

Naheed is strong self-reliant character like Qatrina in the Wasted Vigil, She challenges gender politics, is intellectual and non-believer. She becomes widow, struggles to realizes herself despite the oppressive social and religious norms. Naheed, young widow, advocates education, plan to get diploma and to become teacher.

Female Voices in The Golden Legend

Nargis (Margaret) was born as a Christian pretend to be a Muslim in Fictitious city Zamana. She was living as Muslim but her Blasphemous act is liable for death penalty in Taliban rule. Her daring act defies as feminist stance, she is championship of education in Taliban.

Nargis was born as Margaret to Christian family. She dares not disclose her secret to her husband Massud. She tries to protect herself and her Christian friends from the radical Muslim country. They both open new library. They are champions of education in Muslim society. Nargis rejects all tradition and customs of Muslim community. Her feministic stance is noticed through strong avocation of education. In Pakistani society woman's education is

considered against the Islam and male dominated society. She courageously lives as Muslim without anybody's knowledge and that is serious crime in the eyes of religious fundamentalists. It is considered a blasphemy and its penalty is not less than death. Blasphemy against Islam is a serious crime in Pakistan.

Helen, daughter of Nargis represents rebellious, women's identity and her thoughts of education bring a change. Her article on condemning Islam religion or Mohammad Prophet get death penalty. Also she has written article on Blasphemous cartoons.

Female Voices in The Season of the Rainbirds

Elizabeth Massih is Christian suffered from religious discrimination in Muslim Community. Her illegitimate relation with Azhar Deputy Commissioner as his mistress, it is considered as sinful in Islam Religion. Intercaste marriage are not allowed in Muslim community. She faces not only gender discrimination but also marginalization and ethnic segration under the powerful influence of cultural bias hence she is displaced as 'Chodhi'. Her act of love as considered feminist perspective.

Zebun an ex prostitute socially stigmatized as marginalized female character that suffer ostracism due to social taboos and cultural censure.

Both the female character revolt against social norms developed by structure of Pakistani male dominated Muslim society in search of equality and identity.

Both Elizabeth Massih and Zebun represent feminist aspects. They both revolt against social norms developed by structure of Pakistani male dominated Muslim society in search of equality and identity.

Conclusion

Aslam parallels patriarchal women with the younger generation of women: Mahajabin and Chanda, who are in Tysons words the perfect example of the "recovering patriarchal women". (Tyson, 2006, P.87).

Novels of Nadeem Aslam highlights the suffering of women in Pakistan and

Afghanistan society. They are exploited, killed in the name of honour, their predicament, ordeal, sexual abuse, abduction, alienation, marginalisation, forced marriage, injustice. Under the Islamic laws and Taliban rule, they are considered weak, vulnerable; easily to be exploited in the male dominated society.

Nadeem Aslam as representative novelist among the other Pakistan writers adroitly portrays women and their protective in artistic manner. He advocates women's rights, identity, individuality and liberty through his individual female characters.

References

1. Abbasi, Talat. (2001) *Bitter Gourd and Other Short Stories*. Karachi: Oxford
2. Ahmad, R. (1982). *The status of women in Islam: A modernist interpretation*. In *Islam and current issues*. (pp. 167-197). Lahore: Institute of Islamic Culture Lahore.
3. Amer, Miquel Pomar. "Kaukab in Maps for Lost Lovers by Nadeem Aslam: Representing and Subverting the Unspeakability of the Subaltern". ES. *Revista de Filologia Inglesia* .33 (2012): 253-70 [Googlescholar](#). Web. 18 September 2014.
4. Ameri, Firouzeh. "Veiled Experiences: Re-writing Women's Identities and Experiences in Contemporary Muslim Fiction in English". Diss. Murdoch University, 2012. Web. 20 Jan 2014.
5. Badran, M. (2009) *Feminism in Islam: Secular and Religious Convergences*. England: One world Publications.

THE EFFECTIVENESS OF WEAVER ANTS AS BIOCONTROL AGENT IN UMARKHED REGION ON MANGO TREE

Ghugare, D. S.

Student of P. G. Department of zoology, G. S. G. College Umarched, dist. Yavatmal

ABSTRACT

Weaver ant Or green ants (genus *Oecophylla*) on mango tree cost beneficial studies comparing ant based protection with conventional methods are needed to assess whether it is economically viable. Here we contrast profits of Weaver ants in mango fruit protection, which is supposed to be king of fruits Weaver ants controls fruit flies and other insects on mango. Using chemical pesticides to control insect and fruit flies on mango lowers the fruit yield by 47%. This Weaver ants catch other fruit flies and insects and help to promote better yield to farmers.

Keywords: mango tree, Weaver ant, control, fruit flies, insects, pesticides, *Mangifera indica*, *Oecophylla smaragdina*.

Introduction

In Asia the use of ants to biologically control insects pests in crop has a long tradition, and their potential as biocontrol agents is continually being tested scientifically (Way and Khoo 1992; Agrawal et al. 2007).

Oecophylla ants are the earliest recorded biological control agent. (Huang and Yang 1887) and they are considered the most effective group of ants to fight insects and fruit flies, tropical insect pests. (Way and Khoo 1992) The positive effect of these ants has been described in a multitude of studies and efforts have been put forward to develop techniques to improve the use of ants in biocontrol (Peng et al. 2004; van Mele 2008)

Still, large scale implementation of the *Oecophylla* technology is lacking. One reason may be that the majority of published applied *Oecophylla* researchers does not compare the ant technology with prevalent conventional pest control methods.

Weaver ants or green ants (genus *Oecophylla*) are the eusocial insects of the family Formicidae, (order Hymenoptera). Weaver ants live on trees (they are obligately arboreal) and are known for their unique nest building behaviour where workers construct nests by weaving together leaves using a larval silk.

Weaver ants are highly territorial and workers aggressively defend territories against intruders, because they prey on insects harmful to their trees. Fruit flies and terrible insect pests can destroy the fruits of mango trees. Fruit flies

have stings on their abdomen which they inject in the mango and lay their eggs in the mango.

After inserting the eggs it gets hatched and converted into worms. This causes to drop the mango from the tree. Those trees which have Weaver ants have good quality mangoes and those which have not are bad quality mangoes. When the fruit fly comes and lays an egg in fruit it takes just five minutes but the Weaver ants chase the fruit flies or catch her.

In the Umarched region there are Neelum, Totapuri, Dasher, Kesar and all other types of mangoes variety were found, due to lack of proper cultivation techniques farmers failed to take yield, there are various reasons among them the most important reason is seen that is fruit flies and all other insecticides. Against that fruit flies Weaver ants are seen to be effective biocontrol agents.

Materials and methods

The study was conducted in 2022 in a *Mangifera indica* L. in Umarched taluka region, dist. Yavatmal. The temperature of this region is mostly hot. Hot season lasts for 2.1 months from March 31 to June 2, with average daily high temperature above 104°F. The hottest month of the year in Umarched region is May. The cool season lasts for 6.7 months from July 6 to January 29. The experiment plot consists of 30 year old 11 mango trees from different farms. At the beginning of the experiment in the May month of 2022 some trees were occupied by *O. smaragdina*. Among 11 trees only two trees were without Weaver

ants, we used different cameras to capture their habitats on tree. In this experiment we put a daily observation of ants and their activities by daily visiting the farms at afternoon time because it is the time when fruit flies are active we calculate the daily loss of mangoes done by fruit flies without *O. Smaragdina*. This experiment was done by daily visiting that different 11 mango trees.

Discussion

In this study mango yields were different in trees on which Weaver ants were present and on those on which they were absent. *O. smaragdina* were effective to catch the flies as compared to the trees which don't have *O. smaragdina*. On the other hand the cost of using Weaver ants were lower as compared to using any other pesticides and also the yield was better. The net production of mangoes on trees where Weaver ants were present was near

about 46 % of single tree.

Also oecophylla was shown to control several mango tree pests such as the stinkbug and aphids. The leaf feeding caterpillars and various inflorescence eaters (Van Mele et al. 2002).

Secondly, investigations should look for oecophylla compatible environmentally safe methods to complete or enhance the action of the ants against uncontrollable pest species.

Results and conclusion

In the experiment the mango trees which were selected for study were 11 trees among this 11 trees nine trees were with presence of Weaver ants and two trees were not having ants. On the trees which having ants were better fruit yield as compared to the trees which don't have ants on it. The ants were capable to trap and chase away fruit flies and other insects successfully without causing any harm to the tree.

References

1. Agarwal VM, Rastogi N and Raju SVS, 2007. Impact of predatory ants on two lepidopteran insect pests in Indian cauliflower agroecosystems. *Journal of Applied Entomology* 131: 493-500.
2. Ayenor GK, Van Huis A, Obeng-Ofori D, Padi B and Röling NG, 2007. Facilitating the use of alternative capsid control methods towards sustainable production of organic cocoa in Ghana. *International Journal of Tropical Insect Science* 57: 85-94.
3. Bristowe WS, 1932. Insects and other invertebrates for human consumption in Siam. *Transactions of the Entomological Society of London* 80: 387-404.
4. Césard N, 2004. Harvesting and commercialisation of kroto (*Oecophylla smaragdina*) in the
5. Malingping area, West Java, Indonesia. In: *Forest Products, Livelihoods and Conservation. Case Studies of Non-Timber Product Systems* (Kusters K and Belcher B, eds), Center for International Forestry Research, Jakarta, 61-77.
6. Chen Y and Alue RD, 1994. Ants used as food and medicine in China. *The Food Insects Newsletter* 7: 1-10.
7. Huang HT and Yang P, 1987. The ancient cultured citrus ant. *Bioscience* 37: 665-671.
8. Oudhia P, 2002. Traditional medicinal knowledge about red ant *Oecophylla smaragdina* (Fab.) [Hymenoptera; Formicidae] in Chhattisgarh, India. *Insect Environment* 8: 114-115.
9. Offenber J and Wiwatwitaya D, 2009. Weaver ants convert pest insects into food – prospects for the rural poor. *Proceedings of Tropentag 2009 conference: International Research on Food Security, Natural Resource Management and Rural Development*. Hamburg. URL <http://www.tropentag.de/2009/abstracts/full/309.pdf>.
10. Offenber J and Wiwatwitaya D, 2010. Sustainable weaver ant (*Oecophylla smaragdina*) farming: harvest yields and effects on worker ant density. *Asian Myrmecology* 3: 55-62.
11. Offenber J, 2011. *Oecophylla smaragdina* food conversion efficiency: prospects for ant farming. *Journal of Applied Entomology* 135: 575-81.

12. Peng RK and Christian K, 2004. The weaver ant, *Oecophylla smaragdina* (Hymenoptera : Formicidae), an effective biological control agent of the red-banded thrips, *Selenothrips rubrocinctus* (Thysanoptera : Thripidae) in mango crops in the Northern Territory of Australia. *International Journal of Pest Management* 50: 107-114.
13. Peng RK and Christian K, 2005a. The control efficiency of the weaver ant, *Oecophylla smaragdina* (Hymenoptera: Formicidae), on the mango leafhopper, *Idioscopus nitidulus* (Hemiptera: Cicadellidea), in mango orchards in the Northern Territory. *International Journal of Pest Management* 51: 299-306.
14. Peng RK and Christian K, 2005b. Integrated pest management in mango orchards in the
15. Northern Territory Australia, using the weaver ant, *Oecophylla smaragdina* (Hymenoptera : Formicidae), as a key element. *International Journal of Pest Management* 51: 149-155.
16. Jachim offenberg, nguyen Thi Thu Cue and Decha wiwatwitaya, effectiveness of Weaver ant biocontrol in southeast Asian citrus and mango 2013

CLIMATE CHANGE IMPACT ON PLANT POLLINATOR INTERACTIONS : A REVIEW**P. V. Gadkar* and Dr. M. M. Dhore**

Asst. Professor, Bapuraoji Butle Arts, Narayanrao Bhat Commerce & Bapusaheb Patil Science College Digras
Professor, Department of Botany , Bapuraoji Butle Arts , Narayanrao Bhat Commerce and Bapusaheb Patil
Science College Digras
pranavgadkar@gmail.com

ABSTRACT

Long-term changes in temperature and weather patterns are referred to as climate change. These changes could be natural, such as variations in the solar cycle or anthropogenic. Pollination is essential for the production of fruit and seed crops .It also plays an important role in efforts to improve plant breeding. Synchronus biological events and plant pollinator interactions are also depends on seasons and weather patterns , this are affected by ever changing environment i.e. global warming. The current review discusses how climate change is affecting pollination mechanisms and interactions between plants and pollinators by discussing aspects such as phenological changes in both species, behavioural changes, and the direct effect of climate change on their activity, which leads to a decline in pollination services.

Keywords: *Climate Change, Pollination, Plant Pollinator interactions, Phenology,*

Introduction

Researchers collected ice cores to track global temperatures over the last 100,000 years. The global mean average temperature has only changed by 1 degree Celsius, up or down, over the last 10,000 years. What's remarkable is that the climate was unstable for the majority of that time, alternating between ice ages and scorching heat. This period of climate stability has been labelled the "Holocene" by geologists and it is credited, in no small part, with supporting the development of human civilisation as we know it. It meant that humans could develop agriculture reliant on predictable seasons and weather, and it includes features such as two permanent ice caps that cool the world, plus stable sea temperatures that have allowed life to flourish. In 2016 scientists declared that, as of about 1950, we had moved into a new geographical era, called the "Anthropocene" age, This new period can be defined by the impact of humans on the world, which is changing the climate once more, as opposed to such a change being prompted by nature. The finely tuned natural systems that Earth benefits from will become highly unstable after a certain point of warming and that will start to work against humans in the battle to keep carbon emissions out of the atmosphere. Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar

cycle. Pollination is crucial for the production of fruit and seed crops since it is a requirement for fertilization. It also plays a significant role in initiatives to breed better plants. Additionally, research on pollination is essential for comprehending the development of flowering plants and their current distribution. Because they are sedentary organisms, plants typically depend on outside parties to transfer pollen. In roughly decreasing order of significance, they are insects, wind, birds, animals, and water in flowering plants. Since relying on other methods is a relatively recent evolutionary phenomenon, insect pollination was likely present in early seed plants. The occurrence of synchronous biological events, such as insect emergence, their feeding behaviour, and the start of flowering, is necessary for any successful pollination interactions (Bhatnagar et al, 2019). There are several ways that climate change can impact plant-pollinator interactions, but much of the study focus has been on whether independent phenological alterations will disrupt the temporal overlap between plants and pollinators (Forrest 2014). In this review we discussed about the various potential threats to plant pollinator interactions by climate change and its effect on economic and ecological benefits.

Economic Value Of Pollination

Crop productivity, biodiversity and ecosystem services are provided by pollinators. Insect Pollination is essential for food production directly or indirectly. The Quality and quantity of fruits is considerably increased by pollination. Pollination by insect and other animals increased global agricultural productivity in enormous quantity in past 50 years and contributed for production of biofuels, fibres, medicines, forage, food and fruits. In India crops pollinated by biotic agents contributed about 112615.73 crores to Indian agriculture which represents 8.72 % of total value of agriculture. The economic benefits are highest in vegetables followed by fruits and edible oil. Now this beneficial pollinators are under the risk of changing climate all around globe.

Effects Of Climate Change On Plant Pollinator Interactions

Phenology of flowering and distribution ranges of both plants and their most important pollinators are affected by climate change leading to temporal and spatial mismatches. It is therefore important to identify the phenological changes due to environmental cues and distributional patterns of pollinators in identified species.

Phenological Changes

Phenology is the study of seasonal variation in life cycle of given plant, flowering phenological studies such as timing of flowering and frequency of flowering are important to identify the changes according to seasonal changes in flower and its relation with pollinators. The species specific shifts has been observed in the phenology of both plants and pollinators due to climate change which leads to mismatch in seasonal timing of both interacting species (Bartomeus et al. 2011; Visser & Both, 2005). Heglandt et al (2009) showed the effects of temperature on plant pollinator interaction mismatches and this leads to reduced insect visitation, less foraging behavior and low pollen deposition due to unavailability of pollination rewards to insects. The shift in phenophases over time is one of the reasons for the significant reduction in fruit yield observed

in the case of an apple plantation. Flowering event phenology may disrupt the equilibrium rhythm of plant-insect interactions, causing shifts in the dynamics of pollinating insects and associated trophic communities. A shift in phenology affects more than just wildlife; it may also have serious economic and social consequences.

Effects on Pollinator behavior

Climatic variation in environment changes behavior of pollinators for flower visitation which is demonstrated by many researchers experimentally in warmed greenhouses. Pollinators may change their foraging behavior due to increased temperature and seasonal fluctuations which is a matter of concern because it directly or indirectly affects the crop productivity and other benefits of pollination to ecosystem services. The Maximum daily temperature, number of degree days and day length these phenological aspects in bees are controlled by environment. Elevated body temperature is required for a bee to fly. The temperature of their surroundings determines their foraging activity (Willmer and Stone, 2004; Reddy et al., 2012). Surface to volume ratio is most essential in small bees to absorb efficient heat. Climate factors like temperature, humidity, light intensity, solar radiation, and wind speed affect the activities of insect pollinators. However, other pollinators may react differently to these factors. Climate change may also have an impact on pollinator behaviour and abundance. For instance, honey bees may spend time shivering to maintain acceptable thoracic temperatures for flying (Heinrich, 1993) As a result, as the ambient temperature drops, more time may be spent shivering than foraging. Bees cannot produce enough heat for flying if the temperature falls below 10°C (H. Esch 1988). As temperatures drop, Dipteran pollinators may spend more time in the sun basking to absorb solar energy than to maintain flight (Morgan, 1987). As a result, thermal restrictions could reduce bees' ability to pollinate since they have an impact on their flight patterns.

Conclusion

The long-term effects of climate change should be understood through proper research and experiments on ecological interactions between plants and pollinators. Mitigation strategies are being developed to address the negative effects of climate change, but little is known about how this changing global environment will affect plant pollinator interactions. It is critical to investigate the phenology of various flowering plant species in variable climates, as well as the impact on pollinators. It is also critical to investigate plant pollination ecology,

pollinator distribution patterns, and pollinator diversity in various habitats, as well as how they are responding to climate change. Artificially humans can improve pollinator diversity through beekeeping, butterfly parks, and gardens and pesticides and insecticides used in agroecosystems that harm pollinators should be reduced. It is critical to identify exotic and invasive species in the region that may cause pollinator conflicts and native species being discarded by pollinators.

References

1. Forrest, Jessica. (2014). Plant–pollinator interactions and phenological change: what can we learn about climate impacts from experiments and observations?. *Oikos*. 124. 10.1111/oik.01386.
2. Shiwani Bhatnagar, Desha Meena, Sangeeta Singh (2019). Effect Of Climate Change On Plants And Their Pollinators- A Review. *International Journal of Biotech Trends and Technology*, 9(2),34-39.
3. B. Heinrich, *The hot-blooded insects: strategies and mechanisms of thermo regulation*, Harvard University Press, Cambridge, Massachusetts, 1993.
4. H. Esch, “The effects of temperature on flight muscle Potentials in honeybees and cuculiinid Winter moths”, *Journal of Experimental Biology*, vol. 135, pp. 109–117, 1988.
5. K. R Morgan, and B. Heinrich, “Temperature regulation in bee- and wasp-mimicking syrphid flies”, *Journal of Experimental Biology*, vol. 133, pp. 59–71, 1987.
6. P. G. Willmer, and G. N. Stone, “Behavioral, ecological, and physiological determinants of the activity patterns of bees,” in *Advances in the Study of Behavior*, San Diego, CA, Elsevier Academic Press Inc, 2004.
7. P. V. Rami Reddy, Abraham Verghese And V. Varun Rajan, “Potential impact of climate change on honeybees (*Apis* spp.) and their pollination services”, *Pest Management in Horticultural Ecosystems*, Vol. 18, No. 2 pp 121-127 (2012)
8. F-W. Badeck, A. Bondeau, K. Bottcher, D. Doktor, W. Lucht, J. Schaber, and S. Sitch, “Responses of spring phenology to climate change”, *New Phytologist*, vol.162, pp. 295 – 309, 2004.
9. P. S. Thakur, V. Dutt, and A. Thakur, “Impact of inter-annual climate variability on the phenology of eleven multipurpose tree species”, *Current Science*, vol. 94, pp. 1053-1058, 2008.
10. Z. Luo, O. J. Sun, Q. G. W. Xu, and J. Zheng, “Phenological responses of plants to climate change in an urban environment”, *Ecological Research*, vol. 22, pp. 507–514, 2007

GREEN SYNTHESIS OF SILVER NANOPARTICLES USING AZADIRACHTA INDICA LEAVES EXTRACT AND CHARACTERIZATION BY UV

Gayatri Kale, Dipti Bhatkar, Sneha Rokade, P.M. Ingle and Dr. R.A. Patil

Department of Physics, S.S.S. K.R. Innani Mahavidyalaya Karanja (Lad)

ABSTRACT

The synthesis of Silver nanoparticles using a plant – mediated approach is presented in this paper. Present Work focus on synthesis of Silver nanoparticle by Azadirachta Indica through green Method. Green Synthesis Method is non toxic and ecofriendly. In this work the precursor material was Silver Nitrate ($AgNO_3$) and Azadirachta Indica. The Particles obtained were characterized by UV Visible Spectroscopy for to analyse the absorption pattern.

Keywords: Silver nanoparticles, Azadirachta Indica leaves extract, UV-Vis Spectroscopy, Antibacterial activity.

Introduction

Green synthesis techniques make use of moderately pollutant free chemicals to synthesis nanoparticles and embrace the use of mild solvents such as water, natural extracts Among the various noble metals, silver is preferred as a nanoparticle because of its antibacterial catalytic properties and their nontoxicity towards human in comparison to other metals.

Plant description

Family name : Meliaceae
Botanical name : Azadirachta Indica
Common name : Neem
Plant part taken : Leaves

We can used different careful way for the putting together of Silver Nanoparticle. Which can be either biological ,physical, chemical methods . Earlier methods used for the putting together of silver nano-particles were deadly , full of poison and dangerous chemicals were used for chemical synthesis. Thus the use of nature friendly processes, for the synthesis of silver nano-particles is experienced as “Green synthesis”. Green synthesis is supported over common synthesis because it is eco-friendly, good price, one-step careful way that can be easily scaled up for greatly sized scale synthesis and does not have need of high force over a given square unit, temperature, power for a given time and deadly, full of poison chemicals.

Many researchers have reported the use of materials such as plant leaf extract, root, stem, bark, leaf, fruit, bud and latex , fungi ,bacteria

and enzymes for the synthesis of silver nanoparticle. [1] A lot work has been done on green synthesis of silver Nano-particles using microorganisms including bacteria, fungi and plants because of their antioxidant properties capable of reducing metal compounds in their respective nanoparticle. For the stabilization of silver nanoparticles taken plant extracts to produce best capping material .

The present work try to use the leaf extract of Azadirachta Indica (commonly known as neem) a member of the Meliaceae family used for the green synthesis of silver nanoparticles. Neem is a medical plant and is used for the process bacterial, fungal, viral and many types of skin diseases since old times. The aqueous neem extract is used in the synthesis of different nanoparticles such as gold, zinc oxide, silver and so on. Terpenoids and flavanones are the two important phytochemicals present in neem which play a vital part in making fix the nanoparticle and also act as capping and reducing agent . Aqueous neem leaf extract reduces silver salt to silver nitrate. This capped nanoparticle with neem extract give signs of antibacterial activity.

Azadirachta Indica plant is commonly ready in India and each part of this tree has been used as a family house way of putting things right against different to do with man disease from days long past and for treatment against viral, bacterial and fungal infections. Silver nanoparticles can be produced at low strong amount of leaf extract without using any addition of damaging chemical / physical ways

of doing. The effect of strong amount of metal ions and getting together of leaf extract amount were also valued to make the most out of way to putting together silver nanoparticle. The careful way applied here is simple, price effective, easy to act and able to keep going. The biomedical application of silver nanoparticle can be effective by the use of biologically synthesized nanoparticles which minimize the factors such as toxicity, cost and are found to be exceptionally stable. The selecting cancer units using silver nanoparticles has made certain to be working well.[3-4]

Experimental Method and Materials

Apparatus:

Beaker, Burning stand, conical flask, pipette, ring stand, funnel, Burette, ring stand, bushel burner.

Material :

silver Nitrate (AgNO_3), Plant Extract

Preparation Of Leaf Extract:

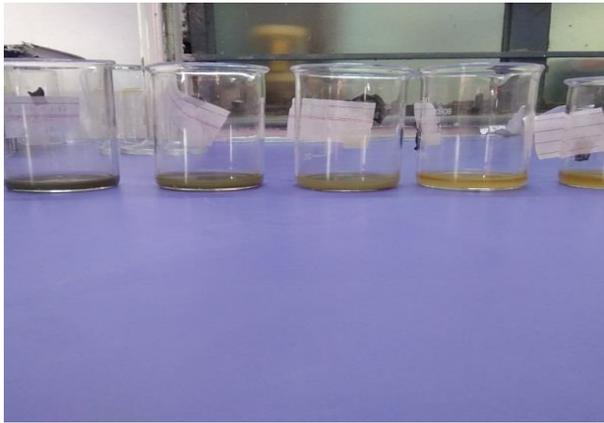
Azadirachta Indica leaf extract was used to prepare silver nanoparticles on the basis of cost effectiveness, ease of availability and its medicinal property. Fresh leaves were collected from college campus. They were surface cleaned with running tap water to remove debris and other contaminated organic contents, followed by double distilled water and air dried at room temperature.[4] 20g of finely chopped Neem leaves were added to 100ml double-distilled water and boiled 30min. The extract was cooled down and filtered with Whatman filter paper and store for further use. This solution was used for green synthesis of silver nanoparticle (AgNP) or reducing the silver ions.[1]



Green Synthesis Of Silver Nanoparticles:

Silver nitrate GR used as such 100ml, 1mM solution of silver nitrate was prepared in an Erlenmeyer flask. Then 1,2,3,4 and 5ml of plant extract was added separate to 5mL of silver nitrates solution keeping its concentration at AgNO_3 (1mM-5mM) keeping extract concentration constant(1mL).[4] This setup was incubated in dark chamber to minimize photo-activation of silver nitrate at room temperature. The colour change from colorless to brown in colour confirms the reduction of silver ions.[1] Its formation was

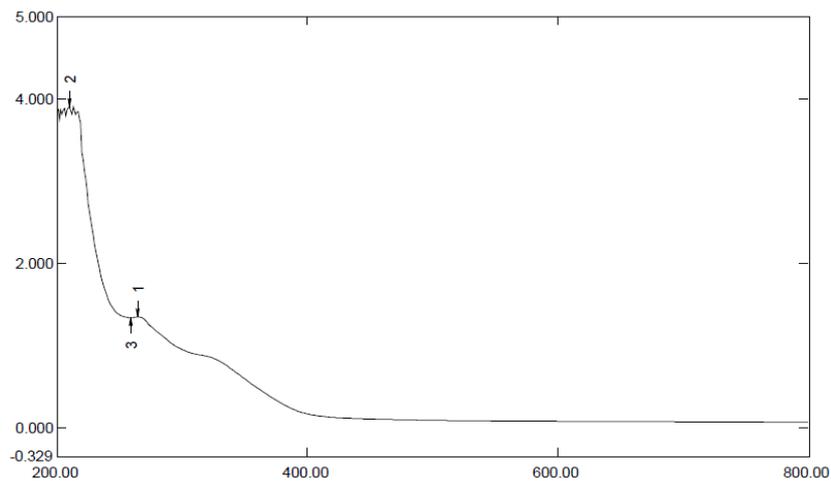
also confirmed by using UV-Visible spectroscopy.[4]



Result and Discussion

a) UV –Vis Spectroscopy

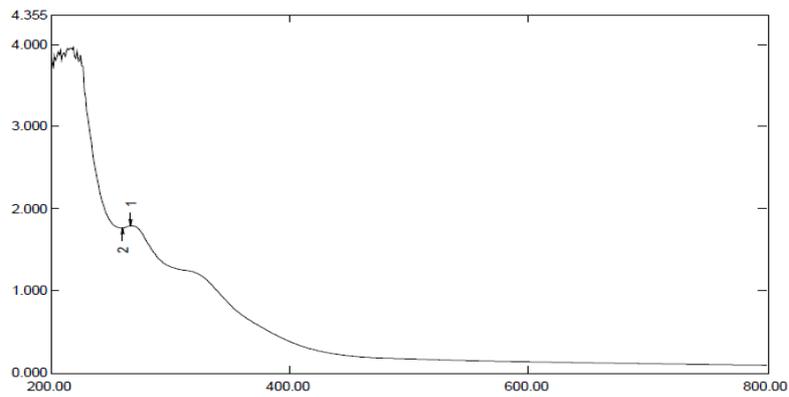
Sample S1 –As it can be seen from the graph for S1. (1ml plant extract + 5 ml silver nanoparticle) at 259 nm wavelength absorbance was recorded at 1.3 , at 264 nm the wavelength absorbance was recorded at 1.3 .



UV Visible Spectra Analysis Sample 1

No.	P/V	Wavelength	Abs.	Description
1	↑	264.00	1.355	
2	↑	210.00	3.916	
3	↓	259.00	1.344	

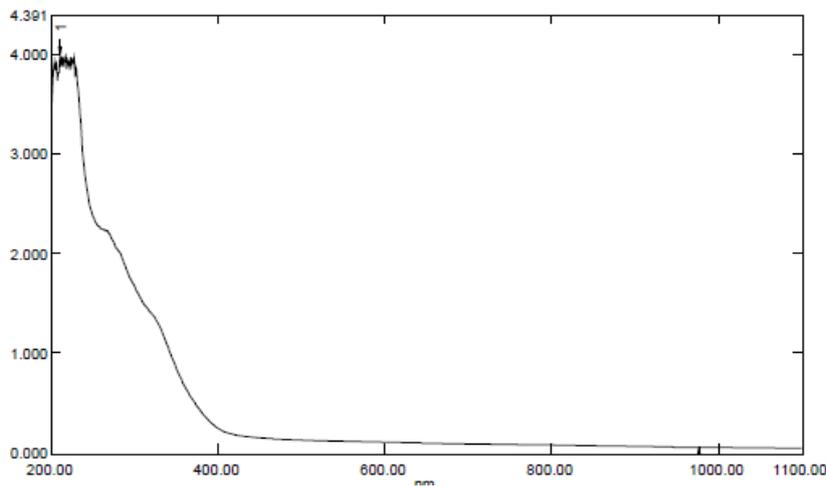
Sample S2 –As it can be seen from the graph for S2(2ml plant extract + 5 ml silver nanoparticle) at 260 nm and 267 nm the wavelength absorbance was recorded at 1.7 .



UV Visible Spectra Analysis Sample 2

No.	P/V	Wavelength	Abs.	Description
1	↑	267.00	1.790	
2	↓	260.00	1.763	

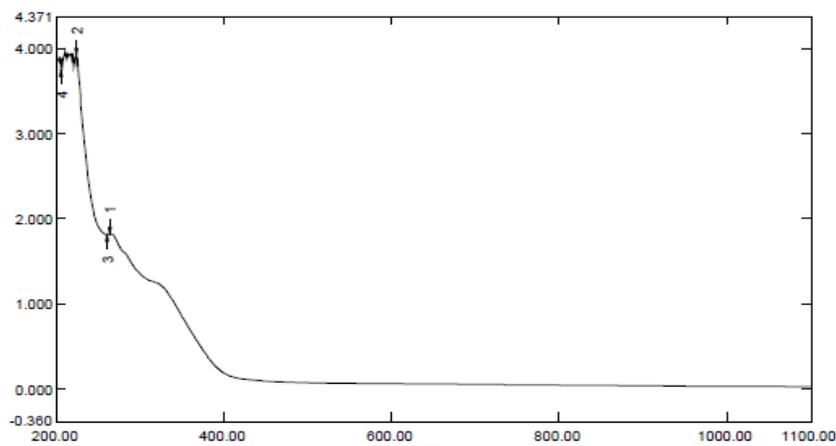
Sample S3 – As it can be seen from the graph for S3 (3ml plant extract + 5ml silver nanoparticle) at 977 nm wavelength absorbance was recorded 0.05



UV Visible Spectra Analysis Sample 3

No.	P/V	Wavelength	Abs.	Description
1	↑	210.00	3.995	
2	↓	977.00	0.053	

Sample S4 – As it can be seen from the graph for S4 (4 ml plant extract + 5 ml silver nanoparticle) at 260 nm the wavelength absorbance was recorded at 1.8 .



UV Visible Spectra Analysis Sample 4

No.	P/V	Wavelength	Abs.	Description
1	↑	263.00	1.827	
2	↑	223.00	3.919	
3	↓	260.00	1.819	
4	↓	205.00	3.753	

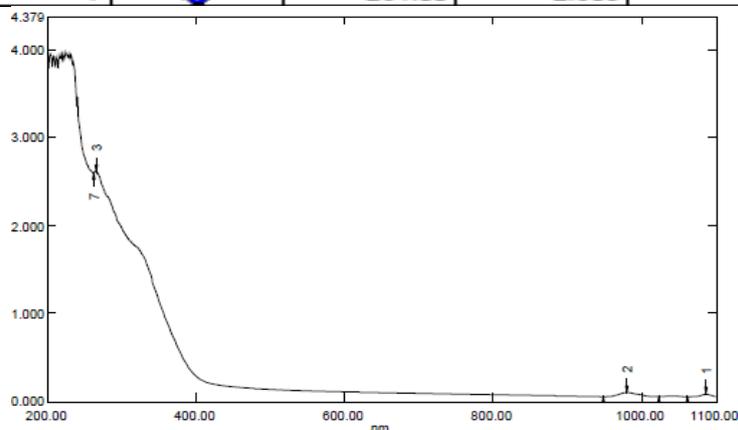
Sample S5- As it can be seen from the graph for S5 (5 ml plant extract + 5 ml silver nanoparticle) at 261 nm the wavelength absorbance at 2.6 and at 265 nm the wavelength absorbance at 2.6 .

Bio reduction of silver ions into AgNP after addition of aqueous Neem extract was confirmed with change in color. Initially, after addition of aqueous neem extract, the color change was pale yellow with the increase in incubation time the color changed from pale yellow to light brown and after 24h. Incubation it was deep brown in color slight variation in

the peak absorbance was observed which might be due to variation in particle size.

The brown color was due to the excitation of the surface Plasmon resonance (SPR), very much a characteristics property of silver nanoparticle. The flavonoids and terpenoids present in neem extract act like natural reducing agents which are responsible for reducing silver salts to silver nanoparticle. A complete colour change was seen within 1h of incubation after which no color change was seen which indicates that all the silver salts are completely reduced to AgNP.

No.	P/V	Wavelength	Abs.	Description
1	↑	1087.00	0.072	
2	↑	980.00	0.095	
3	↑	265.00	2.623	
4	↓	1061.00	0.047	
5	↓	1024.00	0.049	
6	↓	948.00	0.047	
7	↓	261.00	2.603	



UV Visible Spectra Analysis Sample 5

Conclusion

The present work is one of the most simple and thrifty methods for the green synthesis of silver nanoparticles from Azadirachta Indica leaves. This eco-friendly method could be a competitive alternative to the conventional physical/chemical methods used for synthesis

of silver nanoparticles and thus has a potential to use in biomedical applications and will play an important role in opto-electronics and medical devices in near future. Lower ratio of plant extract is best for the synthesis of silver nano-particle.

References

1. Resmi, C.R.,Sreejamol, P.and Prita Pillai (2014) S.V.R.N.S.College, Green synthesis of silver nanoparticle USING AZADIRACHTA INDICA LEAF EXTRACT Department of Botony, Therthapadapuram P.O, Vazhoor east, Kottayam , Kerala-686505 VOL.4(3) 300-303
2. Shakeel Ahmed, Saifullah, Mudasir Ahmad, Babu Lal Swami, Saiqa Ikram (2015) GREEN SYNTHESIS OF SILVER NANOPARTICLES USING AZADIRACHTA INDICA AQUEOUS LEAF EXTRACT ISSN :(Print)1687-8507
3. Pragyony. Bhagyalaxmi Das. Abhipsa Mohanty .Sujata Mohapatra (2017) Green synthesis of silver nanoparticle using AZADIRACHTA INDICA LEAF EXTRACT AND ITS ANTIMICROBIAL STUDY ApplNanosci(2017) 7:843-850
4. Chikdu D., Pal P .,Gujar A., Deshmukh R and Kates S²(2015) Green synthesis and characterization of silver nanoparticles by using ALOE BARBADENSIS AND ITS ANTIBIOTIC ACTIVITY ISSN 2320-1355 ,volume 4,Number 7,2015,pp.2713-2719
5. Vidya C. Mali, Krishna . K. Rangar, Rajendra A. Lavate, Dipak A. Kumbhar , Sanjay S. Sathe, and B.N. Kokare* (2018) GREEN SYNTHESIS OF SILVER NANOPARTICLE FROM PLANTS , Raje Ramrao Mahavidyalaya , Jath , Maharashtra , India *Meenalben Meheta Arts Commerce and science College, Panchagani, Maharashtra, India ISBN 978-93-5254-490-5

AN ETHNOMEDICINAL SURVEY OF TRADITIONAL USED MEDICINAL PLANTS FROM YAVATMAL DISTRICT MAHARASHTRA STATE, INDIA

Sunil N. Khade¹ and Priya R. Jadhav²

¹Department of Zoology, Phulsing Naik Mahavidyalaya, Pusad, Maharashtra, India

²Department of Botany, R.A. Arts, Arts and Science College, Washim, Maharashtra, India

ABSTRACT

Medicinal plants have remained an integral source of therapeutics for primary healthcare since antiquity, the information pertaining to uses of plants. Pusad taluka district Yavatmal is rich in medicinal plants. The present study is on the base of used for ethnomedicinal purposes. The ethnomedicinal plants are used by tribal people, mostly commonly treated diseases were menorrhagia, skin boils, Typhoid, diabetes, piles and diarrhea. It was observed that the majority of plants were used freshly to extract juice, followed by powder and decoction and rarely as tea or oil forms. The present study provides comprehensive ethnomedicinal data including vernacular and botanical names, name of family, mode of preparation diseases treated.

Keywords: Ethnomedicine, Medicinal plants, Traditional knowledge.

Introduction

Ethnomedicinal refers to health practices incorporating plant, mineral and animal sources to treat illnesses or maintain wellbeing. The poor and marginal people of the world today still rely on various traditional health care system [1]. According to World Health Organization (WHO) more than 80% of the world's population relies on traditional medicine for their primary healthcare needs. Though at present Indian health care system consists of both traditional and modern systems of medicines, both originated from ancient organized traditional systems of medicine like 'Ayurveda', 'Siddha' and 'Unani' and unorganized systems like various folk medicinal system [2].

Wardha and Painganga are major river of Yavatmal district and forms boundary of Andhra Pradesh. The natural vegetation of forest includes a variety of plant species having medicinal value. Tribal are largely dependent on forest products for their livelihood. They are knowledgeable about the utility of the majority of these plants. They collect gum, resin, fodder, timber and fuel wood from the sanctuary area and offer it for sale in the nearby town. Therefore, most of the plant species are either becoming less abundant or on the verge of extinction.

Several workers like [2-7] and [9] have been investigating the ethnobotany of northern, southern and central India. However, Yavatmal

district remains neglected, even though the vegetation may be of ethnobotanical interest.

Materials and Methods

The present ethnomedicinal study was conducted in Yavatmal district, Maharashtra state, India. It lies between 20.5937°N , 78.9629°E Longitude. The Yavatmal district covers geographical an area of 13,582 km². (4.41 percent of the state) and a population of 2077144 (2.63 percent of the state). The data on ethnomedicinal use of plants was collected by field survey and structured interview schedules during July 2018 to July 2019. Localities around the village temples, village community forests, sacred grooves, farms and village ponds were preferred sites for data collection due to intimate relations shared by localities with these places and plants around them. The interviews were conducted in vernacular languages with local respondents preferably elders and experienced members including temple priests and traditional health practitioners. In total 160 randomly selected informants were interviewed from different localities. Identification of plant species were identified with the help of Flora of Yavatmal District [7], flora of Marathwada [9]. The research done at Phulsing Naik Mahavidyalaya, Pusad.

Result and Discussion

The ethnomedicinal data of 50 plants species belonging to 33 families were collected from forest

Family	Botanical name	Vernacular name	Parts used	Mode of preparation/ Administration	Disease treated
Fabaceae	<i>Abrus precatorius</i>	Gunj	Leaf and seed	Leafs are eaten with sugar cube. 6g paste of seeds is fed to cattle for expulsion of placenta.	To cure mouth ulcer.
Malvaceae	<i>Abutilon indicum</i>	Atibala	Whole plant	The whole plant is uprooted, dried and is powdered. Consume a spoonful of this powder with a spoonful of honey, once in a day, for 6 months until the day of marriage.	For safe and quick pregnancy.
Amaranthaceae	<i>Achyranthus aspera</i>	Kutri	Whole plant	Whole plant extract is used.	Eyedisorders, cough, snake bites and piles.
Asteraceae	<i>Acmella oleracea</i>	Toothache plant	Leaf & flower	A decoction or infusion of the leaves and flowers is a traditional remedy for stammering.	Toothache, and stomatitis.
Acanthaceae	<i>Adhathoda vasica</i>	Adulsa	Leaf	Juice from the fresh Leaf is given to relieve the symptoms.	Cough and cold.
Amaranthaceae	<i>Avera lanata</i>	Gorakhbuti	Whole plant	Whole plant is used.	Maintaining blood sugar to optimum level and removing stones from kidneys
Simaroubaceae	<i>Ailanthus excelsa</i>	Maharukh	Stembark	Stembark is used for treatment.	Fever and also used as tonic.
Amaranthaceae	<i>Amaranthus viridis</i>	Green amaranthus	Root	The root is useful.	leucorrhoea and leprosy
Papaveraceae	<i>Argimone mexicana</i>	Katedhotra	Flower , seed and root	The root is used. The flowers are used in the treatment. The seed has also been used.	chronic skin diseases, coughs, an antidote to snake poisoning
Balanitaceae	<i>Balanitis aegyptica</i>	Hingnbet	Fruit	5-10 g powder of fruit pericarp mixed with sugar cube is given orally twice a day for 3-4 days to cure cough.	Cough.
Acanthaceae	<i>Blepharis maderaspatensis</i>	Hadsan	Whole plant	Whole plant is used for treatment of a number of ailments like dysuria, headache, diseases of nervous system.	Diuretic and aphrodisiac.
Acanthaceae	<i>Blepharis repens</i>	Hadsan	Leaf	Leaf juice boiled with sesame oil and applied.	Externally to wound.
Plantaginaceae	<i>Bacopa monnieri</i>	Brahmi	Whole plant	Whole plant is used for improving memory.	improving memory
Nyctaginaceae	<i>Borrhavia diffusa</i>	Punarnava	Whole plant	Whole plant is used for treatment of cough, asthma and kidney stone.	cough, asthma and kidney stone

Caesalpinaceae	<i>Cassia tora</i>	Tarota	whole plant	whole plant extract of this species is used.	Cure psoriasis.
Sapindaceae	<i>Cardiopermum helicacabum</i>	Kapalphodi	Leaf	The oil prepared from the Leafs acts as a very effective external application.	Arthritis and other painful conditions of the body.
Apocynaceae.	<i>Catharanthus roseus</i>	Sadafuli	Leaf	Two teaspoonfuls leaves juice is given orally twice a day for a week for diabetes.	Diabetes.
Fabaceae	<i>Clitoria ternatea</i>	Gokarni	Whole plant	Whole plantuse	As a memory enhancer, nootropic. Antistress anxiolytic, antidepressant, anticonvulsant, tranquilizing and sedative agent.
Cleomaceae	<i>Cleome viscosa</i>	Tilavan	Whole plant	Leafs and seeds used to treat infections, fever, rheumatism and headache. The whole herb is used in treatment of inflammation of the middle ear and applied on wounds and ulcers.	Fever, wounds and ulcers.
Convolvulaceae	<i>Convolvulus arvensis</i>	Chandvel	Whole plant and Flower	It is used to treat skin ulcers, reducing wounds, inflammation and swelling .The whole plant (without roots) is used for abdominal pain and abdominal worms in children. A tea made from flowers is laxative	Ulcers, wounds, Pain, laxative.
Dioscoreaceae	<i>Dioscoria bulbifera</i>	Dukkar kand	Whole plant	Whole plant is for treatment of diarrhea and dysentery.	Diarrhea and dysentery.
Gentianaceae	<i>Enicostema axillare</i>	Kadu nai	Whole plant	Whole plant is used for the treatment of intermittent fever and cancer, blood purifier and to treat dermatopathy and venereal infections.	fever and cancer
Euphorbiaceae	<i>Euphorbia hirta</i>	Dudhi	Whole plant and root	Decoction of dry herbs is used.	Skin diseases. Roots are also used for snake bites.
Moraceae	<i>Ficus hispida</i>	Bhui-Umber	Whole plant	Whole plant is used for treatment of ulcer anemia, jaundice, inflammation and intermittent fever.	Fever.
Moraceae	<i>Ficus recemosa</i>	Umber	Stem latex and fruit	The latex of the stem is useful in the treatment of piles and diarrhea. Fruits are said to be useful in relieving stomachache.	Stomachache.

