Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ) ISSN : 2278 – 5639 (IIFS Impact Factor : 6.125)
Volume - XIII, Special Issues – IV, March 2024

ISSN : 2278 - 5639

ISSN: 2278 – 5639

Global Online Electronic International Interdisciplinary Research Journal

(GOEIIRJ)

Peer Reviewed Refereed Journal {Bi-Monthly} Impact Factor : IIFS 6.125
Volume – XIII,
Special Issue – IV,
March - 2024

"ENVIRONMENTAL ISSUES"

Editor
Dr. Vilas B. Ganipurka

ISSN : 2278 – 5639
March - 2024
Volume - XIII
Special Issues – IV
IIFS Impact Factor : 6.125

GOEIIRJ

Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ)

www.goeiirj.com
Peer Reviewed Refereed Journal
{Bi-Monthly}

" Environmental Issues"

EDITOR
Dr. Vilas B. Ganipurkar

Year
2024

GOEIIRJ EDITORIAL BOARD

PUBLISHED BY

GOEIIRJ

Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ)

www.goeiirj.com

INDEX

Peer Reviewed Refereed Journal **ISSN : 2278 – 5639**
Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ)
{Bi-Monthly} **Volume – XIII** **Special Issue – IV** **March – 2024**

STUDY ON PHYSICO-CHEMICAL PARAMETERS OF KHADKPURNA RESERVOIR, DEULGAON MAHI, DIST. BULDHANA, M. S., INDIA

Tandale M. R.
Department of Zoology, Shri Vyankatesh Arts, Commerce and Science College, Deulgaon Raja, Dist. Buldhana, M. S., India.

Nagmote S. R.
Department of Zoology, Late B. S. Arts, Prof. N. G. Science and A. G. Commerce College, Sakharkherda, M. S., India

M. T. Nikam
Head Department of Zoology, Shri Shivaji Science and Arts College, Chikhli, M. S., India.

Abstract:

The Khadkpurna Dam is the most important dam in Buldhana District, which provide water for drinking as well as Agricultural use. As we know the Dam is constructed on the basis of the flow of rivers due to that it brings about changes in abiotic and biotic factors compare to untamed rivers and the response of each river to dam differs. So that investigation of water quality parameters is necessary. During the study periods we investigated the both Physical as well as Chemical parameters of Khadkpurna Dam. The dam water is safe for the use for drinking and agricultural use.

Keywords: Physicochemical, Parameters, Khadkpurna.

Introduction:

The physico-chemical parameters are the major factors that control the dynamics and structure of the phytoplankton of aquatic ecosystem. Changes in physico-chemical parameters directly affect the species composition of any ecosystem. Seasonal variations of such parameters influence the distribution, periodicity and quantitative and qualitative composition of biota. Limnology was studied with reference to the organism especially Plankton. Zooplanktons are extremely responsive to change in the environment and thus indicate environmental changes and fluctuations that may occur; zooplankton community fluctuates according to physico-chemical parameters of the environment **.** The fresh water available in dam is useful as potable, domestic, washing, bathing agriculture and also for fishing. The nature of water is depends on the chemicals are found in it and its effects are shown on biotic factors those depends on sources. Physical factors are effective for improvement of water bodies dependent on fresh water. Micro-organisms like zooplanktons and phytoplanktons play a lead role maintaining quality of water. Improvement

in water quality is related with rich fauna and civilization progresses. Ponds, as sources of water, are of fundamental importance to human being. Monitoring of water quality is initiative step to be taken up for the management and conservation of any aquatic ecosystem. Hence, an assessment was conducted to Studies on Inter-Relationship of Planktonic Animal and Physicochemical Parameter of Khadkpurna dam located in Buldhana District (Maharashtra). The nutrients, primary production, temperature, abundance of predators and competitors, and potential food resources are important factors influencing the structure of rotifer community Even though most rotifers commonly exhibit maximal densities in early summer, in temperate regions they show wide range of temperature tolerance Various rotifer taxa serve as useful bio indicators of water quality of environments within the limits of Limnosaprobity. (**Ekhande *et al.*, 2013).**

Material and Methods

Khadakpurna is one of the three major dams of the Buldana district (Latitude: 20° 4′ 10.79″ N, Longitude: 76° 10′ 4.73″ E, Altitude: 445 meters above sea level) with storage capacity of 160.66 m cm water, has registered 276 mm rainfall in its catchment area. Khadakpurna Reservoir which rises from Gautala forest and upon which the dam lies, is now receiving good amount of water.

Limnological survey of Khadkpurna dam: Proposed research is undertaken to study on the limnological aspect of Khadkpurna dam, to fulfill the objectives of proposed research work, water samples will be collected for twelve month (Jan to Dec 2019) from six different sampling sites viz; S1, S2, S3, S4, S5, and S6.

S1-located on east direction of dam
S2- located on west direction of dam
S3- located on north direction of dam
S4- located in south direction of dam
S5- located in the Middle of the dam
S6- located in the outlet of the dam

Some of the physical parameters and essential noting such as date and time of sampling shall be made on the site of sample collection. Water shall be collected in plastic containers and BOD bottles, for further analysis Samples are brought to the laboratory in sampling bottles. Physical parameters such as, Temperature, pH, Conductivity, Turbidity, Total Dissolved Solids and chemical parameters such as DO (dissolved oxygen), free CO_2 (free carbon dioxide), CO_3 (carbonate), HCO_3 (bicarbonate), Total Hardness, Calcium hardness, Chloride, Salinity, phosphate, Ammonia, Nitrite, Nitrate, Sulphates, Silicates, BOD (biological oxygen demand) and COD (chemical oxygen demand) will be analyzed by following the methods suggested in **APHA (1998)** and **Dhanpathi (2006).**

Results and Discussion

Physical Parameters:

1. Temperature:

During the first year of analysis Temperature of Khadkpurna dam is recorded 18.25 ºC ± 1.7078 to 29.75 ºC ± 0.500 in 2019. Highest value of temperature was recorded in the month of Jun while the lowest was recorded in the month of December. There was not very significant difference in water temperature in the all sampling sites. The water temperature is important factor for indicating the quality of water. It affects the aquatic organism, chemical solutes and dissolved oxygen and carbon dioxide in water.

2. pH:

The water quality is also determine by pH of water sample. During study periods the pH value is ranges from 7.23 ± 0.1708 to 8.1±0.1215. the water quality of Khadkpurna dam is near about neutral. The highest pH was recorded in the month of April and Jun while lowest was observed in November and December.

3. Conductivity:

Conductivity is an important parameter to know the quality of water. The mean values of conductivity ranged between 215 ± 7.746 µmho/cm to 377.50 ± 22.883 mho/cm. The conductivity shows lower value in December in both year and shows higher in February in 2019.

Conductivity was lower in winter season was reported by (**Singh and et al .,2012**). Certain controversial reports are found that the conductivity was higher in winter; the highest value of conductivity might be due heavy load from all side into lake. **(Koshy and Nayar,2000; Karadkhede 2008)**. All water body of Morna reservoir is maximum covered with the field area therefore organic matter influence the water conductivity, in rainy season organic soil are artificially drained, it increases the cation concentration of ponds.

4. Turbidity:

Turbidity of water was found 5.20±0.5142 to 9.14± 0.153 NTU in the first year period January to December 2019 Maximum turbidity observed in the month of June and all over the monsoon and minimum in December.

In Monsoon season turbidity is increases due to rain water flow in the reservoir from all sides, similar result obtained by **Agarwal and Rajwar (2010)**, according to them increased turbidity in monsoon month attributed to soil erosion in nearby catchment also suspended solids. Clay, organic matter, planktons slit and other microscopic organisms are increases turbidity of water. Turbidity was found different i.e. maximum turbidity found in month of February, due to human activity and decrease in water level reported by **Manjare and *et al*., (2010).**

5. Total Dissolved Solids:

Total dissolved solids is used to measure amount of particles that dissolved in water, that is

nitrates, calcium, magnesium, sodium, potassium, iron, carbonates and bicarbonate.

TDS in year 2019 ranged from 228.83 ± 28.798 to 375.36 ± 36.155 mg/L. Total dissolved solids were found to be maximum in the month of June, July and minimum in April. Due to agricultural land near the dam, runoff is rich and it increases the fertilizers, organic matter and salts in aquatic water, therefore the 391 mg/L TDS is found in June, similar result obtained by **Makode (2012)** of Charghad dam Amravati, Maharashtra. Some controversial results obtained by **Verma and *et al.,* (2011)**, they found increased TDS in summer season and decreased in monsoon due to dilution of rain water.

Chemical Parameters

6. Dissolved Oxygen:

During the first year 2019 of investigation, mean values of dissolved oxygen was found 3.90± 0.3559 to 7.70 ± 2.2494 mg/L. Dissolved oxygen was found maximum in the month of December and January and minimum in September, October. Similar results were recorded by **Khan and *et al*.,(2012).** Dissolved oxygen is play vital role in aquatic fauna, it is an important parameter for aquatic life mainly fish culture, it found lower in summer by **(Rani *et al* .,2004 and Medudhula and *et al.,* 2012).**

7. Carbon dioxide:

CO2 is found in three forms i.e. freeCO2, CO3, or HCO3 depends upon the pH and biological condition .The Carbon dioxide found 3.9 ± 0.3559 to 7.7 ± 2.2494 mg/L in 2019. It found maximum in monsoon and minimum in March month in both the study year but presence of free CO_2 is also depends upon the time of sampling and seasonal fluctuations in water body.