Colchicaceae	<i>Gloriosa superba</i>	kal-lavi	Whole plant	Whole plant is used as an antidote for snake poison.	snake poison
Tiliaceae	<i>Grevelia tilifolia</i>	Dhaman	Bark	Bark is used in treatment.	dysentery
Sterculiaceae	<i>Helectoris isora</i>	Muradsheng	Stem bark and root	The decoction prepared from bark and root is an effective remedy.	Cough and asthma.
Asclepiadaceae	<i>Hemidesmus indicus</i>	Khobarvel/ Anantmul	Whole plant	Whole plant is used	Fever, diabetes, cough and blood disorders hypertension.
Convolvulaceae	<i>Merremia gangetica</i>	Undircani	Whole plant, Leaf and root.	A mixture of the root and powdered leaves of plant and flowers is applied externally to relieve swellings. Decoction of the whole plant is used	Swellings, cough, headache, neuralgia and rheumatism.
Celastraceae	<i>Maytinus emarginatus</i>	Bharati	Leaf	A decoction of leafy is used as a mouthwash to relive tooth ache.	Tooth ache.
Fabaceae	<i>Mucuna purita</i>	Khaj-kuyari	Seeds	Seeds are used as a nervine tonic for nervous system disorders and also help in improving the memory power.	memory power
Moringaceae	Moringaceae	Sevga / Mungana	Leaf	Leafs are use for treatment of fevers, bronchitis, eye and ear infections.	Eye and ear infections.
Passifloraceae	<i>Passiflora foetida</i>	Ghani vel	Leaf , fruit and root	Infusion of leaves and roots used for hysteria. Decoction of fruit used for asthma and biliousness. Leaves applied to the head for headaches and giddiness.	Headaches and giddiness.
Oxalidaceae	<i>Oxalis corniculata</i>	Changeri	Leaf	Decoction of the leaves is prescribed in	Fevers and dysentery.
Asclepidiaceae	<i>Pergularia damia</i>	Uteran	Fruit and root	An infusion of the roots is taken against stomach-ache, colic and cough, and as an abortifacient. Crushed young fruits are applied externally to boils, abscesses, subcutaneous worm infections and eczema.	stomach-ache, colic and cough,
Fabaceae	<i>Psoralea corylifolia</i>	Bawachi	Whole plant and seed.	Whole plant is used to cures leprosy, leucoderma. The powdered seeds are applied externally to cure skin problems.	Leprosy, leucoderma, skin problems.
Euphorbiaceae	<i>Phyllanthus amarus</i>	Bhui awali	Whole plant	The whole plant is used in gonorrhoea, menorrhagia and other genital affections. It is useful in gastropathy,	Ulcers and wounds.

				diarrhoea, dysentery, intermittent fevers, ophthalmopathy, scabies, ulcers and wounds.	
Convolvulaceae	<i>Rivea hypocraterif ormis</i>	Sanjvel	whole plant	Whole plant uses	Cough, headache, skin disease.
Acanthaceae	<i>Rungia repens</i>	Ghati-pitpapra	Whole plant	Whole plant is use for treatment.	Fever and cough.
Sapindaceae	<i>Sapindus emarginatus</i>	Ritha	Fruits	Fruits are used in treatment of asthma, colic and dysentery and during child birth.	asthma, colic and dysentery
Fabaceae	<i>Tephrosia purpuria</i>	Unhali	Leaf	The leaf decoction is used for treating	Sluggish liver, heart and spleen disorders, cancerous tumors, asthma and digestive complaints.
Combretaceae	<i>Terminalia arjuna</i>	Arjuna	Whole plant	Whole plant is use for treatment of hypertension or High blood pressure.	High blood pressure
Combretaceae	<i>Terminaria belarica</i>	Baheda	Whole plant	Whole plant is widely used.	headache, leucorrhoea, liver diseases and gastro-intestinal complaints.
Menispermaceae	<i>Tinospora cordifolia</i>	Gulwel	Whole plant	All parts of guduchi plant are used for various medicinal purposes. The plant oil is effective in	reducing pain and edema and in gout and skin diseases. The herb accords longevity, enhances memory, improves health, and bestows youth, betters complexion, voice, energy and luster of the skin. It is helpful in treating digestive ailments such as hyperacidity, colitis, worm infestations, loss of appetite, abdominal pain, excessive thirst, and vomiting and even liver disorders like hepatitis.

Zygophyllaceae	<i>Tribulus terrestris</i>	Gokharu	Fruit	The fruits are used in the treatment.	kidney stones, painful urination and other genito-urinary disorders.
Boraginaceae	<i>Tribulus terrestris</i>	Camel brush	Leaf , flower and root	A decoction made from its flower acts as a sudorific and diuretic drug agent. An infusion made from both its leaves and its roots is taken to treat	Intestinal worms, relieve coughs, chest complaints, and itchiness and throat pains.
Asteraceae	<i>Tridax procumbens</i>	kambermodi	Wholeplant	Wholeplant used for treatment.	Inflammation, wound and ulcers.
Verbinaceae	<i>Vitex negundo</i>	Nirgudi	Stem and Leaf	The Leaves of this species are crushed and mixed with wheat flour in skin disorders. Also, the leaves are smoked to relieve headaches. The branches can be used as a toothbrush.	skin disorders, headaches
Solanaceae	<i>Withania somnifera</i>	Aswagandha	Whole plant	Whole plant is used.	Arthritis, anxiety, trouble sleeping (insomnia), tumors, tuberculosis, asthma and chronic liver disease.

Leaf	Whole plant	fruit	Bark	Root	Leaf & Fruit
11	24	5	3	4	2

Table no. 1 Showing numerical data of contribution of plat.

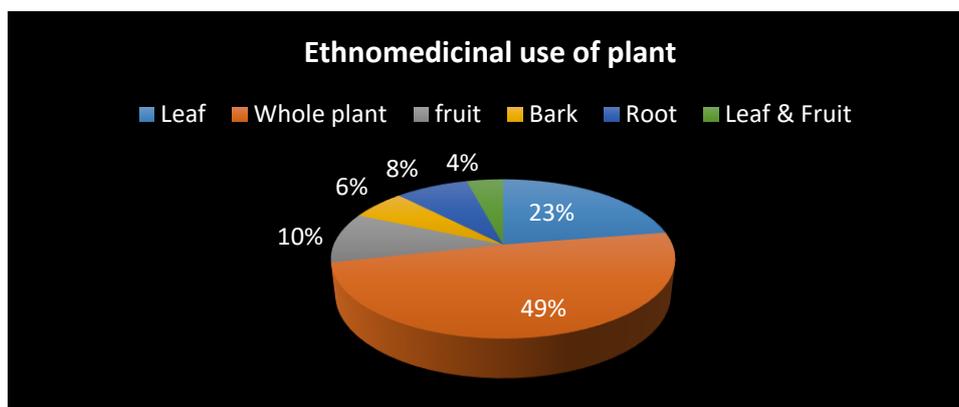


Fig. no. 1 Showing graphical representation of Ethnomedicinaluses of parts of plant.

According to figure no 1. Whole plant used 49%, use of leaf is 23%, Fruits used 10%, aks Bark 6%, as well as Root used 8%, and Leaf-Roots used 49%, Whole plant and Leaf-Root

used is maximum while leaves also used for ethnomedicinal purpose by people of district Yavatmal. Research and extension work are the major pathways to integrate folk knowledge

about ethnobotanical and ethnomedicinal plants for modern primary health care and human welfare. The major objective should be to match safe, effective remedies to common illnesses, using local medicinal plants and cost effective household needs. The problem is that very little is known about folk and traditional medicine proper, and it is impossible to say how effective they are without a lot more research. This survey provides evidence that the tribal people and other villagers residing in the near vicinity of the forest use about these plant species for the treatment of various ailments and household uses. The tribal people depend mostly on herbal medicines. The plants are generally used for asthma, anaemia, arthritis, antidote for snake bite, bronchitis, blood pressure, cough, cold, cancer, chronic liver disorder, diabetes, diarrhea, dysentery, eye diseases, ear infection, eczema, fever, genito-urinary disorder, headache, hypertension, hepatitis, hyperacidity, indigestion, inflammation, insomnia, kidney stone, liver disorder, leprosy, mouth ulcer, nervous system disorder, piles, scabies, stomach ache, tuberculosis. Some plants were used for the manufacture of houses, furniture and agricultural implements.

Conclusion

The native people of the Yavatmal District were found to be enriched with the knowledge of usage of medicinal plant species for curing various health remedies. However, the region is losing its native flora at a fast pace due the encroachment of forest land for agricultural use, deforestation, soil erosion and last but not the least increase in the population of invasive flora in the region majority will become confined to specific location unlike earlier and as predicted by elders of the region majority will become extinct in the coming decade. Also one thing notice that the knowledge sharing is minimized from elder to youngsters, because youngsters showing no interest rich heritage. Therefore, it is recommended to establish medicinal plant nurseries and to strengthen the involvement of local communities in order to conserve the available medicinal plant wealth of the area. It is recommended to launch a special drive to explore and document the traditional knowledge, which is eroding at a fast pace. Such studies provide baseline information for further study in the field of pharmacognosy pharmacology and phytochemistry.

References

1. A.S. Rao, et al., An ethnomedicinal survey of traditionally used medicinal plants from Charkhi Dadri district, Hariyanaan attempt towards documentation and preservation of ethnic knowledge. *Indian journal of traditional knowledge*, Vol.20 (2), April 2021, pp436-450.
2. Anonymous. *The Indian Pharmacopoeia*, 2nd Ed. Government of India Publication, New Delhi, (1966).
3. Bajpai HR and Mitra M. Indigenous medical practices of hill Korwas of Madhya Pradesh. *Jour of Human Eco*, 9(3), 1997, 295-298.
4. Bhalla S, Patel JR and Bhalla NP. Ethnobotanical herbal legumes of Bundelkhand region, Madhya Pradesh. *Jour. of Ecol. and Taxon. Botany*, 10, 1992, 105-109.
5. Bhatnagar LS, Singh VK and Pandey G. Medico-botanical studies on the flora of Ghatigaon Forests, Gwalior, MP. *JRIM*, 8(2), 1973, 67- 100.
6. Dubey G, Shahu P and Shahu R. Role of plants in different religious ceremonies common to Bundelkhand region, Madhya Pradesh. *Jour. Of Med. Arom. Plants Sci.*, 23(11A), 2001, 542- 545.
7. Jain AK. *Studies in Indian Ethnobotany*, I: Less known uses of fifty common plants from the tribal areas of Madhya Pradesh. *Bulletin of BSI*, 5(3/4), 1963, 223-226.
8. Karthikeyan S and Kumar A. *Flora of Yavatmal District, Maharashtra*. Botanical Survey of India, Calcutta, 1993.
9. Khayade P, Awasarkar MS, Desmukh UD and Petkar AS. Ethnobotanical claims from Akole tehsil of Ahmednagar district. *Asian J. Exp. Sci.*, 1(2), 2010, 393-403.
10. Naik VN. *Flora of Marathwada*. Vol.I&II, Amrut Prakashan, Aurangabad, (1998).

11. Nair GG. Taxonomic Relationships and Ethnobotany of Family Convolvulaceae. *International Journal of Basic and Applied Chemical Sciences*, 2 (3), 2012, 56-81.

12. Trivedi PC. Medicinal Plants, Traditional Knowledge. I. K. International Publishing House Pvt. L

VERMICOMPOSTING BY USE OF DIFFERENT GARDEN WASTE USING *EISENIA FETIDA*

Sunil N.Khade and Devyani N. Rathod

Department of Zoology, Phulsing Naik Mahavidyalaya, Pusad, District Yavatmal, Maharashtra, India

ABSTRACT

The present experiment was conducted with the objectives of exploring the vermicomposting process, which involves of vermicompost using dry leaves of four different types and cow & goat manure. The vermicompost produced can be significant value to the end users like farmers for replacement of chemical fertilizers and procuring station; import of a compost earthworm (*Eisenia fetida*); and production using such composting material locally can be made available at much lower cost. Vermicompost was done using *Eisenia fetida* with five setups T1 (cow& goat manure + mixed leaves+ kitchen waste), T2 (cow and goat manure + Banyan leaves), T3 (cow and goat manure+ lemon leaves), T4 (cow and goat manure + neem leaves), T5 (cow and goat manure + pigeon pea leaves). The population of earthworm, the production of vermicompost, and the chemical characteristics of the vermicompost were recorded after 60 or 65 days.

Keywords: Vermicomposting, garden waste, *Eisenia fetida*.

Introduction

In recent years, the disposal of organic wastes from domestic, agriculture and industrial sources has caused increasing environmental and economic problems. Many different technologies to address this problem have been developed. It is estimated that in India nearly 700 million tons organic waste is generated annually included leaves, husk, sawdust, stem barks, flowers etc. which is either burned or land filled (Bhiday, 1994). When these are left as such on-soil surface in excess quantity then it causes problem such as bad smell and forms favorable condition for mosquitoes and other harmful insects. Vermicomposting has been arising as innovative biotechnological process for the conversion of agro-industrial wastes into value-added products (vermicompost and vermiwash), which can be utilized for improving the soil structure and fertility in organic farming (Garg and Gupta, 2009).

What is vermicomposting

Vermicomposting is generally defined as solid phase decomposition of organic residues in the aerobic environment by exploiting the optimum biological activity of earthworm and microorganisms (Garg and Gupta, 2009). Reduced use of water for irrigation, reduced pest attack, reduced weed growth; faster rate of seed germination and rapid seedlings growth and development; greater number of fruits per plant (in vegetable crops) and greater numbers

of seeds per year (in cereal crops) are only some of beneficial effects of the vermicompost usage in agricultural production (Anonymous, 2009). Pure vermicompost is not so good for contains too much nutrients (Olle, 2016 and Olle, 2017). Vermicompost, an organic fertilizer rich in NPK, micronutrients and beneficial soil microbes (nitrogen fixing and phosphate Solubilizing bacteria and actinomycetes), is a sustainable alternative to chemical fertilizers, which is an excellent growth promoter and protector for crop plants (Sinha et al., 2011; Chauhan and Singh, 2015).

(Aalok and Tripathi, 2012) also carried out composting and vermicomposting of process of leaf litters of different plant species namely, Eucalyptus hybrid, *Pinus naxburghii*, *Populus deltoides*, and *Shorea robusta* and leaves of *Panthenium hysterophorus*, mixed with municipal solid waste. Similar types of work were also carried out by (Vasanthi et al., 2013) with mango(*Mangifera indica*) and Guava (*Psidium guajava*) leaves. During vermicomposting process leaf litters mixed with different proportion of cattle dung. (Thangraj 2015) carried out vermicomposting of leaf litter of *Pongania pinnata* with cattle dung in the ratio of 1:1 while (Sandeep et al., 2017) composted leaf litters and cow dung in the ratio of 1:3 ratio. In Maharashtra, farmers grow different crops, but in a respective field's farmers grow certain crops, due to this they can't able to generate good quality of compost, but In this experiment, we have taken different types of leaves. For

analyzing the quality of vermicompost in compare to mixed leaves and kitchen waste mixed with cattle dung and goat manure.

Material and Methods

Collection of Earthworms (*E. fetida*) Worms used in vermicomposting experiment are red wigglers (*Eisenia fetida*). Earthworms (*Eisenia fetida*) were procured from vermicomposting center Phulsing Naik Mahavidyalaya Pusad. *Eisenia fetida* are preferred of its high multiplication rate and thereby converts the organic matter into vermicompost within 60-65 days. **Collection of leaf litters** Organic waste like leaf litters of four plants viz. Banyan (*Ficus bengalensis*), Lemon (*Citrus limon*), Neem (*Azadiracta indica*), Pigeon pea (*Cajanus cajan*) and kitchen waste each of about 2kg use as a substrate. Collected from rural area.

Collection of Cow and Goat manure

As a substrate cow and goat dried manure was collected for the preparation of vermibeds from the rural area. Cow and goat manure was used about 10 kg in each vermibed and pieces of bricks are placed at the base of plastic tubs.

Method of Vermicomposting Construction of vermicompost station

A vermicompost beds arranged in a plastic tub of 1.5 ft (upper diameter) × 0.91 ft (lower diameter) × 0.88 ft (height). For the protection from direct sunlight shady place was selected and for keeping moisture gunny bags were covered over the tubs.

Preparation of culture beds

1st layer- A basal layer of vermibed comprising broken bricks. 2nd layer- Lumps of dry cattle and goat manure spread over the bricks layer. 3rd layer- Dried leaf litters were added on the cattle dung. This sequence of 2nd and 3rd layers repeated up to the three layers. The entire tubs were covered with jute bags (badan) to protect earthworms from sunlight and birds. In this phase, 1 kg composting earthworms, *Eisenia fetida* (epigenic species). The earthworms were cultured for about 2 month was used for the production of vermicompost from dry leaves and cow and goat manure.

Experimental design for vermicomposting Bed design

The vermicomposting experiment was conducted in plastic tubs, for the preparation of vermibed of each combination of cow and goat manure, dry leaves and kitchen waste (in control) in 5:1 ratio. In each tub, 200gm (*Eisenia fetida*) earthworms were inoculated. The entire tubs were moistened and covered with jute bags. It was moistened twice a day and turned once upon 25 days. The first application of feed consisted of 10 kg cow and goat manure and 2 kg of dry leaves.

Treatment 1 (Control)- Cow & goat manure + mixed leaves + kitchen waste.

Treatment 2- Cow & goat manure + Banyan leaves.

Treatment 3- Cow & goat manure + Lemon leaves.

Treatment 4- Cow & goat manure + Neem leaves.

Treatment 5- Cow & goat manure + Pigeon pea leaves.

Watering the Vermibed

To maintain 60% moisture throughout the period of culture, water was sprinkled over the bed as well as jute bags than direct pouring twice a day and turned once upto the harvesting of vermicompost.

Harvesting of vermicompost

As the worms digest food scraps, they produce called a "casting". These casting, which look like dark black threads, make up completed vermicompost. When plenty of casting is present, are ready to harvest the vermicomposting after 60-65 days. During the harvesting of vermicompost upper layer were collected and worms settles down (because they sensitive to light) in the tubs then removed by hands. Harvesting period of vermicompost were different for each six different waste materials. After the casting was observed in large amount and all leaf litters get digested by earthworms, vermicompost and each treatment collected day by day and dried in room temperature for 2 to 3 days. The nutrient content (N,P, K) analyzed by using standard procedures.

Nutrient content Analysis

The nutrient content of the experimental vermicompost samples was done by Fertilizer Control Laboratory, Pusad.

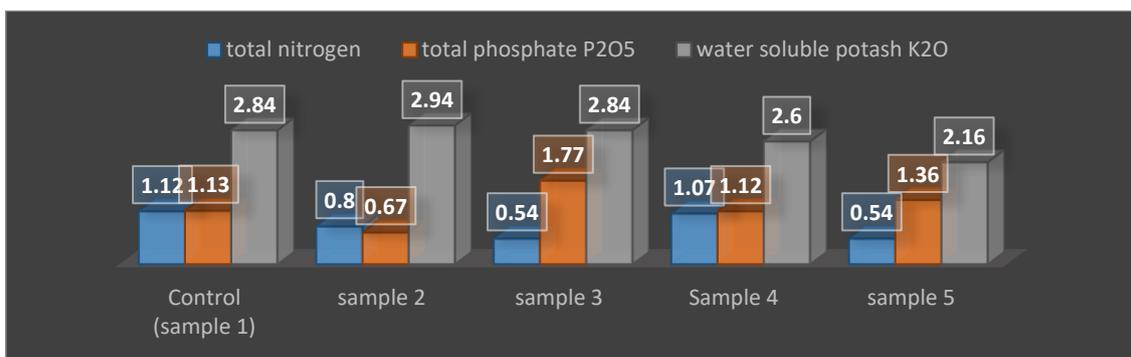
Result and Discussion

Vermicomposting considerably modified the observed characteristics of the initial mixtures. At the end of Vermicomposting process of leaf waste, mixture was recognized dark brown colour and granular form. It was odour less also.

These findings are similar to those previously published by other researchers (Nogales *et al.*, 2005). Nitrogen content in the all the samples are comparatively goes on decreasing than the control samples except the sample 4 (Neem). Total phosphate content is increasing in all samples except sample 2 (Banyan) as it's less than the control value and water-soluble potash content in increasing in sample 2 (Banyan). Constant in sample 3 (Lemon) and goes on decreasing in sample 4 (Neem) and sample 5 (pigeon pea).

Composition as per analysis (in %)	Control (sample 1)	sample 2 (banyan)	sample 3 (lemon)	Sample 4 (neem)	sample 5 (pigeon pea)
total nitrogen	1.12	0.8	0.54	1.07	0.54
total phosphate P2O5	1.13	0.67	1.77	1.12	1.36
water soluble potash K2O	2.84	2.94	2.84	2.6	2.16

Table No.1 Showing Comparative values of NPK in different sets:



Graph. No.1 showing graphical representation of control vs. all Samples

The total nitrogen value observed in present study of 5 samples is ranges from 0.5 -1.12%. the nitrogen value correlate with the study of (Suthar 2009), suggested that the final N content could be related to the quality of the mineralization of the organic matter, as pointed out by (Garg 2011) adding their excretory products, mucus, body fluids, enzymes enhance the N level in the vermicomposting substrate used for worm feeding. Several studies have reported that vermicomposting cause a significant increase in the TN content after worm activity (Garg and Gupta, 2011; Soobhany *et al.*, 2015). The available total phosphate value in samples found in range to 0.67-1.77% the similar observation showed in the (Lee, 1992) increase in amount of phosphate in available from is made as compare as phosphates, exchangeable calcium and soluble

potassium (Orzoco *et al.*,1996). It contains a high concentration of exchangeable K value due to enhanced microbial activity during the rate of mineralization rate (Suthar 2007). The available potassium in the vermicompost samples found in the range of minimum 2.32-2.94%. degradation of dead worms might be another reason for increasing of TKN, because significant portion of worm is protein (Atiyeh *et al.*, 2000). The important goal of vermicomposting is the reduction of disease-causing pathogens in the organic waste. According to reports the vermicompost samples are NPK rich as a requirement of organic fertilizer. Apart from increasing the nutrients the compost also increases the physical structure of the soil and the water holding capacity. Nitrogen content in the all samples are comparatively goes on decreasing than the

control sample except the sample 4 (Neem). Total phosphate content in sample potash content is increasing in samples 2 (Banyan) as its less than the control value. And water-soluble potash content is increasing in sample 2 (Banyan), constant in sample 3 (lemon) and goes on decreasing in sample 4 (Neem) and sample 5 (Pigeon pea).

Conclusion

The vermicomposting of dry leaves, kitchen waste, cow and goat manure using *Eisenia fetida* was successful. The produced vermicompost had a dark color, a mull-like soil odor and was homogenous. It had all the essential macro-plant nutrient rich fertilizer for the agriculture sector. The control sample has high nutrient content than others.

References

1. Aalok A. Tripathi AK (2012): Composting-vermicomposting of different types of leaves using earthworm species *Eisenia fetida*. *Dynamic soil, Dynamic plant 4* (special issue 1): 139-144.
2. Anonymous (2009); Earthworms vermicompost: A powerful crop nutrient over the conventional compost and protective chemical fertilizers for food safety and security-**An-Euras. J. Argic and Environ. Sci.**, (5):01-55.
3. Atiyeh, R.M., Arancon, N.Q, Edwards, C.A and Metzger, J. D. (2001): The influence of earthworm, processed pig manure on the growth and productivity of marigolds, **Bioresource Technol 81**: 103-108.
4. Bhiday M R, (1994): Earthworms in agriculture. **Indian farming**, 43(12):31-34.
5. Garg and Gupta, R. (2009): Vermicomposting of agro-industrial processing waste. In: **Biotechnology for Agro-Industrial Residues Utilization – Springer, Dordrecht**:431-456.
6. Lee, K.E. (1992): Some trends and opportunities in earthworm research or: Darwin's children- the future of our discipline. **Soil Biology and Biochemistry 24 (12)**: 1765-1771
7. Margit (2016): The effect of vermicompost based growth on tomato growth, **Journal of Agricultural science 1**: 38-41.
8. Olle, M (2017): Vermicomposting moju valge peak apsa istika kasvule: Jaimekavatus 2017, Jogeva,29.03.17-jogeva: AS Robellis, 170-174.
9. Orozco, F. H., Cegarra, J., Trujillo, L. M., &Roig, A. (1996): Vermicomposting of coffee pulp using the earthworm *Eisenia fetida*: Effects on C and N contents and the availability of nutrients, **Biology and Fertility of Soils**, **22**: 162-166.
10. Sandeep, Singh D, Yadav J. Urmila (2017): Vermicomposting of winery wastes: **A laboratory study. J. Environ Sci health 34**; 659-673.
11. Sinha, Rajiv, Herat, Sunil, Valani, Dalsukhbhai, Chauhan, Krunalkumar (2009): Earthworms Vermicompost: A Powerful Crop Nutrient over The Conventional Compost & Protective Soil Conditioner against the Destructive Chemical Fertilizers for Food Safety and Security **American-Eurasian Journal of Agricultural & Environmental Science**.
12. Soobhany N, Mohee R, Garg V K (2015): Experimental process monitoring and potential of *Eudrillus eugenia* in the vermicomposting of organic solid waste in Maurities, **EcolEnf84**: 149-158.
13. Suthar S (2007): Nutrient changes and biodynamic of epigenic earthworm *Perionyx excavates* (Perrier) during recycling of some agriculture wastes, **Bioresource Technology 98**: 1608-1614.
14. Suthar S (2009) Verm stabilization of municipal sewage sludge amended with sugarcane trash using epigenic *Eisenia fetida* (*Oligochaeta*). **J Hazard Mater 163**: 199-206.
15. Thangaraj R (2015): Leaf litter waste management by vermicomposting using local and exotic earthworm species, **Journal of Science5(5)**: 314-319
16. Vasanthi K, Chairman K, Ramjit Singh AJA (2013): Vermicomposting of leaf litter ensuing from the tree of mango (*Mangiphora indica*) and Guava(*Psidium*

guajuva) leaves. **International Journal of
Advanced Research 1 (3): 33-38.**

A SIMPLE, "SOLVENT FREE SYNTHESIS OF 3-(BIS(4-METHOXYPHENYL) METHYLENE)5-ETHOXY PENTANOIC ACID AND IT'S ANTIMICROBIAL ACTIVITY

Ghodile R D¹ and Dharamkar R R¹

¹Dept. of Chemistry, S.P.M. Science & Gilani Arts Commerce College, Ghatanji Dist:- Yavatmal, India

²Dept. of Chemistry, VidnyanMahavidyalaya, MalkapurDist:- Buldhana, India

pravinghodile@gmail.com, roshanidharamkar@gmail.com

ABSTRACT

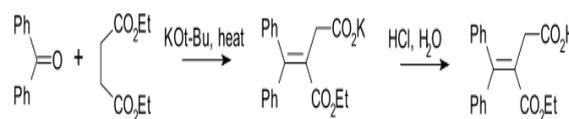
A Simple and solvent free synthesis of alkylidene acid esters by using a mixture of 4, 4 -dichloro-benzophenone and Diethyl succinate was treated with tert.potassiumbutoxide at room temperature. The synthesis of alkylidene acid esters and their different compounds are very popular in the world of synthetic organic chemistry due to their activities such as antibacterial, antiviral and anti-inflammatory. The reaction remained ignored almost for a century, but with the confirmation that alkylidene acid esters possess diverse and important biological properties, the interest in their synthesis has been greatly increased from last decade. In the conclusion, we have developed a simple and solvent free method for the synthesis of compounds containing benzophenone moieties were successfully synthesized in excellent yield and their structures are elucidated using elemental analysis and FTIR, ¹H-NMR spectral analysis. The result of antimicrobial activity reveals that the newly synthesized compound found to have moderate to outstanding antimicrobial effect against various bacteria at all concentrations analyzed.

Keywords : Benzophenone, tert. potassium butoxide, diethyl succinate, 4,4 dichlorobenzophenone, antimicrobial activities etc.

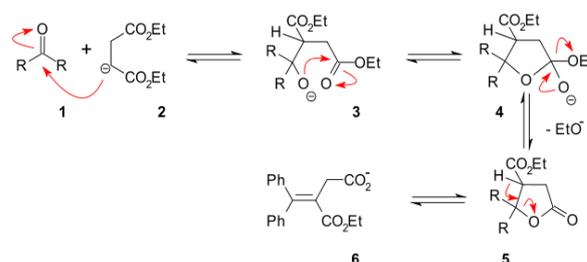
Introduction

In 1893 Hans Stobbe¹ demonstrated that when a mixture of acetone and diethyl succinate was treated with sodium ethoxide the expected acetoacetic ester type of condensation to give a 3-diketo compound, which do not take place; but the main reaction product was Teraconic acid, formed by an aldol type of condensation between the carbonyl group of the ketone and a methylene group of the ester. This reaction was indeed surprising in view of the numerous precedents from the work of Claisen for the former type of behavior. It is striking that this facile aldol type of condensation of esters with ketones is limited to succinic and substituted succinic esters, with few exceptions. Benzophenone condenses with diethyl succinate to give pure 3-carbethoxy-7,substitued-diphenyl-vinylacetic acid² in under the same conditions this ketone in contrast fails altogether to react with ethyl or t-butyl acetate³.

The Stobbe condensation is the reaction in which diethyl ester of succinic acid requiring less strong bases. For example, its reaction with benzophenone as follows:



A reaction mechanism that explains the formation of both an ester group and a carboxylic acid group is centered on an alactones intermediate:



Benzophenone is widely used as photo initiator for inks and lacquers that are cured with ultraviolet light. In the area of food packaging UV-cure inks and lacquers are used without solvent and they contain typically 5–10% photo initiator. UV-cure lacquers are commonly employed either as varnishes for UV-cure printing or as varnishes for materials printed by other processes. Benzophenone is not completely used up or removed during or after the printing process, nor is it bound irreversibly into the print film layer.

In these reaction systems, good to excellent yields (up to 97%) of acylation products were obtained in a short reaction time. This method features high yield, a simple product isolation procedure, ILs reusability and reduced waste discharge, thus rendering this catalytic system both efficient and environment friendly.

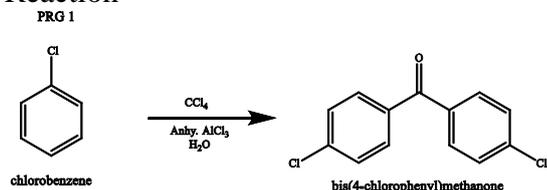
K. Amimoto and etals studied photochromism of organic compound and found Fulgides are important for their photochromic properties⁴⁻⁵stobbe condensation⁶⁻⁷ S. Banerjee &etalsstadied green synthesis of acid ester they reacted different substituted carbonyl compound including aldehyde, aromatic and alicyclic, aliphatic ketones and an active methylene group namely dimethyl succinate were condensed in anhydrous condition and found the reaction is feasible in a dry agate mortar at room temperature, avoiding hazards of using solvent⁸.

Yadav Hanumansingh *et al*⁹ synthesized by greener chemical reaction strategy managed to synthesize Fulgenic acid successfully by simple and efficient means with improved yield. **Experimental Method:**
i) Synthesis of dichlorobenzophenone and its derivatives

A mixture of chlorobenzene react with of carbon tetrachloride in presence of alluminium chloride .This mixture was refluxed for 3-4 hours, after cooling the reaction mixture poured in ice-cold water with stirring till precipitation was complete. Melting point of compound - 139°C

Percentage of yield is 41%

Reaction



Properties of compound:

1.Element detection: Presence of halogen : Sodium extract + dilute H₂SO₄ + boil + dilute HNO₃+ 1% AgNO₃, a heavy curdy white ppt of silver chloride is obtained.

2) Group detection: Test for -CO of ketone. Dissolve a small quantity of sodium nitroprusside in about of 1 ml of distilled water in a clean test tube

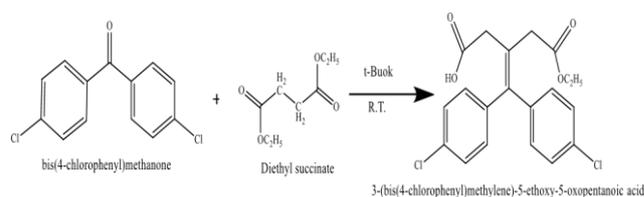
and then add a small quantity of given compound. Shake the test tube well and add sodium hydroxide solution drop wise. Appearance of red colour confirmed the presence of ketonic group.

3) Percentage of elements :

%C	%H	%Cl	%O
62.18	3.21	28.24	6.37

4) Spectral analysis: IR spectral Study

The main absorption bands observed in IR spectrum of compound are shown below.



ii) Synthesis of derivative of 4,4 dichlorobenzophenone.

A mixture of 4, 4 dichlorobenzophenone and D tert.potassimbutoxide at room temperature.

Reaction :

Abs.Obs. (cm ⁻¹)	Assignment	Abs. expected
1494cm ⁻¹	C=C Ring stretch	1600 -
1719cm ⁻¹	C=O stretch of -	1475
1749cm ⁻¹	COOH	1700-
	C=O stretch of Ester	1725
		1735-
		1750

Properties of compound:

1) Element detection: Presence of halogen:Sodium extract + dilute H₂SO₄ + boil + dilute HNO₃+ 1% AgNO₃, a heavy curdy white ppt of silver chloride is obtained.

b) Presence of halogen:Sodium extract + dilute H₂SO₄ + boil + dilute HNO₃+ 1% AgNO₃, a heavy curdy white ppt of silver chloride is obtained.

2) Group detection: Test for -CO of ketone.Dissolve a small quantity of sodium

nitroprusside in about of 1 ml of distilled water in a clean test tube and then add a small quantity of given compound. Shake the test tube well and add sodium hydroxide solution drop wise. Appearance of red colour confirmed the presence of ketonic group.

1485 cm ⁻¹ 1734 cm ⁻¹	C=C Ring stretch C=O stretch	1600 – 1475 1715-1810
--	---------------------------------------	--------------------------

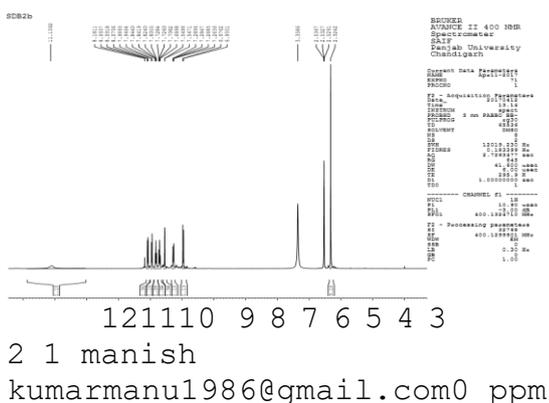
3)Percentage of elements

%C	%H	%Cl	%O
61.08	4.61	18.03	16.27

4) Spectral analysis:IR spectral Study:

The main absorption bands observed in IR spectrum of compound are shown below.

NMR spectral study:¹NMR spectrum shows signals due to three C-H proton of ester at δ 3.35 ppm, singlet due to one hydrogen atom of –COOH at δ 11.13 ppm and aromatic eight protons multiplate at δ6.95-8.18 ppm.



Antimicrobial Activity Of Synthesised Compound:

In the 20 century antibiotics are undeniably one of the most imperative therapeutic discovery that improved or alleviate in human beings that had been effective against serious bacterial infections. The advancement in science and technology occurs in four decades so remarkable progress had been made in the field of

Abs. Observed (cm ⁻¹)	Assignment	Absorption expected
-----------------------------------	------------	---------------------

medicine with the discoveries of many 10 natural and synthetic drugs . However, only one third of the infectious diseases known have been treated from these synthetic

11

products . This is because of the emergence of resistant pathogens that is beyond doubt the consequence of years of widespread indiscriminate incessant and misuse of

12-13

antibiotics . The antibacterial activities of the compounds synthesized in were tested to evaluate their efficiencies against pathogenic organisms.

- i) First the substance to be evaluated must be brought in an intimate contact with the test organisms against which activity is to be estimated.
- ii) Secondly, favourable conditions (nutritional, environmental etc.) must be provided to offer a maximum opportunity for optimum growth of the organisms in absence of antimicrobial agent and
- iii) Thirdly, there should be a method for measuring antibacterial response obtained by antimicrobial agent¹⁴.

The antimicrobial activities of the synthesized compounds against *Escherichia coli* is highly remarkable, synthesized compound was highly active than, *Staphylococcus aureus*, *E.Aerogenes* and *Salmonella typhi*. The synthesized drugs can be used the alternative drugs for the treatment of diseases caused by *E.coli*.

<i>E. Coli</i>	<i>S. Typhi</i>	<i>S. Aureus</i>	<i>E. Aerogenes</i>
Active	Active	Active	Active

RESULTS AND DISCUSSION:

In the present work substituted benzophenone viz. 4, 4 dichlorobenzophenone by reacting them with diethyl succinate. Reaction was carried out in the presence of tertiary potassium butoxide. The reaction mixture stirred for 50 – 60 minutes at the room temperature. The product so obtained is filtered washed with water and crude product

were recrystallized from 80% ethanol. The structure of these compounds was confirmed by FT-IR, ¹H-NMR, and elemental analysis techniques. Spectral data were in good agreement with the composition of the synthesized compounds.

Conclusion : compound containing benzophenone moiety was successfully synthesized in excellent yield; their structure is elucidated using elemental analysis, FTIR, ¹HNMR spectral analysis. The result of antimicrobial activity reveals that all newly synthesized compound found to have moderate to outstanding antimicrobial effect against *E.coli*, *S.aureus*, *E.aerogenes* and

Salomonellatyphi at all the concentrations analysed. Thus it is concluded that these newly synthesized alkylidene acid ester can be used for the development of new antibacterial drugs to cure many disorders caused by different bacterial species.

Acknowledgment:

The Authors are very thankful to the Department of Chemistry VidyanMahavidyalaya Malkapur & S. P. M. College Ghatanji for provide the necessary facilities in the laboratory. And also to CDRI, Lucknow for providing the Spectral analysis.

References

1. Stobbe, Ber26, 2312 (1893). A review article dealing, in part, with the Stobbe condensation has been published by Mile. D. Billet, Bull. soc.chim. France, [51, 16, D297- 321 (1949).
2. Johnson, Petersen, and Schneider, J. Am. Chem. Soc., 69, 74 (1947).
3. Johnson, McCloskey, and Dunnigan, J. Am. Chem. Soc., 72, 514 (1950).
4. S. Banerjee, R. Tayade, B. Sharam, *Journal of Chemistry* Vol.48, pp 882885 (2009).
5. A. M. El-abbady, H. H. Mousa, *Cannadian Journal of Chemistry*. Vol.43 (1965)
6. Frank E. Smith, NgohKhang Goh, Chit Kay Chu, *Applied Organometallic Chemistry*, Vol. 12 pp. 457-466 (1998).
7. F. Beji, J. Lebreton, J. Villieras, *Synthetic communication*, Vol.32 No. 21 pp. 3273-3278 (2002).
8. R. Schobert and Andrea Schlenk, *Bioorganic & Medicinal Chemistry*, Vol. 16 pp 4203-4221 (2008)
9. Yadav Hanumansingh, Gadegone Sunita, Pande Hemant, *Imperial Journal of Interdisciplinary Research (IJIR)*, Vol-3, Issue-3, 2017.
10. Tayade D.T., *Proc.*, 83rd Ind. Sci. Cong., 1996.
11. Preethi R, Devanathan VV, Loganathan M., *Adv. in Bio.Res.* 4(2), 2010, 122-125.
12. Sharma A., *Int. J. of Pharm.Tech. Res.* 3(1), 2011; 283-286.
13. Enne VI., Livermore DM., Stephens P., *The Lancet.*, 28, 2001, 1325-1328.
14. Mukherjee P.K., saha K., Gin S.N., Pal M., Saha B.P., *Indian J. Microbio.*, 35(4), 1995, 327.

CONCERN FOR NATURE AND ENVIRONMENTAL ISSUES IN SECONDARY AND HIGHER SECONDARY ENGLISH COURSE BOOK**Shivraj Punjaram Chincholkar**

Junior college teacher of English, G.S.Gawande College Umarched, Dist. Yavatmal,
Maharashtra, India
shivrajpc@gmail.com

ABSTRACT

Environmental ethics are founded on the awareness, that we all living beings are the part of nature and man being the most intelligent is considered as patron to the nature. Co-existence of man and nature is interdependent. Nature provides the necessary support to man and other living beings on the other hand living beings help nature to grow and develop. In any natural system the well-being of a species is dependent on the growth and harmony of the whole ecosystem. Species other than man has poor understanding of personal and natural growth and development, so it is fundamental ethical responsibility of man to respect and protect nature, its resources and its life supporting systems. Nature should not be taken for granted. Whenever man has exploited the natural resources unethically, nature has responded furiously in the form of ferocious floods, earthquakes, landslide, tsunami and other natural calamities etc. Man might have reached to any level of growth and advancement but the importance of ecological balance for the survival of living beings is same as it was in primitive times. Besides scientists, environmentalists, ecologists and nature lovers, the artists, poets, philosophers, thinkers and writers also have great concern and deep rooted interest for maintenance of the ecological balance and nurturing care for environment. Concern of literary community may be well felt in the literature. If we undertake a literary journey through the literature of any community or language, poets and writers have tried their best to care, protect and preserve the environment. Present research paper is an attempt to study, investigate and understand environmental concerns in the poetry of British American & Indian literature.