The total CO_2 concentration in water depend upon pH Which is governed by the buffering effect of carbonic acid, carbonate and bicarbonate **Hutchinson (1957).** Free Co_2 was recorded negligible at Kagal tank, high at Kanerwadi and moderate at kandalgaon tank by **(Pailwan and *et al* .,2008 ; Sharma and *et al.,* 1978)** also pointed that, absence of free carbon dioxide in unpolluted water bodies.

CO_2 is essential for respiratory metabolism of phytoplankton and aquatic vegetation, increased carbon dioxide level might be due to uptake from autotroph, assimilation by algae and aerobic bacteria of decay add CO_2.(**Sivakumar and Karuppasamy ,2008).**

Alkality

The alkality to natural waters is mainly imparted by three prominent bases; Carbonate ($C0_3$), bicarbonates ($HC0_3$) and hydroxide (OH), therefore alkality estimated as individual base. According to **Solanki and Pandit (2006)** the alkality changes depends upon the carbonate and bicarbonate and also depend upon release of carbon dioxide.

8. CO3 (Carbonate Phenolphthalein alkality):

During the study period Carbonate was found 22± 2.8284 mg/L to 56 ± 23.44 mg// in 2019.

Carbonate value increases in summer and minimized in monsoon season.

9. HCO3 (Bicarbonate or Methyl Orange alkality):

Annual changes found in bicarbonate value are ranged from 98.13± 1.652 mg/L to 139.25 ± 18.464 mg/L in 2019. Bicarbonate value found to be minimum in June month and maximum bicarbonate alkality found in March.

The total value of carbonate and bicarbonate increases in summer and decreases in the month of monsoon it may due to dilution water in rainy season and in summer less water increases the percentage of alkality in water body. The controversial results obtained by **Verma and *et al.*, (2011)** they found maximum value of alkality in monsoon and minimum during summer.

10. Total Hardness:

Total hardness of water was found 141.5± 19.807 to 300.50 ± 58.660mg/L in 2019. The maximum hardness of the dam water increases in February month in both the years and minimum hardness found in winter season during study period.

The total harness was recorded higher in summer, it might be due to decrease in water level and rate of evaporation of water .similar result observed by **(Hujare ,2008; Manjare and *et al.*, 2010).** Total hardness of water increases mainly due to the presence of (Ca^{2+}) and magnesium (Mg^{2+}) ions in every water body which may increases due the human washing clothes, bathing activities in dam.

11. Calcium Hardness:

Calcium is major cation found in water. During first year of study period calcium Hardness found 8.30 ± 0.4999 to 43.40± 8.7741 mg/L. The maximum Calcium hardness found in January month and minimum in Monsoon in both the years. The maximum desirable limit of calcium in drinking water is 75mg/l **(W.H.O)**, therefore above recorded value of calcium, it indicate water is use for drinking purpose. Maximum value of calcium in winter season, controversial result obtained by **Harney and *et al.*, (2013)** recorded calcium hardness minimum in winter season. **Ravikumar *et al.*, (2005)** reported the maximum calcium hardness in April month in Ayyanakere tank in Harapanahalli town in Davangere district of Karnataka.

12. Magnesium Hardness:

Magnesium Hardness was calculated from removing calcium hardness from total hardness. The magnesium hardness found in this reservoir was 25.82 ± 4.8272 mg/L to 63.34 ± 12.3281mg/L in the year 2019. Which not show much more significant differences during study period. Maximum hardness of magnesium was found in the month of February and minimum in winter season of both the year of study period. Similar result found by **(Patil 2014).** The permissible limit of magnesium of drinking water is 50mg/l **(W.H.O)** but our result about magnesium was above 66mg/l, so it may hazarders for drinking purpose.

13. Chloride:

The chloride value of Khadkpurna dam was ranged from 68.43± 6.2610 mg/L to 140.73 ± 3.338mg/l in 2019. The chloride value was higher in summer and minimum during winter season in both the year of study period. Similar result obtained by **Shinde *et al*., (2011)**, according to them Higher level of chlorides in natural water is indication of pollution and domestic sewage. Likewise in dam there may be certain anthropogenic activities increases chloride concentration in water. The result obtained by **Pulugandi (2014)** that chlorides were minimum at winter and shows maximum in monsoon season.

14. Salinity:

Salinity can also calculated from the chloride, during study periods the mean salinity were found 123.54±11.301mg/l to 245.05± 6.0255 during 2019. The highest salinity value was recorded in the month of May while lowest was recorded in the month of February during both years. **Siddqi 2008** studied salinity ranges from 28000-60000mg/l, the low temperature of the water may also higher amount of inorganic salts dissolved in it, which responsible for high lavel of salinity observed in the lake water or dam water.

15. Phosphate :

As the dam is totally surrounded from all sides by field area and totally water in dam is used for irrigation purpose, therefore it also necessary to study the phosphate level in water.

The phosphate level during the first year of study was found 0.17 ± 0.0506 to 2.11 ± 0.4426 mg/l in 2019 . The phosphate level was higher in Monsoon season and lower in summer and winter season. Similar result obtained by (**Arvindkumar 1995; Manjare, 2010 and Makode, 2012**) that the maximum value of phosphate recoded in August and minimum in October i.e.in winter season. Due to surface water runoff, agriculture run off, washer man activities increases inorganic phosphate in water in rainy season therefore phosphate level increases in monsoon season.

16. Sulphate:

The mean Sulphates from the all four sampling sites during 2019 were 3.55 ± 0.5260mg/l to 7.375 ± 2.51976 mg/l. The highest was observed in the month of November and lowest was in the month of February. On sampling site S4 Sulphates values was increases due to which residential area of water supply colony on the bank of Dam water. Similar results obtained by **Borul (2012), Satyanarayan *et. al.,* (2008)** observed sulphates values in the range of 20 to 26.4 mg/L. **Pawar (2010)** observed Sulphates was 22 mg/L in pre-monsoon and monsoon season and 21 mg/L in post-monsoon season.

17. Silicates

During the first year of study period silicate value were ranges between 1.60±0.6801 mg/l to 8.65 ± 2.1044 mg/l in 2019. The lowest value of silicates was observed in both years the month of January and highest was observed in September. Contents of silicates may have triggered the

overwhelming growth of *Bacillariophyceae*. Silicate contents of the dam or lake were recorded vary low from August silicates gradually increase during post-monsoon months and reach at its maximum during summer months by **Dabhade (2006, 2013).** Silicates is known to regulate availability and abundance and dominance of Diatoms in many aquatic environments, it has been recognized as determinant of algal community structure of the lake **Siddiqi (2008).**

18. Ammonia

In the lake or Dam water Ammonia observed due to the died and decomposition of organic matter or it may due to the excretory product from Ammonotelic organism. During the first year of investigation mean Ammonia was 0.03 ± 0.0472 mg/l to 0.78± 0.5258 mg/l in 2019.T he lowest was value observed during the month of March in both years and highest in the month of the May . The trace amount of ammonia were detected is due to the evaporation of the ammonia at higher temperature like the month of May and Jun hence the values of ammonia was under the trace amount. Ammonia was observed high as well as low in the both years of sampling all sites during summer it was observed high and in the winter was low. Then also as compared to both years value of ammonia was observed vary slightly unchanged. High amounts of ammonia and ammonical toxic compounds are produced during decomposition of the algae. Toxicity of these compounds kills the organisms **Dabhade (2006).** During the decomposition lot off ammonia produce along with low dissolved oxygen. **Dabhade (2013)** observed ammonia in lake water was 11.46mg/L. Ammonia is the product of organic decomposition **Siddiqi (2008).**

19. Nitrite

During the first year of study periods mean Nitrite was 0.01 ± 0.0096 mg/l to 0.4858 ±0.41435 mg/l. Nitrite value were observed trace amount similer results also observed by **Shinde *et al.*, (2011),** then also the highest was observed in the December and Lowest was in February 2019. The values are not accepted due to observing trace amount of nitrite. The value slightly changes during investigation of water sample.

20. Nitrate

Nitrates is highly oxidized form of nitrogen, in natural water due to runoff fertilizers, decayed vegetable and domestic waste are increases the amount of nitrogen in water.

Nitrate value ranged from 2.16 ± 0.1415 to 8.32 ± 0.6357 mg/l in 2019. The nitrates value was higher in monsoon season and recorded lower in late winter and summer season. The controversial result obtained by **Dabhade (2006)** i.e. high values of nitrates observed in winter season and gradually increased in summer season. Nitrates is act as nutrient for growth of plants, excess amount of nitrogen helps for rapid growth of algae and other plants in water,

Nitrates is found very small amount in nature because ongoing process of growth and decaying. Most stable form of nitrogen is nitrates which enhances the growth of plankton density and primary production. **Parida et al., (1999).**

21. BOD (Biological Oxygen Demand)

BOD (Biological Oxygen Demand) is very important parameter of water, because on that basis we determine the status of planktons population present in to it. The BOD values were high due to the contribution of nitrates and phosphates present in the lake or Dam water **Dabhade (2013).** So the BOD was estimated monthly by taking the water sample form the Dam and analyzed in to the laboratory. During the study periods mean BOD was observed during the 2019 it was 0.35 ± 0.2265 mg/l to 2.13 ±0.45 mg/l. The highest value of BOD were observed in the month of February and lowest was observed in month of Jun in 2019. Such fluctuation of BOD is due to the Planktonic population that means zooplanktons population. BOD in summer was high as compared to winter. **Dabhade (2013)** The low rate of primary production in aquatic ecosystem of lake is also indicates that the low value of BOD that ranged from 0.1 to 0.9mg/L by **Borul (2012). Verma *et. al.,* (2011)** observed BOD ranges from 38-40 mg l^{-1} showing that the lake water is organically polluted. BOD was observed in the range of 48-96mg/l by **Satynarayan *et. al.,* (2008). Shinde *et, al.,* (2011)** observed high value of BOD in the lake water which was in the range of 1380 to 1864.