Keywords: *Environmental issues, pollution, industrialization, globalization and its effects on human being, deforestation, trees, nature, Eco criticism.*

Introduction

Man and Environment the relationship between man and environment has varied from the early periods of human settlement on the earth to the present day. The environment has considerably affected human beings right from his evolution. Population on earth exists due to variation in the environment. As long as environment is suitable for living being, growth and reproduction continues and populations of different species expand and this process continues till the ecosystem reaches its carrying capacity. At this stage, there is need to establish equilibrium between the living organisms and non-living components of environment. These two are existent in the environment for a long period and if this equilibrium is disturbed, the process of successful living also gets disturbed. Exploiting, selfish and consumerist attitude of modern man has deteriorated the equilibrium of the nature. Ultimately this in-equilibrium created by man has destroyed the peaceful and healthy living conditions for self and other living beings on the name of Industrial Revolution, mechanical power, invention, greater use of natural

resources etc. Exploitation of Nature and Its Resources with the increase in knowledge, skill and development of man for the exploitation of nature and its resources, the need for energy consumption increases. Over use of energy always results in excess production of carbon dioxide and other pollutant elements. It is estimated that carbon dioxide content has increased by 25% in last 100yrs and the global temperature has risen from 0.3 degree Celsius to 0.7 degree Celsius. Increase in carbon dioxide is attributed to large scale deforestation, Industrialization, & automobile use and all of this will lead to smelting of high altitude glaciers and increase in sea level causing submergence of coastal regions. Besides this burning of coal, oil and petroleum (for producing energy to make human life easy and comfortable) add Sulphur dioxide, Lead, carbon monoxide and nitrogen dioxide to atmosphere. These gases result in acid rain which affects aquatic life. Pollutant substances which were not present earlier in the different spheres of environment has got entry are through air, water and soil. The most dangerous one is radioactive substance spewed into the atmosphere by

nuclear explosions. All these pollutants have adverse effects on organisms including man and cause diseases, illness, impairment, irritation, psychological disorders and death. The catastrophe of nuclear disaster at Chernobyl in Ukraine (1988) is a burning example of adverse environmental effects of use of minerals like uranium, thorium etc. through most advanced and sophisticated technology. The environment has already been contaminated to such an extent in certain areas that people are forced to migrate. They are facing scarcity of resources like food and energy. Man's selfish and exploitative attitude has destroyed the environment by polluting not only air, water and land but also organism of biosphere.

Review of Literature

Environmental issues began to be discussed and debated only towards the end of the 20th century. Since then significant amount of literature has been penned down raising awareness about issues of pollution, deforestation, animal rights and several others however it has failed to result in major changes, ideas or even actions to save the environment. Several species of animals have become extinct; pollution level is at an all-time high, global warming is leading to severe climate changes all across the globe but these problems do not seem to alarm the decision makers. Leydier & Martin (2013) also states that, "despite the increasing expression of concern in political and media debates about issues such as climate change, pollution and threats to biodiversity, "political ecology" (operating at the confluence of scientific developments, political engagement and ethical debates) is still trying to find its bearings" (p.7). It is quite evident that environmental issues are not treated in equivalence to political, economic, social or even religious issues. This is because of our market led economy which only focusses on profit, competition and money making rather than a sustainable development approach. "Capitalism" has been identified by several scholars as the root cause for environmental degradation. The biodiversity of lake and pond ecosystems is currently threatened by a number of human disturbances, of which the most important include increased nutrient load,

contamination, acid rain and invasion of exotic species. Analysis of trends suggests that older, well known threats to biodiversity such as eutrophication, acidification and contamination by heavy metals and organochlorines may become less of a problem in developed countries in the future. New threats such as global warming, ultraviolet radiation, endocrine disruptors and, especially, invasion by exotic species including transgenic organisms will most likely increase in importance. However, in developing countries where priorities other than environmental conservation exist, the threat of eutrophication, acidification and contamination by toxic substances is predicted to continue to increase. Although the future of biodiversity in lakes and ponds is seriously threatened, growing concern for environmental problems, implementation of new environmental strategies and administrations, and international agreements, are positive signs of changes that should improve the ability to manage old as well as new, yet undiscovered, threats.

Research Work

Secondary and higher secondary English course book in India have contained with environmental issues like deforestation, pollution, industrialization and its impact on nature, degradation of nature due to urbanization, man Vs wild animal conflicts, etc. I think, Board of Studies main object not only to create awareness in teenager's mind about environmental issues but also make them sentimental about nature. In that case we are going to discuss some poems. Stopping by Woods on a Snowy Evening by Robert Frost Robert Frost's poem "Stopping by Woods on a Snowy Evening" has been well-known for various interpretations on metaphorical levels. I think the poem very well explores the theme of an individual caught between nature and civilization. The speaker in the poem wishes to spend more time enjoying the beauty of nature in the form of the snow-covered woods far from the noises and disturbances of civilization. It was nature at its primitive glorious state. The woods were "lovely, dark and deep" and silence prevailed over the entire landscape. The only sounds that could be heard were the sounds of the harness bells, easy winds and the downy

flake. It was in complete contrast with the buzz and bustles of city life. That is why it was so enjoyable to a person who even felt relieved at the thought that the owner of the woods won't see him watching his woods, as his house was in the village. Again, the speaker couldn't continue watching the woods for long, as he had other responsibilities in life. This is an indication that in this era of modern civilization, we cannot sit in the midst of nature, but have to keep up with our duties in respect to our relations with other individuals and with society at large.

So, to conclude, it's a more than plausible interpretation of Frost's poem "Stopping by Woods" that the poem explores the theme of individual caught between nature and civilization.

Concrete Jungle

We used to walk down the snow sprinkled trail,
Maybe catch a glimpse of a bobcat, playing eye
tricks with its tail

Now there is only one type of bobcat we see
The one that is fur free, clearing the pavement
of all debris

We used to walk through a footpath in a forest
of pine

The smell intoxicating our lungs and mind
Now the only smell to be found comes from
plastic trees

Swaying on my rear-view mirror, labelled pine
breeze

We used to watch the valley play hide and seek
Shadowed by the mountain immeasurable peak

Considered the largest thing known to man
Now skyscrapers are the most extravagant and
titanic part of the plan

We used to sit next to the stream, the wind
caressing our crown

Watching the magnificent untamed beasts roam
far, far from town

Now they are just characters of folktales,
memories we pass down
No more natural goods....

Above poem is the exact description of nature and environmental issues like deforestation, concretization. Due to urbanization nature and wild life totally degrades day by day. Small Towns and The River by Mamang Dai 'Small Towns and The River' by Mamang Dai contains some important themes such as mortality, life vs

death, eternity, nature, and spirituality. The theme of mortality haunts the poet the most. Through the symbol of "small towns", the poet introduces this theme. Moreover, the theme of life vs death is integral to the poetic reflection on mortality. The imagery used to depict this theme can be found in the "wreath of tuberose" and the river that remains constant throughout the poem. In the poem, the river symbolically depicts nature and its permanence. Apart from that, the poet resorts to the cozy bosom of spirituality for recovering from grief. The hope of the afterlife gives the poet peace of mind.

Upon Westminster Bridge: by William Wordsworth While William Wordsworth was taken with the glory of nature, that does not mean to say that he was unaware of the beauty offered in other places as well. London, although considerably not natural, has attracted the attention of several poets, among them Wordsworth. In the early morning, the poet stands on Westminster Bridge, which connected the poor and the rich areas of London, and reminisces on the beauty of London in the early morning. Wordsworth's poems were a celebration of the natural beauty provided by the earth, and it is thus unusual to come across a poem of his that so celebrates the beauty of man-made structures.

Cherry Tree Poem by Ruskin Bond:

The poet Ruskin Bond belongs to India. He considered himself richer having a cherry tree at his door. He felt proud for planting his own tree. The title of the poem is related to the central character i.e., a cherry tree whose journey from planting to upward growth to the blossomed tree is given. The poem deals with the poet's feeling of great joy over a tree that he planted and took eight years to grow. The poem talks about nature; thus, it falls under the category of nature poetry. The tone used is optimism which means that the poet focuses on the growing aspect of nature and how the cherry plant struggles to survive. The poem is realistic as it describes the everyday struggle of a plant to mature into a blooming tree.

Eight years have passed
Since I placed my cherry seed in the grass.
"Must have a tree of my own," I said,
And watered it once and went to bed

And forgot; but cherries have a way of
growing,
Though no one caring very much or knowing.
And suddenly that summer near the end of
May,

I found a tree had come to stay.

The poet says that it has been eight years since he planted a cherry seed in the grass. He did it so that he could have a tree that he could claim but after he watered it once he forgot about it and went to bed. The poet explains that cherries can grow even when they are not being taken care of, they can grow naturally without having to water every day or take care of it. Suddenly that summer by the end of May the poet notices a tree growing from the place he planted the seed. Ruskin Bond here minutely observes growth of tree and he surprised about the nature

because he just panted a seed and totally forgot about it but after eight years he found that the nature made its duty and small sapling converted into a huge tree. He surprised about the growth of tree and nature's power.

Conclusion

Nature and human are interrelated things. We directly or indirectly depend on nature. Many artists, poets, writers and thinkers have inspired from nature since ancient time. The environment is essential to every species in the world and humans need to acknowledge that their activities are destroying us necessarily. We need to do our job of spreading awareness of environmental issues so that we can limit the negative impact the human has.

References

1. Literary criticism and Literary theory by Pramod K. Nair.
2. Higher secondary course book of Maharashtra state Board
3. Secondary course book of Maharashtra state Board
4. Literary criticism and Literary theory by M.H. Abraham

BIOCHEMICAL CHARACTERIZATION AND SECONDARY METABOLITE PROFILING OF BLACK CHERRY HEIRLOOM TOMATOES

Kunal Dhokne^{*1}, Anil N. Khade²

^{*1}Department of Botany, Shri Vitthal Rukhmini Arts, Commerce and Science College, Sawana, Maharashtra, India

²Department of Zoology, Shri Vitthal Rukhmini Arts, Commerce and Science College, Sawana, Maharashtra, India

ABSTRACT

Tomato (Solanum lycopersicon L.) is an important vegetable crop with numerous uses with a high nutritional value as dietary carotenoids serve as a precursor for vitamin A and prevent several chronic-degenerative diseases. Carotenoid profiling is necessary to understand its importance on human health. In tomatoes, carotenoids are important concerning major breeding traits such as fruit color and human health. In our study, we have selected black cherry and black pear heirloom tomatoes and Arka vikas as control. To investigate these heirloom lines, we have studied the biochemical parameter of these heirloom lines and secondary metabolite profiling of the lines. As tomato is a climacteric fruit, we have estimated ethylene content, and levels of chlorophyll by GC-and carotenoid intermediates by HPLC. In the ripening stage of Black Cherry and black pear phytofluene level is completely absent and the lycopene level is 3-fold less in comparison to Arka Vikas. The major carotenoids like phytoene content in ripen stage of Black cherry are completely absent and in the case of Black pear are low.

Keywords: Black Cherry, Carotenoid, Primary metabolites, Arkavikas (AV), Black cherry (BC), Black Pear (BP)

1. Introduction

Fruit and vegetables are of great importance in the human diet, providing the major source of bioactive substances. Among these, tomato (*Solanum lycopersicum*) stands out for its commercial and nutritional properties. Tomato consumption, as processed products or fresh fruit, is higher than that of all other fruits and vegetables due to their year-round availability and accessible prices. Tomato consumption has been related to a reduced likelihood of several chronic diseases, including cardiovascular disease (Wu et al., 2007) and certain cancers (Giovannucci, 1999), and age-related macular degeneration (Seddon & Kiew, 1996). These health benefits have been widely attributed to their key antioxidants such as carotenoids, vitamins, and phenolic compounds (Gómez-Romero et al., 2017). Therefore, the study of tomato fruit development, carotenoid biosynthesis pathway, and fruit ripening processes gain much importance, which is useful in tomato crop improvement. Ripening of fruit is a complex and genetically programmed process. Ethylene a gaseous phytohormone plays an important role in fruit ripening and also in plant growth and development. Ethylene can

alter plant physiology and morphology due to its effect on regulating gene expression (Moctezuma et al., 2003). Such regulation depends on the normal ability of the plant tissues to perceive ethylene and initiate signal transduction. Carotenoids comprise a large group of ubiquitous pigments. In plants carotenoids play indispensable roles in light harvesting and as precursors of the plant hormone abscisic acid (Meléndez-Martínez et al., 2022) They are produced via the general isoprenoid biosynthetic pathway in chloroplasts of photosynthetic tissues and the chromoplasts of fruits and flowers. Tomato is an important model for studying the regulation of carotenoid biosynthesis during fruit ripening (Stanley & Yuan, 2019). The red colour of tomato fruits results from the accumulation of lycopene which constitutes the major portion of the chromoplast carotenoid pool. Therefore, a study of carotenoid contains give an overview of the ripening processes of fruits.

In the present study, we perform biochemical analysis and estimated ethylene content in the red ripe stage to validate the role of ethylene in the fruit ripening process. We also estimate the important carotenoid that plays an essential role in fruit ripening and gives an insight into it.

2. Material and methods

2.1. Plant Materials and Growth Conditions

Arka Vikas (AV) variety was used as control, and black cherry (BC) and back pear (BP) heirloom varieties were used to study biochemical characterization and secondary metabolite profiling of tomatoes. The seeds were surface sterilized with 4% (v/v) sodium hypochlorite approximately for five to ten minutes till the seed coat became thinner which was evident by the visibility of the embryo. Thereafter, seeds were washed thoroughly in distilled water till the hypochlorite smell goes off and spread on filter papers moistened with distilled water in plastic cups for germination. These cups were kept in the darkroom at a temperature of $25 \pm 2^\circ\text{C}$. After seeds germination, seeds were transferred to plastic germination boxes filled with coconut peat. These boxes were kept in a growth room for twenty days then these seedlings were transferred into pots filled with red loam sandy soils in the open field.

2.2. Measurement of fruit firmness

Fruit firmness was measured by Durofel DFT-100 (Agrotech). Two measurements were taken at the equatorial positions of each fruit two times and an average was taken into consideration. The firmness unit was expressed in percentage DUR.

2.3. Measurement of soluble sugar

To measure the soluble sugar from the fruit's pericarp tissue was taken. The pericarp tissue was ground with mortar and pestle. The homogenized sample was filtered with a sieve and sap was used for the measurement. A 300 μl of sap was overlaid on the optical lens digital refractometer (ATAGO, Tokyo, Japan). As measured by a refractometer, Brix detects reduced sugars and other soluble compounds. (1° brix is approximately 1% (W/V) soluble sugars).

2.4. Estimation of Chlorophyll

Chlorophyll was estimated from the fruit tissue. About 50 mg of fruit pericarp tissue was homogenized in a bead beater with 2 ml of 80% acetone (v/v). Then the samples were incubated overnight at 4°C and the next day it was centrifuged at 13,000 rpm for 10 minutes. The absorbance was recorded at 663 nm, 645 nm, and

470 nm for Chl a, Chl b, and total Carotenoids respectively, using UV-Vis spectrophotometer (UVICON-Kontron instruments). The content of chlorophyll a and b were calculated using the following formulae.

$$1. \text{Chl a } (\mu\text{g/g fresh weight}) = (12.28 \times A_{663} - 2.79 \times A_{645})$$

$$2. \text{Chl b } (\mu\text{g/g fresh weight}) = (21.5 \times A_{645} - 5.10 \times A_{663})$$

2.5. Estimation of ethylene

The fruits were harvested at different stages of ripening, weighed and sealed individually in the air-tight containers, and incubated for at least 4 hrs. Then, 1 ml of headspace gas was taken from the container using a syringe and injected into a gas chromatograph (model GC-17A, Shimadzu, Kyoto, Japan) equipped with the flame-ionization detector and packed column (Pora pack "T"). The column, injector, and detector temperature were set at 110°C , 125°C , and 150°C respectively. The gases used for the mobile phase and flame initiations were nitrogen and hydrogen respectively. Ethylene evolved from the fruit samples was calculated by comparing the area obtained of the standard ethylene using the known volume of gas (Chemtron science) using the following formula and expressed in nl/g/hr Fw.

$$\text{Ethylene (nl/g/hr FW)} = (A * V - W * X) / (Y * T) * 1000000$$

a= area of standard, v= volume of container, W= weight of the fruit, X = Area of sample, Y = weight of sample (in gram), T= incubation time (in hour)

2.6. Carotenoid extraction and Quantification

Carotenoids were estimated from different stages of fruit development, for carotenoid estimation, pericarp tissue from fruit was excised. Carotenoids are sensitive to light degradation; therefore, extraction was performed under dim light. Freeze-dried tissue of tomato fruit (150 ± 10 mg) was grounded into powder with a hand-held homogenizer (IKA A11). Extractions were performed in Eppendorf tubes (2.0 ml) and the entire process was carried out on the ice. The samples were extracted in 1000 μL of chloroform and 500 μL of dichloromethane. The suspension was mixed in a Thermo mixer at 1000 rpm for 20 min at 4°C . NaCl saturated solution was then added (500 μL) and was mixed by inversion. A clear

partition of layers was formed by centrifugation at 5000g for 10 min at 4°C. The organic phase was aliquoted and the residue was re-extracted with chloroform (500 µL) and dichloromethane (250 µL) in the same way without the addition of NaCl. Samples were dried using a Speed Vac concentrator (Thermofisher Scientific USA) at room temperature. The residues were suspended in 200 µL of MeOH: MTBE (1:3 v/v) for HPLC. Twenty µl of the sample was injected into the HPLC.

2.7. Statistical analysis

All measurements and estimations were done with at least three biological replicates of control arka vikas and three experimental replicates at each stage of fruit development. The data were represented in the form of graphs using their mean and standard error values plotted by Excell.

3. Result and discussion

3.1. Measurement of Firmness of fruit

Firmness plays an important role in the shelf life of the fruit. Fruit ripening results in a change in levels of cell wall components (Sridhara et al., 2021). There is a decrease in the level of galactose, arabinose, and galacturonic acid and an increase in polyuronide. The action of polygalacturonase results in the solubilization of pectin and softening of the parenchymatous cell wall (Paniagua et al., 2014). The hydrolysis of neutral sugar polymers weakens the complex network of polysaccharides that compromise cell walls and results in loss of fruit firmness. As the ripening progressed the firmness value of fruits decreased from mature green to red ripe. here in our study, we observed that the firmness of Black cherry tomatoes decreased by 20% at the red ripe stage while dramatically increasing in black pear by 15 % as compared to the control.

3.2. Total soluble sugars content

In tomato sugar content of fruit increases during fruit development and ripening. The active

growth pattern in which the supplement of higher carbohydrates to the fruit tissues could be the reason for high sugar content in the mature green stage (Quigley et al., 2013). Increased levels of sugars after the mature green stage (upto red ripe/orange stage) is part of the ripening process, which involves the breakdown of sugar polymers into their monomers. To know the total soluble solutes at the ripe stages of tomato fruits, Brix was measured. We found The total content of soluble sugars is more black and increased by 25% compared to control and while is are negligible changes observed in black pear.

3.3. Chlorophyll estimation

Chlorophyll a and b were estimated from the leaf at red ripe (RR) fruits (pericarp tissue) of arka vikas, black cherry, and black pear respectively. The chlorophyll degradation and accumulation of carotenoids could be the reason for a gradual decline in the chlorophyll content of fruits (Park et al., 2018). The value of chlorophyll a decreased by 6% and 9% in the case of black pear and black cherry . we found a slightly decreased in the level of chlorophyll b.

3.4. Ethylene estimation

The ripening of fleshy fruits represents the unique coordination of developmental and biochemical pathways leading to changes in colour, texture, aroma, and nutritional quality of mature seed-bearing plant organs. The gaseous plant hormone ethylene plays a key regulatory role in the ripening of many fruits (Iqbal et al., 2017). Tomato is a climacteric, climacteric stage of ripening in which ethylene level, as well as cellular respiration level, is high and ethylene also play an important role in other plants developmental process such as organ expansion, senescence, gene expression, sex determination, and so on. Hence it is very important to know the level of ethylene in the developmental stages of fruit. Here we found a gradually decreased in ethylene levels by 50 % in black pear and 65 % in black cherry as compared to control arka vikas.



Figure.1. plant growth condition and developmental stages of Arka vikas, Black cherry and Black pear.

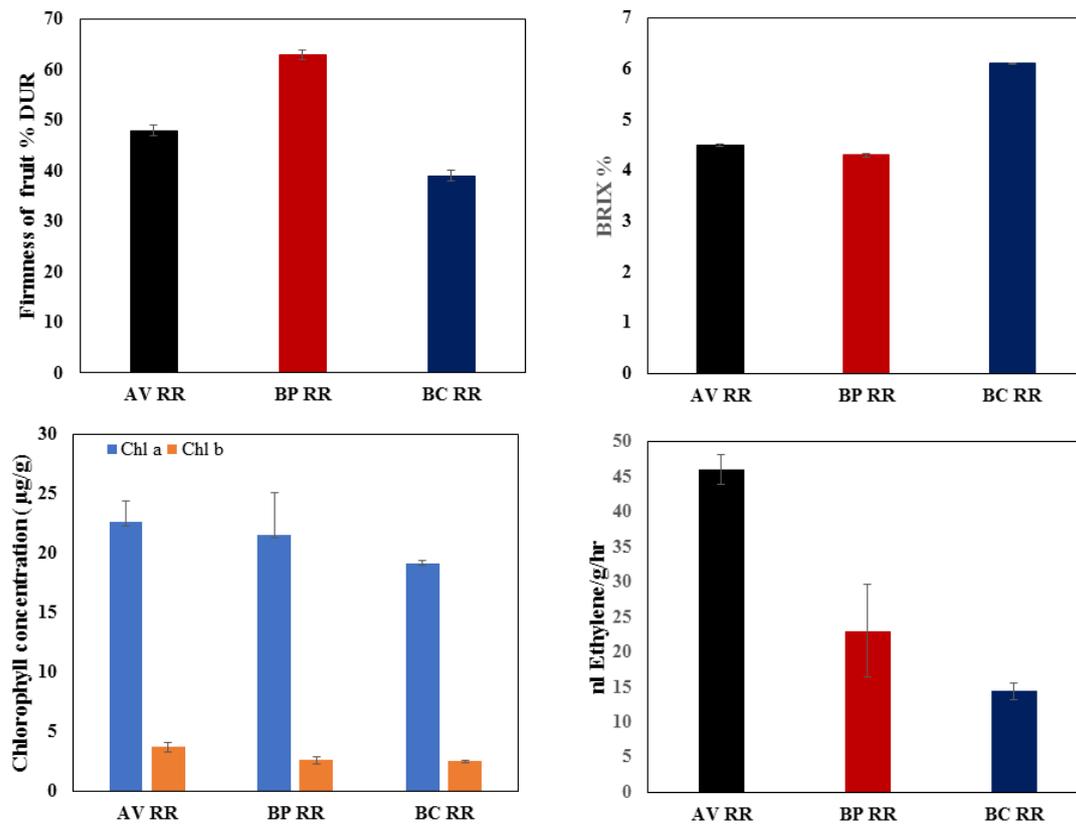


Figure 2. Biochemical analysis of Arka vikas, Black cherry and Black pear. Firmness of fruit (% DUR), Total soluble sugar (Brix 5), chlorophyll concentration (µg/g) and Ethylene gas estimation (nl ethylene/g/hr).

3.5. Measurement of secondary metabolites

Carotenoids are multifunctional compounds serving as structural components of light-harvesting complexes (LHCs), accessory pigments for light harvesting, substrates for abscisic acid synthesis, and components of photoprotection and scavengers of singlet oxygen (Domonkos et al., 2013). Hence it is very important to know carotenoid content at the Red ripe stage of plant development. In our analysis, we found that different carotenoid content such as phytoene, phytofluene, lycopene, beta-carotene, delta-carotene, and lutein at RR stages of fruit development decreased in experimental varieties.

The committed step to carotenoid synthesis is the formation of the C₄₀ compound phytoene, here we found that phytoene level in BP decreased by 65 % absent in BC. In the case of phytofluene level in BC and BP is absent as compared to AV.

Lycopene and β -carotene are the major carotenoid pigments in tomato fruit and mainly play an important role in red colour impartation (Zhou et al., 2022). Constituting around 95% of the total carotenoids. Hence, estimation of the total carotenoid content would give an idea about the lycopene and β -carotene content of a given accession. Total lycopene and beta-carotene content was estimated at RR stage of BP and BC, lycopene was reduced by 75 and 80 % than control AV and there is 30 % decrease in level beta-carotene in BP while 34 % decrease in BC. Lutein, a dihydroxy derivative of α -carotene, it is the most abundant carotenoid in photosynthetic plant tissues where it plays important roles in light-harvesting complex-II structure and function. In red ripe stage, we found lutein levels decreased by 30 % and 42 % in the case of BP and BC whereas the level of delta-carotenoid decreased by 24 and 30 % in the case of BP and BC.

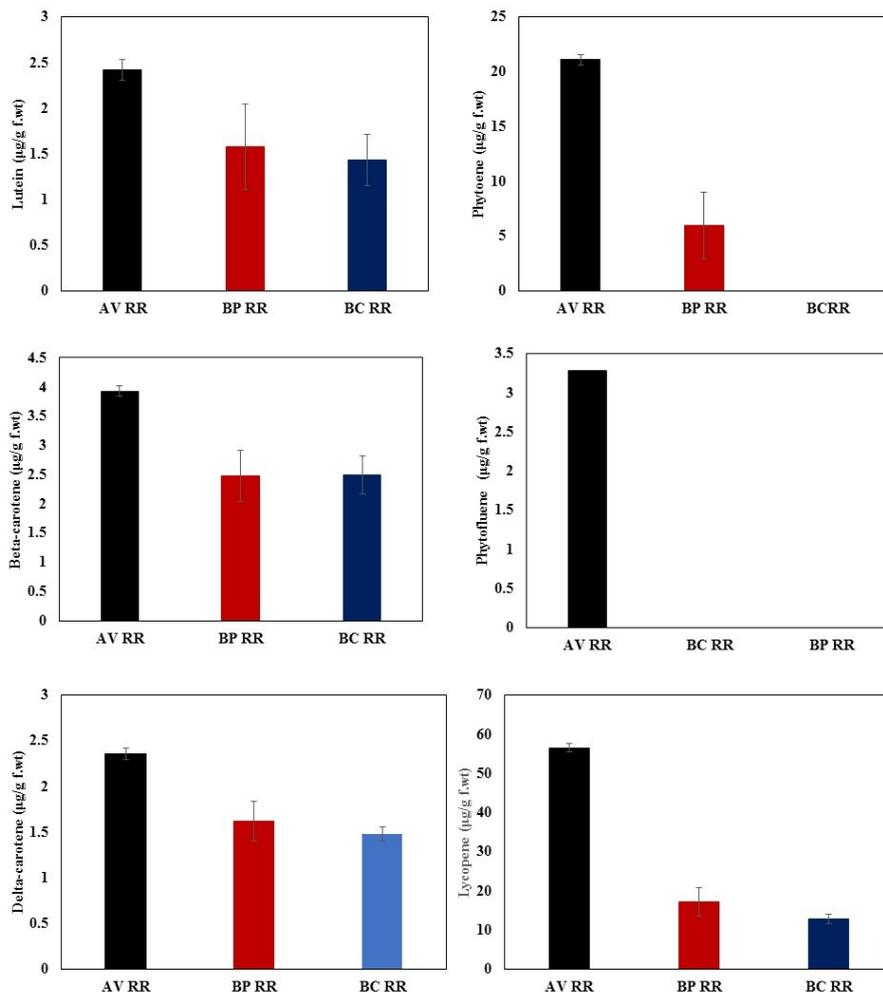


Fig.3. Estimation of total secondary metabolites. Concentration of phytoene, phytofluene, lycopene, beta-carotene, delta-carotene, and lutein ($\mu\text{g/gf.wt}$)

4. Conclusion

Based on the finding discussed in this study, we conclude that at red ripe fruit firmness, total soluble sugar, chlorophyll a and b decreased significantly while ethylene gas production increased dramatically in both black pear and

black cherry tomatoes lead to early riping as compared to control. The concentration of phytoene, phytofluene, and Lycopene decreased significantly whereas the concentration of beta-carotene, delta-carotene, and lutein decreased marginally at the red ripe stage in black pear and black cherry.

References

1. Domonkos, I., Kis, M., Gombos, Z., & Ughy, B. (2013). Carotenoids, versatile components of oxygenic photosynthesis. *Progress in Lipid Research*, 52(4), 539–561. <https://doi.org/10.1016/j.plipres.2013.07.001>
2. Giovannucci, E. (1999). Tomatoes, Tomato-Based Products, Lycopene, and Cancer: Review of the Epidemiologic Literature. *91(4)*, 317–331.
3. Gómez-Romero, M., Jiménez-Palomares, M., Rodríguez-Mansilla, J., Flores-Nieto, A., Garrido-Ardila, E. M., & González-López-Arza, M. V. (2017). Benefits of music therapy on behaviour disorders in subjects diagnosed with dementia: A systematic review. *Neurología (English Edition)*, 32(4), 253–263. <https://doi.org/10.1016/j.nrleng.2014.11.003>
4. Iqbal, N., Khan, N. A., Ferrante, A., Trivellini, A., Francini, A., & Khan, M. I. R. (2017). Ethylene role in plant growth, development and senescence: interaction with other phytohormones. *Frontiers in Plant Science*, 8(April), 1–19. <https://doi.org/10.3389/fpls.2017.00475>
5. Meléndez-Martínez, A. J., Mandić, A. I., Bantis, F., Böhm, V., Borge, G. I. A., Brnčić, M., Bysted, A., Cano, M. P., Dias, M. G., Elgersma, A., Fikselová, M., García-Alonso, J., Giuffrida, D., Gonçalves, V. S. S., Hornero-Méndez, D., Kljak, K., Lavelli, V., Manganaris, G. A., Mapelli-Brahm, P., ... O'Brien, N. (2022). A comprehensive review on carotenoids in foods and feeds: status quo, applications, patents, and research needs. *Critical Reviews in Food Science and Nutrition*, 62(8), 1999–2049. <https://doi.org/10.1080/10408398.2020.1867959>
6. Moctezuma, E., Smith, D. L., & Gross, K. C. (2003). Effect of ethylene on mRNA abundance of three β -galactosidase genes in wild type and mutant tomato fruit. *Postharvest Biology and Technology*, 28(2), 207–217. [https://doi.org/10.1016/S0925-5214\(02\)00181-3](https://doi.org/10.1016/S0925-5214(02)00181-3)
7. Paniagua, C., Posé, S., Morris, V. J., Kirby, A. R., Quesada, M. A., & Mercado, J. A. (2014). Fruit softening and pectin disassembly: An overview of nanostructural pectin modifications assessed by atomic force microscopy. *Annals of Botany*, 114(6), 1375–1383. <https://doi.org/10.1093/aob/mcu149>
8. Park, M. H., Sangwanangkul, P., & Baek, D. R. (2018). Changes in carotenoid and chlorophyll content of black tomatoes (*Lycopersicon esculentum* L.) during storage at various temperatures. *Saudi Journal of Biological Sciences*, 25(1), 57–65. <https://doi.org/10.1016/j.sjbs.2016.10.002>
9. Quigley, J. D., Lago, A., Chapman, C., Erickson, P., & Polo, J. (2013). Evaluation of the Brix refractometer to estimate immunoglobulin G concentration in bovine colostrum. *Journal of Dairy Science*, 96(2), 1148–1155. <https://doi.org/10.3168/jds.2012-5823>
10. Seddon, P., & Kiew, M.-Y. (1996). A Partial Test and Development of Delone and Mclean's Model of IS Success. *Australasian Journal of Information Systems*, 4(1). <https://doi.org/10.3127/ajis.v4i1.379>
11. Sridhara, S., Ramesh, N., Gopakkali, P., Paramesh, V., Tamam, N., Abdelbacki, A.

- M. M., Elansary, H. O., El-Sabrou, A. M., & Abdelmohsen, S. A. M. (2021). Application of homobrassinolide enhances growth, yield and quality of tomato. *Saudi Journal of Biological Sciences*, 28(8), 4800–4806.
<https://doi.org/10.1016/j.sjbs.2021.05.008>
12. Stanley, L., & Yuan, Y. W. (2019). Transcriptional Regulation of Carotenoid Biosynthesis in Plants: So Many Regulators, So Little Consensus. *Frontiers in Plant Science*, 10(August), 1–17.
<https://doi.org/10.3389/fpls.2019.01017>
13. Wu, X., Chory, J., & Weigel, D. (2007). Combinations of WOX activities regulate tissue proliferation during Arabidopsis embryonic development. *Developmental Biology*, 309(2), 306–316.
<https://doi.org/10.1016/j.ydbio.2007.07.019>
14. Zhou, X., Rao, S., Wrightstone, E., Sun, T., Lui, A. C. W., Welsch, R., & Li, L. (2022). Phytoene Synthase: The Key Rate-Limiting Enzyme of Carotenoid Biosynthesis in Plants. *Frontiers in Plant Science*, 13(April), 1–9.
<https://doi.org/10.3389/fpls.2022.884720>

STUDY OF DECREASE IN NUMBER OF BUFFALOES POPULATION IN MULAWA REGION TQ.UMARKHED DIST.YAVATMAL,MAHARASHTRA

Bhone,P.S.

Research student,M.sc 2 nd Year, Department of Zoology
Gopikabai sitaram gawande college,Umarkhed

ABSTRACT

This study conducted as a type of survey in a time period duration of 2 month that starts from the end of the june to the end of august total of the 50 houses were visited from each of the selected Mulawa village of Umarkhed Taluka Dist.Yavatmal along with 10 dairy farms study carried out by questionnaires and by the direct meeting with the keepers of buffalos.Mulawa village selected where the more population of buffaloes were found in Umarkhed Taluka.The farm buffalos were kept mostly for the purpose of selling the milk.Government should take steps to rise there stander(1).

Keywords: Buffaloes, population, number, farmer

Introduction

According to Census 2011 information the location code or village code of Mulawa village is 542934.Mulawa village is located in Umarkhed tehsil of Yavatmal district in Maharashtra, India.It is situated 22 km away from sub-district headquarter Umarkhed and 130km away from district headquarter Yavatmal.As per 2009 stats,Mulawa is the gram panchayat of Mulawa village.

The total geographical area of village is 857.43 hectares.Mulawa has a total population of 6,820 peoples, out of which male population is 3,529 while female population is 3,291.Literacy rate of Mulawa village is 71.82% out of which 77.22% males and 66.03% females are literate.There are about 1,618 houses in Mulawa village.There are near about 65-70 buffaloes in Mulawa(2).

Material & method

We used a survey to check the number of buffaloes.In this method we interacted with the farmers through questionnaires.The questions were as below,

- 1)The number of buffaloes in their household earlier and the number now ?
- 2)Benefits of buffaloes rearing ?
- 3)Methods of feeding buffaloes ?
- 4)Reasons behind decrease in number of buffaloes.

From this method we came to know the

average number of buffaloes.

Discussion

We found the herd of buffaloes in Mulawa to be very less than before.In this study we are meet the farmers & asking them about pet animals and we get ,most farmers have buffaloes in more percent by other pet animals . mostly the Murrah and Jaffrabadi breeds are found in this region .In the questions we asked to the farmers ,what was the numbers of buffaloes in their house ? , the information given by farmers that , the number of cows were 10 - 12 inject house during the year 2000 - 2010 . According to the farmers the borders of their farms were well demarkated but now it is seen than it get decreased .Secondly , they were rearing buffaloes for the milk from this study it is concluded that the main reason behind the decreased number of buffaloes is due to feeding problems .Also the feeding area of buffaloes have decreased and ultimately number of buffaloes also decreased.Also the change in mindset of farmers ,like reducing agriculture area of farming and forward towards modern methods of farming.

Result and conclusion

In this study we concluded that the number of buffaloes are very less than previous years .Farmers are facing difficulties while rearing buffaloes like don't getting enough food.

Suggestions

we have seen that raising cattle is not as easy as drinking lassi ,the government should

support to the farmers through seminar.

References

1)Borghese A,Mazzi Buffalo population and strategies in the world. Buffalo Production and Research 2005;67:1-39.
2)Mahar Q.Impact of systematic dairy farm management ON milk production in sindh,Isra University 2013

3)Rosegrant MW.Biofuels and grain prices:impact and policy responses.International Food Policy Research Institute Washington,DC 2008
4)Porter JR,et all.Food security and food production systems.2014.

SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE**Dr.Gajanan Ashruji Rahate**

Assistant Professor and Dept. Of Economics, Abasaheb Parvekar Mahavidyalaya, Yavatmal

India has the tenth largest forest area in the world. In 2020, India ranked third globally in increasing its forest area during 2010 to 2020. The forests covered 24 per cent of India's total geographical, accounting for two per cent of the world's total forest area in 2020. India's forest cover has increased by more than three per cent during 2011 to 2021. This is mainly attributed to increase in very dense forest, which grew by 20 per cent during the period.

In August 2021, the Plastic Waste Management Amendment Rules, 2021 was notified which is aimed at phasing-out single use plastic by 2022. The draft regulation on the Extended Producer Responsibility for plastic packaging has been notified. The regulation seeks to strengthen the circular economy of plastic packaging waste, promote development of new alternatives to plastics and sustainable plastic packaging.

The chapter discusses ground water resource management and the findings indicate that states/UTs need to manage its ground water resources carefully, including recharge, and to stem over-exploitation. The compliance status of Grossly Polluting Industries (GPIs) located in the Ganga main stem and its tributaries improved from 39 per cent in 2017 to 81 per cent in 2020. The consequent reduction in effluent discharge has been from 349.13 millions of liters per day (MLD) in 2017 to 280.20 MLD in 2020.

India had announced its first Nationally Determined Contribution (NDC) under the Paris Agreement in 2015. The Hon'ble Prime Minister of India, as a part of the national statement delivered at the 26th Conference of the Parties (COP 26) in Glasgow in November 2021, announced ambitious targets to be achieved by 2030 to enable further reduction in emissions. The need to start the one-word movement 'LIFE' which means Lifestyle For Environment urging mindful and deliberate utilization instead of mindless and destructive consumption was underlined.

In 2021, India continued exercising significant climate leadership at the international stage under the International Solar Alliance (ISA), Coalition for Disaster Resilient Infrastructure (CDRI) and Leadership Group for Industry Transition (LeadIT Group). The chapter also discusses several initiatives taken in the area of sustainable finance by the Ministry of Finance, RBI and SEBI.

India's progress on sustainable development goals :-

In September 2015, 193 countries including India committed to the Sustainable Development Goals (SDGs) as detailed in the UN resolution, "Transforming our world: the 2030 Agenda for Sustainable Development". The SDGs comprehensively cover social, economic and environmental dimensions and build on the Millennium Development Goals (MDGs), which covered the earlier fifteen-year period from 2000 to 2015.

India has been making strides towards achieving the social, economic and environmental goals covered under SDGs. This achievement gains further significance in the face of the considerable human and economic costs imposed by the COVID-19 pandemic, which has set countries back on their developmental goals and created serious impediments to the attainment of the SDGs, the world over.

Plastic Waste Management and Elimination of Identified Single Use Plastics :-

India is committed to mitigate pollution caused by littered single use plastics. In 2018, the Hon'ble Prime Minister announced that India would phase-out single use plastic by 2022. The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 as amended regulate the import of identified plastic waste into the country by SEZ and EOUs. The regulation of import of plastic waste prevents dumping of plastic waste by other countries in the country and allows for

recycling of plastic waste generated in the India piloted a resolution on "Addressing Single Use Plastic Product Pollution" which was adopted by the Fourth United Nations Environment Assembly held in 2019. The resolution recognizes the need for the global community to act on the single use plastic products pollution. The adoption of this resolution was a significant step.

The following domestic regulatory actions have been taken in 2021:

- i. In August 2021, the Ministry of Environment, Forest and Climate Change, Government of India, notified the Plastic Waste Management Amendment Rules, 2021 prohibiting identified single use plastic items, which have low utility and high littering potential, by 2022. The manufacture, import, stocking, distribution, sale and use of identified single-use plastic, including polystyrene and expanded polystyrene, commodities shall be prohibited with effect from the July 1, 2022.
- ii. In order to stop littering due to light-weight plastic carry bags, the thickness of plastic carry bags has been increased from fifty microns to seventy five microns with effect from September 30, 2021 and to one hundred and twenty microns with effect from December 31, 2022. Increased thickness of plastic bags will also allow reuse.
- iii. The plastic packaging waste, which is not covered under the phase out of identified single use plastic items, shall be collected and managed in an environmentally sustainable way through the Extended Producer Responsibility of the Producer, Importer and Brand Owner (PIBO), as per Plastic Waste Management Rules, 2016.
- iv. For effective implementation of Extended Producer Responsibility the Guidelines for Extended Producer Responsibility being brought out have been given legal force through Plastic Waste Management Amendment Rules, 2021.
- v. In October 2021, the Ministry of Environment, Forest and Climate Change notified the draft Regulations on the Extended Producer Responsibility for

country.

plastic packaging under Plastic Waste Management Rules, 2016, as amended from time to time, in the Gazette of India vide GSR No. 722 (E) for public consultation. The regulation proposes to mandate reuse, minimum level of recycling of plastic packaging waste, use of recycled plastic content, and environmentally sound management of plastic waste. It also seeks to strengthen the circular economy of plastic packaging waste, promote development of new alternatives to plastics and sustainable plastic packaging.

The waste management infrastructure in the States/UTs is also being strengthened through the Swachh Bharat Mission. All States/UTs have been requested to constitute a Special Task Force for elimination of single use plastics and effective implementation of Plastic Waste Management Rules, 2016. In addition, State /UT Governments and concerned Central Ministries/ Departments have also been requested to develop a comprehensive action plan for elimination of single use plastics and effective implementation of Plastic Waste Management Rules, 2016, and its implementation in a time bound manner. A National Level Taskforce has been constituted by the Ministry of Environment, Forest and Climate Change for taking coordinated efforts to eliminate identified single use plastic items and effective implementation of Plastic Waste Management Rules, 2016. All States/UTs and concerned central ministries are members of the National Task Force. The first meeting of the National Task Force was held on 31st August 2021. The Government has also been taking measures for awareness generation towards elimination of single use plastics and effective implementation of Plastic Waste Management Rules, 2016.

Ground water

Ground water is a crucial resource for India's agriculture, industry and drinking water security. However, unsustainable extraction, i.e. extraction in excess of, or close to, annual recharge, can severely compromise ground water resources.

Rivers

India has several perennial and seasonal rivers. The Ganga River Basin is the largest riverbasin in India, covering more than a quarter of country's land area, hosting about 43 per cent of its population and contributing 28 per cent of India's water resources. In recognition of River Ganga's significant economic, environmental, cultural and religious value, the Government of India declared River Ganga as the National River in 2008. Further, the Government of India launched the Namami Gange Mission in 2014 as an integrated and multi-sectoral mission for conservation of Ganga and its tributaries.

Air

Air pollution is one of the biggest global environmental challenges. The Government of India launched the National Clean Air Programme (NCAP) in 2019 to tackle the air pollution problem in a comprehensive manner, with a target to achieve 20-30 per cent reduction in particulate matter (PM) concentrations by 2024 across the country keeping 2017 as the base year for the comparison of concentration. The NCAP is implemented in 132 cities, of which 124 cities have been identified based on non-conformity with national ambient air quality standards for five consecutive years. This includes 34 million plus cities / urban agglomerations identified by the Fifteenth Finance Commission (XV-FC). In addition, NCAP also covers eight other million plus cities, which fall under XV-FC grant for receiving performance based grant for air quality improvement. Figure 26 shows the funds released under the NCAP in 2019-20 and 2020-21. In 2019-20, the highest funds were released to Uttar Pradesh, followed by Maharashtra and Madhya Pradesh while in 2020-21, the highest funds were released to Andhra Pradesh, Punjab and West Bengal.