22. COD (Chemical Oxygen Demand)

Chemical Oxygen Demand throughout the study periods 2019 was 9.35 ± 1.0777 mg/l to 15.48 ± 3.3856 mg/l. The lowest COD value was observed during the rainy season while the chemical oxygen demand increases from the winter to summer season. Highest demand was investigated in the month of December while lowest was started from the month of January. On sampling site S4 the value of COD was more during the whole study periods. **Verma *et. al.,* (2011)** observed COD ranges from 350-405 mg l^{-1} showing that the lake water is organically polluted. **Borul (2012)** observed COD ranges from 0.01 to 0.06mg/L. **Satynarayan *et. al.,* (2008)** observed highest COD value was 392mg/L. while lowest 276mg/L the COD and BOD ratio ranged between 75 and 10.66 indicating presence of biologically recalcitrant substances of organic nature. **Shinde *et. al.,* (2013)** observed COD in the range of 620 to 3168.

Table No. 1: Physico-Chemical Parameters of Khadkpurna Dam, Buldhana.

Parameters	Mean of Highest Value during Study Periods	Mean of Lowest Values during Study Periods
Temperature ^{0}C	29.75 ± 0.5	18.25± 1.7078
pH	8.1± 0.1215	7.23± 0.1708
Turbidity NTU	9.14± 0.1533	5.2± 0.5142
TDS mg/l	375.36± 36.155	231.37± 12.6415
EC µmho/cm	377.5± 14.4338	215± 7.746
DO mg/l	7.70± 2.2494	4.75± 0.4123

CO2 mg/l	7.7± 2.2494	4.45± 0.4203
CO3 mg/l	56.5± 23.445	23.75± 6.3443
HCO3 mg/l	139.25± 18.4639	98.13± 1.652
Total Hardness mg/l	300.5± 58.66	141.5± 19.8074
Calcium Hardness mg/l	43.4± 8.7741	8.3± 0.4999
Magnesium Hardness mg/l	63.34± 12.3281	25.82± 4.872
Chloride mg/l	140.73± 3.3382	68.43± 6.261
Salinity mg/l	254.05± 6.0255	123.54± 11.3012
Phosphate mg/l	2.11± 0.4426	0.17± 0.0506
Ammonia mg/l	0.78± 0.5258	0.03± 0.0472
Nitrite mg/l	0.48575± 0.41435	0.01± 0.0096
Nitrate mg/l	8.32± 0.6357	2.16± 0.1415
Sulphate mg/l	7.375± 2.519755	3.55± 0.5260
Silicates mg/l	8.65± 2.1044	1.60± 0.6801
BOD mg/l	2.13± 0.45	0.47± 0.1544
COD mg/l	15.48± 3.3856	9.35± 1.0777

Conclusion:

On the Basis of result obtained during study periods, it concluded that the dam water safe enough to be consumed by humans or used with low risk of immediate or long term harm. After physicochemical analysis we found that the Dam water from all four sampling sides is use for Drinking as well as Agriculture point of view is free from pollution and ecologically balanced.

References:

Agarwal, A.K. and G.S. Rajwar (2010): Physico-chemical and Microbial Study of Tehri Dam Reservoir Garhwal, Himalaya, India. Journal of America Science 2010; 6 (6).

APHA (1998) : Standard Method for the examination of water and wastewater, 20th edition. American Public Health Association New York, ISBN-O-87553-235-7.

Arvindkumar,(1995) : Some Immunological Aspects of Fresh water Tropical wetland of Santhal. Pargana (Bihar) India, J. Envi. Poll. 2 (3): 137-141.

Borul S. B. (2012): Study of water quality of Lonar lake. J. Journal of Chemical and Pharmaceutical Research. Vol. 4(3). PP: 1716-1718.

Dabhade, D. S., (2013): Eutrophication, A Threat To Saline Lake In A Crater At Lonar, Maharashtra. Asian Journal of Contemporary Sciences Vol. 2(1) 1-6.

Dabhade, D.S. and R.A. Malu (2006) : Rotifers in Crater Lake of Lonar, Dist. Buldhana (MS). Aquatic Biodiversity Management And Conservation, Nature Conservator, Publication – 9,

31-34, ISBN: 81 – 900467 -6-5.

Harney N.V., A.A. Dhamani and R.J. Andrew(2013) : Seasonal Variation in The Physico-chemical Parameters of Pindavani pond of Central India. **J. DOI:** 10.9780/2321-7871/162013/18, vol.I Issue_6 ISSN:2321-7871.

Hujare, M.S. (2008): Seasonal variation of physico-chemical parameters in the perennial tank of Talsande, Maharashtra. **Ecotoxicol, Environ. Biol.** 11(3), 335-343.

Hutchinson, G.E., (1957): A treatise on limnology vol. I. and II Geography, physics and chemistry,John Wiley and Sons, New York, pp :1015.

Karadkhede, S.V., M.V.Lokhande,D S. Rathod, V. S. Shembekar and S. M. Patil (2008): Studies on physic-chemical characterstics of recreational water body in Nana-Nani Park,Latur, Maharashtra.J.Aqua.Biol.,23(1): 55-58.

Khan, R.M., M.J. Jadhav and I.R. Ustad (2012): Physicochemical analysis of Triveni Lake water of Amravati district in (MS) India., Bioscience discovery, 3(1): 64-66.

Koshy and Nayar (2000): Water quality of river Pamba at Kozhencherry. Poll.Res., 19(4):665-668.

Makode P.M. (2012): Physico-Chemical parameters Charghad Dam district Amravati, Maharashtra.

Manjare, S. A., S. A. Vhanalakar and D.V. Muley (2010): Analysis of water quality using physico-chemical parameters tamdalge tank in Kolhapur district, Maharashtra. International Journal of advanced biotechnology and research. ISSN 0976 – 2612, Vol. 1, Issue 2; Dec – 2010 PP. 115-119.

Medudhula. T. Ch. Samatha, Ch. Sammaiah (2012): Analysis of water quality using physic-chemical parameters in lower manair reservoir of Karimnagar district, Andra Pradesh.

Pailwan, I. F., D.V. Muley and S. Maske (2008): Limnological features, Plankton Diversity and Fishery Status of three fresh water perennial Tank of Kolhapur District (MS) India.

Parida,R.N., S.Nanda and R.K.Rath (1999): Physico-chemical features of water and soil in rural fish ponds and its relationship with pond productivity. J. of Aquaculture. 7: 17-23.

Patil, A.A.(2014): Limnological and Correlation studies of Birnal water body of Sangali, Maharashtra. International Research Journal of Environment Sciences, vol3(9),43-49.

Pulugandi C.(2014): Analysis of water quality parameters in Vembakotti water reservoir, Virudhunagar district, Tamil Nadu – A report. Res.J. Recent Sci. ISSN 2277-2502.

Rani,R., Gupta, B.K. and Srivastav, K.B.L., (2004): Studies on water quality assessment in Satna city (M.P.): Seasonal parametric variation, Nature environment and pollution technology, 3(4). pp 563-565.

Ravikumar ,M.,S. Manijappa, B.R. kiran and E.T.(2005): Hydtochemistry of Ayyanakere Tank in Harpanhalli Town, Davanagere, Karnataka. **J. Aqua. Biol**.20(2) : 117-120.

Satyanarayan, S., P.R. Chaudhari and S. Dhadse (2008): Limnological Study on Lonar Lake: A Unique Brackish Crater Lake in India Sengupta, M. and Dalwani, R. (Editors). Proceedings of Taal 2007: The 12th World Lake Conference: 2061-2066.

Sharma, K.P., Goel,P.K. and B,Gopal(1978): Limnological studies of Polluted fresh water I "physic-chemical characterstics" **Ind J. Ecil. Environ Sci** 4 pp-88-105.

Shinde V. A. and S.M. More (2013): Study of physicochemical characterization of lonar lake effecting biodiversity lonar lake, maharashtra, india. J. International Research Journal of Environment Sciences. Vol. 2(12), 25-28.

Shinde, S.E.,T.S. Pathan,K.S. Raut and D.L.Sonawane (2011): Studies on the physic-chemical parameters and correlation coefficient of Harsool-savangi dam, district Aurangabad, India. Middle-East Journal of Scientific Research 8(3): 544-554.

Siddiqi, S.Z. (2008): Limnological profile of high-impact meteor crater Lake Lonar, Buldana, Maharashtra, India, an extreme hyperalkaline, saline habitat. Proceedings of Taal2007: The 12th World Lake Conference: 1597-1613.

Siddique, K. F., and M. K. Kale (2018): Species Diversity of Zooplankton and Physico-chemical Parameters of Wanjarwadi and Ukhanda Dam of Beed District (M.S.), India International Journal of Universal Print Vol 4(8) 450-463.

Singh S.M. , S.C. Panday., S.Pani and A. Malhosia (2012): Limnology : A case study of highly polluted Laharpur reservoir, Bhopal, (M.P.) India. **J. of Chemical, Biological and Physical Sciences.** Vol.2(3),1560-1566, e-ISSN: 2249-1929.

Sivakumar, K. and R. Karuppasamy (2008): Factors affecting productivity of phytoplankton in a Reservoir of Tamilnadu, India. American – Eurosian Journal of Botany 1(3): 99 – 103, 200.