Several steps are being taken to control and minimize air pollution from various sources in the country, which inter alia include:

i. **Vehicular Emission:** India has leapfrogged from BS-IV to BS-VI norms for fuel and vehicles since April, 2020. Metro rail networks for public transport have been enhanced and more cities have been

covered. Cleaner/alternate fuels like CNG, LPG and ethanol blending in petrol have been introduced. Government has approved Phase-II of FAME Scheme with an outlay of ₹ 10,000 Crore for a period of five years commencing from 1st April 2019. Out of total budgetary support, about 86 per cent of fund has been allocated for demand incentive so as to create demand for electric vehicles in the country. This phase aims to generate demand by way of supporting 7,090 e-buses, 5 lakh e-3 wheelers, 55,000 e-4 wheeler passenger cars (including strong hybrid) and 10 lakh e-2 wheelers. Permit requirement for electric vehicles has been removed.

ii. **Industrial Emission:** Stringent emission norms for coal based thermal power plants have been introduced. There is ban on use of imported pet coke in the country since July 2018, with exception for permitted processes. Online continuous emission monitoring devices have been installed in highly polluting industries. Brick kilns have been shifted to zig-zag technology to reduce pollution.

iii. **Air Pollution due to dust and burning of waste:** Six waste management rules covering solid waste, plastic waste, e-waste, bio-medical waste, construction and demolition waste and hazardous waste have been notified. Waste processing plants have been set up. Extended producer responsibility for plastic and e-waste management has been introduced. Burning of biomass/garbage has been banned.

iv. **Monitoring of Ambient Air Quality:** Air quality monitoring network of manual as well as continuous monitoring stations, under programmes such as National Air Monitoring Programme, have been expanded. Pilot projects have been initiated to assess alternate ambient monitoring technologies such as low-cost sensors and satellite-based monitoring. Air Quality Early Warning System, which provides alerts for taking timely actions, is being implemented in Delhi, Kanpur and Lucknow.

As a result of these initiatives, 96 cities showed a decreasing trend of PM10 concentration in 2020-21 as compared to 2019-20. The number of

cities within the prescribed National Ambient Air Quality Standard (PM10 less than 60 $\mu\text{g}/\text{m}^3$) also increased from 18 in 2019-20 to 27 in 2020-21. However, air pollution remains a major concern, with 36 cities showing an increasing trend in PM10 concentration in 2020-2021 as compared to 2019-2020.

In addition to the above measures, some key measures being taken for reducing air pollution in Delhi / NCR are as follows:

- i. A Commission on Air Quality Management in NCR and Adjoining Areas was promulgated vide ordinance dated 13th July 2021 for better co-ordination, research, identification and resolution of problems surrounding the air quality index.
- ii. To control emissions from stubble burning, under Central Government Scheme on 'Promotion of Agricultural Mechanization for in-situ management of Crop Residue in the States of Punjab, Haryana, Uttar Pradesh and NCT of Delhi', agricultural machines and equipment for in-situ crop residue management are promoted with 50 per cent subsidy to the individual farmers and 80 per cent subsidy for establishment of customhiring centres.
- iii. All diesel vehicles older than 10 years and all petrol vehicles older than 15 years have been banned in Delhi and NCR.
- iv. Expressways & Highways have been operationalized to divert non-destined traffic away from Delhi.
- v. Shifting industries to clean fuel and installation of Online Monitoring of Industrial Emission & Effluent systems in red category industries in Delhi-NCR is in progress.

As a result of these interventions, there has been an improvement in air quality index for Delhi since 2016 .

Climate Change Action program (CCAP) is a central sector scheme, initially launched in 2014, with a total outlay of ` 290 crores for duration of five years. The scheme has now been extended upto 2025-26, and consists of eight broad sub-components including the National Action Plan on Climate Change

(NAPCC) coordination, State Action Plan on Climate Change (SAPCC), National Institute on Climate Change Studies & Actions, National Carbonaceous Aerosols Programme (NCAP), Long Term Ecological Observations (LTEO), International negotiations and capacity building.

India's climate actions, especially the adaptation efforts are largely financed domestically. The National Adaptation Fund on Climate Change (NAFCC) was launched in 2015, and 30 projects with a total allocation of ` 847.5 crores have been sanctioned from 2015-19 (Figure 29). The projects focus on climate sensitive sectors such as agriculture, water, forestry as well as the coastal and Himalayan ecosystem, and are being implemented to enhance the adaptive capacity of the most vulnerable sections of our population and ecosystems.

Conclusion

India's performance on the NITI Aayog SDG India Index has improved from an overall score of 60 in 2019-20 to 66 in 2020-21. India has also been making significant strides in increasing its forest area, ranking third globally in net gain in forest area during the decade (2010-20). Much of India's increase in forest cover during 2011-21 is attributed to enhancement in very dense forest cover, which rose by approximately 20 per cent during the period. Open forest cover also improved by seven per cent during the period. Going forward, there is need to further improve forest and tree cover. Social forestry could also play a significant role in this regard.

States/UTs need to improve management of its ground water resources through improving its recharge and by stemming its over-exploitation, and to prevent the critical and semi-critical assessment units from further worsening.

There is a greater thrust on climate action following the announcement of India's target of becoming Net Zero by 2070. Climate finance will remain critical to successful climate action by developing countries, including India.

References

1. Forest Survey of India. 2021. India State of Forest Report 2021. <https://fsi.nic.in/forest-report-2021-details>
2. Forest Survey of India. 2011. India State of Forest Report 2011. <https://fsi.nic.in/forest-report-2011>
3. Ministry of Jal Shakti. 2021. National Compilation on Dynamic Ground Water Resources of India, 2020. http://cgwb.gov.in/documents/2021-08-02-GWRA_India_2020.pdf
4. NITI Aayog. 2021. North Eastern Region District SDG Index & Dashboard Baseline Report 2021- 22.
5. NITI Aayog. 2021. SDG India Index & Dashboard 2020-21 Partnerships in the Decade of Action.

MATHEMATICAL MODELING METHODS FOR SOLVING ENVIRONMENTAL PROBLEMS FOR SUSTAINABLE DEVELOPMENT**Prof. Mahesh P Thakare**Gopikabai Sitaram Gawande Mahavidyalaya, Umardhed Dist- Yavatmal
profmaheshthakare@gmail.com**ABSTRACT**

The research aim at providing mathematical modeling methods for solving environmental problems for sustainable development. The step of analysis involves application of standard mathematical techniques and procedures to solve the model to obtain the desired results and the analysis is done according to the rules of mathematics and the system.

Keywords-Degradation, Differential Equation, Environment, Environmental Problem, Mathematical Modeling, Simulation, Sustainable Development

I. Introduction**1.0 Background**

By Mathematical modeling, comprises the change of the system under study from its natural environment to mathematical environment in terms of intellectual symbols. The researcher employed some differential equations to model these problems through mathematical formulation and analysis for supporting natural resources allocation, flooding prevention and control, environmental pollution control, ecological protection, and sustainable development improving, where a number of innovative perspectives and findings are advanced. It is known that a single differential equation can serve as a mathematical model for many different phenomena especially in solving environmental problems ranging from groundwater to land use. The research aim at providing mathematical modeling methods for solving environmental problems for sustainable development, having visited the oil spills, gas flare.

1.1 Conceptual Clarification

Differential Equation (DE): An equation containing the derivatives of one or more dependent variables, with respect to one or more independent variables, is said to be a differential equation.

Environment: Environment includes all the factors such as physical, chemical, biological affecting the ecosystem of the unique geographical and biological features like soil,

climate, flora and fauna which create a variety of different types of ecosystem such as forest, fields, and Ocean. The abnormal and unusual environmental and ecological disturbances can upset the stability and even destroy the ecosystem.

Environmental pollution can be described as any undesirable changes in the physical, chemical or biological characteristics of any component of the environment which can cause harmful effects on various forms of life.

Environmental Sustainability

Environmental sustainability is referring to the deliberate efforts by states in international system in relation to policy formulation and implementation aimed at reducing the negative impact of human activities towards the ecosystem e.g. water, land, air and the aquatic animals living inside them and human being inclusive.

Modeling: Modeling can be defined as the process of request of essential information or define the routine of or involvement to simulate a real system to accomplish assured goals.

Mathematical Modeling: The mathematical model or mechanistic approach of environmental systems refers to the mathematical expressions like symbols and equations used to describe factors that results to changes or transformation in environmental Processes with time, space.

Simulation: A simulation of a method is the procedure of a model of the method. The model can be reconfigured and tested with;

frequently, this is difficult, too costly or unrealistic to do in the method it signifies.

Sustainable Development: Sustainable development is a society project, and a political one, that cannot be defined and implemented without science. Broadly defined, sustainable development is a systems approach to growth and development and to manage natural, produced, and social capital for the welfare of their own and future generations. Issues of sustainability are inherently complex and constantly changing.

II. Related Work

Mathematical models in the environmental field can be drawn to back to the 1900s, the original work of Streeter and Phelps on disbanded oxygen being the utmost quoted. Currently, determined essentially by adjusting forces, environmental studies have to be multidisciplinary, distributing with an inclusive range of pollutants experiencing difficult biotic and abiotic processes in the soil, surface water, groundwater, and atmospheric compartments of the ecosphere. It is of great significance to study the parameters of the established mathematical models in environmental processes, by making necessary adjustments, so that the various compartments can be developed in a more conducive system required by man. Environmental processes are usually based on theoretical deductive approach.

Environmental pollution studies conducted to monitor ambient levels and to quantify the concentration of various pollutants entering a given environmental area are of great interest for possible adverse health effects.

The United Nations World Commission on Environment and Development (WCED) in its 1987 report 'Our Common Future' defines sustainable development as: "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Under the principles of the United Nations Charter 'The

Millennium Declaration' identified principles and treaties on sustainable development,

including economic development, social development and environmental protection.

Contaminant transport in groundwater was postulated in 1987, where Bear offered the fundamental equations. Advertise transport and dispersive transport were the two components which Bear presented for hydrodynamic dispersion of the contaminant concentration.

III. Methodology

Mathematical models are recognized as feasible tool that proffers strategic solutions to most environmental and ecological impacts of global warming and climatic change. It is known that a single differential equation can serve as a mathematical model for many different phenomena especially in solving environmental problems ranging from groundwater to land use. In this research, some differential equations are employed to model these problems through mathematical formulation. And these equations can be solve using Analytical and Numerical methods.

The figure below illustrates the various ways of which mathematical model can be formulated in solving Environmental Problems.

The steps of the modeling process shown in FIGURE 1

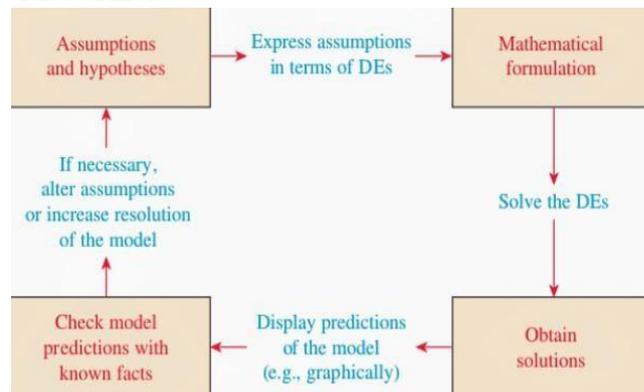


Figure1. Steps in the modeling process

The modeling process above consist; Assumptions and hypotheses, Mathematical formulation, obtain solutions, and Check model predictions with known facts.

Groundwater Flow and Solute Transport Modeling General governing equation for groundwater flow for three dimensional unconfined, transient, heterogeneous, and

anisotropic groundwater flow

$$\frac{\partial}{\partial x} (K_x \frac{\partial h}{\partial x}) + \frac{\partial}{\partial y} (K_y \frac{\partial h}{\partial y}) + \frac{\partial}{\partial z} (K_z \frac{\partial h}{\partial z}) = S_s \frac{\partial h}{\partial t} - R \dots\dots\dots 1$$

where: K_x, K_y, K_z hydraulic conductivity tensor, h :

hydraulic head, S_s : storage coefficient;

R : source or sink

Contaminant transport in groundwater

Advertise transport and dispersive transport were the two components which Bear presented for hydrodynamic dispersion of the contaminant concentration. The outcome of microscopic variation of velocity is an expression of dispersive flux which is a microscopic flux. Bear (1987), postulated the fundamental equations:

$$\frac{\partial (nc^k)}{\partial t} = \frac{\partial}{\partial x_i} (nD_{ij} \frac{\partial c^k}{\partial x_j}) - \frac{\partial}{\partial x_i} (nv_{si}c^k) + q_s s c^k_s + \Sigma R_n \dots\dots\dots 2$$

C^k = Dissolved concentration of species k , kgm^{-3} , n = Porosity of the subsurface medium, dimensionless, t = Time s , x_i = Distance along the respective Cartesian coordinate axis m ,

D_{ij} = Hydrodynamic dispersion coefficient tensor, $m^2 s^{-1}$, v_{si} = Seepage or linear pore water velocity, ms^{-1} , q_s =

Volumetric flow rate per unit volume of aquifer representing fluid sources (positive) and sinks (negative), s^{-1} , Seepage or linear pore water velocity relates to specific discharge or Darcy flux through the relationship $v_{si} = \frac{q_i}{n}$,

C^k_s = Concentration of the source or sink flux for species k , kgm^{-3}

Surface Waters

In surface waters area the mathematical models are used for solving wastewater treatment, industrial pollution, agricultural pollution, protection of potable water sources

The basic equations of the model developed

$$\frac{\partial u}{\partial t} + \frac{\partial u}{\partial x} + g \frac{\partial H}{\partial x} = g \frac{dh_0}{dx} \dots\dots\dots 3$$

$$\frac{\partial A}{\partial t} + \frac{\partial}{\partial x} [A(x, t)u] = 0 \dots\dots\dots 4$$

Where $u(x, t)$ - the average speed of the water flow, $A(x, t)$ - cross-sectional area of the flow, $H(x, t)$ - full depth of the basin, $h_0(x)$ - undisturbed value, g – acceleration of free fall, x – coordinate in the direction of the river flow, t – time.

Cross sectional area of flow is calculated as follows:

$$A(x, t) = \int z(y; x, t) dy \dots\dots\dots 5$$

Analytical solutions have been obtained, which describe the transformation of a steady flow in a channel with variable parameters [3].

Uncertainty of river water quality

A methodology for analyzing the model uncertainty of river water quality was developed, aiming to assess the ecological status of small rivers. Thomann, Mueller (1987) and Chapra (1997) developed the mathematical model, based on the advection-dispersion equation for one-dimensional flow:

$$\frac{\partial c}{\partial t} + u \frac{\partial c}{\partial x} = D_L \frac{\partial^2 c}{\partial x^2} - f(C) \dots\dots\dots 6$$

Where C – concentration of a generic pollutant, t – time, x – longitudinal displacement, u – velocity, D_L – diffusion coefficient, $f(C)$ – a generic term for reactions involving the pollutant C .

System of equations of Sen - Venan

A mathematical model based on the system of equations of Sen–Venan. It was used the one dimensional continuity equation and the equation of motion

$$\frac{\partial v}{\partial x} + V \frac{\partial \omega}{\partial x} + \frac{\partial \omega}{\partial t} = q \dots\dots\dots 7$$

Where Q – water consumption (m^3/s), ω – cross sectional area (m^2), V – the average flow velocity (m/s), q – side flow per unit of length (m^2/s), x - spatial coordinate (m), t - coordinated time (s)

IV. Results And Discussion

Interpretation and evaluation of results

During the iterative process, performance of the model is compared against the real system to ensure that the objectives are satisfactorily met. This process consists of two main tasks; calibration and validation.

Task 1: Calibrating the model: In the calibration process, observed data from the real system are used. An efficient way to calibrate a model is to perform preliminary sensitivity analysis on model outputs to each parameter one by one. If the model cannot be calibrated to be within acceptable limits, the modeler should backtrack and reevaluate the system characterization and/or the model formulation steps [1].

Task 2: Validating the model: A model can be considered valid if the agreement between the two under various conditions meets the goal and performance criteria. Most environmental systems can be approximated in a satisfactory manner by linear and time variant descriptions in a lumped or distributed manner, at least for specified and restricted conditions. Analytical solutions are possible for limited types of systems; while computer based mathematical modeling using numerical solutions provide solutions for problems of complex geometry and properties.

Table 1: Typical Procedures of Mathematical Models used in solving problems in different environmental matrices.

Environmental media	Issues/ concerns	Use of models
Atmosphere	Hazardous air Concentration profiles; pollutants, air exposure; design and emissions, toxic analysis of control releases, acid processes and equipment; rain; particulates, evaluation of management smog, health actions; environmental concerns impact assessment of new projects; compliance with regulations	
Surface water	Wastewater Fate and transport of treatment pollutants; concentration plant plumes; design and discharge analysis of control industrial processes and equipment; discharges; waste load allocations; agricultural evaluation of management /urban runoff; actions; environmental storm water discharge; impact assessment of new potable water projects; compliance with source; food regulations chain	

Groundwater	Leaking Fate and transport of underground pollutants; design and storage tanks; analysis of remedial leachates from actions; drawdowns; landfills and compliance with agriculture; regulations injection; potable water source
	Subsurface Land application Fate and transport of solid pollutants; concentration and plumes; design and hazardous wastes; analysis of control spills; processes; evaluation of leachates from management actions landfills; contamination of potable aquifers
	Ocean Sludge disposal; Fate and transport of spills; outfalls; pollutants; concentration food chain , plumes; design and analysis of control processes; evaluation of management actions .

Mathematical analysis; This step of analysis involves application of standard mathematical techniques and procedures to solve the model to obtain the desired results. The analysis is done according to the rules of mathematics and the system.

V. Conclusion And Future Scope

In this research, some differential equations are employed to model the problems through mathematical formulation. And these

equations can be solve using Analytical and Numerical methods The Mathematical models in this research describe complex environmental processes and interactions, characterize the spatial and temporal variations, and predict the fate and transport of the contaminants; thereby assess potential risks existing in various resources-related activists and the associated socioeconomic and environmental impacts under a variety of system conditions. This work can be modified and expand upon in the future.

References

[1]. B. A. Zeidan, "Mathematical Modeling of Environmental Problems" Faculty of Engineering, Tanta University, Egypt, **2015**.

[2]. M. Dyvak.; A. Rot.; R. Pasichnyk; V. Tymchyshyn.; N. Huliiev.; Y. Maslyiak, "Monitoring and Mathematical Modeling of Soil and Groundwater Contamination by Harmful Emissions of Nitrogen Dioxide from Motor Vehicles". Sustainability **2021**

[3]. G, MARUSIC (), "A study on the mathematical modeling of water quality in "river-type" aquatic systems". WSEAS

TRANSACTIONS on FLUID MECHANICS.

- [4]. J.P. C. Mbagwu, B. M. Obidike, C. W. Chidiebere, C. E. Enyoh ,
"Series Solutions of Mathematical Modeling of Environmental Problems". world Scientific News; An International Scientific Journal. WSN 160, **2021**.
- [5]. L. Ao, "Mathematical Modelling of Ecological Systems in Patchy Environments" (**2021**).
- [6]. M V Volik, "The use of mathematical modeling methods for solving geoeological problems of sustainable development of regions", Conferences **2020**
- [7]. UN REPORT "NO CLEAN-UP, NO JUSTICE, AN EVALUATION OF THE IMPLEMENTATION OF UNEP's ENVIRONMENTAL ASSESSMENT, NINE YEARS ON. JUNE **2020**.
- [8]. O. C. Joachim, "GLOBAL ENVIRONMENTAL SUSTAINABILITY AND THE IMPLEMENTATION OF THE 2011 UNITED NATIONS. South East Journal of Political Science **Vol.4 No1, 2018**.
- [9]. O. H. Yakubu; "Addressing Environmental Health Problems through Implementation of United Nations Environment Program Recommendations": Environmental Management Strategies. Environment MDPI, **2017**.
- [10]. P. Gurme, M.N.Hedao, Environmental Degradation, "A Mathematical approach with Context of Population, Poverty and Demand". (Formulation of Hedao Gurme IPAD Equation), Compliance Engineering Journal **Volume 10, Issue 12, 2019**
- [11]. S, Salma, C. Anita, and G. Radha, 'A Review - Mathematical Modelling on Water Pollution and Its Effects on Aquatic Species'. Advances in Applied Mathematics (AAM - 2019).
- [12]. S. Shikaa, R.I Taparki and H.U. Waniyos, "A Mathematical Model to Study the Dynamics of Hazardous Substances in E-Waste on Ecosystem in Developing Countries". Mathematical Theory and Modeling, IISTE Journal **Vol.5, No.8, 2015**.
- [13]. "Special Issue On Environmental System"; International eJournal of Mathematical Modeling and Analysis of Complex Systems: Nature and Society **Vol 1, No 1, 2015**.
- [14]. United Nations Environment Programme: "Environmental Assessment. First published by the United Nations Environment Programme, **2011**.
- [15]. X Jingjing, "Ecology and Evolution of Dispersal in Metapopulations". Electronic Thesis and Dissertation Repository, **2018**.
- [16]. Y. P. Li, G. H. Huang, S. L. Nie, B. Chen and X. S. Qin, "Mathematical Modeling for Resources and Environmental Systems", Hindawi Publishing Corporation Mathematical Problems in Engineering Volume **2013**.
- [17]. N. Nirmalakahandan, "Modeling tools for environmental engineers and scientists", CRC Press LLC, **2002**.
- [18]. R. Chaudhary, S. Soni, "Assessment and Impact Study of Pesticides Residue Pollution in River Water", A Review. International Journal of Scientific Research in Multidisciplinary Studies **Volume-5, Issue-4, pp.01-14, 2019**.

- [19]. C. Singh, "Environmental Science and Sustainable Development: Educating Students about It", *International Journal of Scientific Research in Multidisciplinary Studies* **Volume-2, Issue-4, 2016**.
- [20]. D. G. Zill (2017), "Advanced Engineering Mathematics Sixth edition", Loyola Marymount University. Description: Burlington, MA: Jones & Bartlett Learning.
- [21]. F. E. Cellier, "Continuous System Modeling", Springer - Verlag, New York, **1991**.

**STUDY OF MAGNITUDE OF DESTRUCTIVE EFFECT OF BOLLWORM
(HELICOVERPA ARMIGERA) AND PINK BOLLWORM
(PECTINOPHORAGOSSYPIELLA) ON COTTON CROP AT KHARUS (KHURD)
REGION, UMARKHED**

Mahesh Vilasrao Gadekar

Student of M.sc 2nd year, department of zoology, Gopikabai sitaram Gawande college umarkhed

ABSTRACT

The present investigation was carried out at the farm of different farmer's in kharus (khurd) region during 2021-2022 kharip season. The present investigation data show that the observation on cotton plant is totally affected by pink bollworm (pectinophoragossypiella) and white common bollworm (Helicoverpa armigera) it reduces the yield and quality of cotton in the given field of different farmer's. The larvae of cotton bollworm is feeded on wide range of plant which including cultivated crops such as soybean (glycine max), as well as different grasses and shrubs, initially both species are feeds on cotton leaf, and during flowing stage at August, it's feed on buds of cotton flowers, and in September month it's initiated to damage whole bolls of cotton crop. Larval stage of both species is generally feeds on the buds of cottonflowers. The Life cycle of cotton bollworm is of 30 to 35 days.

Keywords:- pectinophoragossypiella, Helicoverpa, armigera cotton boll, larvae, buds of cotton.

Introduction:-

Cotton (*Gossypium hirsutum*) is also called as white gold. In Vidarbha, region Maharashtra States, it's primary crop of farmer's. Is also called as king of fibers which produces large amount of fibers. Yavatmal is also known for white gold district in Vidarbha. Cotton belongs to the family malvaceae and genus *Gossypium* [1]. Cotton is commercially used to making the Seeds, clothes, world wide, it's seeds also Used for making oil and feeder for animals. Pink bollworm (*Pectinophora gossypiella*) [2], and common white bollworm (*Helicoverpa armigera*) [3], both are the most important destructive species of cotton plant. India account for about 32% of the global cotton and contributed to 21% of the global cotton [3]. Pink bollworm distributed in all most all cotton growing States of the country and has caused millions of the rupees of damage. Cotton crop is day by day affected by different pest and disease which resulting in decrease in a quality as well as quantity of cotton. Cultivating area is also decrease due to effect of bollworm and other pest from 2017. Cotton yield decrease every year continuously. Impact of that the international market of cotton in net quantity reduce annually.

Materials and methods:-

Field experiment was carried out at different area of kharus (khurd) region. There were totally four farm's field area's had by observation method. Each and every farm land present at different places having different directions each and every samples of boll were from different farm. Every boll were dissected and observed for pink bollworm damage with the help of blade and cutters. All boll randomly selected from four different area's having different plant. By the method of observation, the given field work experiment was conducted. The data generated were statistically analysed by using graph.

Discussion:-

This research required time more than two months. The research was already done by **J.s. Ingole, P.w. Nemade and S.b Kumere**. In My observation in given field area's of cotton was initially not affected by bollworm in August months at date of 22, but in September 10th there were initially effect observed on buds and bolls. Which indicates that bollworm, at beginning attack on bud condition and it's larval form further damage the bolls of cotton plant. Those bolls were first formed, which does not affected by pink bollworm but second and third staged bolls

were observed to be affected. Hence that there was a decrease in the quality and quantity of cotton.

Result and conclusion:-

In the present investigation there were totally four areas of farm field selected as located in different and opposite directions. One plot was in the East, second was in the North, third was in the West and fourth was in the South direction. Out of four plots, three plots were similarly affected in ratio but one plot was not much affected by bollworm which is due to the forest area. Due to the forest region in the East, most of the birds feed on this bollworm and hence, there was less effect observed of bollworm in the East area of fields. Remaining three were maximum affected by pink bollworm. Out of 100 bolls, 30 were damaged by pink bollworm and 22

damaged by white bollworm. Due to this type of destruction caused by bollworm day by day the quality and yield of cotton decrease annually.

Table No-1 Irrigated field area's

Field area's	Affected bolls per plant	Total yield per Hactor
1	35/100	16.70kt
2	30/100	17.40kt
3	32/100	16.70kt
4	27/100	18kt

Table No-2 Non irrigated field area's

Field area's	Affected bolls per area	Total yield per Hactor
1	28/100	14kt
2	34/100	12kt
3	39/100	10.35kt
4	43/100	8.70kt

References

1. Girhe Av. Adoption of integrated nutrient management practice by cotton growers. MSc(agri) thesis (unpub) Dr.pdkv.akola,2011.
2. J. Ingole cotton research unit, Dr.P.D k.v.Akola Maharashtra India P.W.Nemade, cotton research unit,Dr.P.D.K.V.Akola Maharashtra India.
3. Roy.h.technological gap in adoption of improved cultivation of by cotton in akola district.M.sc (agri) thesis (unpub), dr.p.d.k.Akola.
4. S.b Kumere, cotton research unit,Dr.P.D.K.V.Akola Maharashtra India.
5. Shambharkar y.b. Involvement of farmers in feed back management in agriculture with reference to cotton crop. RRC report (81) Dr.P.D.K.V. Akola 2009.
6. Shambharkar y.b sarbaik S.D,ade AH knowledge and adoption of BT cotton growers about integrated nutrient management practice in Yavatmal district Vidarbha region international J of current microbiology and applied sciences special 2018 (6).
7. Vijay shinde,M.sc scholar department of extension education Dr.P.D.K.V Akola Maharashtra India.

EFFECT OF TOXIC CHEMICAL WASTE ON ENVIRONMENT**Prof. Archana P. Mitake¹, Dr. S.P. Rathod², Prof. S. B. Waghmare³ and Dr. T.M. Bhagat⁴.**

Department of Chemistry, G.S.GawandeMahavidyalaya, Umarched.

mitake@gsgcollege.edu.in

ABSTRACT

Role of Chemicals in human life is very important. They are essential and have adverse impacts on the environment, which has a direct relation with all living things. The three essentials for any life Air, Water and Food which constitutes our environment, are being polluted / adulterated. Our environment is having majority of chemical substances due to various humans' activities. It is not the case of today but of the past as well. The difference only lies in the ratio of population verses environment, which is increasing day by day. As a result, there is a direct impact on the physical and chemical environment. These chemicals are the waste from industrial and agricultural processes, structural materials, pesticides, insecticides, weedicides etc. It is evident that some chemicals are useful but many are toxic and harm the environment and our health. A human activity has a complex impact on the environment and affects a chain of interconnecting ecosystems. Use of safe and useful chemicals not only minimizes the risks occurring in the environment but also in human beings.

Keywords: chemical waste, toxic Substances in pollution, contamination, environment, dangerous waste etc.

Introduction

Chemicals have become a part of our life, sustaining many of our activities, preventing and controlling many diseases, increasing agricultural productivity. However one cannot ignore that many of these chemicals may, especially if not properly used, endanger our health and poison our environment. It has been estimated that approximately one thousand new chemicals come onto the market every year, and about 100 000 chemical substances are used on a global scale. These chemicals are usually found as mixtures in commercial products. One to two million such products or trade names exist in most industrialized countries. More substances and rising production mean more storage, transport, handling, use and disposal of chemicals. It is not just the worker handling chemicals who is at risk. We may be exposed in our homes through misuse or by accidents, and be contaminated by consumer products including food. The environment may be affected, chemicals may pollute the air we breathe, the water we drink, and the food we eat. They may have entered into forests and lakes, destroying wildlife and changing the ecosystems. Chemicals are not all of equal concern. The assessment of health risks of chemical substances is a continuous process

where information of the chemical hazards is made available through a variety of sources.

Review of Literature**1. Chemical Toxicology**

No chemical substance can cause adverse effects without first entering the body or coming to contact with it. There are four main ways, that is routes of exposure, for chemical substances to enter the human body.

Inhalation (breathing in)

Absorption (through the skin or eyes)

Ingestion (eating, swallowing)

Transfer across the placenta of a pregnant woman to the unborn baby.

Most chemicals used at the place of work may be dispersed into the air to form dust, mist, fumes, gas or vapour and can then be inhaled. In this way also workers who are not actually handling them but stay within the reach can be exposed to a mixture of chemicals from various sources.

Handling chemical substances without proper protection exposes the worker to the risk of absorbing harmful amounts of chemical through the skin. This usually happens when handling the chemical in liquid form. Dust may also be absorbed through the skin if it is wetted by, for instance, sweat. The capacity of different chemical substances to penetrate the skin varies considerably. Some substances pass through it without creating any feeling. Skin

absorption is, after inhalation, the second most common route through which occupational exposure may take place. The protective external layer of skin may be softened (by toluene, dilute washing soda solution, etc) thus permitting other chemicals to enter readily to the bloodstream (such as aniline, phenol, benzene, etc).

Eyes may also absorb chemical substances, either from splashes or from vapours.

Dangerous chemicals can enter the body through ingestion as gases, dusts, vapours, fumes, liquids or solids. Inhaled dust may be swallowed, and food or cigarettes may be contaminated by dirty hands. Eating, drinking and smoking should be prohibited at a place of work where dangerous chemicals are used.

Whatever the route of entry, chemicals can reach the blood stream and be distributed all over the body. In this way damage can be caused at the site of entry as well as to organs distant from the exposed area.

2. How chemicals affect us?

The harmful effects of chemical substances depend on the toxicity and the exposure to that chemical. Toxicity is a property of the chemical substance, while the exposure depends on the way the chemical is used. The level of exposure depends on the concentration of the hazardous chemical and on the period of contact time. Many substances do not give any warning by odour, even though they may be present at dangerous concentrations in the workplace air.

Acute effects - Chronic effects

The effects may be acute: after a short exposure an immediate effect may be experienced. Chronic effects usually require repeated exposure and involve a delay between the first exposure and appearance of adverse health effects.

A substance may have acute and chronic effects. Both acute and chronic conditions can result in permanent injury.

Injury from exposure to a chemical substance can be temporary, i.e. reversible. It will disappear when exposure to that chemical stops.

Exposure to solvents may cause contact dermatitis, headache or nausea. These effects could be both acute and temporary. Solvents

can also cause chronic effects and result in an irreversible, permanent injury to the nervous system.

Local effects - Systemic effects

Hazardous substances may cause local effects. Acute local effects may include corrosive injuries from acids and bases or lung injuries from inhaled gases such as ozone, phosgene and nitrogen oxides. Many other gases cause adverse effects only after they have been inhaled repeatedly over a long time period. Low concentrations of a gas may also be effective in this way. A persistent irritation of the respiratory system can arise from exposure to gases such as sulphur oxides, hydrogen fluoride and hydrogen chloride.

Once the hazardous substance has entered the blood circulation, it may be distributed to all parts of the body. It will reach the liver, which is the most important detoxication organ of the body. The liver attempts to convert the toxic agents to a less toxic ones or to the ones useful to the body. This process is called metabolism. Some substances such as alcohol and carbon tetrachloride can damage the liver. The body excretes unwanted chemicals. The kidneys filter them from blood circulation, which is the main way that the body excretes poisons, but in doing this, they can be damaged by toxic substances such as carbon tetrachloride, ethylene glycol and carbon disulphide. Cadmium causes permanent damages to kidneys.

Other means of excretion are via faeces, sweat and through lung exhalation.

The nervous system is sensitive to chemicals. The adverse effects may be on the central nervous system or on the nerves that transport impulses to other parts of the body. Organic solvents are commonly used at work and are known to be able to affect the nervous system. Many other substances may behave in the same way such as carbon disulphide, mercury, lead, manganese and arsenic.

Our body has a considerable capacity to excrete, to render dangerous substances harmless, and to protect us. However, our defense system can be overloaded by repeated heavy exposure so that it no longer fulfills its function. The body stores the harmful

substance which may consequently result in health problems.

Lead is an example of a substance for which removal from the body takes a long time. Cadmium is an example of a substance that is not processed by the body at all, and once it has entered it will stay there.

3. Common chemical groups that cause health risks

3.1 Dusts, fumes and gases

Dust may be just a nuisance, and the danger depends on the type of material in the dust, and on the amount and the size of the particles.

The smaller the particle is the deeper it will penetrate into the lungs with the inhaled air, thereby passing the defensive systems of the lungs. This type of dust is invisible to the eye and identified using microscope technique. Such dust can accumulate in the lungs over a long period of time and cause a lung disease called pneumoconiosis, which is a common incapacitating occupational disease. Dusts containing crystalline silica or asbestos are particularly dangerous.

Sand and many types of stone contain crystalline silica, as do many ores, concrete, ceramics and diatomite. Processing of these materials creates dust with result of silica accumulating in the lungs. This may lead after years to a incurable lung disease, even though the exposure has been stopped years before.

Asbestos is a natural mineral fibre which is very resistant to fire and to many chemicals. Asbestos fibres are very strong and thin. Asbestos exists in various forms and names: chrysotile, crocidolite, amosite, anthophyllite, actinolite and tremolite asbestos. Chrysotile is used in isolating materials, protective carpets and clothes.

The dust penetrates the lungs destroying the lung tissue. This condition is called asbestosis. Asbestos can also cause lung cancer. The risk of cancer is many times higher if the asbestos exposure is combined with smoking. Many countries have restricted or banned the use of asbestos.

Exposure to metal fumes can cause damage to the body. 'Metal fume fever' is a known health effect when metal fumes, often containing zinc,

are inhaled. It usually appears on the day following that of the exposure.

Gases do not necessarily have a warning odour at a dangerous concentration. The odour may be apparent only at very high concentration in the air. Gases may have an irritating effect, or they may enter the blood circulation and cause internal damage.

Sulphur oxides, nitrogen oxides, chlorine and ammonia are toxic gases that are corrosive and irritating to the respiratory system. They are widely used in industry. Phosgene is formed when solvents containing chlorine, such as "TRI" (1,1,2-trichloroethylene), come into contact with hot surfaces or flames. Phosgene can be deadly poisonous even before the odour is detected.

Carbon monoxide is a toxic, odourless, colourless gas which is formed by the incomplete burning of materials of organic origin. It may enter the blood circulation. Some gases can pass through the skin, for example, hydrogen cyanide.

3.2 Solvents

Most solvents are liquid organic chemicals. They are used because of their ability to dissolve other substances, particularly fat and grease, which are insoluble in water. Many of them evaporate rapidly at ambient temperatures. They are often flammable and may ignite by heat from smoking, welding or static electricity. Vapours move with air currents and can ignite even by a distant heat source.

Inhalation is the most common way for solvents to enter the body, but some of them penetrate intact healthy skin. Once in the blood stream a solvent can be transported to different organs, such as the brain and liver.

Solvents have different effects on humans, depending on their evaporation rate and their solubility in water. The risks of health effects depend on the period of exposure and the concentration of the solvent in the inhaled air.

Many solvents have a narcotic effect; they may cause dizziness, headache, reduced comprehension or tiredness. They may also irritate the eyes and the respiratory tract. Frequent skin contact defats the protective layer of the skin causing irritation. Some solvents are very hazardous to the liver, kidneys, bone

marrow or nervous system. Benzene, carbon tetrachloride and carbon disulphide belong to the category of solvents which should be substituted with less dangerous ones.

3.3 Metals

Metals can enter the body in the form of dust and fumes (in grinding or welding) or even through the skin. One of these is tetraethyl lead, which is used as an anti-knocking agent in petrol. Mercury vapours are often inhaled, as this liquid metal evaporates readily at room temperatures.

Lead is used in various industries: battery, glass and mining industries, cable manufacturing, foundries and in printing works. Steel constructions are protected with anti-corrosive paint containing lead, which may be released during welding operations, for example, on ships.

Mercury is present in many pesticides and pickling baths. In the environment, it may accumulate in fish. Mercury poisoning has serious effects on the nervous system.

Nickel is present with other metals in various alloys. Nickel and its compounds are known to be sensitizers. Once a person has had an allergic reaction to nickel, the reaction reoccurs following the contact with very small amounts of nickel used in products such as leather, cement, or door handles. Some compounds of nickel can cause cancer.

Chromium compounds, particularly chromates and bichromates, are widely used in industry. Cement contains small amounts of chromium compounds. These compounds can cause allergy and even lung cancer. Unlike cobalt and nickel, pure metallic chromium does not cause allergy. Chromium compounds may cause birth defects if mothers are exposed to these compounds during pregnancy.

Arsenic compounds are used in pesticides, insecticides and in some colouring materials. Chronic arsenic poisoning can start with irritation to the respiratory system, inflammation of the eyes, or skin problems, followed by damage in nervous system. Arsenic and its compounds can cause cancer.

3.4 Acids and bases

Strong acids and bases are mostly used as water solutions. They are corrosive to human tissue. Working with acids or bases can give rise to mists which have the same corrosive properties as the solutions.

When acids and bases are mixed with each other the phenomena of neutralization occurs, usually with strong production of heat. The heat production has particularly serious effects when water is added to concentrated sulphuric acid: the heat will splash the highly corrosive liquid up, risking injury to the worker.

Some acids are explosive when in contact with organic material, such as sawdust.

Serious damage can result when treating metal pieces in an acid bath. The bath may contain more than one acid in a mixture and may release flammable hydrogen gas, as well as acid mist, when a piece of metal is placed in it.

Phosphoric acid is used to treat metals. When in contact with hot surfaces, phosphoric acid can give off poisonous gases. Ammonia, sodium and potassium hydroxides are commonly used bases. They are corrosive to human tissue in such a way that a certain period of time is required before the corrosive feeling is sensed. Bases penetrate the skin and cause deep sores. They are difficult to wash away. Dilute water solutions are irritating.

Sodium and potassium hydroxides are used, for example, in hot degreasing baths for cleaning metals.

3.5 Pesticides

Pesticides are intended to destroy or control pests of all kind. They are used in industry, for example, to impregnate wood, and in agriculture to control insects, weed, fungi, and rats. These are many different types of pesticide compounds and they are used also as mixtures.

Some countries apply restrictions in using certain compounds, and the use of some of them is completely banned because of their serious adverse effects. In Europe, the list of banned pesticides includes compounds such as inorganic mercury compounds, camphechlor, chlordane, dieldrin, DDT, HCH (lindane), heptachlor, hexachlorobenzene, and nitrofen.

Insecticides are divided into following broad groups:

Organophosphorous compounds

These are often acutely poisonous to insects and to humans. They can damage the nervous system and even cause death. They are effective even at low concentrations. Dichlorvos, demeton, parathion and thioazin belong to this group.

Organochlorine compounds

These compounds have a lower acute poisoning effect than organophosphorous compounds. They decompose slowly and can therefore accumulate in the environment and in the body. Aldrin, dieldrin, heptachlor, and DDT belong to this group.

Carbamates are insecticides and fungicides

They are poisonous to humans causing same type of symptoms as organophosphates. Dithiocarb and carbaryl belong to this group.

4. How to minimize the risks caused by chemicals?

Improving safe use of chemicals can be achieved at different levels.

4.1 In the enterprise

A Safety Committee should be formed with the task of working regularly with safety issues. It could start to work with following:

Organizational measures

- assess chemical hazards and set priorities concerning the safety in the organisation;
- create emergency plans for the assessed hazards;
- organize occupational health care and regular surveys as necessary;
- organize contacts with authorities/laboratories to create a monitoring system for chemical hazards, and to reliably measure and/or estimate occupational exposures to chemicals when needed;
- start collecting case studies of accidents and sickness records in the enterprise to create a basis for priority measures in the control of hazards;
- identify chemicals in use;
- obtain information of their hazards;
- collect this data and make an inventory list of all chemicals used in the factory: create a Register for Workplace Chemicals;

- involve workers in safety organizations, such as the system of Safety Representatives, and Safety Committees;

Technical measures to control the hazard

Technical measures can be used to prevent chemical hazards at source, and to prevent the transfer of dangerous chemicals. By technical means it is possible to reduce the exposure of the worker.

Substitution

An effective control method for any hazardous chemical is substitution: a hazardous chemical is replaced with a less hazardous one. This is especially important when the chemicals in question can cause cancer, damage to the reproductive functions or create allergic reactions. Choosing a safer process or changing an old and hazardous process to a less dangerous one effectively reduces the risks.

An example of safer choice is to have pellets or paste instead of powdered substances which readily produce high levels of dangerous dusts. Water-based paints and adhesives are available to replace harmful products containing solvents.

All possible information should be made available when considering the change of a substance or the whole process so that the new choice does not create unexpected new dangers.

Engineering control

Closed system

If hazardous chemicals cannot be replaced by less dangerous ones, exposure must be prevented by protecting the worker. Enclosing the hazardous process or chemical is an effective method.

One example is to use sealed pipes to transfer solvents and other liquids instead of pouring them in the open air. Vapours and gases caused by spray painting or produced in pickling or hardening baths in the metal industry should be controlled, ventilated and not allowed to enter the workplace air.

Local exhaust ventilation

It is not always possible to enclose all dangerous operations. A properly designed local exhaust ventilation is the second choice in order to remove the contaminants at the source. A local exhaust ventilation system consists of a hood, ducts or pipes, a system to collect and

separate the pollutants from the clean air, and an efficient fan to create enough suction force. The hazardous gases, fumes and dust can be collected from the vented air. They should not go untreated, straight out, to pollute the surroundings of the factory and the environment. Attention should be paid to the clean air inflow which replaces the exhaust. Inspection, proper maintenance, regular cleaning and changing of filters are essential to protect the worker against hazardous contaminants.

General ventilation

Where it is difficult or impossible to prevent hazardous chemicals, fumes, dusts, mists or particles from entering the workplace air at the source, a general dilution ventilation can be installed. This should be designed to meet the needs of the specific work process and workplace. At its best it should consist of an inflow of clean air and an outflow of exhaust forced by fans at right places. It can also be used with other preventive measures.

Housekeeping

When working with dangerous chemicals, a proper housekeeping is essential. Storage areas must be well organized and kept in order. The transport of chemicals within the industrial premises should be planned and the transport routes kept clear. Maintenance of premises and equipment should also be planned. These tasks should be dedicated to persons/work groups/departments. Workers using the equipment should know the person responsible for repairing faulty equipment.

Monitoring the efficiency of housekeeping and inspections should be carried out regularly; this

should involve the workers themselves, who are experts in their own work.