Solanki,H.A. and B.R. Pandit (2006): Trophic status of lentic waters of ponds water of Vadodara, Gujrat state, India. Int.J. of "Bioscience Reporter" 4(1): 191 -198.

Verma P.U. , D.K. Chandawat and H.A. Solanki (2011): Seasonal variation in physic-chemical and Phytoplankton analysis of Kankaria Lake,Gujrat University, Ahmedabad _Gujrat, **Life science Leaflets** 19:842, ISSN 0976-1098.

Verma P.U. , D.K. Chandawat and H.A. Solanki (2011): Seasonal variation in physic-chemical and Phytoplankton analysis of Kankaria Lake,Gujrat University, Ahmedabad _Gujrat, **Life science Leaflets** 19:842, ISSN 0976-1098.

W.H.O.(1993) : Guidelines for driking water quality (vol.2.): Recommendations, World Health Organization, Geneva.

Peer Reviewed Refereed Journal **ISSN : 2278 – 5639**
Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ)
{Bi-Monthly} **Volume – XIII** **Special Issue – IV** **March – 2024**

CHANGE IN ATMOSPHERE AND IT'S CHALLENGES OF BIODIVERSITY, CONSERVATION AND ISSUES OF INLAND FISHERIES GODAVARI RIVER NANDED CITY M.S.

Shyam Laxmanrao Ingle
Asst.prof.in Botany
H.J.P.College Himayatnagar dist .Nanded.

Abstract:-

The present survey has focused on the atmosphere changes and its influences on the life living organism including human beings and other creature. This biodiversity has deeply influenced only because of the growth in increasing population and the problems of solid waste, Industrial waste, agriculture west etc. all this things of Godavari river. Simultaneously this polluted things how reasonable invites the pandemic diseases water borne diseases like malaria Ameobeasis ,dengue diarrhea etc. changes in the important inland climate features as a water temperature ,Global temperature ,pH, salinity ,Dried condition of Inland water resource and rainfall are becoming evident as a result of climate changes Food security is one of the challenges that face in India Human being should have to consume such a food that gives us nutrition and become beneficial for the health .The consumption food have increased a lot of because the damage of this food have enhanced that why many businessman tempted to produce such a foods. Thus the climate changes effects impact the environment, fishery, social economics, and development drives. It is important the understand factor that contribute vulnerability of biological and human system in order to develop sustainable adaptation pathway. the circumference has deeply impacted on the realness of some aquatic animals like fishes, Crapes, prawns etc and depletion of biodiversity due to impact of water pollution many aquatic species changes in their physiological activities and their life come on the verse of variety. Urbanization causes the decreasing of land and Agriculture along cannot support sufficiently for the production of the food of the next generation so the evidently available water bodies could be making us for the culture of the fishes in the plenty which could supply the richest protein at the lowest cost .The aquatic species have helplessly adapting the changes in freshwater ecosystem due to increase in the population percentage of rainfalls decrease and its effect on biodiversity ultimate decrease in the Inland fishery production .Near about from last 3 to 5 decades are more than that 40 to 50% aquatic species are goes in danger zone.

Keywords:- Atmospheric changes, Inland fishes ,biodiversity ,climates, conservation, Godavari river ,Nanded City.

Introduction:-

Climate change in the burning issue faced by the entire human race and all the species of universe because indirectly it has deeply influenced the DNA system of all the species that is why the predators and its Prey are looking for the other habitats for their survival. In developing countries such as India where approximately 20% of its population live in coastal area in the major source of live hood (Shyam S Salim et. al2014) it is the evident that climate change is the distribution and productivity of Inland fisheries fresh water spaces and impacting the sustainability. Global capture fishery production has been more or less stabilized at around 80 million tones (FAO,2012a). Due to change in water pollution automatically climate and temperature changes fisheries migrate polluted area of water to other area some species of fishes get extent in particular area that why disturbing food chain. Rainfall decreases and increasing water pollution life of Inland fishery goes dangerous condition and its leads to changes in habitat frequently of extreme events variability in catches and lowering fish production (Vivekananda, 2010).Godavari river has the most diverse freshwater fauna in India. Most of the Godavari river fishes Nanded region are in them order(Cyperiniformes).Fishes are most important ecological links in the food chain, feeding on insects and serving as prey of other small fishes, aquatic Birds and other wildlife some fishes now goes endangered due to water pollution.

Study area:- Godavaeu river is the famous in Maharashtra as Dakshin Ganga because it crosses seven district in Maharashtra that is Nashik to Nanded Godavari river goes 10.5 km bank of river .Nanded district along with it has also provided placement for the poor middle class person in the form of Inland fisheries and finally the rivers nurtures the most of the land of Telangana state and provides them and option of Inland fisheries.

Material and Methods:-

Nanded district in Godavari river is one of the most England and capture ficiary productive and fish selling among the Marathwada reason in Maharashtra. from this area daily 12 to 15 quintals fish were capture fish market also better in Nanded city and lot of people also interested to demand it. Geographically its better area and also good temperature to grow and culture such fishes. During the December 2018 to January 2020 . Fish can be identified by their body shape, color and different patterns. The collected different species of fish identified taxonomically in fresh condition by using standard identification key such as Jayaram (2010),Munro(2000), Froese and Pauly(2010).

Biodiversity:-

Fresh water biodiversity is threatened and has declined in many areas as a result and their impact .Aquatic ecosystem (Inland)represent the most biodiversity source of the food consumed by human beings .Biodiversity includes Shannon Weiner index originally proposed by Claude Shannon in 1948, dominance index (To calculate the dominance index divide number of species

in the sample by the total number of species in the population to multiply the result by 1000)to get dominance index in percentage and evenness index were calculated using PAST software (Hammer et.al 2006).

Sampling:-

Researcher has chosen three better samples in order to observe entire simple range of locality and other recent area of human Sample collected by researchers various as per the seasonal period .It covers January 2018 to December 2020.These sample are collected by using desi hooks and nets (kakrajal).All the collected species are stored in special polythene bag used temperature up to Five degree These species were tested by the researcher in laboratory and identified as different species of Inland fisheries given by (Day 1875),Jalwar and Jhingran (1991) and Danieles(2001).

Conclusion:-

Godavari river in Nanded district found rich diversity in different species of fishes responsible by human activities ie problem arising water pollution, industrialization, urbanization, habit destructionist. Due to climate change affects fish stocks specially fresh water ecosystem. If we not controlled this impact fresh water ecosystem goes in danger zone.Control of water pollution in Urban area is better way to save aquatic life(Fishes,Crabes etc).Some modern technology use to control water pollution and unwanted wastage disposal other than city area otherwise inland fishes goes in extent.

References:-

1) Daniels S.R.(2002).Fresh water fishes of Peninsular India.University press,288pp.
2) Day,F.(1875).The fishes of India .Being a natural history of the fish known to inhabit the seas and freshwater of India ,BurmaCeylon Text and Atlas in 4 parts . London,xx + 778: 195 pp.
3) FAO (2012a), Barriers to achieving low impact fuel efficient fishing in:The state of World Fisheries and Aquaculture 2010.FAO Rome ,PP.126-134.
4) Froese ,R and Pauly D .(2010) :Fish Base .World wide web Electronic publication.
5) Galib SM (2015) Fish fauna of the Brahmaputra River, Bangladesh: richness,theats and Conservation needs.Journal of Fisheries 3(3):285-292.
6) Hammer,et. al.(2006)PAST-Palaeontological Statics.
7) Jayaram K.C(2010):The fresh water fishes of the Indian region.Narendra publ.House (Dehli) second revised edition.Xxxi+616PP.
8) Menon A .G .(2004). Threatened fishes of India and their conservation. Zoological survey of India , Kolkata,170.
9) Munro ,I.S. R.(2000).The marine and Fresh water fishes of Ceylon .Narendra Publ.Hpuse, Dehli.PP351.

MOUTH AND BODY ADAPTATION IN RELATION TO FEEDING HABIT AND HABITAT OF CATLA CATLA

Mr. S. M. Paikrao,
Mrs. Pooja Phatale,
Mrs. Roshani Sonkamble,
Mr. H. A. Alladwad
Department of Zoology, Degloor College Degloor

Abstract

A study was conducted to determine mouth and body adaptation in relation to feeding habit and habitat of Catla catla during the period of 2023-24. From this study it has been shown that Mouth and body adaptation in fish increases with increase in size, weight of fish and gonad weight. Fish have evolved to have different types of mouths depending on what their diet is and how they feed. The four different mouth types shown below are all designed to help fish catch their next meal most efficiently. Fish that have terminal or protrusible mouths generally feed on other fish. Fish that have superior mouths are generally ambush predators, meaning they generally are hidden and wait for fish to come close to them before they strike. Common examples of this type of predator include the angler fishes. Inferior mouth types generally denote that the fish is a bottom feeder and eats things such as crustaceans or shellfish

Keywords: Catla catla, Mouth and body Adaptation

Introduction

Fishes are the one of the most fascinating and remarkable animal form, that dominates water ofthe world through a marvellous variety of morphological, physiological and behavioural adaptations..Habit and habitat**-** Catla is one of the renowned and the fastest growing of major carps. This fish is found in ponds, lakes, ox-bow lakes, beels, streems, rivers, canals etc. It is non-predatory and its feeding is restricted to the surface and mid waters. Morphological description:Compressed body is comparatively short with broad head. Mouth is wide, upper lip is thin and covered by skin of snout. Lower lip is moderately thick, broad and continuous post labial grove. Dorsal profile is more convex than that of abdomen. Gill opening is circular and body deepest at origin of dorsal (Talwar and Jhingran, 2001). Pectoral fins are long and extend to pelvic fins. Scales are conspicuously large, lateral line complete with 40-43 scales. In life, its colour is grayish on back and flanks, silvery-white below, fins dusky.Habit and habitat**-**Catla is one of the renowned and the fastest growing of major carps. This fish is found in ponds, lakes, ox-bow lakes, beels, streems, rivers, canals etc. It is non-predatory and its feeding is restricted to the surface and mid waters. It resides in fresh or brackish water, being found within the tidal influences (Day,

1989). Fishes are the one of the most fascinating and remarkable animal form, that dominates water ofthe world through a marvellous variety of morphological, physiological and behavioural adaptations. The fresh water sources like rivers, canals, springs have different type of fish species owing to different habitats; as such they have developed and adapted for differenttypes of food and feeding habits (herbivorous, carnivorous or omnivorous). It is well assumed that morphological differences in animals are due to the action of several environmental and biological factors which are related to feeding and other physiological activities of fish species. The various aspects of mouth morphometry like variation in shape and size of the feeding apparatus; mouth shape and position.

Materials And Methods

Fish sampling and study site 96 samples of Catla catla were randomly gathered from the culture farm which is situated at Parbhani Godavari river using a net that is commonly called drag net. Fish samples were immediately transferred to the Fisheries Research Lab of Parbhani Godavari river. Mouth and body adaptation in relation to feeding habit and habitat of *Catla catla* were studied.

Observation Table

Table 1: Mouth and body adaptation in relation to feeding habit and habitat

	Mouth and body adaptations	Habitat preference	Feeding habit
1	Elongated, deep to shallow body, moderately and sharply pointedhead. Mouth anterior, oblique, thin lips and hard jaws are present.	Clear shallow or deep waters with pebbly androcky bottoms and surface dwelling	Surface feeder omnivore
2	Elongated sub-cylindrical body. Head is dorso-ventrally compressed, mouth inferior and ventral. Upper lip developed in papillated free margin.	Fresh water streams with gravel and stonybottoms. Bottom dwelling	Bottom feeder herbivore

3	Elongated, sub-cylindrical body. Mouth ventral, transverse and suctorial. Upper lip modified into fringed anterior labial fold. Beside semicircular suctorial disc, lower lips was modified as posterior labial fold and in pharyngeal portion, chin callous part and posterior part of disc was present.	Fast moving fresh waters or stagnant water lakes having stones and rocky bottoms rich in algae and debris. Surface dweller but also browses well in middle portions of water bodies	Bottom feeder herbivore
4	Deep and laterally compressed body with small head. Mouth small, terminal having equal jaws.	Fast water columns as well as near substrate in still, shallow marginal waters of small ponds	Column feeder omnivore
5	Elongate sub-cylindrical body with large head. Mouth inferior, transverse and lower jaw has hard cartilaginous covering. Thick lips, lower lip modified into sucker or adhesive disc	Fast clear mountain streams usually rich in algae, plants and detritus etc near column and bottom of water bodies	Bottom feeder herbivore
6	Elongated cylindrical snake like body with prominent and conical head. Mouth terminal with sharp teeth, thick lips, snout was pointed with fleshy appendages. Upper jaw was longer than lower.	Fast running water streams and rivers with sand, pebbles or boulder substrate near bottoms and lower columns.	Column feeder carnivore

Results and Discussion

Catla, also known as the major South Asian carp, is an economically important South Asian freshwater fish in the carp family Cyprinidae. It is native to rivers and lakes in northern India, Catla is a fish with large and broad head, a large protruding lower jaw, and upturned mouth. It has large, greyish scales on its dorsal side and whitish on its belly. It reaches up to 182 cm (6.0 ft) in length and 38.6 kg (85 lb) in weight.[Catla is a surface and midwater feeder. Adults feed on zooplankton using large gill rakers, but young ones feed on both zooplankton and phytoplankton. Catla attains sexual maturity at an average age of two years and an average weight of 2 kg. During the present investigation the association of morphological adaptations with their food or feeding habits (herbivore, carnivore or omnivore) and habitat preferences (surface, column

or bottom dweller) has been conducted. Descriptive statistics of the fishes has been summarized in Table-1.It is concluded that Mouth and body adaptation in fish increases with increase in size, weight of fish and gonad weight.

References

1. Bhuiyan AS, Haque MS. Studies on the seasonal changes of food habit of *Mystus vittatus* (Bloch) (Bagridae: Cypriniformes). Proc. 4th. Nat. Zool. Conf. Bangladesh, 1984, 88-91.
2. Bhuiyan AS, Islam MN. Seasonal variation in the percentage composition of the food of *Xenentodon cancila*. Univ. J Zool. Rajshahi Univ. 1990; 7:33-34.
3. Bhuiyan AS, Islam MN. Observation on the food and feeding habit of *Ompok pabda* (Ham.) from the river Padma (Siluridae: Cypriniformes). Pakistan J Zool. 1991; 23(1):75-77.
4. Dewan S, Shaha SN. Food and feeding habit of *Tilapia nilotica* (L) (Perciformes: Chichlidae). II. Diet and seasonal patterns of feeding. Bangladesh J Zool. 1979; 7(2):75-80.
5. Doha S. Investigation in to the biology of the goby *Glossogobius giuris* (Ham. Buch.) (Perciformes: Gobidae). Bangladesh J Zool. 1974; 2 (2): 95-106.
6. Ekpo IE, Mandu A, Essien J, Joseph NN. Food and feeding habits and condition factor of fish species in Qua Iboe River estuary, Akwa Ibom State, Southeastern Nigeria. Int. J Fish. Aquatic Studies. 2014; 2(2):38-46.
7. Hora SL, Pillay TVR. Hand book on fish culture in the Indo-Pacific region. FAO Fisheries Biological Technical Paper. 1962; 14:204.
8. Hossain MA, Rahman MH, Parween S. Notes on the length-weight relationship of *Lepidocephalus guntea.* Bangladesh J Zool. 1991; 19(1):145-146.

ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

Dr. Anurath M. Chandre

Associate Professo, Dept. of Commerce & Research Guide

N.S.S.R's Arts & Commerce College

Parli-Vaijnath Dist. Beed-341515 (Maharashtra)

Introduction:-

In the second decade of the 21st century, we can all feel very modern and advanced, because we have overcome all the obstacles that come our way. fear to achieve a life style of absolute comfort and luxury. This is possible because we are not only using but also over-exploiting our natural resources, beyond the natural capacity to regenerate them with the help of technological advances of the two countries. the following We can better manage our natural resources by pursuing ancient India's environmental conservation practices. Development does not only mean modernization and therefore Westernization, but PEACE, HARMONY and HEALTH of all living things on Earth. There are many paths in Indian culture and way of life towards sustainable development. Organizations around the world have begun to realize that this human behavior can not last forever. Although concerns about mental degradation on an international scale began with the first United Nations conference on the humane environment in Stockholm in 1972, the role of our lifestyles has only recently been recognized internationally recognized only very recently. India has rich natural resources of fertile soil, hundreds of rivers and tributaries, verdant forests, countless mineral deposits below the surface of the earth, vast expanse of India. Oceans, mountain ranges, etc. The black soil of the Deccan Plateau is particularly suitable for growing cotton, leading to the concentration of textile industries in this area. The Indo-Gangetic plains stretching from the Arabian Sea to the Bay of Bengal are among the most fertile, cultivated and densely populated regions in the world.The forests of India, although unevenly distributed, provide green cover for most of the population and natural cover for wildlife. Significant deposits of iron ore, coal and natural gas are found in the country. India accounts for nearly 8% of the world's iron ore reserves. Bauxite, copper, chromate, diamond, gold, lead, lignite, manganese, zinc, uranium, etc. are also available in different parts of the country.However, development activities in India have resulted in pressure on the country's limited natural resources, in addition to creating impacts on human health and well-being. India's environmental threat is a dichotomy between the threat of environmental degradation caused by poverty and the threat of pollution from its wealth and rapidly growing industrial sector. Air pollution, water pollution, soil erosion, deforestation and wildlife extinction are amongIndia's most pressing environmental concerns.

Sustainable Life And Indian Culture:-

An Indian view of life embodied in a coherent worldview in which all its aspects exist in a harmonious state of interdependence, governed by a universal order reflected in all areas of human life and experience. Man is part of an orderly system in which all aspects of life and nature have their place, not in opposition but in harmony with each other. This harmony between man and nature is an integral part of Indian traditions and ethos. Today, when people allover the world are concerned about environment aldegradation and its disastrouscon sequences, the traditional ethics of nature conservation can be seen as a source of inspiration and guidance.for the future.Perhaps no other culture can offer as many cultural practices and ecologically healthy relationships with nature as the Indians. According to India,it is the most sustainability conscious country in the world.

Global Warming:-

Global warming is the gradual increase in the average temperature of the earth's lower atmosphere due to an increase in greenhouse gases since the industrial revolution. Much of the recent observed and predicted global warming is of human origin. It is caused by human-induced increases in carbon dioxide and other greenhouse gases through the burning of fossil fuels and deforestation.Adding carbon dioxide, methane and other gases (which can absorb heat) into's atmosphere without further changes would make our planet's surface warmer. Atmospheric concentrations of carbon dioxide and CH4 have increased by 31% and 149%, respectively, of pre-industrial levels since 1750. Over the past century, atmospheric temperatures have increased by 1.1°F (0.6°F), respectively.°C) and sea level rose by several inches.Some of the long-term results of global warming are melting of polar ice along with rising sea levels and coastal flooding; interruption of drinking water supply dependent on snowmelt; extinction of species as ecological niches disappear; more frequent tropical storms; and increased incidence of tropical diseases. Factors that can contribute to global warming include burning coal and petroleum products (source of carbon dioxide, methane, nitrogen oxides,ozone), deforestation, increasing the amount of carbon dioxide in the atmosphere; methane emissions from animal waste; and increased beef production, contributing to deforestation, methane production and fossil fuel use. A UnitedNationsconference on climate change, held in Kyoto, Japan, in 1997, resulted in an international agreement to combat global warming calling industrialized countries reduce deflation.greenhouse gas emissions.