Conclusion

At the shop-floor level, a Safety Committee could do regular inspection using checklists made for the particular chemicals and chemical processes in use; mark and label all chemicals keep at hand an inventory list of all chemicals handled in the place of work together with a collection of chemical safety data sheets for these chemicals. The fumes or splashes should never reach the area where cylinders are kept. Hazardous substances can leak, cause a fire or give off dangerous fumes and vapours. When two substances come into contact with one another, they may react violently. The reaction products may be much more dangerous than the original chemicals. Written instructions of storage practices should be provided, and chemical safety data sheets of dangerous substances kept in stock should be available in the storage area. Chemicals react in the same characteristic ways whether they are wastes or are used in a production process. The hazards are also the same. Where chemicals are used, the enterprise should plan labelling, collecting and handling of wastes. Some countries have introduced legislation and provide detailed advice on how to treat dangerous chemical waste. To gain maximum benefit for all, a response is essential, from the shop-floor, where the chemicals are actually used, up to the management, which should plan the whole, safe 'lifecycle' for every substance. Cooperation with and within authorities is needed to fulfill these tasks.

References

1. EU 2003 Dangerous Substances Handle with Care. Magazine of the European Agency for Safety and Health at Work No.6. Luxembourg: European Agency for Health and Safety at Work, 2003.
2. EU 2003 Dangerous Substances Handle with Care. Magazine of the European Agency for Safety and Health at Work No.6. Luxembourg: European Agency for Health and Safety at Work, 2003.
3. EU 2003 Dangerous Substances Handle with Care. Magazine of the European Agency for Safety and Health at Work No.6. Luxembourg: European Agency for Health and Safety at Work, 2003.
4. Paoli P, Merlie D. *Third European Survey on Working Conditions 2000*. European Foundation for the Improvement of Living and Working Conditions, 2001.
5. Kamanyire R, Karalliedde L.

- Organophosphate toxicity and occupational exposure. *Occup Med (Lond)* 2004; 54:69–7
6. Canfield RL, Henderson Jr CR, Cory-Slechta DA, Cox C, Jusko TA, Lanphear BP, 2003. Intellectual impairment in children with blood lead concentrations below 10 µg per decilitre. *N Engl J Med* 2003; 348:1517–1526.
 7. Gidlow DA. Lead toxicity. *Occup Med (Lond)* 2004; 54:76–81
 8. Cummings TF. The treatment of cyanide poisoning. *Occup Med (Lond)* 2004; 54:82–85.
 9. Carrington, Damian "Global pollution kills 9m a year and threatens 'survival of human societies'". The Guardian. Retrieved October 20, 2017.
 10. Spengler, John D.; Sexton, K. A. (1983). "Indoor Air Pollution: A Public Health Perspective". *Science*. 221 (4605): 9–17., doi:10.1126/science.6857273.
 11. Hong, Sungmin; (1996). "History of Ancient Copper Smelting Pollution During Roman and Medieval Times Recorded in Greenland Ice". *Science*. 272 (5259): 246–249., doi:10.1126/science.272.5259.246.
 12. Nagham Mahmood Aljamali, Aseel Mahmood Jawad, Imad Kareem Alwan Alsbri., "Public Health in Hospitals ", 1 First Edition, 2020, Eliva Press, ISBN: 9798636352129.
 13. Beil, Laura., "Pollution killed 9 million people in 2015 ". *Sciencenews.org*. Retrieved 1 December 2017.

CREATING ENVIRONMENT SUSTAINABILITY IN ACADEMIC LIBRARIES THROUGH GREEN PRACTICES

Dr Rekha Kalbande

Librarian, Bhausaheb Lahane Dnyanprakash Arts College, Pinjar, Dist. Akola (MS)

ABSTRACT

This paper expresses the critical insight on the role that green practices and services in libraries play in making them more environmentally friendly. With new technologies like computer printers, fax machines, photocopiers, etc. being used all the time and easy to get, it is very important to protect the environment. Since all of these machines use paper, ink, and electricity, they all have an effect on the environment. This paper starts with a description of sustainability, environmental sustainability, green printing, copying, etc. Also shows the different ways that libraries can be sustainable. And also shows how to deal with the effects of using paper, ink, and electricity. This paper will also show librarians a different way to do green practises or services. The negative effects of new technologies on the environment also make it more important for libraries to offer green services and reduce their carbon footprints. This will automatically improve environmentally sustainable practises, which is a good way to improve people's lives.

Keywords: Carbon footprint, Environmental sustainability, Green practice, Green copying,

Introduction

Libraries are the most important way for future generations to learn. They have been storing knowledge in many different ways, from leaf inscriptions, incunabula, stone inscriptions, parchment, and modern printed books. Then, in the 1950s, when computers were invented, things changed a lot. Libraries began to use different kinds of information and communication technologies (ICTs) in their work. This also changed the way people learned and published, and it made digital documents better. From offline mode to online mode, users also changed in terms of who they were and how many there were. At that time, libraries were good for the environment because they had printed books and other reading materials. However, as research and publishing grew, libraries ran out of space. This problem was solved by putting electronic devices in libraries. As with every new thing, digitization has both good and bad effects on the environment. This is because the process of digitization uses electronic gadgets that won't break down, which is bad for the environment. For the environment to get better, digital libraries need to be built in a way that is sustainable. At the moment, every government and nongovernment organization, business, institution, etc. is working on this issue. Through their green library initiatives, libraries

have also added green practices to protect the environment. Environmental services that are better for the environment are also becoming more and more important as time goes on. Printing and making copies are two of these greener services. Libraries can lead to eco-friendly or environmentally sustainable practices, like reusing and recycling materials, reducing waste and toxic products, and making new technologies.

Literature Review

In the attempted review of related literature this research was limited to the research articles published thorough reputed national and International journals. Most of the papers reviewed which are about the research on green practice and provides practical suggestions for achieving eco-friendly ways to go on as well as bent on providing its economic, social and environmental aspects were argued as well as its significant value in the search for a new form of development. For instance , Bruntland Report for the World Commission on Environment and Development (1992) states: The important quotes below will provide some ideas on what constitutes sustainable development and sustainability. A process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional change are all in harmony and enhance both

current and future potential to meet human needs and aspirations.

Likewise, The World Commission on Environment and Development. The definition for sustainability from Forum for the Future is definitely more inspirational: A dynamic process which enables all people to realize their potential and to improve their quality of life in ways that simultaneously protect and enhance the Earth's life support systems. This definition realizes our responsibility and duty towards betterment of environment because it makes explicit the fact that we all are dependent on the earth, so we have to better look- after it, whilst making the link to all people realizing their potential – we (collectively) will have a better life if we (collectively) take care of the environment.

The Research Work

This paper also aim at discussing possible issues and challenges to be faced by future library and Institutions in developing countries. And also, it can be an example for librarians to achieve greener printing and copying in making the libraries greener for good and healthy environment.

Knowing the concept sustainability

As we found actually the term “sustainability” was introduced as an international issue by the book “The World Conservation Strategy” in 1980 (IUCN et al., 1980). Since that time onwards, the term has been used more often, and its economic, social, and environmental aspects, as well as its importance in the search for a new way to develop, have been debated. This idea was talked about in depth in a report called the "Brundtland Report" that was made for the UN World Commission on the Environment (World Commission on the Environment and Development, 1987). This report says, among other things, that it is very important to make a big change in how we think about and approach human development because all of the earth's ecological systems are being hurt in dangerous and irreversible ways. How to Define Sustainability Sustainability and sustainable development may mean different things to different people and groups,

as many are trying to figure out what they mean.

All the definitions mean the same thing and use the same method as:

- Making do with what you have
 - Knowing how the economy, society, and environment are connected;
 - Fairly sharing resources and opportunities;
- (sustainable measure) "Sustainability is the ability to improve human life while staying within the carrying capacity of the eco-systems that support life on Earth." The International Union for Conservation of Nature (IUCN) came up with this definition. IUCN's work is driven by the fact that the way people make and use things around the world is destroying nature at a steady and dangerously high rate. No one can agree on a single definition of what it means to be sustainable.

Many people have different ideas about what this term means and how it can be reached or kept. The idea of sustainability comes from the idea of sustainable development, which became a common phrase at the first Earth Summit in Rio in 1992. (Taken from global footprint) Most people agree that the original definition of sustainable development was: "Development that meets the needs of the present without making it harder for future generations to meet their own needs." As it says in It's not just "we should do this because we have to"; it also gives us hope. The term "environmental sustainability" may have been made up by scientists at the World Bank. At first, "environmentally responsible development" was the term that was used (World Bank, 1992). After that, "development that is good for the environment" was used (Serageldin and Streeter, 1993). Lastly, the idea of keeping the environment healthy was made (Goodland, 1995).

Goodland says that environmental sustainability "tries to improve human welfare by protecting the sources of raw materials used for human needs and making sure that the sinks for human wastes are not overused, so as not to hurt humans." Goodland's idea of environmental sustainability fits into the "limits to growth" framework for an ecological economy with limited resources. The OECD

Environmental Strategy for the First Decade of the 21st Century made a big change to the idea of environmental sustainability (OECD, 2001). The Strategy lays out four specific criteria for environmental sustainability: regeneration (renewable resources should be used efficiently, and their use should not be allowed to exceed their long-term rates of natural regeneration), substitutability (non-renewable resources should be used efficiently, and their use should be limited to levels that can be offset by substituting them with renewable resources or other forms of capital), assimilation (releases of hazardous or polluting substances should be absorbed by the environment), and assimilation (releases of It lists five interconnected goals for making environmental policies more cost-effective and workable in the context of sustainable development:

- Keeping ecosystems in good shape by taking care of natural resources well.
- Decoupling environmental pressures from economic growth
- Improving information for decision-making: measuring progress with indicators
- The relationship between society and the environment: improving the quality of life.

The interdependence of the global environment: improving governance and cooperation. Environmental sustainability means taking care of the environment in a way that doesn't use up or damage natural resources and keeps the environment in good shape for a long time. Sustainability in the environment helps make sure that the needs of today's people are met without putting the needs of future generations at risk. One of the first people to work on ecological sustainability, Herman Daly, looked at the problem from the point of view of maintaining natural capital. In 1990, he suggested that: For renewable resources, the rate of harvesting shouldn't be faster than the rate of regeneration (sustainable yield); for pollution, the rate of waste from projects shouldn't be faster than the environment's ability to handle it (sustainable waste disposal); and • For non-renewable resources, the depletion of non-renewable

resources should require the development of renewable substitutes for that resource.

Library Initiative

Green printing is a movement in the printing industry that focuses on reducing, recycling, and reusing resources to make printing, copying, and advertising easier on the environment. This method uses low-VCO (Volatile Organic Chemical) inks, recycled paper, computers and equipment that use less energy, remanufactured laser toner cartridges and ink cartridges for printers, paperless or electronic information distribution, and attempts to teach and inform people about green printing. Friendly to the environment or Green printing is the process of printing paper products in a way that is good for the environment. It involves a number of steps that are better for the environment than the usual steps for printing. Some tips for printing in an eco-friendly way are to use digital formats instead of print formats whenever possible, Using recycled paper, using recycled ink cartridges, Buying soy-based ink that doesn't contain any chemicals and printing on both sides of the paper Green Printing The amount of paper used each year has reached almost 400 million tonnes, and the rate of growth is very fast.

Even though technology for transferring information and storing it in data centres is getting better and better all the time, people are still using more and more paper. Without printed documents in every library and information centre, digital and electronic archives, e-mail, and the Internet will not be able to compete. Libraries of all sizes and types are making environmental sustainability and the preservation of natural resources a priority and an effective programme. One benefit of printing in a green way is that it can save you money on printing costs. Depending on how eco-friendly strategies are used, costs can be cut by up to 70% or more in a library or even at home. When it comes to concerns about the environment, green printing can help protect and keep the natural resources.

Publications and making paper both use a lot of water, trees, energy, and other natural resources, as well as materials that could be

dangerous. Inks, solvents, acids, lacquers, dyes, dryers, varnishes, shellacs, and many other solutions are used in the printing process. Some of these can be harmful to people and the environment. When paper is bleached with chlorine, chemicals and pollutants can get into the water. Bindings, glues, foils, and other things used in printed materials can also make it hard to recycle them. And libraries and information centres may not always be able to or want to go completely digital. But there are a number of ways to use less paper, ink, and other resources. Because of this, paper is something that almost every library uses a lot of. We all know that libraries are where books and papers are kept. And people are so used to using paper that they rarely question it. In the same way, using paper hurts the environment in ways that are hard to see. Paper can be made from new wood, pre-consumer waste (waste from paper mills and manufacturing plants), or post-consumer waste (waste from recycling programmes, printing processes, etc.). All of the steps that go into making paper, like getting the wood, processing it, making the paper, transporting it, using it, and throwing it away, cause big problems for the environment.

Through recycling, we can cut down on how much paper we use. Paper recycling is the process of turning used paper into something that can be used again. Paper is one thing that can be easily recycled, as we all know. Recycled paper is made from old pieces of paper and other paper products that have been used and then reclaimed. Recycling paper is the most environmentally friendly choice because it uses less energy, water, and carbon than making new paper. So, using recycled paper is important for the environment. In many ways, it helps the environment.

Everyone needs to know that recycling paper is important, but it will be a while before the same behaviour spreads to recycling printer cartridges. Printing isn't as important as it used to be now that mobile phones and e-readers are getting better and more popular, but it's still very important at home and in the office. Printing is still a big part of our daily lives, so more people need to know about how bad it is for the environment.

The carbon footprint is a way to measure the amount of pollution that a person and their way of life cause. The total amount of greenhouse gases (GHG) that an organisation, event, or product puts into the air. This is called its "carbon footprint." It is often said in terms of the amount of carbon dioxide or other greenhouse gases that are released. Water vapour, carbon dioxide, methane, nitrous oxide, ozone, and chlorofluorocarbons can all be turned into greenhouse gases. They are all different types of natural gases, but humans can make too much of them by doing things that make pollution. To lower our Carbon Footprint, we should use materials that are good for the environment or made from recycled materials. We should use ways to save energy and use renewable energy sources more. We should also reduce waste and make plans for waste separation. Also, we shouldn't use plastic bags or cups and should get rid of or stop using them.

This conversation could help a lot with figuring out what the social responsibility of libraries is, since they are the most important source of information for society. As we all know, most people want to keep the parts of the environment that produce resources that can be used over and over again, like water, air, forests, and solar energy.

Taking care of the environment is an urgent need for everyone right now. Sustainability is the ability to keep doing something for a long time. Environmental sustainability is the ability to keep living at a level that is valued in the environment without making any changes. Libraries can play a big part in making the world as sustainable as possible by doing well in all green practises. Everyone—students, employees, employers, and publishers—who works with print in some way or another needs to be aware of and take responsibility for how much paper they use every day. We don't have to do it just to save money; we also have to know that we're saving the planet at the same time. By making some changes right now, libraries can print in a way that is better for the environment. Green printing is all about being aware of the environment and the effects that a printing job can have. As experts in

information, librarians should know what environmental labelling really means and be able to give this information to the people who use them.

References

1. Bedrich Moldan, S. J. (2012). How to understand and measure environmental sustainability: Indicators and targets. *Ecological Indicators*, 17, 4-13.
2. Daly, H. (1990). Toward some operational principles of sustainable development. *Ecological Economics*, 2, 1-6.
3. Goodland, R. (1995). The concept of environmental sustainability. *Annual Review of Ecology and Systematics*, 26, 1-24.
4. Hauke, P., & Schubert, S. (2013). Designing the Green Library: environmental sustainability in Library space, Library management, and Library service. BOBCATSSS. Ankara: Turkey.
5. Kruse, Ted (2011). Greener library printing and copying. *The Bottom Line*, 24(3), 192-196. Available at: <http://dx.doi.org/10.1108/08880451111186053>. Assessed on 26 February 2017.

ENVIRONMENTAL ATTUNEMENT IN HEALTH, SPORTS AND PHYSICAL EDUCATION

Dr Nanasaheb Sapkal

Director of Physical Education Bhausahab lahane Dnyanprakash Arts College, Pinjar, Dist. Akola (MS)

ABSTRACT

This Special Issue on environmental attunement introduces seven papers that engage with a range of different insights and practices of nature-culture and embodied connections to place across health, sport and physical education. We have organised the papers into three themes that explore possibilities for: (i) notions of the environment and 'nature' in research and practice; (ii) possibilities and challenges of translating environment, sustainability and 'nature' from policy and curriculum documents into practice; and (iii) philosophical and theoretical links to emplaced and embodied learning – past-present-future. These are by no means exclusive themes and readers will recognise other patterns of theoretical and empirical possibility as well as important geographical and contextual nuances that need to be explored further. Because of this, we hope that this collection inspires further submissions via an extended call for papers that engage with the challenges and the possibilities of how we might approach the complex environmental, ecological, political and cultural factors that shape health, sport and physical education in current times.

Keywords: *translating environment, environment sustainability, ecological, political and cultural factors*

Introduction

The concept environment is structured through dealing with many issue including the three major as i) notions of the environment and 'nature' in research and practice, ii) possibilities and challenges of translating environment, sustainability and 'nature' from policy and curriculum documents; and, iii) philosophical and theoretical links to emplaced learning – past-present-future. We first introduce the notion of environmental attunement and then provide some commentary on the terrain of theory travelled in crafting this work. This Special Issue, like many good ideas in academic spirit, was conceived through a themed symposium. We presented 'Health as more-than-human: environmental attunement in health education' at the inaugural *Critical Health Studies (CHESS)* Conference in May 2018, Queenstown, New Zealand (Fitzpatrick et al., 2019) under a simple (and optimistic) conversational premise; to 'grow *new grass*' rather than lament that 'the grass is (or could) be greener' elsewhere. The purpose was to expand possibilities and practices of educational and embodied connections to environmental knowledge of place, space and *nature*¹ in health, sport and physical education.² Utilising the notion of attunement, helped us to explore the 'epistemological habits' (Trout, 2008, p. 63) or 'leaning in' to

notions of environment that focus on a body-mind-culture-nature connection to the lands and waters in a deep sensory and even spiritual sense of care for others (Brymer et al., 2010). At the time, Nicole was working on bluespace research and collecting data on how notions of participation in National Parks and greenspace were being increasingly converged with health and fitness discourses through advertising and social media. Rosie had been engaging in health and food and nutrition education with Australian Indigenous elders and making place-based links to environmental knowledge with field trips to gardens and farms. Through this practice with pre-service teachers, imagined possibilities for environmental attunement were materialised with students creating novel cross-curricular assessment for learning tasks that integrated and utilised the Australian Curriculum capabilities of Sustainability and Aboriginal and Torres Strait Islander Histories and Cultures (ATSIHC). Michael was rediscovering Ivan Illich, contemplating the rich multitude of possibilities of histories and purposes of health and physical education through time, and thinking about what we can learn from animals and multi-species in this endeavour. We have attended to and travelled beyond these initial ideas to author the Introductory paper of this Special Issue (Welch et al., 2021); synthesising literature from multidisciplinary

perspectives to understand more clearly why and how environmental attunement is necessary in the everyday actions and settings that relate to philosophies, histories and futures of health, sport and physical education. Our intention is not to burden teachers with additional demands, or seek to change the behaviour of students so that they become 'good' environmental citizens (Maniates, 2001). Some may see this Special Issue as timely, or even 'late to the party' in the scheme of environmental public discourse and educational research, yet in considering the dominance of global north/ colonial over global south/ subaltern local tendencies of scholarship (Naidu, 2020; Skerrett, 2017; Takayama et al., 2017), it is even more delayed in responding to the deep ancestral First Nations epistemologies and ontologies of relationality, landscape, healing and wellbeing (McGuire-Adams, 2020). In any case, for us 'environmental attunement' is an ongoing project given its subjugation in meanings of health and physical education (Taylor et al., 2019) that appears to be of increasing concern in current times and thus poignant material for more focused theoretical and epistemological inquiry. In this Issue, we discuss the what, why and how of environmental attunement and take ongoing inspiration from research and practice at the interstices of local places, governance, educational systems and pedagogical practice (Aikens, 2020; Gray & Martin, 2012; Madsen et al., 2015).

Environmental attunement

While we accept that a person's surrounding conditions constitute part of what we are referring to as 'environment', we want to call for a more expansive and political approach to the concept. The Introductory paper of this Special Issue takes this up in more detail to examine how within the field of health and physical education the term environment is often used in a generalist sense to describe a particular context that could influence performance or participation. In *Sport, Education and Society*, articles have examined sports or athlete environments, or non-competitive environments (e.g. Dhillon et

al., 2020), but few have examined the relationality of environment to pedagogy. The exceptions are Sanderud et al.'s (2020) work on *Bildung* and children's perspectives on nature-play relationships in snow-covered playgrounds which examines the way movement memories are entangled in the geographical materiality of weather. Other examples include recent valuable scholarship on informal sport (O'Connor & Penney, 2021), exercise and the environment (Hitchings & Latham, 2017), eco-motricity (Pazos-Couto et al., 2021), outdoor education (Dyment & Potter, 2015; Quay, 2016) and sustainability (Truong, 2017), all of which has included notions of the environment and nature as a unique and important (yet often marginalised) intersection with movement and physical education. Across this collection of literature, the authors point to both longstanding issues for the field, especially in the marginalisation of outdoor education, as well as the more recent empirical developments of tracing the shifting social and cultural practices of participation in health and sport. There is much more literature beyond, but ancillary to the field, to turn to for inspiration; for instance, research on green exercise and restorative and therapeutic landscapes (Olafsdottir et al., 2017), natural environments and physical activity and health (Jansen et al., 2017; Merchant & Wiltshire, forthcoming), and issues of child health equity in access to green space (Feng & Astell-Burt, 2017). There are also the Sustainable Development Goals (Barakat et al., 2016) and the frameworks of the social, environmental and commercial determinants of health that are concerned with health equity, policy and promotion (Baum, 2007; Maani et al., 2020; Friel et al., 2011; Schwerdtle et al., 2020). In our first paper of this Issue, we clarify our stance on environmental attunement by outlining these four statements:

- We live in a world that is constantly changing and is challenging established approaches to managing human and ecological health (Patrick et al., 2015). Our attunement needs to be focused on the premise that environments shape health

and that human health is reliant on the natural world.

- Health and physical education and environmental knowledge need to be integrated via holistic and participatory approaches that recognise shifting social and cultural practices in both built and natural environments. This includes especially a sensitivity to histories and ontologies of place; especially First Nations or Indigenous ontologies of land such as Country, and practices such as *dadirri* or deep listening (Atkinson, [2002](#)) practices to establish emotional relationships of ‘love, care and solidarity’ (Renshaw & Tooth, [2017](#)).
- While all disciplines could be linked to environmental attunement (e.g. STEM, Geography, The Arts), health and physical education offers a unique intersection of multidisciplinary learning through embodied and socio-cultural pedagogies that connect to self, place, space, community and more-than-human life. Adopting a critically mindful pedagogy (Tinning, [2020](#)) is rich with learning possibilities in the cultural politics of human relationships to environment and ‘nature’. To this end the concepts of critical inquiry, problem-based learning, creativity, health literacy and valuing movement (in, through and about) can all be mobilised in practice.
- Reflection on what has shaped educators’ micro-biographies and ecological identities (Thomashow, [1996](#)) is an important step, alongside pedagogical resources, in deepening epistemological habits of possibilities for environmental attunement across health, sport and physical education.

Grafting theoretical inquiry to the cause of environmental attunement: theory as a tool, timing and trap

Initially using ‘more-than-human’ in the title of this Special Issue we had included theoretical links to new materialist, post-human and agential realism ways of knowing, being and becoming (Massumi, [2009](#); Wright, [2015](#)). The broader turn to decentre the human in research

theory and methods has helped our conceptions and thinking about this Issue. We came to think about the perennial search for ‘new directions’ in theory and publishing and the need for theory to respond to the research problems of the times of social, environmental and political experience. While we generally agree that theories come at a particular moment of history, it can be quite hard to decide ‘when’ they began. Textbooks often say that Marxist theory emerged in Europe in the nineteenth century. As teachers, we often start somewhere and, in educational terms, that can be appropriate. But how do we guide students who may want more than an emergent narrative of Marxist theory. Like ideas, the ‘beginning’ of Marxist theory can be seen wherever you look. Should we go to Babeuf during the eighteenth century French revolution (Rose, [1978](#)), or look to Spinoza philosophy (Dobbs-Weinstein, [2015](#)) or ‘Diggers’ in the seventeenth century England revolution (Kennedy, [2008](#)) or indeed to Early Christianity (Kurian, [1974](#))? We often talk about theoretical battles between theories – ‘capitalism’, ‘socialism’ and ‘liberalism’ – but there are also ‘fingerprints’ everywhere. Whilst following eagerly, we were sometimes flummoxed in what to utilise from post-humanistic (or more-than-human or non-human) theory in the context of this project on *environmental attunement*. In her discussion of the role of ‘gender’ in more-than-human literature, Probyn reflects that ‘sometimes my head begins to buzz with the ferocious pace of word play and theoretical riffs’ ([2016](#), p. 109). We wonder, can terminology be a form of camouflage, or a trap? Monforte and Smith ([2020](#)) have conversationally discussed grappling with post-qualitative research as an early career researcher and later career researcher. Monforte speaks of the tension and trends, that ‘the problem of incommensurability and onto-epistemological incoherence has always been there, pinching me. Every time I think about and do research, I feel the tensions between conventional and post versions of qualitative research in the flesh’ (Monforte & Smith, [2020](#), p. 1). We wonder if ‘new’, complex and different terms

can appear alluring but also unnecessary to describe a fairly straightforward proposition; we are a tiny part of a much larger de-centred human ecological context. We defer to Sonia Hazard (2019) here who has illuminated this theoretical tension:

We are in a moment in which many different kinds of thinkers are pursuing overlapping techniques of thought. Broadly speaking, what they have in common is that they approach materiality as generative. They recognize, in other words, that material entities and forces exert power on humans, in ways that make a priori separations between humans and nonhumans difficult to sustain. Some of these thinkers may self-identify as new materialists or align themselves with that canon. A great many more do not. (Nor are analogous ways of thinking utterly “new,” as archeologists, art historians, environmental and *longue durée* historians, and others, frequently point out.)

When we think of new materialism in this way – as an orientation or a technique of thought – it appears that new materialism is everywhere. For instance, several scholars have been re-examining even well-trodden areas of study by asking what comes into view when we consider nonhumans as social actors. (2019, p. 629)

Herein lies the challenge and opportunity, as Hazard points out, new materialism and non-human actors are everywhere, thus the possibility for environmental attunement to be theorised in this way is also ‘everywhere’. We have to live with believing and not believing our theories. Theories are an ideational tool: active, timeless, being both a religious and rational ingredient of life. Massumi (2009) in an interview describes the focus on the instant-by-instant analysis. He argues that we must be ‘alive’ to the interaction with every molecule, every word, every thought, every passing mood. On reading Massumi’s work, we reflected that ‘complexity’ can be useful, but we can be overloaded by theory for no good reason. Every theory can, unfortunately, lead us to madness. But we also want to emphasise the post-human spirit and the relationship with one’s self. An unresolved tension for us emerged, as post-human, new materialist and

post-qualitative literature proliferates in educational scholarship, is it affording new thinking and writing about important questions on the environment and the relationship between people and more-than-human ‘actors’ in the world (e.g. Clarke & Mcphie, 2020). We follow Fullagar’s (2017, p. 255) lead in her article on post-qualitative inquiry and the new-materialist turn:

One of the challenges ahead is to create generative and generous intellectual cultures that enable us to think rhizomatically as we negotiate the changing power relations of austerity, audit culture, marketisation of education and the rise of conservative global politics.

One must live in both theoretical and practical worlds; as a micro and macro part of one’s own system. There are complex power relations that shape the conditions of possibility across theory and practice. Language in this resolve is unequivocally essential to understanding. The discipline techniques from cultural studies help to examine how language offers powerful ways to understand and mediate human experiences of ‘nature-culture’. Fullagar (2000), in earlier work, highlights the need for a cultural analysis of the nature-culture nexus, given that often environmental philosophy is drawn on to understand nature. Utilising tools from cultural studies, the mediation of language becomes a prism through which to understand the sensory experiences between self and ‘nature’ and can involve self-transformation. We see research that takes up cultural analysis of environmental attunement as essential, amongst other approaches, to understand and shape the epistemological habits of health, sport and physical education. Many tools are need to examine the complexity of nature-culture in health, sport and physical education. This led us to welcome papers to this Special Issue that engage with a variety of approaches; especially research that is imaginative and considered in the application of ethical methods of purpose (Gerrard et al., 2016). The complexity and richness of theory coalesces as either a purposive tool, a circular trap or in the timing of the zeitgeist.

Theme 1: notions of the environment and 'nature' in research and practice

After our first introductory paper that responds to the question, why environmental attunement in health and physical education? The second paper in this Special Issue by Holly Thorpe et al. (2021) delves into important possibilities of more-than-human theory in the social sciences.

Thorpe et al. (2021) make the point that sociology of sport scholars have been slow to take up environmental thinking, especially compared to feminist social theorists such as Donna Haraway who has been arguing for a more central exploration of humans relationships to *nature* in humanities research since the 1990s. They point to the ongoing search for environmental and nature-centered politics that has been pressed for decades by scholars outside the discipline, citing Rachel Carson's 'Silent Spring' in the 1960s, through to the intensified socio-political priorities in the present. They provide a rich literature review of feminist new-materialist methodological approaches and notions of the environment in sport. Demonstrating the utility of feminist new-materialist theory, they explore the ontological promise it holds for responding to the environmental challenges of our time, especially given the lag in the sports and movement scholarship, compared to social sciences, to problematise 'anthropocentric foundations of sociology, and the tendency for sport scholars to focus on humans' lived experiences and moving bodies' (Thorpe et al., 2021, p. 4). This resonates with recent work by Martschukat (2021) that maps and historicises the individualised age of fitness that has been deeply celebrated in and dominated western democracies. Thorpe and her colleagues demonstrate the need for a fundamental relational environmental change in sport and highlight a range of recent literature that is addressing this in different ways. They also make links to examples of pedagogical possibilities for environmental attunement. In putting forward a feminist new materialist agenda, they point to the ethics of accountability and urgency, arguing, we cannot understand ourselves as observing or thinking or writing from an external

perspective, rather we are always implicated in and a part of the world's becoming, and this includes our implications in the world's undoing in times of environmental and climate crisis.

Drawing on materialist ontological theory for reconceptualising the relational ethics of sport, they map possibilities for methodological approaches that de-centre anthropocentric ways of knowing that have dominated sport and fitness research and practices.

The third paper by Howard Prosser (2021) offers a rich examination beyond the nature/culture divide to argue that within football there is a universal cultural experience of joy and social connection that is characteristic of human and non-human encounters. Using Critchley and Adorno's philosophy of nature to explore the ethnographic experience of football in an international school in Argentina, Prosser engages in rich storytelling of the layered and embodied nature of playful seriousness and genuine reflection and interaction with the world that is possible via the structure of the football game's lingua franca. His ethnographic exposition is situated in continental philosophy to offer a rich engagement in thought of what it means to play and how; for instance, he writes about 'moments of playful seriousness' or the 'desire to emancipate ourselves from the taming of the nature'. In so doing, this paper points to the simplicity of social and ecological poetics in play, yet how humans tend to 'overlay nature's blankness with meaning'. Prosser eloquently balances some of the contradictions or tensions of nature/culture in the environment tracing how soccer is part of the success of modernity (with market-led organisation such as FIFA) and subsequently there is an environmental cost in sports grounds construction and maintenance with the use of pesticides and insecticides to achieve 'the perfect playing surface'.

Theme 2: possibilities and challenges of translating environment, sustainability and ‘nature’ from policy and curriculum documents in practice

The papers in this section engage with curriculum documents and teachers values and beliefs from the Australian context to consider the challenges and possibilities of translating environmental attunement to practice. There is much scope to expand this theme through further research to examine the interstices of enacting environmental attunement in local places, governance, educational systems and pedagogical practice (Aikens, [2020](#); Gray & Martin, [2012](#); Madsen et al., [2015](#)).

In the fourth paper, Rebecca Olive and Eimear Enright ([2021](#)) provide an analysis of the complexity and challenges of the way the Australian Curriculum Cross-Curriculum Priority (CCP) of Sustainability is articulated through the Australian Curriculum: Health and Physical Education (AC:HPE). Many outside the learning area have examined how the CCP of Sustainability, along with the two other CCPs (Asia and Australia’s Engagement with Asia (AAEA) and Aboriginal and Torres Strait Islander Histories and Cultures (ASIHC)), are not prioritised in practice. As Barnes et al. ([2019](#), p. 380), there is ‘no explicit requirement (or accountability) for whether and how to teach them, nor are there specific metrics to determine how successfully teachers have implemented them’. Olive and Enright join forces, drawing on their backgrounds in recreational lifestyle sports and curriculum studies, to cross boundaries of youth activism and environmental issues in education in order to explore how these fields intersect in possibilities for enacting the AC:HPE Sustainability CCP. Drawing on the work of Val Plumwood ([2000](#)), they situate their work within ecofeminist theory to consider sustainability through ecological and ethical terms, pointing out that opportunities for environmental engagement emerge anytime the words ‘health’ or ‘wellbeing’ is used in the AC:HPE curriculum. Utilising ‘oceanic ways of thinking’ (Steinberg & Peters, [2015](#)), as part of an eco-feminist approach, they apply this ontological approach to their textual analysis of

reading curricular documents to highlight the multiplicity of possibilities in terms such as ‘community’ and ‘health’. This paper also takes readers into new terrain to consider how the human might be decentred in conceptions and enactments of sustainability and the AC:HPE to consider complex ecologies and Indigenous ontologies as they relate to knowledge and pedagogy.

The fifth paper by Nicole Taylor et al. ([2021](#)) examines the ways teachers of primary and secondary AC:HPE in Australian schools conceptualise gardens and garden-based learning in their practice. Curriculum policy documents that explicitly include links to gardening, as well as the rise in popularity of school gardening as linked to wellbeing, nature and educational discourses are examined. This backdrop is then brought into conversation with empirical data from a larger study with 24 health and physical education teachers about their meanings of environmental health within the learning area. Their work reveals how many teachers made obvious links to food, nutrition and physical activity. However, there was also a complexity to many of the teachers’ discursive meanings, and how these suggest conditions of possibility for garden-based links to Australian Health and Physical Education curriculum in teachers’ conceptions and practice, including sensory and embodied engagements with the materiality of gardens as well as a tool for student learning and management beyond the classroom. In resisting a romanticisation of gardening and health and physical education, this paper outlines possibilities for engaging with garden-based learning in primary and secondary contexts.

Theme 3: philosophical and theoretical links to emplaced learning – past-present-future

This third theme engages with language and experience of emplaced connections to environments. The papers grouped under this theme, have some overlap with the others in theoretical purpose, especially the work of social connection and joy in football expressed in Howard Prosser’s paper, in that they engage with rich accounts of making meaning of embodied experience, affect and emotion in pedagogy. There are also some similarities here

to literature that engages the notion of pleasure in movement education (e.g. Brown, [2017](#); Pringle et al., [2015](#); Stevens & Culpan, [2021](#)) and self and social learning (Thorburn, [2020](#)). The sixth paper by Stephen Smith ([2021](#)) brings a rich and evocative use of language to phenomenologically explore the sensory and affectively-charged interactions with water, or all aqueous bodies, including man-made and natural waterscapes. Drawing on the theory of Maurice Merleau-Ponty and Richard Shusterman, this work situates bodily knowledge as developed through ‘kinaesthetic registers’ between oneself and being in water. Smith examines links to swimming and the experiential aspects of sensorial feeling and affect. This is brought together with the notion of eco-pedagogy to examine ‘bringing attention to the dynamics, reciprocities, and textures of this distinctively motile manner of bodily immersion in a flow motioning world’. Through examining the dynamics of flow, the reciprocities of flow, the textures of flow in waterscapes, Smith points to the possibilities for ‘a fuller environmental immersion’. He argues that this is not mutually exclusive to a disciplined practice of swimming. In guiding the reader through how the practice of swimming itself is a living praxis, he theorises how reflective and analytic abstractions emerge from learning to feel the flow of motion. Smith demonstrates how agency arises from being pedagogically attuned to experiencing the world.

The seventh paper by Michael Gard ([2021](#)), concludes this Issue with a thought-provoking exposition of the political, philosophical and technological turns in the health and physical education discipline: from past, to present, to future. He highlights the ‘former glory’ of the learning area yet points to the unwavering educational importance of understanding physical experiences of the body. Michael espouses the precept ‘let many flowers bloom’; that is, not to close down possibilities in the context of opportunities to theorise divergent possibilities teaching movement, including what we can learn from animals. He draws on a range of theoretical devices, but particularly Ivan Illich’s work, to help historically situate

the philosophical purposes of educating the physical body in schooling through time. With thought prompts of open endings and vicissitudes to entertain the timeliness and relevance of what physical education is for and can be, this is a piece to think with.

Conclusion

Together the papers in this Special Issue have taken various theoretical and empirical approaches to the notion of environmental attunement across health, sport and physical education; all central themes of *Sport Education and Society*’s readership. As noted in the abstract, there are many important geographical and contextual differences and similarities to explore further beyond this initial collection. Because of this, we do hope to inspire further diverse submissions via an extended call for papers that respond to this first Issue and engage with the challenges and possibilities of how we might approach the complex environmental, ecological, political and cultural factors that shape health, sport and physical education practice in current times.

Acknowledgements

We would like to thank Professor John Evans and Professor Jan Wright for their ongoing encouragement and feedback in materialising this Special Issue. We immensely thank the authors of the articles – we couldn’t have made this happen without your scholarship and patience. We also thank all of the reviewers who responded so thoughtfully and helped to improve the collection through peer review.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Notes

1 We need to qualify what we mean here by ‘nature’, as we resist essentialist debates and align this work to the non-separation of nature and culture. While the term ‘nature-culture’ is often used to avert such bifurcation of nature to humans, the built and unbuilt environment or landscapes our position is to have sensitivity to these complex interrelationships between nature and culture by applying inverted commas around ‘nature’ (see Plumwood, [2000](#); Fullagar, [2000](#); Tamboukou, [2020](#)).

2 Health, sport and physical education includes Health and Physical Education (HPE). This grouping acknowledges the varied configurations of how the subject is taught in various places internationally and within individual countries states or provinces. HPE includes links to Health Education, Physical

Education, or integrated notions of Health and Physical Education. At times we refer specifically to health education or physical education or related disciplines of leisure and sports studies which is not to exclude 'HPE' as part of these.

References

1. Aikens, K. (2020). Imagining a wilder policy future through interstitial tactics. *Policy Futures in Education*, <https://doi.org/10.1177/1478210320972578> [Crossref], [Web of Science ®], [Google Scholar]
2. Atkinson, J. (2002). Trauma trails, recreating song lines: The transgenerational effects of trauma in indigenous Australia. Spinifex Press. [Google Scholar]
3. Barakat, B., Bengtsson, S., Muttarak, R., K ebede, E. B., Cuaresma, J. C., Samir, K. C., & Striessnig, E. (2016). Education and the sustainable development goals (Background Paper prepared for the 2016 Global Education Monitoring Report). UNESCO. [Crossref], [Google Scholar]
4. Barnes, M., Moore, D., & Almeida, S. (2019). Sustainability in Australian schools: A cross-curriculum priority? *Prospects*, 47(4), 377–392. <https://doi.org/10.1007/s11125-018-9437-x> [Crossref], [Google Scholar]
5. Baum, F. (2007). Cracking the nut of health equity: Top down and bottom up pressure for action on the social determinants of health. *Promotion and Education*, 14(2), 90–95. [Crossref], [PubMed], [Google Scholar]
6. Brown, K. M. (2017). The haptic pleasures of ground-feel: The role of textured terrain in motivating regular exercise. *Health & Place*, 46, 307–314. <https://doi.org/10.1016/j.healthplace.2016.08.012> [Crossref], [PubMed], [Web of Science ®], [Google Scholar]
7. Brymer, E., Cuddihy, T. F., & Sharma-Brymer, V. (2010). The role of nature-based experiences in the development and maintenance of wellness. *Asia-Pacific Journal of Health, Sport and Physical Education*, 1(2), 21–27. [Taylor & Francis Online], [Google Scholar]
8. Clarke, D. A., & Mcphie, J. (2020). New materialisms and environmental education: Editorial. *Environmental Education Research*, 26(9–10), 1255–1265. <https://doi.org/10.1080/13504622.2020.1828290> [Taylor & Francis Online], [Web of Science ®], [Google Scholar]
9. Dhillon, K. K., Centeio, E. E., & Dillon, S. (2020). Drumming and dancing: Creative movement for convention refugee youth in a physical activity space. *Sport, Education and Society*, 25(3), 318–331. [Taylor & Francis Online], [Web of Science ®], [Google Scholar]
10. Dobbs-Weinstein, I. (2015). Spinoza's critique of religion and its Heirs: Marx, Benjamin, Adorno. Cambridge University Press. [Crossref], [Google Scholar]
11. Dymont, J., & Potter, T. (2015). Is outdoor education a discipline? Provocations and possibilities. *Journal of Adventure Education and Outdoor Learning*, 15(3), 193–208. <https://doi.org/10.1080/14729679.2014.949808> [Taylor & Francis Online], [Web of Science ®], [Google Scholar]
12. Feng, X., & Astell-Burt, T. (2017). Do greener areas promote more equitable child health? *Health & Place*, 46, 267–273. <https://doi.org/10.1016/j.healthplace.2017.05.006> [Crossref], [PubMed], [Web of Science ®], [Google Scholar]
13. Fitzpatrick, K., Leahy, D., Webber, M., Gilbert, J., Lupton, D., & Aggleton, P. (2019). Critical health education studies: Reflections on a new

conference and this themed
symposium. Health Education
Journal, 78(6), 621–

632. <https://doi.org/10.1177/0017896919860882> [[Crossref](#)], [[Web of Science](#)], [[Google Scholar](#)]

THE DESIRE TO DIE IN THE PLAYS OF TENNESSEE WILLIAMS: AN ILLUSORY STRATEGY AGAINST REALITY

N.G. Jadhao

Asst. Prof., Dept. of English, S.S.S.K.R. Innani Mahavidyalaya, Karanja (Lad), Dist. Washim (M.S.), India
ngjadhao7777@gmail.com

ABSTRACT

The present article is aimed to explore the recurrent desire to die cherished by Tennessee Williams' characters as a strategy to escape from the clutch of the unbearable reality of the life in which they feel uncomfortable. Here, the death is utilized as the strategy to get relief from the burden of the agonized reality imposed by the age and celebrate the fundamental pleasure of the lives. All the characters in his major plays are shown trapped in the hard clutch of the reality along with the struggle to come out of it with all the means of escape. Of course, they fight up to the last moment against the oddities by conjuring numbers of fantasies and impressions but when they get confirmed about the impossibility to come out of the condition, they often wishes to die as the final medication to all the troubles. They fantasy the death as the only finishing means to come out of the struggle and get relief from the soreness of reality. Most of his plays come with this underlining theme revolves around the desire to die but here his four plays viz. 'The Glass Menagerie', 'The Streetcar Named Desire', 'Summer and Smoke' and 'The Rose Tattoo' are undertaken for critical appreciation to show the extravagance of his characters in death to escape from the burden of life.