Pollution Control Board:-

To address two major environmental problems in India viz. water and air pollution, the government established the Central Pollution Control Board (CPCB) in 1974. This was followed by the states establishing their own cantonal boards to address all concerns. about environment. They research, collect and disseminate information related to water, air and soil pollution, establish standards for wastewater and emissions from wastewater/commercial water. These councils

provided technical assistance to governments in to promote clean water sources and wells through the prevention, control, and reduction of water pollution, while improving air quality and preventing prevent, control or reduce domestic air pollution.These councils also conduct and fund investigations and research into water and air pollution problems and their prevention, control or mitigation. They are organizing, through the mass media, a complete public awareness program on the issue. PCB preparesmanual, rules and guidelines regarding the treatment and disposal of wastewater and commercial waste water. They assess air quality by regulating industries. In fact, theStateCommissions, through their officials at the district level, periodically inspect each sector within their jurisdiction to assess the adequacy of the remedies provided for handling.wastewater and emissions.It also provides basic air quality data needed for industrial layout and urban planning. The Pollution Control Commission collects, collates and disseminates technical and statistical data related to water pollution. They monitor water quality in 125 rivers, wells, lakes, streams, ponds, reservoirs, sewers and canals.

Strategies For Sustainable Development:-

Using Non-Conventional Energy Sources: India, as you know, relies heavily on thermal and hydroelectric power plants to meet its electricity needs. Both have negative environmental impacts.Thermal power plants emit large amounts of carbon dioxide, a greenhouse gas. It also produces fly ash which, if not used properly, can contaminate water,soil and other elements of the environment. Hydroelectric projects flood forests and impede the natural flow of water in river basins and river basins. Wind and solar energy are good examples of conventionalenergy.In recent years, efforts have been made to harness these energies.Gather Detailed Information About such a site in your area, if available, and discuss it as a class.

LPG, Gobar Gas In Rural Areas: Households in rural areas often use wood, manure cake or other biomass as fuel. This practice has anumberofharmfulconsequencessuchas deforestation, reduced green cover, waste of livestock manure and air pollution. To remedy this situation, subsidized LPG is provided. In addition, the gasworks are offered through easy loans and grants. As for liquefied petroleum gas (LPG), it is a clean fuel — it significantly reduces household pollution.In Addition, energy waste is minimized.

CNG InThe City: In Delhi, the use of compressed natural gas (CNG) as a fuel in the public transport system has significantly reduced air pollution and the air has become cleaner. In recent years, many other cities inIndiahave also started using CNG.

Wind power: In areas where wind speeds are typically high, wind turbines can provide electricity without any negative impact on the environment. Wind turbines move with the wind and electricity is generated.Undoubtedly, the initial cost is high. But the advantages that the high cost is easily absorbed.

Solar Power By Photovoltaic Cells : India is blessed with a large amount of solar energy in the form of sunlight by nature. We use it in different ways. For example, we dry clothes, grains, other agricultural products as well as various everydayitems.We also use sunlight to keep us warm in winter. Plants use the sun's energy to carry out photosynthesis. Today, thanks to the use of photovoltaic cells, solar energy can be converted into electricity. These cells use a special material to capture solar energy and then convert the energy into electricity. This technology is extremely useful for remote areas and places where electricity cannot be suppliedovernetworks or power lines or has proven to be very expensive.SmallHydelPlants:In mountainous areas, streams can be found almost anywhere. A large percentage of these lines are perennial. Mini-hydel power plants use the energy from self laws to move small turbines. The turbines that produce electricity can be used locally. These Trees are more or less respectful of the environment because they do not change the land use patterns in the areas where they are located; they generate enough energy to meet local demand.This means they can also eliminate the need for large-scale transmission towers and cables and avoid transmission losses.

Traditional Knowledge and Practice: Traditionally, Indiansare close to their environment. They are a component of the environment, not its controller. If we look at the agricultural system, the health system, the housing, the transportation, etc., we will see that all the activities are environmentally friendly. Only recently have we moved away from traditional systems and caused large-scale damage to the environment and our rural heritage.Now, it is time to go back. One apt example is in healthcare. India is very much privileged to have about 15,000 species of plants which have medicinal properties. About 8,000 of these are in regular use in various systems of treatment including the folk tradition. With the sudden onslaught of the western system of treatment, we ignored our traditional systems such as Ayurveda, Unani, Tibetan and folk systems.These health systems are once again in great demand to deal with chronic health problems.

Bio-Organic Fertilizers: In the quest to increase agricultural production over the past 5 decades, we have almost completely abandoned the use of organic fertilizers and completely switched to the use of chemical fertilizers. Asaresult, large swaths of productive land have been affected, water bodies, including ground water systems, affected by chemical pollution and the need for irrigation increases every year. . Farmers, in large numbers across the country, have continued use compost made from organic waste of all kinds. In some parts of the country, cattle are raised just because they make manure, an important fertilizer, and improve the soil.Earthworms can convert organic matter into compost faster than conventional composting. This process is now widely used. Indirectly, city governments also benefit because they have to deal with a reduced

Amount of Of waste.Pest Control: With the advent of the green revolution, the country began to frantically use more and more chemical pesticides for higher yields.Soon the negative

effects began to appear; Food products have been contaminated, soil, water sources and even groundwater has been contaminated by pesticides.Even milk, meat and fish were found to be contaminated. To address this challenge, efforts are being made to implement better pestcontrol methods. One of these measures is the use of pesticides based on plant products. Neem tree proves to be very useful. Several types of pest control chemicals have been isolated from neem and they are used. Intercropping and growing different crops in consecutive years on the same land has also helped farmers.

Conclusion:-

Economic development, which aimed at increasing the production of goods and services to meet the needs of a rising population, puts greater pressure on the environment. In the initial stages of development, the demand for environmental resources was less than that of supply. Now the world is faced with increased demand for environmental resources but their supply is limited due to overuse and misuse. Sustainable development aims at promoting the kind of development that minimizes environmental problems and meets the needs of the present generation without compromising the ability of the future generation to meet their own needs. Sustainable lifestyle has to be location specific & can not be same Standards across the globe. A transition from a focus on growth, GDP & material welfare to more social & fair well being is necessary.

References:-

1. Business Council For Sustainable Development (WBCSD) Sustainable Consumption Facts, from a business Perspective & Trends
2. Kineman John J & Anand Deepak , Roots of sustainability in ancient India The Journal of ISSS
3. National Geographic & Globe Scan (2014)Greendex 2014: Consumer Choice and the Environment – A Worldwide Tracking Survey
4. Saran Shyam Hindustan Times Delhi, Nov.25,2016
5. Sustainable Development available at www.un.org/https://sustainable-development-goals/
6. WWF-India, Climate Friendly Lifestyle Practices in India, Prepared for Ministry of Environment, Forest and Climate Change (MoEFCC).
7. Kala M & Sharma A. Traditional Indian beliefs: a key toward sustainable living (March 2010) The Environmentalist
8. Babita Saini (2010), Green marketing and its impact on consumer buying behavior, International Journal of Engineering Science Invention, Volume 2 Issue 12, PP.61-64 Chang, N.J and Fong,

STUDY OF SOME PHYSICAL AND CHEMICAL PARAMETERS OF INDUSTRIAL EFFLUENTS

Ganesh N. Kyadare
Department of chemistry
Degloor College Degloor, Nanded (MS)-431717

Sandip D. Gorshetwar
Department of chemistry
Yashwantrao Patil Science College, Solankur, Kolhapur (MS)

Abstract:-

The study aimed to assess the impact of industrial effluent on the surrounding environment due to significant contribution of industrial activities to environmental pollution. Specially, the study focused on analyzing the levels of Nickel, Copper, Zinc, Iron, Lead, Manganese, cobalt and Chromium in the effluents from a vegetable oil processing industry. Analysis was conducted using Atomic Absorption Spectroscopy (AAS) on samples collected from two different points within the industrial site.

Keywords: Industrial effluent, Physico-chemical parameters, Heavy metals.

INTRODUCTION

Industrial wastewater treatment involves the application of processes to manage was produced as an undesirable by-product of industrial activities. Following treatment, the resulting treated industrial wastewater, also known as effluent, can either be reused or discharged into a sanitary sewer or surface water in the surrounding environment. Certain industrial establishments produce wastewater that is suitable for treatment in conventional sewage treatment plants. However, many industrial operations, including those in petroleum refineries, chemical plants, and petrochemical facilities, typically have dedicated treatment facilities designed to address the specific characteristics of their wastewater. These facilities aim to ensure that the concentrations of pollutants in the treated wastewater adhere to regulatory standards for its disposal into sewer or environmental water bodies such as rivers, lakes, or oceans[1]

This particularly applies to industries generating wastewater with elevated concentrations of organic matter (such as oil and grease), toxic pollutants (including heavy metals and volatile organic compounds), or nutrients like ammonia[2]. Some industries adopt a pre-treatment system to eliminate certain pollutants, such as toxic compounds, before discharging the partially treated wastewater into the municipal sewer system[3].