Keywords: *escape, depression, psychic reality, materialism, human consciousness, marginalized section, antagonistic environment, distressed souls, solitariness, alienation, frustration, deprivation, emotionally estranged and displaced, cultural consciousness, American Dream etc.*

Introduction

Tennessee Williams, one of the most representative and receptive playwrights of the age of depression era in American literature, often handles numerous contextual themes associated with the social and economical conditions of the age. Being born and brought up in a period which was full with the turmoil of the Wars and the Great Depression, he does not miss the prospect to come with the governing spirit of the age through his theatrical sensibility. Naturally, the age finds its voice in his playwriting. As a sensible playwright and true child of the age he writes extensively about the psychic reality that came on the wake of modernism dominated by the individual's aspiration against the social deprivation. The disintegrations of the American, particularly Southern myth and culture in a state of catastrophe are taken as an elementary precept of his writing. Through his ground saturated sensibility he has observed that both the public and individual lives are under the menace, menace of covetousness, physical decline, the loss of the real and above all the desire to die. Obviously the deep-seated themes that recurrently occur in his plays are the yields of the American culture in which he is concerned with the explorative contact with

the human consciousness. His plays are mostly set in the very social and economical milieu of the age and concerned to describe the plight of the less privileged and deprived sections of the society and its impact to shape internal response to the external world. Being an accessible playwright, he is often concerned to depict the lives of the people who have been often socially deserted and spiritually deprived. His plays frequently depict the lonely vulnerable whose present torment of uncertainty lead them in the realm of darkness. Having a great sympathy for the common folks whose suffering souls fail to match with the adverse social scenario, he gives a more space in his writing to depict the impact of the age on the psychological lives of this class. He is essential a playwright having great sympathies for the outsider whose very survival have been denied by the society as Bigsby C. W. E. observes, "His sympathies are certainly with the outsider, the bohemian, the underclass, but not because they represent a revolutionary potential. It is simply that they stand for an alienation which goes beyond Marxist notions." (33) He is often concerned with the marginalized section of the society, the distressed souls who hopelessly struggle to make certain their survival in antagonistic environment. The representatives of this

section are often seen fighting the single-handed battle against the idiosyncrasies of the lives to ensure their survival and esteem the fundamental spirit to have the contentment of the life. The very desire to ensure the survival and enjoy the pleasure associated with the life lead them in a clash against reality. The desire to cope against the reality paves the way for them to conjure various fantasies. Hence the clash becomes the dominating feature of his dramatic work of art that is often found in the form of the clash between spiritualism and materialism, soul and body, virtue and vice, heavenly and earthly, emotion and passion, realism and expressionism etc. His plays often reveal the conflicts resulting between the hopes and despairs in the form of the American Dream and their constant denial against the hopeless and helpless condition of the depression consequences. The clash between such individuals and the unfavorable society often lead them in the gulf of despair. Smith-Howard, Alycia and Heintzelman, Creta observe, "Controversy and conflict were also prominent thematic features at the heart of many of the works Williams produced at this time." (12) Naturally they suffer at the psychological level that leads them to nurture the feeling of loneliness, alienation and despair and ultimately the feeling of escape from the life in favour of the death. They often suffer with the psychic peculiarities in the sensible world. "Loneliness, social isolation, and the conflict between repression and release are primary themes in Williams' work, which are also characterized by eloquent dialogue and richly complex characters." (Smith-Howard & Heintzelman ix) The critic W. J. Weatherby observes, "Williams' plays share at least two distinctive qualities. One is a feeling for evanescent moods and conditions. Another is an emphasis on psychological peculiarities." (Devlin, 28) The very dramatic vision inspired him to handle many contextual themes in respect to his time. Hence, beneath his plays, one can find the most underlying themes such as solitariness, alienation, frustration, deprivation and above all to escape from reality into illusion. The very bump of the feelings of solitariness, alienation and frustration pave the way for escapism in the form of death.

It is also noted that the very desire to flee from life in the form of death is resulted out of his own experience and his dramatic sensibility to see life. In his credo of playwriting, he is much concerned to explain the significance of life, not to project his characters as heroes and villains or come with the poetic justice. He frequently discusses the corollary of life on the basis of his personal experience and sensibility. He often considers that life is a kind of question that cannot be easily answered. But still he believes in the dignity and value of the question. He is impressed that human beings are trapped in this question; hence nobody is able to come with the answer. Everybody is confined in his own problems having no time to value the other. He wrote, "Nobody ever gets to know nobody, with all of us sentenced to solitary confinement inside our own skins for life. We're under a lifelong sentence to solitary confinement inside our lonely skins for as long as we live. (Memoir, 55) Naturally, in his plays, he is more concerned to state the desire of freedom in the form of death; the escape from the distress of living and accepts the peace of death.

The subtle study of the plays undertaken for the appreciation reveals the fact that his characters always try to escape from the world of painful reality into the world of illusion to ensure their survival. But very often their illusions get punctured as they confront to the naked and harsh reality of the life. The very situation leads them to get the impression about the unkind nature of the life and compassion of the death. Besides they do not find any hope in the transforming culture of the age. The very hopeless and helpless stipulation leads them to foster the desire to die to fulfill the eternal quest of perfection. The resulting disillusion of their illusion makes them psychologically ready to give up the fortitude of survival and admit the death as the therapy to cure their psychic wounds given by the adjacent milieu. Here his four plays i.e. *The Glass Menagerie*, *A Streetcar Named Desire*, *Summer and Smoke* and *The Rose Tattoo* are undertaken for critical appreciation to show the extravagance of his characters in death to escape from the burden of life.

The Glass Menagerie

The play *The Glass Menagerie* is a memory play narrated from the wistful sense to depict the lives of the Wingfield family living in a small apartment against the period of depression. All the members of family are seen emotionally estranged and displaced from each other because of the lack of considerate, inability to communicate, desire to fulfill the cherished dream and escaping from the financial strain and imposed social status. Tom, the narrator, Amanda, the mother, and Laura, the sister disengage themselves in favour of their respective reverie against reality. The action revolves round the theme of escape, get away from the unbearable reality of the lives somewhere in the dominions of adventure, melancholy or glorious past. Amanda often feels trapped in the harsh web of reality devoid of any hope to see bright future. She hopes the settling of her children so she may be able to run off from her responsibility. But her hopeless daughter and the dreamy son never let her to come out of her responsibility in absence of her husband. She is always concerned with their future against the wearisome present. But when she finds that it is fruitless to hope against them, she longs to escape from such painful reality in favour of death. The death wish is apparently seen in her assertion, "I wanted to find a hole in the ground and hide myself in it forever." (12) She is bewildered with the reality, and often wants to run away from the life with the means of death. Laura, being shy and fragile girl, lives in her own world subjugated by the glass animals and old phonographs along with inferiority complex. She does not like to face the harsh reality of her life and is often seen retreating in her own world to ensure her survival. She feels herself trapped in a cage without any hope to come out of it. To avoid the reality, she also desires to give up such a life.

A Streetcar Named Desire

The play *A Streetcar Named Desire* handles the theme of break out from the reality in search of the ideals. It occupies the innermost role in the American cultural consciousness with the delineation of the effort of survival of venerable individual in the vicious world rampant with brutality with the aid of the

mental tendency to run away from the reality. The play is very much apprehensive with the emotional struggle of escape of the lonely protagonist, Blanche, who feels trapped in the cruel reality. However, when she comes to know that it is impossible to get purge from the ill thoughts, she desires to escape from the life by thinking about the death like her beloved husband, Allan. Her desire to escape from the earthly reality is clearly seen in her longing, "How pretty the sky is! I ought to go there on a rocket that never comes down." (25) At the end when everything goes against her longing of survival she summons the death to free herself from the torturing reality of her life. She fantasizes the desire to die in the sea by eating unwashed grapes. She gives a way to her illusion to die:

I can smell the sea air. The rest of my time I'm going to spend on the sea. And when I die, I am going to die on the sea. You know what I shall die of? I shall die of eating an unwashed grape one day out on the ocean. I will die – with my hand in the hand of some nice-looking ship's doctor ... And I'll be buried at the sea sewn up in a clean white sack and dropped overboard – at noon – in the blaze of summer- and into an ocean as blue as my first lover's eyes (102)

Summer and Smoke

Set in a small southern town in background of puritan culture, the play *Summer and Smoke* depicts the conflict between body and soul that compels the protagonist, Alma, to escape from the imposed reality and longs for the death. She is seen fostering the feeling to run away from her painful present in search of meaning to her life. She even takes sleep pills to escape from her dilemma resulting out of suppression. Whenever she feels the burden of her passion, she seeks protection in sleeping pills. When she is scolded by her father for her detachment from the spirit of survival, she expresses the desire to escape from her existing life in kindness of death as she cries, "Don't call anybody to help me. I want to die." (63) She feels lonely so withdraw from the social affairs and responsibilities. Her talks with Dr. John sr. reveals her true nature favourable for escaping from her present status in sympathy of death.

She even confesses about her emotional death, "But even if I survive, I won't be the same. I'll be terribly changed in some way." (20) She expresses her anguish against life by saying that, "All rooms are lonely there is only one person." (77) Naturally the desire to gives up the spirit of survival and accepts the death as the ultimate remedy dominates her life.

The Rose Tattoo

The theme of escape from the painful reality and indulgence in the illusion outline the very action of play *The Rose Tattoo*. Serafina Della Rose, a Sicilian idealistic lady living in America, is often seen escaping from the reality of her life in the realm of fantasies. The play is concerned to show how the escaping attitude from reality paralyses her and ultimately leads her to withdraw from the main stream of life and desire the death to end all the troubles of living. Her disinterest from the spirit of survival is seen when Rose speaks, "This is the way she goes around all the time. She hasn't put on clothes since my father was killed. For three years she sits at the sewing machine and never puts a dress on or goes out of the house." (27) She even cuts herself from the most celebrated urge of her sexuality. Ultimately, when she comes to know about the truth of her husband's infidelity she breaks the Urn and scatters the ashes of her husband. She blames Madonna for her ordeals and cuts her religious faith. She does not like to survive in

this unkind world which is full with distress. This act of breaking the urn and scattering the ashes suggests her escape from the memory of her died husband and accepts the emotional death of her life. His daughter, Rosa, is also seen frequently escaping from the reality of her life to ensure her romantic survival. She escapes from the clutch her mother's constraint by establishing the romantic relation with Jack Hunter. When her mother locks her and opposes her meeting with her lover, she expresses the desire to escape from the life as she says that "I am so ashamed I could die." (27)

Conclusion

The brief textual discussion of the plays reveals the fact that the very actions of these plays are built around the theme of escape from the world of unbearable reality into the world of illusion and fantasy. But when their illusions and fantasies fail to sustain their lives, they indulge in the desire to die to come out of the all the anguishes and troubles imposed on their lives by the reality. Their helpless and hopeless conditions lead them to accept the death as the reality of life. They prefer death by taking it as the paramount remedy to cure all types of mental and psychic diseases. Death emerges as the final panacea to boost their moral against the burden of the lives. They accept death as the only medication to end the chain of adversities and ensure the satisfying survival.

Bibliography

1. Williams, Tennessee. *Summer and Smoke*. Dramatists Play Service Inc, 1977, New York.
2. Williams, Tennessee. *A Streetcar Named Desire*. The Penguin Group, 2009, London, England.
3. Williams, Tennessee. *The Rose Tattoo*. New Directions Publishing Corporation, 2010, New York.
4. Williams, Tennessee. *The Glass Menagerie*. Bloomsbury Publishing India Pvt. Ltd., 2015, New Delhi.
5. Williams, Tennessee. *Where I Live: Selected Essays*. edited by C. Day & B. Wood, New Direction.
6. Williams, Tennessee. *Memoirs*. The Penguin Group, 2007, London England.
7. Bigsby, C. W. E. *Modern American Drama 1945-2000*. Cambridge University Press, 2004, UK.
8. Devlin, Albert J. *Conversation with Tennessee Williams*. University Press of Mississippi, 1986, Jackson and London.
9. Griffin, Alice. *Understanding Tennessee Williams*. University of South Carolina Press, 2011, Carolina, U.S.A.
10. Smith- Howard, Alycia & Heintzelman, Creta. *Critical Companion to Tennessee Williams*. Facts On File, Inc., 2005, USA.

QSTR MODELING FOR DIFFERENT PESTICIDES FOR *Pseudokirchneriellasubcapitata*Vijay H. Masand*¹, Mithilesh M. Rathore¹, Sumer D. Thakur², N.D. Gawhale³, C.D. Badnakhe⁴¹Department of Chemistry, Vidya Bharati Mahavidyalaya, Amravati, Maharashtra, India- 444 601²Department of Chemistry, RDIK and NKD College, Badnera-Amravati 444 701, Maharashtra, India³Department of Chemistry, G. S. Tompe College, Chandur Bazaar, Amravati, Maharashtra, India⁴Dr. Manorama & Haribhau Pundkar Arts, Commerce & Science College Balapur, Akola, Maharashtra, India**ABSTRACT**

For the purpose of understanding the structural features affecting the EC_{50} for a 24-hour based experiment, QSTR modelling is carried out for the microalga *Pseudokirchneriellasubcapitata* utilizing a data set of 301 compounds from various chemical classes. The balanced QSTR model includes seven straightforward chemical descriptors, is statistically robust, and has excellent predictability. According to the suggested OECD rules, the model is a Genetic algorithm Multi-linear Regression (GA-MLR) that has undergone internal validation, Y-randomization test, application domain analysis, and external validation. A large number of suggested validation parameters, including $R^2 = 0.735$ and $Q^2_{LOO} = 0.717$, are satisfied by the newly created model's threshold values. With regard to previously reported and more recent structural alarms, the newly established QSTR model is successful in determining the sort of hybridization or particular type of atoms involved. The work may thus be helpful for completing data gaps and broadening mechanistic understanding of toxicity for various substances.

Keywords: QSTR, *Pseudokirchneriellasubcapitata*, *Raphidocelissubcapitata*, Toxicity

Abbreviations: OECD - Organization for Economic Cooperation and Development, FIFRA- U.S. Federal Insecticide, Fungicide and Rodenticide Act, EPA - U.S. Environment Protection Agency, ECHA, QSAR - Quantitative Structural-Activity Relationship, QSTR - Quantitative Structural-Toxicity Relationship, GA-MLR - Genetic Algorithm and Multiple Linear Regression

1. Introduction:

Because algae are more sensitive than fish (Aruoja et al., 2011) and are the first organisms to absorb many harmful chemicals like medications and pesticides, the 2006 OECD guidelines (OECD, 2006) need accurate toxicity data for growth inhibition on aquatic plants, preferably on algae (Machado and Soares, 2021). In turn, this means that the availability of high-quality data on algae toxicity may reduce the need for regulatory toxicity testing on higher organisms like fish. As a result, toxicity testing has been successful when using *Pseudokirchneriellasubcapitata*, *Pediastrum duplex*, *Monoraphidium arcuatum*, *Nannochloropsis*-like sp., and *Chlorella* sp. 12, among other organisms (Stone et al., 2019; Machado and Soares, 2021).

A microalga called *Raphidocelissubcapitata*, formerly known as *Pseudokirchneriellasubcapitata* (*P. subcapitata*), is very sensitive to the presence of hazardous chemicals in fresh water (Machado and Soares, 2021). As a result, it serves as a bioindicator species in

ecotoxicological investigations (Baskin et al., 2017). Its widespread dispersion across the environment also makes it useful for assessing the quantity of nutrients (Marques et al., 2007). As a result, many scientists used *P. subcapitata* in their toxicological studies. However, the in vivo and in vitro toxicity studies are costly and time-consuming (Yang et al., 2020b). In order to reduce these drawbacks, other strategies based on computational techniques, such as QSAR, are preferred (Yang et al., 2020b). Quantitative Structure-Activity Relationships, or QSARs, have been recognized and approved by numerous regulatory bodies, including the OECD, the REACH framework, the Agency for Toxic Substances and Disease Registry (ATSDR), the European Union Commission's Scientific Committee on Toxicity, Ecotoxicity, and Environment (CSTEE), etc. due to their capacity to recognize structural alerts for toxicity, decipher plausible toxic mechanisms, and predict the toxicity of a compound. 2019 (Khan et al.) (Khan and Roy, 2019; Fu et al., 2015; Toropov et al., 2017)

In reality, Biocidal Products Regulation (BPR) encourages the use of QSAR for the adaptation

of data requirements, provided that the produced model complies with all criteria listed in annex IV on general rules (Khan et al., 2019; Khan and Roy, 2019). These specifications call for the use of suitable and trustworthy documentation of the applicable method for developing QSAR models, followed by the model's proper validation, and the chemicals must fall within the model's applicability domain (Eu, 2012). As a result, the QSARs models are anticipated to accurately forecast the toxicity for compounds that lack experimental toxicity data or have not yet been produced.

Many researchers created QSTR models for *P. subcapitata* as a result of this. However, they lacked diversity in chemical classes, or they employed smaller data sets (see Table 1). A six-parametric QSTR model for pEC50 (24 hr) was published by Khan and Roy in 2019 using a bigger data set of 334 chemicals made up of a range of substances (Khan and Roy, 2019). $R^2 = 0.72$ is the coefficient of determination for the developed model. Later, Yu (Yu, 2020) used the same data set to create an eight-parametric SVM-based QSTR model, which is satisfactory with $R^2 = 0.75$ and MAE = 0.60. They did, however, employ pEC50 calculated for a 24-hour experiment. Therefore, utilizing a bigger data set that includes pEC50 obtained for 24hr assays necessary to create a fully validated and balanced (Masand et al., 2021)

QSTR model for toxicity against *P. subcapitata*. The current work is an effort to use a larger data set to construct a QSTR model that balances descriptive and predictive elements for pEC50 for a 24-hour *P. subcapitata* assay. The effort also aims to locate innovative, significant, and hidden structural characteristics that are challenging to observe visually.

2. Resources and techniques:

The current work has adhered to the best practices for QSTR analysis established by the OECD and other regulatory bodies (OECD, 2006). The process includes creating and maintaining data sets, calculating molecular descriptors and trimming them, creating a model, thoroughly validating it, and interpreting the model from a mechanistic perspective (Gramatica, 2007; Johnson, 2008; Dearden et al., 2009; Cherkasov et al., 2014; Gramatica, 2014; Fujita and Winkler, 2016; Gramatica, 2020).

The current study uses a *P. subcapitata* data set for QSTR analysis, which involves organic compounds from several scaffolds with a wide range of substitution patterns and toxicity profiles. Few typical molecules have been shown in Table 1 as examples simply to highlight the diversity of compounds in the data set out of convenience using SMILES notations.

No.	CAS	Smiles notation	pEC50 (mols/L)(exp.)
286	42576023	<chem>c1(c(ccc(c1)Oc1c(cc(cc1)Cl)Cl)[N+](=O)[O-])C(=O)OC</chem>	9.113
299	90982324	<chem>c1(c(S(=O)(=O)NC(=O)Nc2nc(cc(n2)Cl)OC)cccc1)C(=O)OCC</chem>	8.363
1	50328	<chem>c12c3c4ccc1c1c(cc2ccc3ccc4)cccc1</chem>	8.165
271	23184669	<chem>c1(N(COCCCC)C(=O)CCl)c(cccc1CC)CC</chem>	7.75
289	51218496	<chem>c1(N(CCOCCC)C(=O)CCl)c(cccc1CC)CC</chem>	7.684
46	81049	<chem>c1(c2c(c(S(=O)(=O)O)ccc2)ccc1)S(=O)(=O)O</chem>	1.267
19	60322	<chem>C(CC(=O)O)CCCN</chem>	1.17
187	609541	<chem>S(=O)(=O)(c1c(ccc(c1)C)C)O</chem>	1.04
33	67641	<chem>C(=O)(C)C</chem>	0.957
35	67685	<chem>S(=O)(C)C</chem>	0.31

The information was gathered from books and a freely accessible database (Connors et al., 2019). After that, it underwent curation before going through QSTR analysis (Fourches et al., 2010). Duplicate entries, metal derivatives,

complexes, salts, and compounds without EC50 values are all eliminated throughout the curation process. When there were two identical entries with different EC50 values, the entry with the lower value was kept in

order to take the worst-case scenario into consideration (Yang et al., 2020a). Additionally, before beginning the analysis, the EC50 values that were available in mg/ml form were converted to mol/L. As a result, 301 molecules were examined for *P. subcapitata* during the course of a 24-hour assay in the data set. From the chosen data set, the Table 1 lists the five least and most harmful substances. The additional material includes each molecule's pEC50, SMILES notation, and CAS number. The next phase involved calculating molecular descriptors using PyDescriptor (Masand et al., 2017b; Masand and Rastija, 2017) and PaDEL (Yap, 2011). As a result, there are more than 29,000 molecular descriptors in the descriptor pool. Then, to get rid of redundant descriptors that is almost constant (99%) and highly correlated ($|R| > 0.95$) molecular descriptors, we utilized QSARINS 2.2.4 (Gramatica et al., 2013). The number of molecular descriptors for the data set was considerably reduced as a result. Although the number of molecular descriptors has decreased, there are still many molecular descriptors available, such as atom-pairs, the presence or absence of specific functional groups or atoms, molecular characteristics, etc. Therefore, it encompasses a wide range of molecular descriptors to make it possible to identify key structural characteristics.

The data set was then for further steps of QSAR modeling. The genetic algorithm (GA) multi-linear regression (MLR) analysis was used to develop a model by selecting the right number of molecular descriptors. Using Q2LOO as a fitness function and 10,000 generations as the number of generations, the Genetic Algorithm (GA) module in QSARINS 2.2.4 (Gramatica et al., 2012; Gramatica, 2013; Gramatica et al., 2013; Gramatica, 2020) was used to search the molecular descriptors. Seven parametric models were produced for the data set as a consequence of the GA-MLR study. The reported model-A was then chosen based on its superior statistical performance, which includes meeting suggested threshold values for various internal and external validation parameters, hence confirming the model-A's proper validation. The following suggested

values for various internal and external validation parameters:

With RMSE and MAE near to zero, the following values are considered cutoff values: $R^2_{tr} = 0.6$, $Q^2_{loo} = 0.5$, $Q^2_{LMO} = 0.6$, $R^2 > Q^2$, $R^2_{ex} = 0.6$, $RMSE_{tr} > RMSE_{cv}$, $K = 0.05$, $CCC = 0.80$, $Q^2-Fn = 0.60$

All models that didn't meet the cutoff values were eliminated. Additionally, Y-scrambling was used to get rid of models that were created by accident (Dearden et al., 2009; Gramatica, 2013; Masand et al., 2015a; Gramatica, 2020). Williams plot was used to evaluate the proposed model's applicability domain.

Observations and Discussion

The first rule and benefit of a QSAR analysis is to discern in-depth expertise and knowledge about structural characteristics related to a bioactivity (descriptive QSAR) and to forecast the desired activity of an unknown molecule prior to its synthesis and bioscreening (predictive QSAR) (Fujita and Winkler, 2016). In order to accomplish these objectives in the current QSTR study, molecular descriptors that are simple to interpret in terms of structural aspects were used during model development. The following is the developed QSTR model for the data set:

Model-A:

$$\text{pEC50} = 1.161 (\pm 0.288) + 1.526 (\pm 0.362) * \text{notringS_notringN_9B} + 2.485 (\pm 0.201) * \text{McGowan_Volume} + -1.609 (\pm 0.521) * \text{KRFP3752} + 0.74 (\pm 0.215) * \text{AD2D12} + -0.195 (\pm 0.065) * \text{nHBDOn_Lipinski} + -0.443 (\pm 0.09) * \text{O_sp3C_2B} + -2.186 (\pm 0.416) * \text{ad_S_1B}$$

Model-A validation criteria:

	Parameter	Value	Parameter	Value
1.	R^2_{tr}	0.735	MAE_{cv}	0.654
2.	$R^2_{adj.}$	0.728	$PRESS_{cv}$	211.243
3.	$R^2_{tr} - R^2_{adj.}$	0.006	CCC_{cv}	0.838
4.	LOF	0.723	Q^2_{LMO}	0.713
5.	K_{xx}	0.151	R^2_{Yser}	0.023
6.	ΔK	0.083	Q^2_{Yser}	-0.032
7.	$RMSE_{tr}$	0.811	R^2-ExPy	0.717
	MAE_{tr}	0.635	R'^2_o	0.631
	RSS_{tr}	197.863	k'	0.968
	CCC_{tr}	0.847	$1 - (R^2 / R'^2_o)$	0.12
	s	0.822	r^2_m	0.507
	F	115.963	R^2_o	0.717

R^2_{cv} (Q^2_{loo})	0.717	k	0.998
$R^2 - R^2_{cv}$	0.018	$1 - (R^2 - ExPy/R_o^2)$	0
$RMSE_{cv}$	0.838	r^2_m	0.706

The model has been constructed using a sufficient number of variables, as evidenced by the close values of the R^2_{tr} , $R^2_{adj.}$, and R^2_{cv} (Q^2_{loo}) coefficients of determination (Kiralj and Ferreira, 2009). The low value of the Y-scrambling-related parameters R^2_{Yscr} and Q^2_{Yscr} , as well as the high value of Q^2_{LMO} (Leave-many-out coefficient of determination), which is necessary to confirm internal validation of a model, show that the model is statistically robust and free from chance correlations (Cherkasov et al., 2014; Gramatica, 2014; Masand et al., 2015b; Fujita and Winkler, 2016; Gramatica, 2020). The high values of R^2_{ex} , Q^2_{Fn} , and CCC_{ex} indicate that model-A has a high capacity for external prediction (Consonni et al., 2009; Chirico and Gramatica, 2011, 2012; Gramatica, 2014; Consonni et al., 2019). The significant statistical significance of the model-A is supported by the Fischer value F. As a result, the model-A satisfies the given requirements when its validation parameters are compared to the indicated threshold values for the same parameter.

Seven parameters viz. $notringS_notringN_9B$, $McGowan_Volume$, $AD2D12$, $KRFP3752$, $nHBDOn_Lipinski$, O_sp3C_2B , ad_S_1B make up the model-A. Three molecular descriptors viz. $notringS_notringN_9B$, $McGowan_Volume$, $AD2D12$ exhibit positive coefficients out of the

seven parameters in model-A. A higher toxicity will follow from any rise in these values. The remaining molecular descriptors $KRFP3752$, $nHBDOn_Lipinski$, O_sp3C_2B , ad_S_1B , however, have the opposite effect because they have negative coefficients in model-A.

Conclusion

For regulatory organizations and policy makers, it is crucial to identify novel structural alarms for toxicity. In addition to successfully identifying new structural alerts, the QSTR model constructed employing a variety of chemicals in the current work has also expanded and deepened knowledge and comprehension of existing structural alerts. It is statistically sound and has demonstrated great performance for predicting exogenous substances within the model's applicability domain by applying a large number of validation criteria. The model recognized key characteristics that control a molecule's toxicity, including the significance of aromatic carbon atoms, chlorine atoms, lipophilicity, number of rings, etc. The model should be helpful for completing data gaps, forecasting toxicity values of novel or untested biocides, and reducing the expense associated with toxicity evaluation.

Acknowledgments

We are also thankful to Dr. Paola Gramatica and her team for providing QSARINS 2.2.4.

Conflict of Interest: The authors declare no actual or potential conflicts of interest.

References

- Artemenko, A.G., Muratov, E.N., Kuz'min, V.E., Muratov, N.N., Varlamova, E.V., Kuz'mina, A.V., Gorb, L.G., Golius, A., Hill, F.C., Leszczynski, J., Tropsha, A., 2011. QSAR analysis of the toxicity of nitroaromatics in *Tetrahymena pyriformis*: structural factors and possible modes of action. SAR and QSAR in Environmental Research 22, 575-601.
- Aruoja, V., Sihtmäe, M., Dubourguier, H.-C., Kahru, A., 2011. Toxicity of 58 substituted anilines and phenols to algae *Pseudokirchneriella subcapitata* and bacteria *Vibrio fischeri*: Comparison with published data and QSARs. Chemosphere 84, 1310-1320.
- Baskin, T.I., Yamagishi, T., Yamaguchi, H., Suzuki, S., Horie, Y., Tatarazako, N., 2017. Cell reproductive patterns in the green alga *Pseudokirchneriella subcapitata* (= *Selenastrum capricornutum*) and their variations under exposure to the typical toxicants potassium dichromate and 3,5-DCP. PloS one 12.

5. Brill, J.L., Belanger, S.E., Barron, M.G., Beasley, A., Connors, K.A., Embry, M., Carr, G.J., 2021. Derivation of algal acute to chronic ratios for use in chemical toxicity extrapolations. *Chemosphere* 263.
6. Cherkasov, A., Muratov, E.N., Fourches, D., Varnek, A., Baskin, II, Cronin, M., Dearden, J., Gramatica, P., Martin, Y.C., Todeschini, R., Consonni, V., Kuz'min, V.E., Cramer, R., Benigni, R., Yang, C., Rathman, J., Terfloth, L., Gasteiger, J., Richard, A., Tropsha, A., 2014. QSAR modeling: where have you been? Where are you going to? *J Med Chem* 57, 4977-5010.
7. Chirico, N., Gramatica, P., 2011. Real external predictivity of QSAR models: how to evaluate it? Comparison of different validation criteria and proposal of using the concordance correlation coefficient. *J Chem Inf Model* 51, 2320-2335.
8. Chirico, N., Gramatica, P., 2012. Real external predictivity of QSAR models. Part 2. New intercomparable thresholds for different validation criteria and the need for scatter plot inspection. *J Chem Inf Model* 52, 2044-2058.
9. Connors, K.A., Beasley, A., Barron, M.G., Belanger, S.E., Bonnell, M., Brill, J.L., de Zwart, D., Kienzler, A., Krailler, J., Otter, R., Phillips, J.L., Embry, M.R., 2019. Creation of a Curated Aquatic Toxicology Database: EnviroTox. *Environmental Toxicology and Chemistry* 38, 1062-1073.
10. Consonni, V., Ballabio, D., Todeschini, R., 2009. Comments on the definition of the Q2 parameter for QSAR validation. *J Chem Inf Model* 49, 1669-1678.
11. Consonni, V., Todeschini, R., Ballabio, D., Grisoni, F., 2019. On the Misleading Use of Q2F3 for QSAR Model Comparison. *Mol Inform* 38, e1800029.
12. Dearden, J.C., Cronin, M.T., Kaiser, K.L., 2009. How not to develop a quantitative structure-activity or structure-property relationship (QSAR/QSPR). *SAR QSAR Environ Res* 20, 241-266.
13. Eu, E.P.A., 2012. Regulation (EU) No 528/2012 of the European Parliament and of the Council of 22 May 2012 Concerning the Making Available on the Market and use of Biocidal Products. p. 2985.
14. Fourches, D., Muratov, E., Tropsha, A., 2010. Trust, but verify: on the importance of chemical structure curation in cheminformatics and QSAR modeling research. *J Chem Inf Model* 50, 1189-1204.
15. Fu, L., Li, J.J., Wang, Y., Wang, X.H., Wen, Y., Qin, W.C., Su, L.M., Zhao, Y.H., 2015. Evaluation of toxicity data to green algae and relationship with hydrophobicity. *Chemosphere* 120, 16-22.
16. Fujita, T., Winkler, D.A., 2016. Understanding the Roles of the "Two QSARs". *Journal of Chemical Information and Modeling* 56, 269-274.
17. Ghavami, R., Sepehri, B., 2015. QSPR/QSAR solely based on molecular surface electrostatic potentials for benzenoid hydrocarbons. *Journal of the Iranian Chemical Society* 13, 519-529.
18. Giuseppina, G., Thomas, F., Anna, L., Antonio, C., Emilio, B., 2019. A New QSAR Model for Acute Fish Toxicity based on Mined Structural Alerts. *Journal of Toxicology and Risk Assessment* 5.
19. Gramatica, P., 2007. Principles of QSAR models validation internal and external, *QSAR & Combinatorial Science* Volume 26, Issue 5. *QSAR & Combinatorial Science* 26, 694-701.
20. Gramatica, P., 2013. On the development and validation of QSAR models. *Methods in molecular biology* 930, 499-526.
21. Gramatica, P., 2014. External Evaluation of QSAR Models, in *Addition to Cross-Validation Verification of Predictive Capability on Totally New Chemicals*. *Molecular Informatics* 33, 311-314.
22. Gramatica, P., 2020. Principles of QSAR Modeling. *International Journal of Quantitative Structure-Property Relationships* 5, 61-97.
23. Gramatica, P., Cassani, S., Roy, P.P., Kovarich, S., Yap, C.W., Papa, E., 2012. QSAR Modeling is not Push a Button and Find a Correlation: A Case Study of Toxicity of (Benzo-)triazoles on Algae. *Molecular Informatics*, pp. 817-835.
24. Gramatica, P., Chirico, N., Papa, E., Cassani, S., Kovarich, S., 2013. QSARINS: A new software for the development, analysis, and validation of QSAR MLR

- models. *Journal of Computational Chemistry* 34, 2121-2132.
25. Han, S., Hatzios, K.K., 1991. Uptake, translocation, and metabolism of [¹⁴C]pretilachlor in fenclorim-safened and unsafened rice seedlings. *Pesticide Biochemistry and Physiology* 39, 281-290.
26. He, G., Feng, L., Chen, H., 2012. A QSAR Study of the Acute Toxicity of Halogenated Phenols. *Procedia Engineering* 43, 204-209.
27. Johnson, S.R., 2008. The Trouble with QSAR (or How I Learned To Stop Worrying and Embrace Fallacy). *Journal of Chemical Information and Modeling* 48, 25-26.
28. Khan, K., Khan, P.M., Lavado, G., Valsecchi, C., Pasqualini, J., Baderna, D., Marzo, M., Lombardo, A., Roy, K., Benfenati, E., 2019. QSAR modeling of *Daphnia magna* and fish toxicities of biocides using 2D descriptors. *Chemosphere* 229, 8-17.
29. Khan, K., Roy, K., 2019. Ecotoxicological QSAR modelling of organic chemicals against *Pseudokirchneriella subcapitata* using consensus predictions approach. *SAR and QSAR in Environmental Research* 30, 665-681.
30. Kiralj, R., Ferreira, M.M.C., 2009. Basic validation procedures for regression models in QSAR and QSPR studies: theory and application. *Journal of the Brazilian Chemical Society* 20, 770-787.
31. Machado, M.D., Soares, E.V., 2021. Exposure of the alga *Pseudokirchneriella subcapitata* to environmentally relevant concentrations of the herbicide metolachlor: Impact on the redox homeostasis. *Ecotoxicology and environmental safety* 207.
32. Marques, C.R., Abrantes, N., de Figueiredo, D.R., Pereira, M.J., Gonçalves, F., 2007. Are *Pseudokirchneriella subcapitata* and *Chlorella vulgaris* Affected by Environmental Samples from a Rice Field? *Water, Air, and Soil Pollution* 189, 49-59.
33. Masand, V.H., El-Sayed, N.N.E., Bambole, M.U., Patil, V.R., Thakur, S.D., 2019a. Multiple quantitative structure-activity relationships (QSARs) analysis for orally active trypanocidal N-myristoyltransferase inhibitors. *Journal of Molecular Structure* 1175, 481-487.
34. Masand, V.H., El-Sayed, N.N.E., Bambole, M.U., Quazi, S.A., 2018. Multiple QSAR models, pharmacophore pattern and molecular docking analysis for anticancer activity of α , β -unsaturated carbonyl-based compounds, oxime and oxime ether analogues. *Journal of Molecular Structure* 1157, 89-96.
35. Masand, V.H., El-Sayed, N.N.E., Mahajan, D.T., Mercader, A.G., Alafeefy, A.M., Shibi, I.G., 2017a. QSAR modeling for anti-human African trypanosomiasis activity of substituted 2-Phenylimidazopyridines. *Journal of Molecular Structure* 1130, 711-718.
36. Masand, V.H., El-Sayed, N.N.E., Mahajan, D.T., Rastija, V., 2017b. QSAR analysis for 6-arylpyrazine-2-carboxamides as *Trypanosoma brucei* inhibitors. *SAR and QSAR in Environmental Research* 28, 165-177.
37. Masand, V.H., Elsayed, N.N., Thakur, S.D., Gawhale, N., Rathore, M.M., 2019b. Quinoxalinones Based Aldose Reductase Inhibitors: 2D and 3D-QSAR Analysis. *Molecular Informatics* 38.
38. Masand, V.H., Mahajan, D.T., Nazeruddin, G.M., Ben Hadda, T., Rastija, V., Alfeefy, A.M., 2015a. Effect of information leakage and method of splitting (rational and random) on external predictive ability and behavior of different statistical parameters of QSAR model. *Medicinal Chemistry Research* 24, 1241-1264.
39. Masand, V.H., Mahajan, D.T., Nazeruddin, G.M., Hadda, T.B., Rastija, V., Alfeefy, A.M., 2015b. Effect of information leakage and method of splitting (rational and random) on external predictive ability and behavior of different statistical parameters of QSAR model. *Medicinal Chemistry Research* 24, 1241-1264.
40. Masand, V.H., Patil, M.K., El-Sayed, N.N.E., Zaki, M.E.A., Almarhoon, Z., Al-Hussain, S.A., 2021. Balanced QSAR analysis to identify the structural requirements of ABBV-075 (Mivebresib)

- analogues as bromodomain and extraterminal domain (BET) family bromodomain inhibitor. *Journal of Molecular Structure* 1229.
41. Masand, V.H., Rastija, V., 2017. PyDescriptor : A new PyMOL plugin for calculating thousands of easily understandable molecular descriptors. *Chemometrics and Intelligent Laboratory Systems* 169, 12-18.
42. OECD, 2006. OECD Guideline 201 for the Testing of Chemicals, Alga, Growth Inhibition Test. . Organisation for Economic Cooperation and Development, Paris, France.
43. Rasulev, B., Kušić, H., Leszczynska, D., Leszczynski, J., Koprivanac, N., 2010. QSAR modeling of acute toxicity on mammals caused by aromatic compounds: the case study using oral LD50 for rats. *Journal of Environmental Monitoring* 12.
44. Stone, S., Adams, M.S., Stauber, J.L., Jolley, D.F., Warne, M.S.J., 2019. Development and application of a multispecies toxicity test with tropical freshwater microalgae. *Environmental Pollution* 250, 97-106.
- 50.
45. Toropov, A.A., Toropova, A.P., Marzo, M., Dorne, J.L., Georgiadis, N., Benfenati, E., 2017. QSAR models for predicting acute toxicity of pesticides in rainbow trout using the CORAL software and EFSA's OpenFoodTox database. *Environmental Toxicology and Pharmacology* 53, 158-163.
46. Yang, L., Wang, Y., Chang, J., Pan, Y., Wei, R., Li, J., Wang, H., 2020a. QSAR modeling the toxicity of pesticides against *Americamysis bahia*. *Chemosphere* 258.
47. Yang, L., Wang, Y., Hao, W., Chang, J., Pan, Y., Li, J., Wang, H., 2020b. Modeling pesticides toxicity to Sheepshead minnow using QSAR. *Ecotoxicology and environmental safety* 193.
48. Yap, C.W., 2011. PaDEL-descriptor: An open source software to calculate molecular descriptors and fingerprints. *Journal of Computational Chemistry* 32, 1466-1474.
49. Yu, X., 2020. Quantitative structure-toxicity relationships of organic chemicals against *Pseudokirchneriella subcapitata*. *Aquatic toxicology* 224.

HEALTH HAZARD OF NOISE POLLUTION AND ITS LEGAL REMEDY**Chandani Vishwasrao Ghogare**

Amolakchand Vidhi Mahavidyalaya, Yavatmal

chandanihghogare02@gmail.com

ABSTRACT

History told us that in past most of the sounds are created by nature. There is no noise pollution in past era. Due to technological development and modernization noise pollution is increased in society. Noise pollution not gives proper attention like other pollution like air or water. Attention towards noise pollution is lacking but impacts are huge and indirect. Physiological and psychological problems are increased due to increasing noise pollution. Researcher wants to know whether there is any legal remedy for protection of noise pollution.

Keywords- Pollution, Physiological, psychological, legal remedy

Introduction

History told us that in past most sounds are created by nature. There is no noise pollution in past era. Due to advancement our nature change and leads to modernization and technology hence different types of contamination added in this nature. These contaminations become harmful to human life. These harmful contaminations we called as pollutants. There are different kinds of pollutants added in air, water, soil etc. and it called as air pollution, water pollution, soil pollution etc.

Due to this technological development and modernization today we suffer from different types of pollution and its impact through various diseases like skin, breathing, heart etc. Today technological development also contributes to noise pollution in society. Difference between noise pollution and other pollution is that noise has not given more attention from the society and hence it become like a silent killer. Other hand air, water, or soil pollutants are shows or feel directly hence we become more cautious about these pollutants. Though noise is affects to the health of human being we are unaware about this fact. Hence, here writer wants to take attention towards increase level of noise pollution in India and its health hazard and to know whether there is any legal remedy provided for health safety in our Indian law.

Research Methodology

This research article is based on Doctrinal research work. For this work researcher goes

through Secondary data with Environmental related books, various articles published in various journals and E- journals. As a Primary authoritative data use for this research article is Indian Constitution, Indian Penal Code, Criminal Procedure Code and Environmental related statutes and rule and regulation related to noise pollution and various case law decided by Supreme Court and Various High Courts in India.

Research Questions-

With this research article research would like to find out following questions-1) whether noise has effects on physical and psychological effects? 2) Whether statutes in India provides any legal remedy for protection of side effects?

Meaning Of Noise

From Latin term "Nausea" the word noise is derived. When sound is unwanted and harmful to human being it is called as noise. Hon'ble Supreme Court in India in Re: Noise Pollution case¹ gives the meaning of noise as 'Noise is defined as unwanted sound. Sound which pleases the listeners is music and that which causes pain and annoyance is noise.' Thus, the disturbance produced in our environment by the undesirable sound of various kinds is called "noise Pollution."²

Noise As Health Hazard

At work, at home, at travelling, at sleeping bed we observe the production of sound. Many of

¹ Writ Petition (Civil) 72 of 1998, decided on 18 July, 2005.

² Ibid.

the time we try to adjust or ignore to such type of sounds. But some time these sounds create physical or psychological stress and not only our senses but also our body immune system not tolerate to sound more time. That time it becomes annoyance and nuisance to the person. At the movement sound leads to create annoyance to person it starts hazardous impact on human's body, brain, mind and family disturbance.

Hearing loss-

Due to noise hearing capacity of ear is lost. Some time its temporary and some time it's permanent. Generally when sound is less than 75 dB (A) Leq not create hearing loss. When it more than 8 (eight) hours it may create risk of hearing loss. Temporary hearing loss cure by treatment but permanent hearing loss is not recoverable. Permanent threshold of noise arose when noise maximum at 4,000 Hz in its frequency.

Sleep disturbance

Rest for some time is important for healthy life. Hence human beings need sleep. But when sleep is disturbed it is harmful to health. All the function run properly due to sleep will disturb and impact badly in healthy nature of human being. Sleep loss create many psychological and physical problems. Many times noise nearby us becomes reason for sleep disturbance which affect to human health.

Annoyance-

Annoyance is state of mind and related to feelings of human being. When person feels displeasure, sad, unhappy, or angry it comes under Annoyance. Some time sounds nearby us turn our mind to feel sad, unhealthy or feeling of distress.

Neurological disturbances-

Noise affects to brain function. Mostly Headaches arose due to noise. Apart from that fatigue, feeling of hypertension, loss of proper attention in work or different tasks of daily life arises due to noise. Excessive noise some time becomes the reasons for nervous breakdown.

Effects on Cardiovascular system

Due to noise some time alters the force of heart to work faster. There are many reasons

responsible for accelerating the rate of cardiac aliment alteration and one of them is noise.

Effects on birth rate and birth defects

Increase of noise has effect on reproductive cycles of human beings including persons, birds, animals, and mammals etc living organisms. Noise can temporarily diminish sexual feelings which effect on egg laying and hatching in many birds and mammals. Not only noise effects to birth rate but also birthing fetus and after birth children's also physical and physiological effects.

Legal Controls Of Noise Pollution In India

Indian Constitution-

Indian Constitution under article 21 shows right to life. Right to life is including quality of life including good health. Right to health is included in right to life. For health perspective every person has protected from unhealthy noise.

In Free Legal Aid Cell Shri Sujan Chand Aggarwal alias Bhagatji v. Govt. of NCT of Delhi and others³ it was said that 'pollution being wrongful contamination of the environment which causes material injury to the right of an individual. Noise can well be regarded as a pollutant because it contaminates environment, causes nuisance and affects the health of a person and would therefore, offend Art. 21, if it exceeds a reasonable limit.'

In Burrabazar Fireworkers Dealers Association v. Commissioner of Police Calcutta,⁴ it has been held that Article 19 (1) (g) of the constitution of India does not guarantee the fundamental right to carry on trade or business which creates pollution or which takes away that communities safety, health and peace. A citizen or people cannot be made a captive listener to hear the tremendous sounds caused by bursting out from a noisy firework. It may give pleasure to one or two persons who burst it but others have to be a captive listener whose fundamental rights guaranteed under Article 19 (1)(a) and other provisions of the constitution are taken away, suspended and made meaningless. Under Article 19 (1) (a) read with Article 21 of the Constitution of India, the

³³ AIR (2001) Delhi 455.

⁴ AIR 1998 Cal. 121.

citizens have a right of decent environment and they have a right to live peacefully, right to sleep at night and to have a right to leisure which are all necessary under Article 21 of the Constitution.

The Noise pollution (Regulation and Control) Rules, 2000

In order to curb the growing problem of noise pollution, the Government of India has enacted the Noise Pollution (Regulation and Control) Rules 2000. Whereas the increasing ambient noise levels in public places from various sources, inter-alia, industrial activity, construction activity, fire crackers, sound producing instruments generator sets, loud speakers, public address systems, music

systems, vehicular horns and other mechanical devices have deleterious effects on human health and the psychological well being of the people, it is considered necessary to regulate and control noise producing and generating sources with the objective of maintaining the ambient air quality standards in respect of noise.

Rule 5 of Environment (Protection) Rules 1986, the Central Government provides the rules for noise pollution. Ambient air quality standards in respect of noise for different zones provides under section 3 (1) and 4 (1) of the Noise pollution (Regulation and Control) Rules 2000.

Ambient Air Quality Standards in respect of Noise

Area Code	Category of Zone	Limits in dB(A)Leq Day time	Limits in dB(A)Leq Nighth time
1)	Industrial area	75	70
2)	Commercial area	65	55
3)	Residential area	55	45
4)	Silence area	50	40

In this limits day time means from 6.00a.m.to 10.p.m. and night time means from 10.00 a.m. to 6.00 p.m.

The respective state pollution Control Boards or Pollution Control Committees in consultation with the Central Pollution Control Boards shall collect, compile and publish technical and statistical data relating to noise pollution and measures devised for its effective prevention, control and abatement.

Indian Penal Code

Under Indian Penal Code 1960 noise pollution is one kind of nuisance to the public. Under section 268, of the Indian Penal Code it is mentioned that 'A person guilty of a public nuisance who does any act or is guilty of an illegal omission which causes any common injury, danger or annoyance to the public or people in general who dwell or occupy property in the vicinity, or which must necessarily cause injury, obstruction, danger or annoyance to persons who may have occasion to use any public right.' Under section 290 and 291 shows punishment for Public nuisance

which extends to two hundred for first offence and for repeat of offence which may extend to six months, or with fine, or with both.

Criminal Procedure Code 1976

Under section 133 of Criminal Procedure code the magistrate has the power to make conditional order requiring the person causing nuisance to remove such nuisance.

Difficulty In Implementation Of Noise Pollution In India

Noise pollution in India has not been taken seriously as ought to have been. Executive has lack of will to implement the laws and lack of infrastructure essential for attaining the enforcement of laws to control noise pollution. Now we observe that people generally accept noise pollution as a part of life, a necessary consequence of progress and prosperity. They have not proper attention towards side effects of noise pollution. Awareness on the part of citizens is important.

Conclusion

Noise creates more noise in life when we ignore the indirect effect of noise pollution. Many physical and psychological effects of noise pollution arose with technological advancement. Responsibility is ours protect

from noise pollution. Constitution, statutes, rule, regulations are exists in India to protect from noise pollution. Now it's necessary to aware about these legal provisions which are protective of us from noise pollution.

References

- 1)Dr. Paramjit S. Jaswal, and Dr. Nishtha, Environmental Law, Allahabad Law Agency, Faridabad.
- 2) Mr. Ranjit Singh, " Legal Control of Noise Pollution in India: A Critical Evaluation," International Journal of Research in Humanities and social studies, volume 3, Issue 4, April 2016, ISSN 2394-6288,Sryahwa publication.

Case laws-

- 1) Re: Noise Pollution case Writ Petition (Civil) 72 of 1998, decided on 18 July, 2005.
- 2) Free Legal Aid Cell Shri Sugan Chand Aggarwal alias Bhagatji v. Govt. of NCT of Delhi and others AIR (2001) Delhi 455.
- 3) Fireworkers Dealers Association v. Commissioner of Police Calcutta, AIR 1998 Cal. 121.

ENVIRONMENTAL ATTUNEMENT IN HEALTH, SPORT AND PHYSICAL EDUCATION**Dr. Ravindra Pandurang Jagtap**Shree Nashikrao Tripude College of Physical Education, Nagpur

ABSTRACT

This Special Issue on environmental attunement introduces seven papers that engage with a range of different insights and practices of nature culture and embodied connections to place across health, sport and physical education. We have organized the papers into three themes that explore possibilities for (i) notions of the environment and 'nature' in research and practice (ii) possibilities and challenges of translating environment, sustainability and 'nature' from policy and curriculum documents into practice and (iii) philosophical and theoretical links to emplaced and embodied learning – past-present-future. These are by no means exclusive themes and readers will recognize other patterns of theoretical and empirical possibility as well as important geographical and contextual nuances that need to be explored further. Because of this, we hope that this collection inspires further submissions via an extended call for papers that engage with the challenges and the possibilities of how we might approach the complex environmental, ecological, political and cultural factors that shape health, sport and physical education in current times.

Introduction

This Special Issue, like many good ideas in academic spirit, was conceived through a themed symposium. We presented 'Health as more-than-human: environmental attunement in health education to 'grow new grass' rather than lament that 'the grass is (or could) be greener' elsewhere. The purpose was to expand possibilities and practices of educational and embodied connections to environmental knowledge of place, space and nature¹ in health, sport and physical education.² Utilizing the notion of attunement, helped us to explore the ecological habits leaning in' to notions of environment that focus on a body-mind-culture-nature connection to the lands and waters in a deep sensory and even spiritual sense of care for others. At the time, Nicole was working on blue space research and collecting data on how notions of participation in National Parks and green space were being increasingly converged with health and fitness discourses through advertising and social media. Rosie had been engaging in health and food and nutrition education with Australian digenous elders and making place-based links to environmental knowledge with field trips to gardens and farms. Through this practice with pre-service teachers, imagined possibilities for environmental attunement were materialized with students creating novel cross-curricular assessment for learning tasks that integrated

and utilized the Australian Curriculum capabilities of Sustainability and Aboriginal and Torres Strait Islander Histories and Cultures contemplating the rich multitude of possibilities of histories and purposes of health and physical education through time, and thinking about what we can learn from animals and multi-species in this endeavor.

Environmental attunement

While we accept that a person's surrounding conditions constitute part of what we are referring to as 'environment', we want to call for a more expansive and political approach to the concept. The Introductory paper of this Special Issue takes this up in more detail to examine how within the field of health and physical education the term environment is often used in a generalist sense to describe a particular context that could influence performance or participation. In Sport, Education and Society, articles have examined sports or athlete environments, or non-competitive environments but few have examined the relationality of environment to pedagogy. The exceptions are Sundered work on Building and children's perspectives on nature-play relationships in snowcovered playgrounds which examines the way movement memories are entangled in the geographical materiality of weather. Other examples include recent valuable scholarship on informal sport the shifting social and

cultural practices of participation in health and sport. There is much more literature beyond, but ancillary to the field, to turn to for inspiration; for instance, research on green exercise and restorative and therapeutic landscapes natural environments and physical activity and health. There are also the Sustainable clarify our stance on environmental attunement by outlining these four statements. We live in a world that is constantly changing and is challenging established approaches to managing human and ecological health. Our attunement needs to be focused on the premise that environments shape health and that human health is reliant on the natural world.

Health and physical education and environmental knowledge need to be integrated via holistic and participatory approaches that recognize shifting social and cultural practices in both built and natural environments. This includes specially a sensitivity to histories and ontologism of place; especially First Nations or Indigenous ontologism of land such as Country, and practices such as *dadirri* or deep listening practices to establish emotional relationships of 'love, care and solidarity'.

While all disciplines could be linked to environmental attunement (e.g. STEM, Geography, The Arts), health and physical education offers a unique intersection of multidisciplinary learning through embodied and socio-cultural pedagogies that connect to self, place, space, community and more-than-human life. Adopting a critically mindful pedagogy is rich with learning possibilities in the cultural politics of human relationships to environment and 'nature'.

and valuing movement (in, through and about) can all be mobilized in practice.

Reflection on what has shaped educators' micro-biographies and ecological identities is an important step, alongside pedagogical resources, in deepening epistemological habits of possibilities for environmental attunement across health, sport and physical education.

Grafting theoretical inquiry to the cause of environmental attunement: theory as a tool, timing and trap

Initially using 'more-than-human' in the title of this Special Issue we had included theoretical

links to new materialist, post-human and agential realism ways of knowing, being and becoming. The broader turn to decentre the human in research theory and methods has helped our conceptions and thinking about this Issue. We came to think about the perennial search for 'new directions' in theory and publishing and the need for theory to respond to the research problems of the times of social, environmental and political experience. While we generally agree that theories come at a particular moment of history, it can be quite hard to decide 'when' they began. Textbooks often say that Marxist theory emerged in Europe in the nineteenth century. As teachers, we often start somewhere and, in educational terms, that can be appropriate. But how do we guide students who may want more than an emergent narrative of Marxist theory. Like ideas, the 'beginning' of Marxist theory can be seen wherever you look. Should we go to Babeuf during the eighteenth century

Theme 1: notions of the environment and 'nature' in research and practice

After our first introductory paper that responds to the question, why environmental attunement in health and physical education? The second paper in this Special Issue by Holly Thorpe et al. delves into important possibilities of more-than-human theory in the social sciences. Thorpe et al make the point that sociology of sport scholars have been slow to take up environmental thinking, especially compared to feminist social theorists such as Donna Haraway who has been arguing for a more central exploration of humans relationships to nature in humanities research since the 1990s. They point to the ongoing search for environmental and nature-centered politics that has been pressed for decades by scholars outside the discipline, citing Rachel Carson's 'Silent Spring' in the 1960s, through to the intensified socio-political priorities in the present. They provide a rich literature review of feminist new-materialist methodological approaches and notions of the environment in sport. Demonstrating the utility of feminist new-materialist theory, they explore the ontological promise it holds for responding to the environmental challenges of our time,

especially given the lag in the sports and movement scholarship, compared to social sciences, to problematise ‘anthropocentric foundations of sociology, and the tendency for sport scholars to focus on humans’ lived experiences and moving bodies’. This resonates with recent work by Martschukat that maps and historicises the individualised age of fitness that has been deeply celebrated in and dominated western democracies. Thorpe and her colleagues demonstrate the need for a fundamental relational environmental change in sport and highlight a range of recent literature that is addressing this in different ways. They also make links to examples of pedagogical possibilities for environmental attunement. In putting forward a feminist new materialist agenda, they point to the ethics of accountability and urgency, arguing, we cannot understand ourselves as observing or thinking or writing from an external perspective, rather we are always implicated in and a part of the world’s becoming, and this includes our implications in the world’s undoing in times of environmental and climate crisis. Drawing on materialist ontological theory for reconceptualising the relational ethics of sport, they map possibilities for methodological approaches that de-centre anthropocentric ways of knowing that have dominated sport and fitness research and practices. The third paper by Howard Prosser offers a rich examination beyond the nature/culture divide to argue that within football there is a universal cultural experience of joy and social connection that is characteristic of human and non-human encounters. Using Critchley and Adorno’s philosophy of nature to explore the ethnographic experience of football in an international school in Argentina, Prosser engages in rich storytelling of the layered and embodied nature of playful seriousness and genuine reflection and interaction with the world that is possible via the structure of the football game’s lingua franca. His ethnographic exposition is situated in continental philosophy to offer a rich engagement in thought of what it means to play and how; for instance, he writes about ‘moments of playful seriousness’ or the ‘desire to emancipate ourselves from the taming of the

nature’. In so doing, this paper points to the simplicity of social and ecological poetics in play, yet how humans tend to ‘overlay nature’s blankness with meaning’. Prosser eloquently balances some of the contradictions or tensions of nature/culture in the environment tracing how soccer is part of the success of modernity (with market-led organization such as FIFA) and subsequently there is an environmental cost in sports grounds construction and maintenance with the use of pesticides and insecticides to achieve ‘the perfect playing surface’.

Theme 2: possibilities and challenges of translating environment, sustainability and ‘nature’ from policy and curriculum documents in practice

The papers in this section engage with curriculum documents and teachers values and beliefs from the Australian context to consider the challenges and possibilities of translating environmental attunement to practice. There is much scope to expand this theme through further research to examine the interstices of enacting environmental attunement in local places, governance, educational systems and pedagogical practice. In the fourth paper, Rebecca Olive and Eimear Enright (2021) provide an analysis of the complexity and challenges of the way the Australian Curriculum Cross-Curriculum Priority (CCP) of Sustainability is articulated through the Australian Curriculum: Health and Physical Education. Many outside the learning area have examined how the CCP of Sustainability, along with the two other CCPs (Asia and Australia’s Engagement with Asia (AAEA) and Aboriginal and Torres Strait Islander Histories and Cultures (ASIH)), are not prioritized in practice.

Olive and Enright join forces, drawing on their backgrounds in recreational lifestyle sports and curriculum studies, to cross boundaries of youth activism and environmental issues in education in order to explore how these fields intersect in possibilities for enacting the AC:HPE Sustainability CCP. Drawing on the work of Val Plumwood, they situate their work within ecofeminist theory to consider sustainability through ecological and ethical

terms, pointing out that opportunities for environmental engagement emerge anytime the words ‘health’ or ‘wellbeing’ is used in the AC:HPE curriculum. Utilising ‘oceanic ways of thinking’ (Steinberg & Peters, 2015), as part of an eco-feminist approach, they apply this ontological approach to their textual analysis of reading curricular documents to highlight the multiplicity of possibilities in terms such as ‘community’ and ‘health’. This paper also takes readers into new terrain to consider how the human might be decent red in conceptions and enactments of sustainability and the AC:HPE to consider complex ecologies and Indigenous ontologies as they relate to knowledge and pedagogy.

Theme 3: philosophical and theoretical links to emplaced learning past, present, future

This third theme engages with language and experience of emplaced Connections to environments. The papers grouped under this theme, have some overlap with the others in theoretical purpose, especially the work of social connection and joy in football expressed in Howard Prosser’s paper, in that they engage with rich accounts of making meaning of embodied experience, affect and emotion in pedagogy. There are also some similarities here to literature that engages the notion of pleasure in movement education Pringle et al Stevens & Culpan, and self and social learning. The sixth paper by Stephen Smith brings a rich and evocative use of language to phenomenological explore the sensory and affectively-charged interactions with water, or all aqueous bodies, including man-made and natural waterscapes. Drawing on the theory of Maurice Merleu-Ponty and Richard Shuster man, this work situates bodily knowledge as developed

through ‘kinesthetic registers’ between oneself and being in water. Smith examines links to swimming and the experiential aspects of sensorial feeling and affect. This is brought together with the notion of eco-pedagogy to examine ‘bringing attention to the dynamics, reciprocities, and textures of this distinctively motile manner of bodily immersion in a flow motioning world’. Through examining the dynamics of flow, the reciprocities of flow, the textures of flow in waterscapes, Smith points to the possibilities for ‘a fuller environmental immersion’. He argues that this is not mutually exclusive to a disciplined practice of swimming. In guiding the reader through how the practice of swimming itself is a living praxis, he theorizes how reflective and analytic abstractions emerge from learning to feel the flow of motion. Smith demonstrates how agency arises from being pedagogically attuned to experiencing the world.

Conclusion

Together the papers in this Special Issue have taken various theoretical and empirical approaches to the notion of environmental attunement across health, port and physical education; all central themes of Sport Education and Society’s readership. As noted in the abstract, there are many important geographical and contextual differences and similarities to explore further beyond this initial collection. Because of this, we do hope to inspire further diverse submissions via an extended call for papers that respond to this first Issue and engage with the challenges and possibilities of how we might approach the complex environmental, ecological, political and cultural factors that shape health, sport and physical education practice in current times.

References

1. Aikens, K. (2020). Imagining a wilder policy future through interstitial tactics. *Policy Futures in Education*, <https://doi.org/>
2. Atkinson, J. (2002). *Trauma trails, recreating song lines: The transgenerational effects of trauma in indigenous Australia*. Spinifex Press.
3. Barakat, B., Bengtsson, S., Muttarak, R., Kebede, E. B., Cuaresma, J. C., Samir, K. C., & Striessnig, E. (2016). *Education and the sustainable development goals (Background Paper prepared for the 2016 Global Education Monitoring Report)*. UNESCO.

4. Barnes, M., Moore, D., & Almeida, S. (2019). Sustainability in Australian schools: A cross-curriculum priority? *Prospects*, 47 (4), 377–392. <https://doi.org/10.1007/s11125-018-9437-x>
5. Baum, F. (2007). Cracking the nut of health equity: Top down and bottom up pressure for action on the social determinants of health. *Promotion and Education*, 14(2), 90–95.
6. Brown, K. M. (2017). The haptic pleasures of ground-feel: The role of textured terrain in motivating regular exercise. *Health & Place*, 46, 307–314. <https://doi.org/10.1016/j.healthplace.2016.08.012>
7. Brymer, E., Cuddihy, T. F., & Sharma-Brymer, V. (2010). The role of nature-based experiences in the development and maintenance of wellness. *Asia-Pacific Journal of Health, Sport and Physical Education*, 1(2), 21–27.

E-WASTE ENVIRONMENT AND HUMAN HEALTH HAZARDS**Dr. Manju H. Pardeshi**

Assistant Professor, Department of Zoology, Arts Commerce & Science College Maregaon, Dist. Yavatmal.
manjupardeshi80@gmail.com

ABSTRACT

As technology became intertwined into everyday life its evolution has become expeditious. This rapid evolution means that technology will become outdated and abandoned quickly. Unused or damaged electronics are considered E-waste. Some people aren't aware of the dangers of throwing away E-waste and will throw away electronics with no regard of what happens after. E-waste contains harmful toxins that cause adverse effects to the environment. The aim of this paper is to discuss the impact of the growth of the electrical and electronic equipment leading to the increase of waste hampering the environment of the globe. This in one hand is directly contributing the growth of technology and smoothening path for the growth of humanity and all the other factors associated with it but negatively affecting the environment challenging sustainable growth. Our aim is to understand threats associated with the increasing volume of e-waste and to suggest the possible solutions to the problem.

Keywords : e-waste, environment, toxic, landfill, ecosystem.

Introduction

Electronic waste, also known as e-waste, is any electronic product, or product containing electronic components, that has reached the end of its usable life cycle (Freeman 1989). Unbeknownst to many consumers, electronics actually contain toxic substances - therefore they must be handled with care when no longer wanted or needed. If a product is outdated, consumers can donate it to someone who might still find it valuable. Many retailers also offer trade-in programs or incentives for people looking to upgrade electronics that require the surrender of an older model; the retailers are able to reuse or repurpose the older models. However, if a product is totally unusable or broken, instead of just being thrown in the garbage, it must be thrown away by a certified e-waste hauler or recycler, or taken to a designated drop-off at a government building, school or organization as e-waste can potentially cause harm to humans, animals and the global environment if disposed of improperly.

The consequences of improper e-waste disposal in landfills or other non-dumping sites pose serious threats to current public health and can pollute ecosystems for generations to come. When electronics are improperly disposed and end up in landfills, toxic chemicals are released, impacting the earth's

air, soil, water and ultimately, human health (United nations news service 2012).

The Negative Effects on Air

Contamination in the air occurs when e-waste is informally disposed by dismantling, shredding or melting the materials, releasing dust particles or toxins, such as dioxins, into the environment that cause air pollution and damage respiratory health. E-waste of little value is often burned, but burning also serves a way to get valuable metal from electronics, like copper. Chronic diseases and cancers are at a higher risk to occur when burning e-waste because it also releases fine particles, which can travel thousands of miles, creating numerous negative health risks to humans and animals. Higher value materials, such as gold and silver, are often removed from highly integrated electronics by using acids, desoldering, and other chemicals, which also release fumes in areas where recycling is not regulated properly. The negative effects on air from informal e-waste recycling are most dangerous for those who handle this waste, but the pollution can extend thousands of miles away from recycling sites

The air pollution caused by e-waste impacts some animal species more than others, which may be endangering these species and the biodiversity of certain regions that are chronically polluted. Over time, air pollution

can hurt water quality, soil and plant species, creating irreversible damage in ecosystems. For instance, an informal recycling hub in Guiyu, China that was formed by parties interested in extracting valuable metals from e-waste, and subsequently has caused the region to have extremely high lead levels in the air, which are inhaled and then ingested when returned to water and soil. This can cause disproportionate neurological damage to larger animals, wildlife and humans in the area (Leung Anna et al.2008).

The Negative Effects on Soil

When improper disposal of e-waste in regular landfills or in places where it is dumped illegally, both heavy metals and flame retardants can seep directly from the e-waste into the soil, causing contamination of underlying groundwater or contamination of crops that may be planted near by or in the area in the future. When the soil is contaminated by heavy metals, the crops become vulnerable to absorbing these toxins, which can cause many illnesses and doesn't allow the farmland to be as productive as possible.

When large particles are released from burning, shredding or dismantling e-waste, they quickly re-deposit to the ground and contaminate the soil as well, due to their size and weight. The amount of soil contaminated depends on a range of factors including temperature, soil type, pH levels and soil composition. These pollutants can remain in the soil for a long period of time and can be harmful to microorganisms in the soil and plants. Ultimately, animals and wildlife relying on nature for survival will end up consuming affected plants, causing internal health problems.

The Negative Effects on Water

After soil contamination, heavy metals from e-waste, such as mercury, lithium, lead and barium, then leak through the earth even further to reach groundwater. When these heavy metals reach groundwater, they eventually make their way into ponds, streams, rivers and lakes. Through these pathways, acidification and toxification are created in the water, which is unsafe for animals, plants and

communities even if they are miles away from a recycling site. Clean drinking water becomes problematic to find.

Acidification can kill marine and freshwater organisms, disturb biodiversity and harm ecosystems. If acidification is present in water supplies, it can damage ecosystems to the point where recovery is questionable, if not impossible.

The Negative Effects on Humans

As mentioned, electronic waste contains toxic components that are dangerous to human health, such as mercury, lead, cadmium, polybrominated flame retardants, barium and lithium. The negative health effects of these toxins on humans include brain, heart, liver, kidney and skeletal system damage. It can also considerably affect the nervous and reproductive systems of the human body, leading to disease and birth defects. Improper disposal of e-waste is unbelievably dangerous to the global environment, which is why it is so important to spread awareness on this growing problem and the threatening aftermath. To avoid these toxic effects of e-waste, it is crucial to properly e-cycle, so that items can be recycled, refurbished, resold, or reused. The growing stream of e-waste will only worsen if not educated on the correct measures of disposal.

Solutions To The Problems Of E-Waste

1. Don't throw the waste cell phones, dumped systems into the landfills. Properly, deliver them to the organizations where recycling is carried out.
2. Get the electronic goods from the vendors who can take back for recycling.
3. Take care of the lifetime of your hardware equipments and so that e waste can be efficiently decreased
4. Big Industries may buy recyclers that can be used for long time.
5. Citizens should turn their interests to use the recycled products.
6. Support green engineering.

Recovery and reuse

This technique could eliminate waste disposal costs, reduce raw material costs and provide income from a salable waste. Waste can be

recovered on-site, or at an off-site recovery facility, or through inter industry exchange (J. Krishna et al. 2002). A number of physical and chemical techniques are available to reclaim a waste material such as reverse osmosis, electrolysis, condensation, electrolytic recovery, filtration, centrifugation etc. For example, a printed-circuit board manufacturer can use electrolytic recovery to reclaim metals from copper and tin-lead plating bath. However recycling of hazardous products has little environmental benefit if it simply moves the hazards into secondary products that eventually have to be disposed of. Unless the goal is to redesign the product to use nonhazardous materials, such recycling is a false solution.

Sustainable product design

Minimization of hazardous wastes should be at product design stage itself keeping in mind the following factors

- **Rethink the product design:** Efforts should be made to design a product with fewer amounts of hazardous materials. For example, the efforts to reduce material use are reflected in some new computer designs that are flatter, lighter and more integrated. Other companies propose centralized networks similar to the telephone system.
- **Use of renewable materials and energy:** Bio-based plastics are plastics made with plant-based chemicals or plant-produced polymers rather than from petrochemicals. Bio-based toners, glues and inks are used more frequently. Solar computers also exist but they are currently very expensive.
- **Use of non-renewable materials that are safer:** Because many of the materials used are nonrenewable, designers could ensure the

product is built for re-use, repair and/or upgradeability. Some computer manufacturers such as Dell and Gateway lease out their products thereby ensuring they get them back to further upgrade and lease out again.

Conclusion

Environment friendly methods to dispose of and recycle IT and electronic equipment must be promoted and provided is the best solution for the problem of e-waste Product design must be employed to help to minimize not only the nature and amount of waste, but also to maximize end-of-life recycling. Manufacturers, retailers, users, and disposers should share responsibility for reducing the environmental impacts of products. Adopt product stewardship approach i.e. a product-centered approach should be adopted to preserve and protect environment (Vijay et al.2014). Electronic goods Manufacturing Companies must be legally ensured to mention the disposal methods of their product in their user manual. As E-wastes are the known major source of heavy metals, hazardous chemicals and carcinogens, certainly diseases related to skin, respiratory, intestinal, immune, and endocrine and nervous systems including cancers can be prevented by proper management and disposal of E-waste. With a view to bridge the digital divide, there is exponential growth in the use of Electrical and electronic equipment (EEE) and so there is alarming effect on environment and human health when the ICT wastes are not disposed of scientifically. There is an emergent need to implement the existing policies and guidelines in line with the international standards and practices for an healthy E-waste management system.

References

1. Freeman M. H.(1989). Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Company, USA.
2. United Nations News Service "As e-waste mountains soar, UN urges smart technologies to protect health". United Nations-DPI/NMD - UN News Service Section.
3. <https://elytus.com/blog/e-waste-and-its-negative-effects-on-the-environment.html>
4. Dioxins (n.d.) Retrived August 30, 2016 from <http://www.niehs.nih.gov/health/topics/agents/dioxins>

5. Leung Anna O. W.; NurdanS.; Duzgoren-Aydin; K. C. Cheung; Ming H. Wong. (2008). "Heavy Metals Concentrations of Surface Dust From E-Waste Recycling and its Human Health Implications in Southeast China," *Environmental Science and Technology* 42, No.7(2008):2674-80
6. J. Kristina et.al. 2002 "Exposure to polybrominateddiphenyl ethers and tetrabromobisphenol A among computer technicians," *Chemosphere*, Vol. 46,709–716.
7. Vijay et al.(2014). *International Journal of Advanced Research in Computer Science and Software Engineering* 4(2), February - 2014, pp. 442-44

NANOTECH: A PREVENTIVE AND EXTENSIVE TOOL FOR FORENSIC INVESTIGATION

Muskan singhal¹, Vidhi Kanere¹, Mrunal Kapgate¹, Tisha Ramteke¹, Rashi Chimurkar,
Hemant Sapkal², Archana Mahakalkar^{1*}

¹Government Institute of Forensic Science, Nagpur, Maharashtra
Shri. Shivaji College of Arts, Commerce and Science Collage, Akola

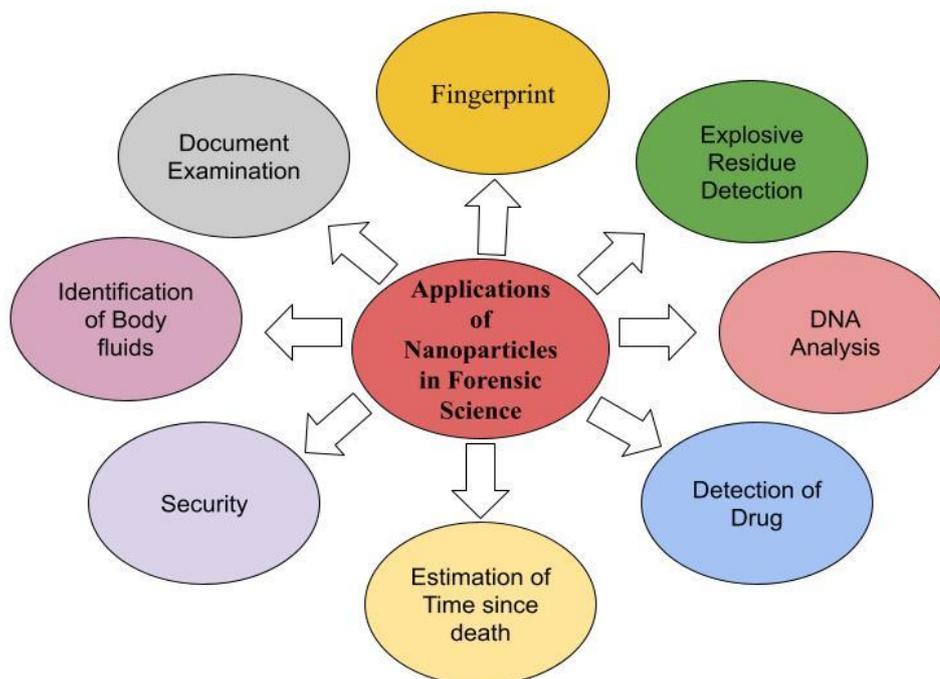
*Corresponding Author –archanasap79@gamil.com

ABSTRACT

The crime rate in society has risen dramatically in recent decades. In this scenario Nanotechnology has been proven to have a great potential in solving criminal cases in comparison with other techniques that failed to give any incontestable results. Nanotechnology, together with other technologies, has uses in the analysis of DNA, the detection of fingerprints, the detection of explosive residue, the detection of narcotics, the estimation of the time since death, and many other things. Nanomaterials have been crucial to security measures and the identification of criminals. Forensic Nanotechnology is a growing field of research as it has potential to make a significant contribution in investigation. The present review paper focused on the detection, examination methods and applications of nanomaterials in Forensic Science.

Keywords : Nanotechnology, nanomaterial, Fingerprint, DNA, Drugs, Body fluids

Graphical Abstract



Introduction

The scientific field of forensics is concerned with conducting legal research. A suspect's guilt or innocence can be determined by analyzing the forensic evidence. When there is very little evidence at the crime site, it can be difficult to conduct an investigation. However, nanotechnology has made it possible to collect

very small amounts of evidence effectively [1]. Alok Pandya in his research suggested that among all the emerging technology, nanotechnology is one of the most promising and disputable technology [2]. The use of nanoparticles in forensic science will accelerate the investigation by making it more efficient, sensitive, and real-time [3].

Nanotechnology supports forensic science in examining samples at the nanoscale and more quickly and with more accuracy [4,5]. The type of nonmaterial that is used in the inquiry includes quantum dots, nanocrystals, nanoparticles, nanoclusters, nanocomposite, etc. The development of nanosensors has been

extremely beneficial in drug-related illnesses. Nanosensors can detect a wide range of drugs, including alcohol, opioids, amphetamines, ketamine, diazepam, zolpidem, and many more since they have thermal, electrical, and optical properties [6].

S.No.	Forensic Application	Nanomaterial	Reference
1	Fingerprint	metal nanoparticles, metallic oxide nanoparticles, semiconductor quantum dots, carbon dots, polymer dots, fluorescent silica nanoparticles, fluorescent mesoporous silica nanoparticles, fluorescent silica nanoparticles, conjugated-polyelectrolyte dots, aggregation-induced emission luminogensmolecule incorporated nanomaterials and uncommon earth fluorescence nanoparticles	[7]
2	Explosive residue detection	Turmeric extracted curcumin nanoparticles, amine-terminated nanoparticles	[2]
3	DNA analysis	Magnetic nanoparticle, Carbon nanotubes, gold nanoparticles	[2,8]
4	Drug analysis	Nano-gold (Au-NPs), nano-silver, and nano-titane, nium dioxide (TiO ₂)	[8]
5	Estimating time since death	Nano-chip	[8]
6	Security	Inorganic and organic luminescent powders like phosphors and fluorophors, Quantum dots	[8]
7	Body fluid identification	Iron oxide nanopowder	[8]
8	Document examination	Gold nanoparticles assisted LDI-MS	[28]

Table 1: A brief analysis of different nanoparticles used in different forensic application

Use Of Nanoparticles In Fingerprint

Nearly every case requires fingerprint detection because latent fingerprints, which are prints that cannot be seen with the human eye. Nanoparticles can interact with a fingerprint residue on porous and non-porous surfaces due to their unique qualities, including their vast surface area, small size, and varied optical properties. Sweat interacts with nanoparticles via electrostatic attraction, creating the print. To visualise latent fingerprints, scientists use a variety of nanomaterials, including metallic oxides, semiconductor quantum dots, carbon dots, polymer dots, fluorescent silica nanoparticles, fluorescent mesoporous silica nanoparticles, conjugated-polyelectrolyte dots, aggregation-induced emission luminous molecules, and uncommon earth fluorescence nanoparticles [7,9]. The fingerprint that is created has improved imaging, a clear ridge

pattern, great sensitivity, and a backdrop with a high contrast because of the hydrophilic interaction between the fingerprint and the nanomaterial [10, 11]. Additionally, the Multi Metal Deposition (MMD) process enhances the potential of different metal oxide nanopowders, particularly gold. Silver nanoparticles are a common type of nanomaterial that can detect both young and old fingerprints [11]. Metallic nanopowders have the ability to read prints on both porous and non-porous surfaces. Additionally, these powders are inexpensive and have an adhesive quality that aids in better results [12]. Due to their special property of having higher emission qualities, fluorescent nanoparticles like quantum dots and up conversion nanomaterials are employed for the production of latent print [13].

Use Of Nanoparticles In Explosive Residue Detection

Terrorism is currently the greatest threat to society on the planet. Because explosive-based weapons and gadgets are readily available and made, it is a large and expanding field of criminality. Unfragmented portions of the explosive stay at the area after the explosion, while fragmented explosive residue can be dispersed away from the actual blast site. Investigators employ nanotechnology to find minute quantities of shattered explosives at crime scenes. In the majority of explosion incidents, it is challenging to distinguish between unfragmented explosives. The use of a high-resolution scanning electron microscope (SEM) and X-ray spectroscopy claims that gunshot residue analysis is an important step in shooting cases that aids the community in crime prevention by providing enough supporting evidence. Chu et al. proposed a novel sensing approach in 2015 for the detection of 2, 4, 6-trinitrotoluene based on amine-terminated nanoparticles [2, 13].

Use Of Nanoparticles In Dna Analysis

DNA analysis is the process of interpreting genetic sequences for a variety of purposes. It can be used to distinguish between species and individuals. Y-chromosome, autosomal, and mitochondrial DNA testing are the most widely used DNA tests. There are various ways to stop such terrible crimes from happening and to punish the offender by locking them up. The genetic material, or DNA, is one of the most significant pieces of evidence. Nanotechnology allows for the source of DNA collected from crime scenes to be identified. Magnetic nanoparticles are currently widely used in the extraction of DNA from numerous biological sources, such as hair, blood, skin, semen, and saliva. By putting DNA molecules in carbon nanotubes, Parihar K. uses AFM to analyse DNA sequences. The effectiveness of the polymerase chain reaction (PCR) has also been discovered to be greatly increased by nanotechnology. Fe₃O₄ is a single magnetic nanoparticle that is used to swiftly extract DNA from a range of sources, including hair, saliva, and semen [2,8,14].

Use Of Nanoparticles In The Detection Of Drugs

Crimes involving illegal drugs are also referred to as "date rape" or "drug-facilitated crimes" (DFC). Chemicals called drugs are used by people to experience pleasurable or exciting experiences. Drug usage can result in various crimes or criminal offences, such as rape, sexual harassment, prostitution, and other crimes like murder, theft, burglary, robbery, and extortion if the amount of drugs consumed is high. It is a challenging task for the investigating officer and the forensic investigator to assist law enforcement authorities by finding and analysing these types of drugs. The traditional methods are pricey, time-consuming, fragile, and subject to interpretational restrictions [15]. The separation of several dangerous elements and their quantification from various forensic evidence, such as blood, hair, saliva, urine, vitreous humour, etc., are successfully accomplished by forensic toxicology using the present development of nanotechnology. Many innovative nano-techniques like HPLC, XPS, and ToF-MS are used to detect various legal medications like paracetamol and criminal narcotics like cocaine and heroin. Nano-gold (Au-NPs), nano-silver, and nano-titanium dioxide (TiO₂) particles in combination with capillary electrophoresis, SEM, TEM, and FTIR [16]. In order to detect the presence of narcotics, a tiny device is now dipped into a spit stain from a crime scene. Nanotechnology has been utilised to modify the alcohol detector used in drug tests [17]. Illicit drugs, especially narcotics, play a crucial role in forensics since they act as a connection for criminal profiling, drug trafficking, environmental monitoring, and even security surveillance. The nanoparticles are sensed by electrochemical, colorimetric, fluorescence, Surface Plasmon Resonance (SPR), and Surface Enhanced Raman Spectroscopy (SERS) methods. Electrochemical sensing is less sensitive in the case of opioid alkaloids because nanoparticles are not present. Additionally, unique nanomaterials such as nanodiamonds (ND) and nanocrystals, which have a variety of electrode

properties, have been used to detect morphine and codeine, respectively [18, 19].

Use Of Nanoparticles In The Estimation Of Time Since Death

Estimating the time since death (TSD) is a vital feature in all medicolegal proceedings. The investigating officer and forensic investigator use the time of death and the cause of death to help them solve civil and criminal cases. The traditional technique has a number of variables that can be used to calculate the passing of time since death. These signs included rigour mortis, algor mortis, alterations in the eye, post-mortem hypostasis, changes in decomposition, stomach and intestine contents, bladder contents, and anecdotal evidence. The body fluids (blood, pericardial fluid, synovial fluid, spinal fluid, aqueous humour, and vitreous humour) vary over time after passes away, and this helps to identify the TSD. The only fluid that does not change after a lengthy period of death is vitreous humour (VH). The slow variation in amino acid levels in VH aids in identifying the exact TSD. The newly developed lab-on-chip approach for the straightforward determination of cysteine is quick, economical, and distinct. It is simple to calculate the TSD in the first 96 hours after death because the VH fluctuates slowly throughout this time, but beyond 96 hours, when the VH noticeably increases, it becomes more challenging to accomplish [8, 20]. The same physical and chemical changes found during the post-mortem interval also help in determining the TSD [21]. Furthermore, estimates of the DNA degradation rate made by a flow cytometry-based approach in the spleen and brain tissue up to 96 hours aid in the detection of TSD. Future TSD estimation techniques would make use of fluorescent nanoparticles that aid in determining the quantity of VH and its measurement by flow cytometry [22, 23].

Use Of Nanoparticles In Security

With the aid of the most recent developments in nanoscience and nanotechnology, there is a need to find a solution to the growing challenges relating to the security of the

society, such as the early detection and protection against the Chemical, Biological, Radiological and Nuclear (CBRN) agents in IT and cyber defence, Biotechnology, etc. Nanoscience and nanotechnology have been used to create and characterise nanostructures from a variety of materials, including ceramics, polymers, glasses, etc. For the real-time monitoring and analysis of CBRN threats, as well as the development of advanced sensors [24]. Gold nanoparticles are used in sensors for both biological and chemical warfare agents [25]. Recently, there has been a lot of interest in invisible, flexible, high-security counterfeiting ink. By chemically integrating spiropyran into copolymer latex nanoparticles based on methyl methacrylate and butyl acrylate by the method of semi-continuous miniemulsion polymerization, high-security invisible anticounterfeiting ink was created. Using DSC Thermograms to measure T_g values, the flexibility of copolymers was examined. The observed disparity between the theoretical and experimental T_g values was not particularly noteworthy. The morphology of the latex nanoparticles was discovered to be spherically formed with a size range of 50-80nm when they were studied under SEM, TEM, and by DLS. The examination of gunshot residue is a crucial stage in shooting cases, according to the usage of a high-resolution scanning electron microscope (SEM) and X-ray spectroscopy, and it helps the neighbourhood with crime prevention by offering sufficient supporting evidence. In 2015, Chu et al. reported a novel sensing method based on amine-terminated nanoparticles for the detection of 2, 4, 6-trinitrotoluene. This high-security ink is used to print-mark various security papers including passports, certificates, and currency. It is made utilising photochromic and fluorescent latex nanoparticles with the best optical qualities. The printed markings on security documents exhibit photochromism (colourless to purple) and red fluorescence when exposed to UV radiation. [26]. Therefore, the method developed for preparation the high-security invisible photochromic anticounterfeiting ink

employing spiropyran is effective for the application of authorisation.

Use Of Nanoparticles In Body Fluid

One of the most crucial components of a criminal investigation is body fluid analysis. The presence of bodily fluids including semen, saliva, blood, and vaginal secretions can give investigators crucial information that can help them catch the offender. There are numerous traditional techniques for identifying bodily fluids, including chemical assays, protein catalytic activity, and immunological studies [27]. However, these tests could only identify one bodily fluid at a time, and they also take more time and money. Nanoparticles were therefore developed for the detection and identification of bodily fluids in order to solve these issues. Due to the fact that body fluids are difficult to see with the unaided eye, especially against a dark background, nanoparticles form an image with a high degree of contrast. Frascione, N. et al. created iron oxide nanoparticles linked with antibodies specific to the blood and saliva components in order to detect minute amounts of chemicals against non-contrasting substrates like glass, ceramic tile, paper, and black cloth. Their application led to significant outcomes[28].

Use Of Nanoparticles In Questioned Document Examination

A document is something that has information in it, has marks or symbols on it that have meaning, and communicates information to a recipient. A questioned document is a piece of evidence with handwritten, typewritten, or printed markings whose veracity is in issue. The technology to investigate the substance at the nanoscale has also been paced by the contested document. Forensic document examination is the process of identifying an original document from a forgery or fraudulent build-up. The ability of nanotechnology in forensic science has been demonstrated to be the most significant in uncovering the latent clues at the crime scene that can be more crucial in ensuring justice. The word "nano," which refers to one billionth size, or roughly

one nanometer, is a synonym meaning dwarf or nanometer (nm) [29]. Metal oxides are one of the most frequently used nanoparticles. A lot of attention has been paid to quantum dots and fluorescent materials because of their small size and excellent luminous intensity [30]. The nanoparticles added to the documents can be examined using atomic force microscopy (AFM). In order to protect the security and confidentiality of security papers, self-erasing medium and self-erasing ink consisting of gold and silver nanoparticles, each measuring 5 nm, have been very beneficial[31]. When the document is scanned to establish the order of ink strokes, AFM is able to see the ink crossover. The 3-D morphology offered by atomic force microscopy is highly helpful in determining the important details regarding the sequence of ball pen strokes or ribbon strokes[32]. Scientists had developed on solvent-free gold nanoparticles assisted LDI-MS approach to detect the image inks and visible dyes in order to identify any forgeries or alterations in the documents or bank notes. Materials with metal, carbon, and silicon nanostructures have been created to help Surface Assisted Laser Desorption/Ionization Mass Spectroscopy (SALDI-MS) in examining questioned documents[33].

Conclusion

The goal of this study was to highlight the areas of forensic science where nanotechnology has been used and applied in a variety of ways and fields, such as fingerprinting, explosives detection, DNA analysis, ion beam analysis, drug detection, time since death estimation, security, and its use in examination of body fluids and document examination. Criminal investigations, the inspection of evidence, and the facilitation of its admission in court have all benefited greatly from nanotechnology. Nanotechnology is therefore anticipated to have a large critical role in the development of more perceptive tools that will help detectives solve cases more successfully in the future.