Most sectors generate wastewater as a byproduct of their operations. In recent times, there has been a shift towards minimizing such wastewater production and incorporating the recycling of

treated wastewater back into the production process. Certain industries have achieved success in redesigning their manufacturing processes to either reduce or completely eliminate the release of pollutants[4].

The imperative for high-quality water necessitates a thorough exploration of alternative treatment methods that are both dynamic and comprehensive. Such approaches are crucial to effectively treat the diverse waste products generated by modern technology before their safe discharge into the environment. The physico-chemical treatment method proves to be efficient in this regard. This method produces effluents with minimal suspended solids (SS), biochemical oxygen demand (BOD), chemical oxygen demand (COD), and other contaminants. Consequently, these treated effluents can be directly released into public water sources without posing any environmental risks. Alternatively, they can be reused directly for various industrial purposes, including cooling, quenching, or washing [5-7]

Materials and Methods:-

There is a rapid increase in the pollution of our environment due to an increase in industrialization and developmental processes and other factors of pollution in the world today. If this increase is allowed, the problem of pollution of the environment will become more acute as the amount of pollutants being introduced to the environment continues to be on the increase. In other to keep this environmental risk in check, some safety measure must be applied. However, from the variety of analytical methods available, no standard method of analysis has been selected for particular types of environmental samples (soil, plant, water, air, and sediments). The analytical procedures applied to a particular pollutant depend on the facilities and the experience existing in the laboratory.

Physical Parameters

Temperature

Temperature is the degree of hotness or coldness of a substance. The apparatus used for the measurement was mercury thermometer. The thermometric bulb containing the mercury was Vertically immersed in the effluent and allowed to stand for some minutes till the temperature reading was steady before obtaining reading.

Total Solids (TS)

Procedure

A clean dish of suitable size was dried at 103-1050C in an oven until a constant weight was obtained. It was subsequently cooled to room temperature in a desiccator and laterweighed. 100ml sample was measured into a dish and evaporated to dryness on a steam bath. The outside of the dish was wiped and the residue was dried in an oven for 1 hour at 103-105oC. The dish was quickly transferred to a desiccators, cooled to room temperature and weighed. The dish was dried

further in an oven for 10-20 minutes, reweighed after cooling to room temperature.

This was repeated until the weight of the dish plus residue was constant to within 0.05mg

Total Suspended Solids (TSS)

Procedure

Glass fiber filter paper of diameter 5.5cm was dried to a constant weight at 103-1050C in an oven, cooled to room temperature in a dessicator and the weight was noted. Gooch funnel and Rubber adapter were fixed to a filtering flask, the glass fiber was placed into the Gooch funnel Carefully with the aid of a pair of tongs. The wastewater sample was thoroughly mixed on a Magnetic stirrer, after which 100ml was quickly measured into the filtering apparatus. After filtration elapsed, a pair of tongs was used to remove the glass fiber carefully from the Gooch funnel and then dried to a constant weight at 103-105oC. The weight was noted.

Total Dissolved Solids

Procedure

Effluent sample was stirred with a magnetic stirrer and a measured volume was taken onto a glass fiber filter with applied vacuum. It was washed with three successive 10ml volumes of distilled water, allowing complete drainage between washings, and suction was continued for 3 minutes after filtration was completed. Total filtrate with washings was transferred to weighed evaporating dish and evaporated to dryness on a steam bath. Evaporated sample was dried in the oven for 1 hour at 180±20C, cooled in a dessicator and weighed

Oil and Grease by Gravimetry

Procedure

The water sample was acidified previously at the sampling site (1:1) HCL to pH<2 or lower (generally, 5ml is sufficient for 1 liter sample). 200ml wastewater sample was transferred to a separatory funnel followed by the addition of 30ml n-hexane. It was shaken vigorously for 30 minutes for layers to separate. The n-hexane layer was drained through a funnel containing 10g Na2SO4 on a filter paper already rinsed with n-hexane. The extraction was repeated twice using 30ml n-hexane for each of the extraction. The funnel was rinsed with 10ml n-hexane after filtration in each case. All the hexane layers were mixed in a crucible already dried and weighed to a constant weight. The crucible was placed on a water bath until content evaporated completely. After which the crucible was placed in an oven for 5minutes. It was later removed and placed in the desiccator to cool and weighed. This was repeated until a constant weight was obtained. Blank was determined by taking 100ml n-hexane through the whole procedure.

Chemical parameters

Chemical parameters considered are chloride, hardness, acidity and alkalinity

Dissolved Oxygen

The amount of oxygen found by determination in a sample of water or wastewater at the

time of collection is the dissolved oxygen (DO). Measurement was carried out by the use of Winkler's titration.

Procedure

The water sample was put in a250ml bottle, followed by the addition of 1ml MnSO4 solution and 1ml alkali-iodide-azide reagent well below the surface of the liquid. It was stoppered with care to exclude air bubbles and mixed inverting. It was allowed to settle for 2 minutes, after which 1ml concentrated H2SO4 was added by allowing the acid to run down the neck of the bottle restoppered, and mixed by gentle inversion until dissolution was completed. At this stage, the iodine must have been uniformly distributed through the solution. 201ml of the solution was titrated with 0.0125M Na2S2O3. 5H2O solution to a pale straw color. 1-2ml of starch solution was added, which turns the color blue; the titration was preceded by adding the thiosulphate solution drop wise until the blue color disappears. The reappearance of blue color was disregarded.

DO (mg/l) = 16000*M*V /V2/V1 (V1-2)

Where

M= molarity of the thiosulphate solution

V= volume of thiosulphate used for titration

V1= volume of the bottle with stopper in place

V2 = volume of aliquot taken for titration

Chloride for Silver Nitrate Titration

Procedure

25ml sample was measured and diluted to 50ml with distilled water. The pH of the sample was adjusted to 7.5 with H2SO4 followed by 1ml KCrO4. The sample was titrated with 0.0141M AgNO3 standard solution until the colour changed from yellow to faint red. Reagent was titrated blank using only distilled water without the sample.

$Ag+ + Cl- \rightarrow AgCl$

$2Ag+ + CrO4 \rightarrow Ag2$ (Reddish Brown)

Cl- (mg/l) = (A-B) *M*35,450/V

Where

A= volume of AgNO3 used for titrating sample

B= volume of AgNO3 used for titrating blank

M = molarity of AgNO3

V= volume of sample

Acidity by Titration

Procedure

25ml sample was titrated with 0.02M NaOH solution using phenolphthalein indicator at room temperature. 0.01M of H2SO4 was added to the sample to reduce the pH to 4 or less. 5 drops

of 30% H2O2 was subsequently added to the sample and boiled for 2-5 minutes. The sample was cooled to room temperature and titrated with standard 0.02M NaOH solution using 5 drops of Phenolphthalein indicator.

Acidity as mg/l CaCO3 = A*M*100,000/V

Where

A= volume of the titrand

M= molarity of titrandV= volume of sample

Alkalinity by Titration

Procedure

25ml sample was titrated with 0.01M H2SO4 acid solution using 3-5 drops of phenolphthalein indicator. The result was expressed as phenolphthalein alkalinity. Another 25ml sample was titrated with 0.01M H2SO4 with 3-5 drops of methyl orange indicator. Blank titration was carried out in both cases.

Phenolphthalein alkalinity, mg/l CaCO3 = A*M*100,000/V

Where

A = volume of standard acid used

M= molarity of standard acid

V= volume of sample

Methyl orange alkalinity mg/l CaCO3 = A*M*100,000/V

Where

A = volume of standard acid used

M = molarity of standard acid

V = volume of sample

Total Hardness by Calculation

The hardness of water is a measure of the capability of the water to precipitate soap. The precipitation of soap is chiefly due to the presence in water of calcium and magnesium ions.Precipitate of soap may also be due to other polyvalent metal ions such as Al, Fe, Mg, Zn and Sr and of course, by hydrogen ions.Natural waters contain calcium and magnesium only in significant concentrations.Polluted or wastewaters may contain all the metallic ions mentioned above in significant concentrations. The unit in which the hardness of water is expressed is mg/l CaCO3.

Total hardness mg/l CaCO3 = 2.497[Ca, mg/l] + 4.118[Mg, mg/l

From the results obtained, it can be observed that the level of cadmium, lead and iron in the wastewater samples was high when compared to the level of other metals in the samples.The high level of lead in the sample can be said to be from the parts of the equipment or machinery used at different stages of the production of the vegetable oil.

The high level of cadmium and iron in the samples can be attributed to the presence of abandoned metal scraps at the site of the wastewater outlets. The high concentration of these metals could have adverse effect on the aquatic life and man in general.

It can be observed that the following parameters : pH, SS, TDS, TS, Chloride, Oil and grease, Temperature, Alkalinity, Acidity and Hardness determined , are higher at point 1 than point 2. This is due to the fact that the sample collected at point 1 (refinery outlet) is highly coloured and turbid and may contain high pollution load due to its closeness to the production outlets.While the sample collected at point 2 has been diluted from wastewater from other sources in the factory. Highlevel of lead at point 2 can be attributed to vehicular emission since it is closer to a busy express road and also gasoline and petrol used by vehicles contain organic lead as an antiknocking agent. These may be released as particulate when the fuel is burned

Conclusion

The study showed that effluent from vegetable oil producing industry contains some hazardous substances e.g. lead, cadmium and iron. Their concentrations exceeds the permissible limit of national and international standards, hence, the effluent should be treated and the concentration of some or all of the hazardous substance should be reduced before the effluent are discharged into the environment so as to circumvent their adverse effect on aquatic life and man.