Reference

1. Ganesh, E. N. (2016). Application of nanotechnology in forensic science. *environment, 1*(1).
2. Pandya, A., & Shukla, R. K. (2018). New perspective of nanotechnology: role in preventive forensic. *Egyptian Journal of Forensic Sciences, 8*(1), 1-11.
3. Lodha, A. S., Pandya, A., & Shukla, R. K. (2016). Nanotechnology: an applied and robust approach for forensic investigation. *Forensic Res CriminolInt J, 2*(1), 00044.
4. Yonar, F. C., Karatas, O., Erkan, I., &Yukseloglu, E. H. (2022). NANOSCIENCE AND FORENSIC GENETICS. *Understanding Crime Through Forensic Sciences, 54*.
5. Singh, S., &Samal, N. (2021). Nanotechnology: A Powerful Tool in Forensic Science for Solving Criminal Cases. *Arab Journal of Forensic Sciences & Forensic Medicine, 3*(2), 273-296.
6. Kumar, N., &Sharma, A. (2021). Nano-Forensics: The New Perspective in Precision Forensic Science. In *Nanotechnology Applications in Health and Environmental Sciences* (pp. 111-134). Springer, Cham.
7. Prabakaran, E., & Pillay, K. (2021). Nanomaterials for latent fingerprint detection: a review. *Journal of Materials Research and Technology, 12*, 1856-1885.
8. Kesarwani, S., Parihar, K., Sankhla, M. S., & Kumar, R. (2020). Nano-forensic: new perspective and extensive applications in solving crimes. *Latent in applied nanobioscience, 10*(1), 1792-1798.
9. Becue, A., Champod, C., & Margot, P. (2007). Use of gold nanoparticles as molecular intermediates for the detection of fingermarks. *Forensic science international, 168*(2-3), 169-176.
10. Sodhi, G. S., & Kaur, J. (2016). Physical developer method for detection of latent fingerprints: A review. *Egyptian Journal of Forensic Sciences, 6*(2), 44-47.
11. Sandhyarani, A., Kokila, M. K., Darshan, G. P., Basavaraj, R. B., Prasad, B. D., Sharma, S. C., ... &Nagabhushana, H. (2017). Versatile core-shell SiO₂@SrTiO₃: Eu³⁺, Li⁺ nanopowders as fluorescent label for the visualization of latent fingerprints and anti-counterfeiting applications. *Chemical Engineering Journal, 327*, 1135-1150.
12. Peng, D., Liu, X., Huang, M., & Liu, R. (2018). Characterization of a novel Co₂TiO₄ nanopowder for the rapid identification of latent and blood fingerprints. *Analytical Letters, 51*(11), 1796-1808.
13. Singh, S., &Samal, N. (2021). Nanotechnology: A Powerful Tool in Forensic Science for Solving Criminal Cases. *Arab Journal of Forensic Sciences & Forensic Medicine, 3*(2), 273-296.
14. Saiyed, Z. M., Ramchand, C. N., &Telang, S. D. (2008). Isolation of genomic DNA using magnetic nanoparticles as a solid-phase support. *Journal of Physics: Condensed Matter, 20*(20), 204153.
15. Lad, A. N., Pandya, A., & Agrawal, Y. K. (2016). Overview of nano-enabled screening of drug-facilitated crime: a promising tool in forensic investigation. *TrAC Trends in Analytical Chemistry, 80*, 458-470.
16. Chen, X., Tang, Y., Wang, S., Song, Y., Tang, F., & Wu, X. (2015). Field-amplified sample injection in capillary electrophoresis with amperometric detection for the ultratrace analysis of diastereomeric ephedrine alkaloids. *Electrophoresis, 36*(16), 1953-1961.
17. Rawtani, D., Tharmavaram, M., Pandey, G., & Hussain, C. M. (2019). Functionalized nanomaterial for forensic sample analysis. *TrAC Trends in Analytical Chemistry, 120*, 115661.
18. Simioni, N. B., Oliveira, G. G., Vicentini, F. C., Lanza, M. R., Janegitz, B. C., &Fatibello-Filho, O. (2017).

- Nanodiamonds stabilized in dihexadecyl phosphate film for electrochemical study and quantification of codeine in biological and pharmaceutical samples. *Diamond and Related Materials*, 74, 191-196.
19. Zhang, C., Han, Y., Lin, L., Deng, N., Chen, B., & Liu, Y. (2017). Development of quantum dots-labeled antibody fluorescence immunoassays for the detection of morphine. *Journal of agricultural and food chemistry*, 65(6), 1290-1295
20. Swann, L. M., Forbes, S. L., & Lewis, S. W. (2010). Analytical separations of mammalian decomposition products for forensic science: a review. *Analytical chemistry*, 82(1-2), 9-22.
21. Garg, V., Oberoi, S. S., Gorea, R. K., & Kaur, K. (2004). Changes in the levels of vitreous potassium with increasing time since death. *JIAFM*, 26(4), 136-9.
22. Williams, T., Soni, S., White, J., Can, G., & Javan, G. T. (2015). Evaluation of DNA degradation using flow cytometry: promising tool for postmortem interval determination. *The American Journal of Forensic Medicine and Pathology*, 36(2), 104-110.
23. Navaee, A., Salimi, A., & Teymourian, H. (2012). Graphene nanosheets modified glassy carbon electrode for simultaneous detection of heroine, morphine and noscopine. *Biosensors and Bioelectronics*, 31(1), 205-211.
24. Petkov, P., Achour, M. E., & Popov, C. (Eds.). (2020). *Nanoscience and Nanotechnology in security and protection against CBRN threats*. Springer Netherlands.
25. Strem Chemicals. (2019, December 02). Defense Applications for Nanomaterials and Nanoparticles. AZoNano. Retrieved on September 12, 2022 from <https://www.azonano.com/article.aspx?ArticleID=1337>.
26. Abdollahi, A., Alidaei-Sharif, H., Roghani-Mamaqani, H., & Herizchi, A. (2020). Photoswitchable fluorescent polymer nanoparticles as high-security anticounterfeiting materials for authentication and optical patterning. *Journal of Materials Chemistry C*, 8(16), 5476-5493.
27. An, J. H., Shin, K. J., Yang, W. I., & Lee, H. Y. (2012). Body fluid identification in forensics.
28. Frascione, N., Thorogate, R., Daniel, B., & Jickells, S. (2012). Detection and identification of body fluid stains using antibody-nanoparticle conjugates. *Analyst*, 137(2), 508-512.
29. Shukla, R. K. (2016). Nanotechnology: An Applied and Robust Approach for Forensic Investigation. *Forensic Res. Criminol. Int. J.*, 2, 35-37
30. Menzel, E. R. (2001). Fingerprint detection with photoluminescent. *Advances in fingerprint technology*, 456
31. Cantu, A. A. (2008, October). Nanoparticles in forensic science. In *Optics and Photonics for Counterterrorism and Crime Fighting IV* (Vol. 7119, pp. 134-141). SPIE.
32. Prasad, V., Lukose, S., Agarwal, P., & Prasad, L. (2020). Role of nanomaterials for forensic investigation and latent fingerprinting—a review. *Journal of forensic sciences*, 65(1), 26-36.
33. Han, Z., Liu, H., Wang, B., Weng, S., Yang, L., & Liu, J. (2015). Three-dimensional surface-enhanced Raman scattering hotspots in spherical colloidal superstructure for identification and detection of drugs in human urine. *Analytical chemistry*, 87(9), 4821-4828.

ULTRASONIC STUDY OF MOLECULAR INTERACTION OF 2-(4-DIMETHYLAMINO PHENYL)- 4, 5-DIPHENYL IMIDAZOLE IN BINARY MIXTURE AT DIFFERENT TEMPERATURE

Kalyani K. Kumbhare and Triratna. M. Bhagat

P. G. Dept. of Chemistry, G. S. Gawande College, Umardhed, Dist-Yeotmal (MS)

bhagat.t@gsgcollege.edu.in

ABSTRACT

The measurement of density and ultrasonic velocity of 2- substituted 4,5-diphenyl imidazole with ethanol have been 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 results are discussed in the light of solute-solvent interaction and structural effects on the solvent in solution.

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

Introduction

Ultrasonic technique has been adequately employed to investigate the properties of any substance to understand the nature of molecular interaction in pure liquid, liquid mixture and ionic interaction in electrolytic solution¹⁻⁴.

In the present work an attempt has been made to investigate the behavior of binary mixture with regard to adiabatic compressibility, intermolecular free length and specific acoustic independence from ultrasonic measurement at different temperature. Ultrasonic investigation of liquid mixture consisting of polar and non polar component enable to understand the molecular interaction and structural behavior of molecules and their mixture. The intermolecular interaction influences the structural arrangement along with the shape of the molecule.

Such studies as a function of concentration are useful in gaining insight into the structure and bonding of associated molecular compound and other molecular processes⁵⁻¹⁰. Ultrasonic velocity measurements have been successfully employed to detect and assess weak and strong molecular interaction present in binary liquid mixture. Results 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 theoretically estimated velocities based on empirical, semiempirical & 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, liquid mixture and electrolytic solution.

2. Material and Method:

2.1. Synthesis of 2(4-diamino phenyl)- 4 ,5-diphenyl imidazole.

In a 100 ml round bottom flask, Benzil (2.1gm), P-dimethylamino benzaldehyde (1.49 gm), ammonium acetate (4.62 gm) in glacial acetic acid (20ml) refluxed for 3 hrs. After refluxing the reaction mixture the content was kept overnight. The obtained solid product was filtered, washes with water then recrystallised by using ethanol. Yield of compound is 2.67 gm and M.P.-190°C.

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 an 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 $\pm 0.05\%$. 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 solutesolvent, solvent-solvent interaction and structural changes.

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

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

$$(ii) \text{ Intermolecular free length } (L_f) :- L_f = K\sqrt{\beta_s} \text{-----(2)}$$

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

$$(iii) \text{ Specific acoustic impedance } (Z) :- Z = u_s \rho_s \text{-----(3)}$$

$$(iv) \text{ Molar sound velocity or Rao's constant } (R) :- R = \left(\frac{M}{\rho_s}\right) \cdot u_s^{1/3} \text{-----(4)}$$

Where 'M' molar mass of the solution.

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

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

$$(vi) \text{ Apparent molar volume } (\Phi_V) :- \Phi_V = \left(\frac{1000}{m\rho\rho_o}\right) (\rho_o - \rho) + \left(\frac{M}{\rho_o}\right) \text{-----(6)}$$

Where 'm' molarity of solution.

$$(vii) \text{ Apparent molar compressibility } (\Phi_\beta) :- \Phi_\beta = \left(\frac{1000}{m\rho\rho_o}\right) - (\rho_o\beta - \rho\beta_o) + \left(\frac{\beta_o M}{\rho_o}\right) \text{-----(7)}$$

$$(viii) \text{ Viscosity relaxation time } :- \Gamma = \frac{4\eta}{3\rho \cdot u^2} \text{-----(8)}$$

$$(ix) \text{ Ultrasonic attenuation : } (a/f^2) = \frac{8\pi^2\eta}{\rho \times u^2} \text{-----(9)}$$

$$(x) \text{ Relative viscosity } (\eta_r) :- \eta_r = \left[\frac{d_s \cdot t_s}{d_w \cdot t_w}\right] \eta_w \text{-----(10)}$$

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

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

3. Result & Discussion:

Compound In Ethanol

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 $\text{m}^3\text{mol}^{-1}$	Φ_β m^2n^{-1}
T=303.15K						
0.04	0.4868	1254.4	7.837×10^{-3}	3.2323	4.8687×10^2	4.8060×10^3
0.02	0.4861	1146.4	7.705×10^{-3}	2.7036	4.8613×10^2	4.0179×10^3
0.01	0.4855	1142.1	7.638×10^{-3}	2.6866	4.8551×10^2	3.9909×10^3
0.005	0.4848	1132.4	7.576×10^{-3}	2.6450	4.8480×10^2	3.9273×10^3
T=308.15K						
0.04	0.4844	1123.6	7.482×10^{-3}	2.6062	4.8447×10^2	3.8688×10^3
0.02	0.4839	1119.6	7.459×10^{-3}	2.5940	4.8393×10^2	3.8493×10^3
0.01	0.4831	1118.8	7.238×10^{-3}	2.5910	4.8311×10^2	3.8427×10^3
0.005	0.4828	1114.8	7.076×10^{-3}	2.5741	4.8280×10^2	3.8169×10^3
T=313.15K						
0.04	0.4824	1106.4	6.868×10^{-3}	2.5375	4.8247×10^2	3.7617×10^3
0.02	0.4819	1101.6	6.848×10^{-3}	2.5182	4.8193×10^2	3.7318×10^3
0.01	0.4812	1100.4	6.820×10^{-3}	2.5163	4.8121×10^2	3.7271×10^3
0.005	0.4795	1095.2	6.644×10^{-3}	2.5014	4.7950×10^2	3.7008×10^3

Table 2: Acoustical Impedance (Z), Intermolecular free length (L_f), viscosity relaxation time (τ), Ultrasonic attenuation (α/f^2) Rao's constant (R), relative association (R_A),						
Conc.	$Z \text{ Ns/m}^3$	L_f m	τ s	α/f^2	R	R_A
T=303.15K						
0.04	6.106×10^1	5.4473×10^2	8.0040×10^{-1}	2.5064×10^2	873.54	1.0769
0.02	5.572×10^1	4.9819×10^2	6.5631×10^{-1}	1.8836×10^2	799.48	1.1761
0.01	5.544×10^1	4.9661×10^2	6.4493×10^{-1}	1.8486×10^2	797.47	1.1773
0.005	5.489×10^1	4.9276×10^2	6.2797×10^{-1}	1.7898×10^2	791.83	1.1851
T=308.15K						
0.04	5.442×10^1	4.9782×10^2	6.1007×10^{-1}	1.7282×10^2	786.33	1.3210
0.02	5.417×10^1	4.9603×10^2	6.0325×10^{-1}	1.7063×10^2	784.34	1.2085
0.01	5.404×10^1	4.9575×10^2	5.8357×10^{-1}	1.6549×10^2	785.08	1.2067
0.005	5.382×10^1	4.9415×10^2	5.6609×10^{-1}	1.6016×10^2	782.76	1.2091
T=313.15K						
0.04	5.337×10^1	4.9857×10^2	5.4075×10^{-1}	1.5209×10^2	777.50	1.2346
0.02	5.308×10^1	4.9666×10^2	5.3395×10^{-1}	1.4984×10^2	774.93	1.2333
0.01	5.295×10^1	4.9648×10^2	5.2984×10^{-1}	1.4895×10^2	775.21	1.2321
0.005	5.251×10^1	4.9500×10^2	5.0950×10^{-1}	1.4357×10^2	774.29	1.2279

All discussions are discus 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 behaviour 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 of 2(4-dimethylamino phenyl)- 4, 5-diphenyl imidazole results the linearly decreases in adiabatic compressibility and free length. This trend supports weak solute-solvent interaction and suggests aggregation of solvent molecules around solute molecules [12,13]. The magnitude of adiabatic compressibility and free length decreases with increase in temperature, it clearly reveal that interaction become stronger at higher temperature [14]. The specific acoustic

impedance is the parameter related to the elastic properties of the medium. The specific acoustic impedance is the impedance offered to the sound wave by the components of the mixture. In present investigation, specific acoustic impedance decreases 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 to adiabatic compressibility^[16].

Molar sound velocity (Rao's constant) nonlinearly increases or decreases with decrease in concentration which indicates that the magnitude of molecular interaction is enhanced in the system, which indicates interaction between solute-solvent molecules decreases. This leads to tight packing of the medium by decreasing the molecular interactions^[17].

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

The apparent molar compressibility and apparent molar volume decrease with decrease in concentration which indicates interaction between solute-solvent molecules is enhanced.

Values are positive due to the compressibility of solvent due to the weak electrostatic force in

the vicinity of ions. This trend supports that the availability of more number of components in a given region of space. This leads to tight packing of the medium and thereby 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 nonlinearly decreases with decrease in molar concentration and decreases with increase 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 shows the instantaneous conversion of excitation energy to translational energy^[19]. Absorption coefficient decreases with decrease in concentration and this trend suggests 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 concluded 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.

References

- 1) A Ali, A K Nain, J. Pure Appl. Ultrason 22(2000), 10-15.
- 2) SJ Askar Ali. J. Chem. Pharm. Res 4(1)2012, 617-632.
- 3) VS Soitkar; SN Jajoo. Acoust Lett. 7(12), 1991-1992.
- 4) M Satya Narayanamurthy. Current science, 1964, 33, 364-365.
- 5) K. Sheshagiri; KC Reddy. Acustica (Germany), 1973, 29, 59-64.
- 6) MV Kaulgud; KJ Patil. Indian J Pure Appl Phys., 1975, 13, 322-326.
- 7) Manisha Gupta; JP Shukla. Indian J Pure Appl Phys 1996, 34, 769-772.
- 8) V Tiwari; JD Pandey., Indian J Pure Appl Phys 1980, 18, 51-56.
- 9) ME Hobbs; WW Bates. J Am Chem Soc., 1952, 74, 746-754.
- 10) S Velmourougane; T K Nambinarayanan; A Srinivasa Rao; B Krishnan. Indian J Phys, 1987, 61B, 105-110

- 11) A.N.Kannapan,Thirumaran.,Palanichammy , J. Physical sci,vol.20(2),(2009) 97-108.
- 12) H. Eyrin, J.F. Kincad, J.Chem.Phys,6(1938)620-629.
- 13) K.C. Patil and V.D. Umare, Int.J.Resh.in Pure app. Phys,2(4);(2012) 25-27.
- 14) A. Pal, H. Kumar, R. Mann, H. K. Sharma, J. Chem. Eng. Data 58 (2013) 3190-200.
- 15) R. K. Bachu, M. K. Patwari, S. Boodida, S. J. Tangeda, S. Nallani, Ind. J. Chem. 47A (2008) 1026.
- 16) S. J. Kharat, Physics Chemistry liqs. 51 (2013) 1-10.
- 17) S.Padma, RasayanJ.Chem 6(2)(2013) 111.
- 18) R. Mohanty and R. Paikaray, Res. J. of Chem. Sci. 3(5) (2013) 71-73
- 19) S.Nithiyanantham and Palaniappanchem. sci. Trans., 2(1) (2013) 35-40.
- 20) Zareena Begaum, et.al., J.Mol.Liqs, 178 (2013) 99-112.

EFFECT OF HERBICIDES ON THE PROTEASE ACTIVITY OF THE FRESH WATER SNAIL, LYMNEA ACUMINATA

Dr. Ghuge D.S.

Narayanrao Waghmare Mahavidyalaya Ak.Balapur Dist.Hingoli (MH)

ABSTRACT

Alteration in the Protein constituent of the fresh water snail, *Lymnea acuminata* (Lamark) were estimated after 24, 48 and 72 hours of sub-lethal dose of Endoin and Trizophos intoxication. the total Protein content was found to be decreased at all exposure periods from 100 mg/gm dry weight by tissue.

Keywords: *Lymnea acuminata* Basalin, *Euphorbia nerrifolia* enzyme activity, protease and, digestive gland.

Introduction

The freshwater environment is becoming increasable polluted with various pesticides, since they get accumulated directly or indirectly to aquatic bodies and cause threat to the inhabiting fauna. The physiological functions of animals get disturbed on exposure to pollution stress. Since mollusks have specific ecological adaptations in aquatic ecosystems, they constitute a remarkable component in ecosystems.

A large number of pesticides are drained regularly in water bodies, where snails, Fishes encounter with them and develop various metabolic abnormalities. The mollusk digestive gland is the principle metabolic center for a variety of functions. A large system of enzymes is functional at various metabolic pathways and any change it gets reflected as functional disorders, hence enzymes assays and the study if various metabolites have been proposed as a valid biochemical means to evaluate the extend of the toxicity (Rao K.R.et al 1995). Numerous biochemical indices of stresses have been purpose to assess the health of non-target organism exposed to toxic chemical in aquatic ecosystem. The present study includes impact of the herbicides Basalin and latex of *Euphorbia nerrifolia* on digestive enzymes i.e. protease metabolism in the digestive gland of fresh water snail *Lymnea acuminata*.

Material and Method

The freshwater snails *Lymnea acuminata* collected from Isapur dam near Kalamnuri city. They were brought to laboratory and kept for 8 days for acclimatization. Lethal concentration (LC50) for 24 hours and 48 hours were determined by static bioassay method following Probit analysis and 1/3 of the LC10 was selected for scarified the digestive gland were isolated by [Summer and Sommer (1971)] method and used for biochemical estimations. Protease was estimated by Prosser and Vanweel (1958). indicate a rapid inhibition and breakdowns of proteins, to meet the energy demands during toxic stress. (Sarika P. Fulpagare., (2009).)

All biological activities are regulated by enzymes and hormone which are also protein if any alternation takes place in the protein turnover, it may have and adverse influence on their important and complex group of biological material, comprising of the nitrogen constituents of the body and food intake the performing biological functions.

Impact of pesticides on Protein content in Foot o fresh water snail *Lymneaacuminata* (Lamark) (mg/gm dry wt.)

Note: \pm Each value is the mean of five observations S.D.

Values are significant at P <.01 , P <.02.

Values indicate % stimulation (+ve) or % inhibition (-ve).

Organ	Triazophos			Endoin			
	Control	24 Hrs	48 Hrs	72 Hrs	24 Hrs	48 Hrs	72 Hrs
Foot	57.000	38.400	36.870	33.719	53.897	47.700	46.210
S.D	± .1.12	± .076	± .072	±.066	±.1.06	±.094	±.092
'P' value		P<.001	P<.001	P<.001	P<.001	P<.001	P<.001
%		-32.63	- 35.31	-40.84	- 5.44	- 16.31	- 18.92

Harmful Fresh Water Snail *Lymnea Acuminata* (Lamarck) Induced By Changes in protease content in the muscle. Heteropneustes fossilis is exposed to carbaryl (Sapana Shrivastav and Sudha Sing (2001). Alteration In Carbohydrate, Protein And at Metabolism Of The Synthetic Pesticides.(Sarika P. Fulpagare., (2009). The

pollutant acts as a one kind of stress to an organism and the organism responds to eat by developing necessary potential to counteract that stresses. During the stress and organism needs sufficient energy which is supplied from the reserve food material that is Glycogen, Protein and Lipid.

Table: Impact of herbicides on protease activity digestive gland of fresh water snail, *Lymnea acuminata* in mg/gm dry wt.

Organ	Control	Basalin			Euphorbia nerrifolia		
		24 Hrs	48 Hrs	72 Hrs	24 Hrs	48 Hrs	72 Hrs
Digestive gland	0.0421	0.0524	0.0530	0.0539	0.0449	0.0452	0.0479
S.D	+-.003	+-.0005	+-.0005	+-.005	+-.0003	+-.0003	+-.0004
'p' value		P<.001	P<.001	P<.01	P<.01	P<.001	P<.0011
%		-24.46	-25.89	-28.02	-6.65	-7.363	-13.77

Note

- Enzyme activity is expressed as mg of amino acids/gm protein.
- Each value is the mean of five observation +- S.D.
- Values are significant at P<.001, P<.01.
- Values indicate % stimulation (+ve) or % inhibition (-ve).

Result and Discussion

The protease activity of the digestive gland of fresh water snail *Lymnea acuminata* is increased after sub-lethal concentration of Basalin and latex of *Euphorbia nerrifolia* (table) Enzymes are the important metabolites that provides the required energy to animals for performing the vital processes. Digestive gland of the molluscan is the principal metabolic center for a variety of functions. it is presumed that the digestive gland contribute to the defense of calms by the ability of its cells to "accumulate high concentration of pollutants." The digestive gland, the primary target is

evolved in the bioconcentration, magnification and biotransformation of toxicants. Among the vital organs, the digestive gland is the chief metabolic organ in bivalve. Similar results were found obtained by the several workers Tiwari S. and Singh A. (2003,2004); Swami et.al. (1983); Brick et.al. (1962) Mouri and Orlando (1981) Henry and Carls (1985).

The enzyme activity increase more with increasing the exposure period. The increase protease activity or enzymes activity after the pesticidal treatment might be due to 'physiological shock' such as increase in the enzymes activity [S.Krishna (1995). Elevated activity of protease in fresh water snail, *Lymnea acuminata* (Lamarck) by proteolysis, suggesting the proteins were utilized to meet excessive energy demands imposed by toxic stress [Tilak K.s (2002)]. Considerable increase in enzymes activity in the digestive gland of freshwater snail *Lymnea acuminata* can be correlated with disfunction of the organ.

Bibliography

1. Birk Y.K., Haepz I., Ishaya I. and Bondi A.(1962): Studies on the proteolytic activity of the beetle, Tenebrio and Tribolium.J. Insect Physiol.(8) 417-419
2. Finney D.G.(1971); Probit analysis Caombridge University Press London.
3. Henrey and CARles (1985); Sensitivity pollutant of the secreatory cell in the digestive gland of amrine organization to pollutants. Mar. Envion. Res.(5) 172-174.
4. Mouri M. And E. Orlando (1981) Accumulation of Fe, Mn, Cu. and Zn in the tissues of Donax tracunllus (2) Bivalve. Quad Lab . Techno. Pesca. Ancona 3(1); 643-648.
5. Prosser and Vnweel(1958); Effect if diet on digestive enzymes in mid gut gland of African Giant snail, Achatina fulcia (Ferb).Physio.Zoo.31 (3) 171-178
6. Rao K.R. and et.al.(1958): Effect of fluride toxicity on the carbohydrate metabolism of the carbohydrates metabolism of the freshwater crab, Barytelphusa cunicularis. Trends in life sciences (India) 10(2), 65-69.
7. Sudershankumar R. And Krishanan S. (1995); Effect of pesticides on enzymes activity in the digestive system o coconut pests, Oryctes rhinoceros (L) Coleoptera. J. Ecotoxicol. Environ.Monit. 5(2) 1003-106
8. Summer J.B. and G.F. Sommer (1947); Chemistry of enzymes. Academic Press New York.
9. Swami K.S. (1983): The Possible metabolic diversions adapted by the fresh water musselsto counter the toxic metabolic effects of selected pesticides. Indian J.Comp.Physiol. Vol.1, 95-106
10. Tilak K.S.and et.al. (2002);studies of some biochemical changes in tissues of Catla catla (Ham), Labeo rohita (Ham) and Cirrihina mirgala (Ham), Exposed to NH3-N, NO3-N J. Environ . Bio. 23(4) 377-381. Cahudhari R. D. and et al (1994); Effect of lipid metabolism in terrestrial snail, Zooteus insularis due to monocrotophos intoxication.

IMPROVING WEB PERFORMANCE USING WEB CACHING

H.B. Patelpaik¹ and Dr. Vinay Chavan²

¹Lokmanya Tilak Mahavidyalaya, Wani

²Seth Kesarimal Porwal College, Kamtee, Nagpur

ABSTRACT

The WWW contains vast amount of information almost on every topic. WWW has become an important tool for accessing information and interaction among people on the globe. It provides a wide range of Internet-based services including shopping, banking, entertainment, education, governance, etc. World Wide Web traffic has been increasing vastly due to various web applications on every web site. The rapid growth of online web applications is making network traffic congested and increase serve load which delays response, thereby frustrating the web user. Caching the popular web objects, is an effective solution to the latency problem which bring documents closer to the web user.

Keywords: WWW, Caching, Web Proxy Caching, Server Caching etc.

1. Introduction

The World Wide Web contains huge amount of information almost on every subject such as education, environment, defense, business, sports, medical science, banking, shopping etc. Popularity of World Wide Web has introduced new issues such as bandwidth consumption, Internet traffic thereby leading to latency in service being provided by the application servers. Due to huge traffic on Web can lead to considerable delays in accessing objects on the web. Caching of objects is widely used technique to reduce latency, network traffic and server load. Caching involves storing copies of objects at a location that are closer to the user. Caching plays an important role to increase the performance of web sites. Several caching policies are available such as Least-Recently-Used (LRU), Least frequently used (LFU), Greedy-Dual-Size (GDS) and Greedy-Dual-Size-Frequency (GDSF) etc. Conventional Web caching policies do not perform well in every situation of caching the web object.

2. Related Work

Most web proxy servers are still based on traditional caching policies. These conventional policies are suitable for traditional caching like CPU caches and virtual memory system, but they are not efficient in Web caching area. This is because they only consider one factor in order to make caching decision and ignore the other factors that have impact on the efficiency of the Web proxy caching [1, 2]. Three features of Web caching

make it attractive to all participants, including network manager, content creator and users [3]. Classification of Web replacement policies was Caching reduces network bandwidth, user-perceived delays and loads on the origin server. The important factors of Web objects that can influence the replacement are recency, frequency, size, modification time, and expiration time [4]. A different replacement classification was given on the basis of various factors such as recency, frequency, recency/frequency, function and randomize. [5].

3. Web Caching Techniques

Web caching technique is renowned strategy for improving the performance of Web based system by keeping Web objects closer to the user that are used in the future. Web caching keeps a local copy of Web objects in places close to the end user. Caches are found in clients' browsers and in any of the Web intermediate between the user and the origin server. Basically web caching mechanisms are implemented are as follows.

- Client Based Caching
- Sever Based Caching
- Intermediate Web Caching
- Miscellaneous Web caching

3.1 Client Based Caching

Client based caching is done at client proxies, which cache the documents recently accessed by the clients. Typically, a cache is located in client (browser cache), proxy server (proxy cache) and origin server (cache server) [6, 4] as shown in Fig.1.

3.1.1 Browser Caching

It is a storage area in memory or on disk that holds the most recently downloaded Web objects temporarily. The user configures the cache setting of any modern Web browser such as Mozilla Firefox, Netscape, Internet Explorer, Safari and Google Chrome. This browser cache is useful, when users hit the "back" button or click a link to see a page they have just accessed it. The browser compares the dates of the cached object with the current Web object. If the Web object has not changed, the cached object is displayed immediately. If the Web object has changed, it is downloaded, displayed and cached. If the user uses the similar navigation images throughout the browser, they will be served from browsers' caches almost instantly.

3.2 Server Based Caching

Server based caching is done at server proxies (called edge servers). A server proxy stores (partially) replicated data of web site and acts as 'front-end' of this web server to the clients.

3.2.1 Origin Server Caching

Server-side caching differs from browser caching in that it serves many visitors from the same cache without requiring individual first-time site visitors to make requests to the origin server. This helps reduce the stress on the origin server and speeds up the Web page load for all site visitors. Even the origin server, maintains a cache for reducing the need for redundant computations or database retrievals. This is called as server side cache. This reduces the load on server considerably.

3.3 Intermediate Caching

A cache is an intermediate storage that retains data for repeat access. It reduces the time required to access the data another time.

3.3.1 Proxy Server Caching

The proxy server cache located between client and origin servers. It works on the same principle as browser cache, but larger in size. The browser cache which deals with only a single user whereas proxies serve hundreds or thousands of users in the same way. When a request from client is received, the proxy server

checks its cache. If the object is found, it sends the object to the client, otherwise, the proxy server will request the object from the origin server and send it to the client and newly fetched object is stored in the proxy's cache for future requests. The proxy cache is utilized widely by network administrators, technology providers, and business vendors to reduce user delays and to alleviate Internet congestion [7, 1, 8]

3.3.2 Reverse Proxy Caching

Reverse proxy caching is an interesting form of proxy cache approach in which cache is deployed near to the servers, instead of near the clients. This is an effective cache mechanism for servers that expect a high number of requests and need high level of quality of service. Reverse proxy caching mechanism is more useful to support mapping of virtual domains.

3.4 Miscellaneous Web Caching

There are some other types of web caching based on their location and used which are explained below

3.4.1 Transparent Caching

The proxy server approach requires to configure web browsers. This is a major drawback of proxy server cache approach. This drawback is eliminated in the architecture of transparent caching in cache work by intercepting HTTP request and redirecting them to web cache servers or clusters.

3.4.2 Adaptive Web Caching

It consists of multiple, distributed caches which dynamically join and leave cache groups based on content demand. It uses the content Routing Protocol (CRP) and Cache Group Management Protocol (CGMP).

3.4.3 Push Caching

A server decides when and where to cache its documents, was introduced as push caching. The idea is to keep cached data close to those clients which request that information more frequently. This Data is dynamically mirrored as originating server identifies where requests originate from.

3.4.4 Site Caching

A site cache or page cache stores the website data for the first time a webpage is loaded. Every time a user returns to your website, saved elements are accessed quickly and displayed to the users. It is a type of client-side caching, means that stored elements are controlled by the end-user.

3.4.5 Micro Caching

It is another type of caching, many website owners might not be aware about micro

caching. Micro Caching method stores content for very short periods of time. It saves static versions of dynamic elements for up to 10 seconds.

3.4.6 Active Caching

An active cache mechanism is required to support caching of dynamic contents at the web proxies. The active cache mechanism migrates the parts of server processing to the caching proxy in a flexible manner and on demand from each user request.

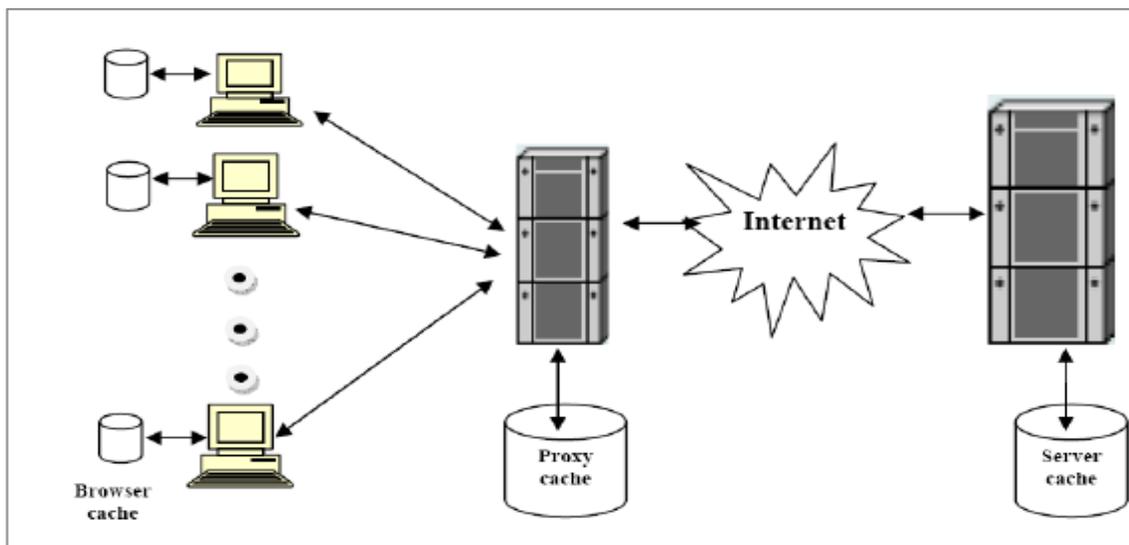


Fig. 1. Locations of Web Cache

4. Performance Metrics and Factors

Several metrics and factors affect the decision to select appropriate caching policy for different situation. To maximize efficiency, it is helpful to assess performance of different algorithms based on the factors and metrics relevant to the different situation.

4.1 Performance Metrics

4.1.1 Hit Ratio

Hit ratio is the ratio of objects obtained through caching policy versus the number of requests made [9]. Higher hit ratio indicates better caching policy. However, it may only be relevant if the objects are homogenous in size.

4.1.2 Byte Hit Ratio

Byte hit ratio is the ratio of bytes accessed from the cache to the total bytes accessed [9].

In case of objects being of different sizes, Byte hit ratio is better metric for measurement.

4.1.3 Bandwidth Utilization

It is an important count where an algorithm that reduces consumption of bandwidth is better [9].

4.1.4 User Response Time

It is the time a user waits for the system to retrieve the requested object. It is also known as latency.

4.2 Performance Factors

4.2.1 User Access Patterns

If a user accesses objects small in size more frequently, then the objects that are small in size stand for caching. User access patterns are not static and therefore a good caching algorithm should not be static either [10]. Cache replacement techniques decide which objects to be discarded when the cache is full.

4.2.2 Cache Removal Period

Cache removal period dictates that documents will be removed when there is no space in the cache [11]. Continuous cache removal period suggests that cache has no more space to hold the object that currently being accessed. Fixed cache removal period means that objects will be removed only at the beginning of removal period [9].

4.2.3 Cache size

If the cache is larger in size, it implies that cache can store more web objects which means increased the hit ratio. Cache size is however expensive in terms of processing cost and complexity [12]. In a small cache, a caching mechanism may either store many small sized objects or few large size objects. Maximum cacheable object size is a user defined factor that puts a limit on the size of objects that can be stored in the cache [9]

5. Web Caching Techniques

Cache replacement policy plays an important role in Web caching. The Design of efficient cache replacement algorithm is required to achieve highly sophisticated caching mechanism [13, 14]. Cache replacement algorithms are also called Web caching algorithms [15].

Since cache size is limited, a cache replacement techniques are needed to handle the cache content efficiently. When a new web object is needed to be stored in cache the replacement policy determine which object is to be removed, to make room for the web object. The Optimal replacement policy make the best utilization of available cache space, to improve cache hit rates, and to reduce loads on the main server. Most of the Web proxy servers rely on traditional policies for caching the Web object [2, 16]. These conventional policies are suitable in traditional caching like CPU caches and virtual memory systems, but they are not efficient that much in Web caching [17]. The most common cache replacement techniques is as follows.

5.1 Least Recently Used (LRU)

Least Recently Used technique removes the least recently accessed objects until there is sufficient space for the new objects. LRU is

easy to implement and proficient method for caching objects of uniform size, like in case of memory cache. However, it does not perform that much effectively in Web caching since it does not consider the size or the download latency of objects [17].

5.2 Least Frequently Used (LFU)

Least Frequently Used (LFU) is another caching mechanism that replaces the object with the least number of accesses. Least Frequently Used keeps more popular web objects and evicts rarely used objects. However, Least Frequently Used technique suffers from the cache pollution in objects with the large reference accounts, which are never replaced, even if they are not re-accessed again.

5.3 Size

The SIZE cache policy is one of the common and frequently used web caching approaches. In this policy the object(s) having largest size is replaced from cache when space is needed for a new object, so that sufficient space can be created. The major drawback of this policy is that, the cache can be polluted with small objects which are not accessed again.

5.4 Greedy Dual Size (GDS)

To alleviate the cache pollution in SIZE cache policy, [17] suggested Greedy-Dual-Size (GDS) policy as an extension of the SIZE policy. The GDS algorithm considers several factors like cost, size and recency to decide on cache replacement. This policy used a key value or priority value for each web object stored in the cache. When object in a cache is required to be replaced with new object, the object with the lowest key value is removed. When user requests an object p , GDS algorithm assigns key value $K(p)$ of object p as shown in following Equation.

$$K(p) = L + \frac{C(p)}{S(p)}$$

where

$C(p)$ is the cost of fetching object p form server into the cache.

$S(p)$ is the size of object p , and

L is an aging factor.

L starts at 0 and is updated to the key value of the last replaced object. The key value $K(p)$ of

object p is updated using the new L value since the object p is accessed again. Thus, larger key values are assigned to objects that have been visited recently. The GDS algorithm achieved better performance compared with some traditional caching algorithms[17].

5.5 Greedy-Dual-Size Frequency (GDSF)

The GDS algorithm ignores the frequency of web object. The GDS algorithm have been enhanced by integrating the frequency factor into of the key value $K(p)$ as shown below. And the policy is termed Greedy- Dual-Size-Frequency (GDSF)[18].

$$K(p) = L + F(p) * \frac{c(p)}{s(p)}$$

where

$F(p)$ is frequency of the visits of object p . Initially, when p is requested by user, $F(p)$ is initialized to 1. If p is in the cache, its frequency is increased by one.

When the cache becomes full and new object need to be stored in the cache, a replacement

policy comes into play to determine which object to evict to create room for the new object.

6. Conclusion

Web caching is the most popular technique to reduce internet traffic, bandwidth consumption and minimizing web latency. Proxy caches are regularly used to reduce bandwidth globally. Various caching techniques are used around the world and improve the experience of the web by minimizing latency. In this paper, we discuss various caching techniques and their merits and demerits. However, the web has an ever-changing and complex structure and more suitable algorithms are required. Future work may comprise of web caching systems need to be integrated with machine learning techniques to adapt to the important changes in usage patterns and store appropriate objects incache while utilizing the cache efficiently.

References

1. C. C. Kaya, G. Zhang, Y. Tan, and V.S Mookerjee, "An admission-control technique for delay reduction in proxy caching", *Decision Support Systems*, 46(2), pp 594-603, 2009
2. J. Cobb, and H. ElAarag, "Web proxy cache replacement scheme based on back-propagation neural network", *Journal of System and Software*, 81(9), pp. 1539-1558, 2008
3. Davison B.D, "A Web caching primer", *IEEE, Internet Comput*, pp 38-45, 2001.
4. B. Krishnamurthy, J. Rexford, *Web protocols and practice: HTTP/1.1, networking protocols, caching and traffic measurement*. Addison-Wesley, 2001.
5. Jin S., Bestavros A., "Greedy Dual: Web caching algorithms exploiting the two sources of temporal locality in Web request streams." In *proceedings of the 5th International Web Caching and Content Delivery Workshop*, 2000
6. H.T. Chen, *Pre-fetching and Re-fetching in Web caching systems: Algorithms and Simulation*, Master Thesis, TRENT UNIVESITY, Peterborough, Ontario, Canada, 2008.
7. C. Kumar, J.B. Norris A new approach for a proxy-level web caching mechanism, *Decision Support Syst.* 46(1),C pp52–60, 2008.
8. C. Kumar, "Performance evaluation for implementations of a network of proxy caches", *Decision Support Systems*, 46(2), pp. 492-500, 2009.
9. Athena Vakali, George Pallis, "A study on web caching architectures and performance"
10. Lixia Zhang, Sally Floyd and Van Jacobson, "Adaptive Web Caching", April 25, 1997
11. Waleed Ali, Siti Mariyam, Shamsuddin, Abdul Samad Ismail, "A Survey of Web caching and Prefetching", *International Journal of Advanced Soft Computing Applications*, Volume 3- No. 1, March 2011

12. Dhawaleswar Rao. CH, "Study of the web caching Algorithms for Performance Improvement of the response speed", *Indian Journal of Computer Science and Engineering*", Volume 3 – No. 2, April-March, 2012.
13. T. Chen, "Obtaining the optimal cache document replacement policy for the caching system of an EC Website", *European Journal of Operational Research*. 181(2),(2007), pp. 828. Amsterdam.
14. H. Che, Y. Tung, and Z. Wang, "Hierarchical Web Caching Systems: Modeling, Design and Experimental Results", *IEEE Journal On Selected Areas In Communications*, 20(7), (2002), 1305-1314
15. T. Koskela, J. Heikkonen, and K. Kaski, "Web cache optimization with nonlinear model using object feature", *Computer Networks Journal*, elsevier , 43(6), pp. 805-817, 2003
16. H. ElAarag and S. Romano, "Improvement of the neural network proxy cache replacement strategy", *Proceedings of the 2009 Spring Simulation Multiconference, (SSM'09)*, San Diego, California, pp: 90.
17. P. Cao and S. Irani, "Cost-Aware WWW Proxy Caching Algorithms", In *USENIX Symposium on Internet Technologies and Systems*, Monterey, CA, pp. 193-206, 1997.
18. L. Cherkasova, "Improving WWW Proxies Performance with Greedy-Dual-Size-Frequency Caching Policy", In *HP Technical Report*, Palo Alto, 1998.