References:

1. Tchobanoglous G, Burton FL, Stensel HD (2003). *Metcalf & Eddy Wastewater Engineering: treatment and reuse* (4th ed.). McGraw-Hill Book Company. ISBN 0-07-041878-0.
2. George Tchobanoglous; Franklin L. Burton; H. David Stensel (2003). "Chapter 3: Analysis and Selection of Wastewater Flowrates and Constituent Loadings". *Metcalf & Eddy Wastewater engineering: treatment and reuse* (4th ed.). Boston: McGraw-Hill. ISBN 0-07-041878-0. OCLC 48053912
3. *Von Sperling, M. (2007). "Wastewater Characteristics, Treatment and Disposal". Water Intelligence Online. **6**. doi:10.2166/9781780402086*
4. "Pollution Prevention Case Studies". Washington, D.C.: U.S. Environmental Protection Agency (EPA). 11 August 2021.
5. Ademoroti, C.M.A. (**1979**). Studies on physico-chemical methods of water treatment.Ph.D Thesis. University of London.394

DISSOLVED OXYGEN (DO) ESTIMATION OF FRESH WATER CRAB *BARYTELPHUSA CUNICULARIS* FOUND IN NANDED (MH) REGION.

Sawant Suraj Venkati,
Research Scholar,
N.E.S. Science College Nanded

Dr. Vidya V Bhoyar,
Research Guide
L.B.D.G. College, Umri.

Abstract:

In this study the O2 consumption of fresh water crab (Barytelphusacunicularis) is estimated. The O2 estimation is done in normal/ controlled condition as well as in presence of chemicals namely sodium Phosphate and Sodium Nitrate. For O2 estimation Winker's method is used. The average estimated dissolved O2 of controlled condition was 3.72 mg/L , and for Sodium Phosphate and Sodium Nitrate were 7.36 mg/L and 5.20 mg/L respectively. The conclusion was drawn out from this study as the O2 estimation of Sodium Phosphate water sample was more as compared to the other water samples.

Keywords: Fresh water crab, *Berytelphusacunicularis,* O2 estimation, DO, Dissolved oxygen, BOD estimation, Crab in Maharashtra.

Introduction:

*Barytelphusa cunicularis*is one of the fresh watercrab species found in Maharashtra, India. *B.Cunicularis*crab lives mostly in muddy region were sufficient water available for oxygen consumption.They stay in water for short time. Crabs are omnivorous. In terrestrial crabs, gill chambers have 2 different structures; a) Gills used for breathing under water b) Specially adapted to take up $O_2$from air (pseudo lungs).(Pande)

In crabs primary respiratory organs are gills. Externally gill chamber is covered by branchiostegite.(Ekambrarantha). The theoretical maximum amount of oxygen that any body of water can hold at a given temperature is called 100% saturation. So if water can hold a theoretical maximum of 10 parts per million of oxygen at 20°C, and the actual concentration is only 8 parts per million, the percent saturation is 80% (8/10).The amount of dissolved oxygen determines the types of aquatic animals that can live in the water.(Meiyin Wu).

Methodology:

The O_2 estimation is done by a Winkler Method (Bruckner). Measurements carried out within 24hrs -48hrs. The process of Winkler's Method is that the water sample is taken in BOD

bottle about 300 ml from glass thank. 1ml of manganese sulphate and 1ml alkaline iodide is added in water, the brown (whitish) colored ppt is formed. After ppt formation sulfuric acid is added then ppt turns brown to yellow. 200 ml water from BOD bottle is taken into conical flask. Sodium thiosulfate is put into burette up to the 0 mark. 2- 4 drops of starch are added into the water at conical flask, water turns bluish in color. Titrate it with sodium thiosulfate till water becomes colorless. The final reading of burette is taken, this will be the Dissolved Oxygen value.

This process is done in 3 different conditions: 1) Controlled/ Normal condition. 2) In presence of Sodium Phosphate 3) In presence of Sodium Nitrate. In this study total 6 tanks are used at above mentioned condition.

1) **Controlled Condition:**In this condition total 3 tanks are used out of 6 tanks. In 3 tanks 3 female crabs are introduced respectively, and tanks are filled with tap water at N.E.S Science College campus. The O_2 estimation of these tanks were done by using Winkler's method. After O_2 estimation the water in tanks is changed, and in this changed water crabs are kept for 24hrs. After 24hrs of change of water all 6 tanks were used and condition 3 and 3 applied simultaneously.

2) **In presence of Sodium Phosphate:**In first 3 tanks Sodium Phosphate is introduced for 3-4hrs. The Sodium Phosphate was added in amount of 1gm, 2gm & 3gm in Tank I, Tank II & Tank III respectively. The O_2 estimation is done of these tank having Sodium Phosphate in them.

3) **In presence of Sodium Nitrate:**In remaining 3 tanks Sodium Nitrate is introducedfor 3-4hrs.The Sodium Nitrate was added in amount of 1gm, 2gm & 3gm in Tank IV, Tank V & Tank VI respectively. The O_2 estimation of the tanks having Sodium Nitrate in them is also done.

Observation:

The above done estimation observation are noted down the dissolvedoxygen in table form.

1) **Value of O_2 estimation in Controlled condition:**

Sr.No	Number of Tank	Value of DO	Mean DO
1.	Tank I	4.5 mg/L	**3.72mg/L**
2.	Tank II	2.9 mg/L	
3.	Tank III	3.5 mg/L	

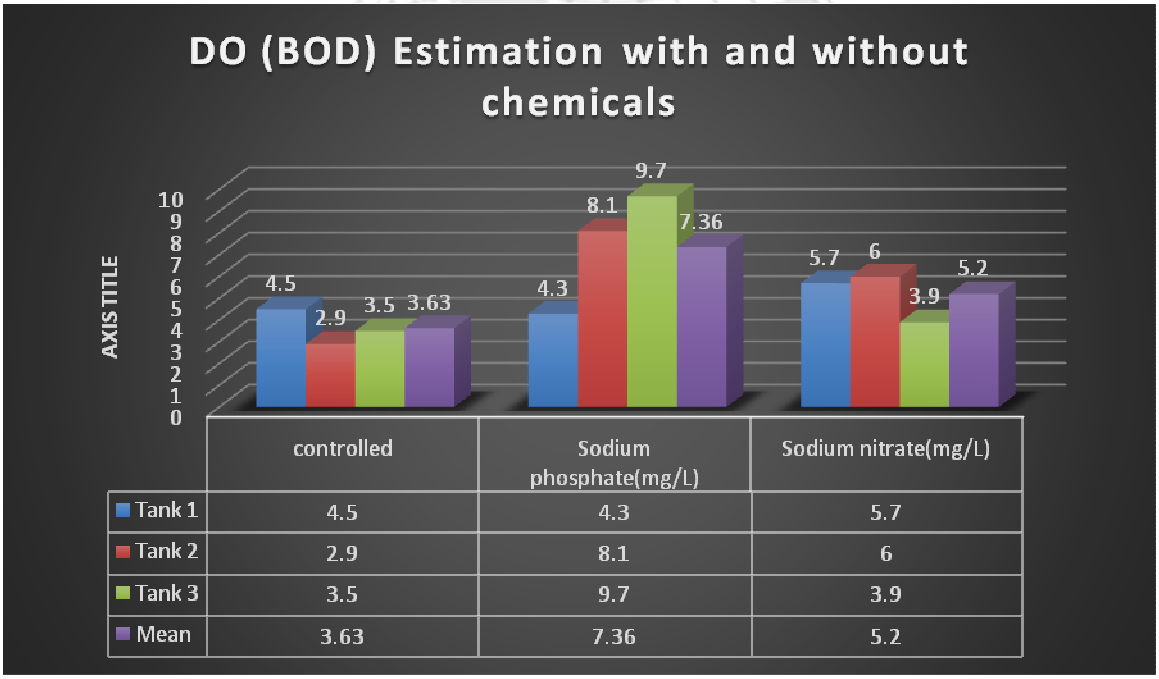
2) **In presence of Sodium Phosphate:**

Sr.No	Number of Tank	Value of DO	Mean DO
1.	Tank I	4.3 mg/L	**7.36 mg/L**
2.	Tank II	8.1 mg/L	
3.	Tank III	9.7 mg/L	

3) In presence of Sodium Nitrate:

Sr.No	Number of Tank	Value of DO	Mean DO
1.	Tank I	5.7 mg/L	**5.20 mg/L**
2.	Tank II	6 mg/L	
3.	Tank III	3.9 mg/L	

We observe DO (BOD) estimation value increasing from control to sodium phosphate solution. But again it somewhat decreases to sodium nitrate. We observe thatburette reading of sodium phosphate water solution it increases with increasing sodium phosphate concentration in water. And burette reading of control and sodium nitrate water solution firstly increases and then somewhat decreases. This may be due to size of crabs.



Results & Discussion:

The study of dissolved oxygen (DO) estimation done by Winkler's method in absence and presence of chemicals in 3 conditions. Some observations are done which are mentioned above in tabular form. The mean value dissolved O_2 estimation of tanks kept in Controlled condition is 3.72 mg/L. The mean value dissolved O_2 estimation of tanks having Sodium Phosphate is 7.36 mg/L. The mean value dissolved O_2 estimation of tanks having Sodium Nitrate is 5.20 mg/L.

From the observation the conclusion is drawn out that the minimum rate of dissolved O_2 is in controlled condition where chemicals are absent. In presence of chemicals specifically Sodium Phosphate the maximum rate of dissolved O_2 is observed. From this we can conclude that DO estimation regarding *B.cunicularis* is very much affected by sodium nitrate and sodium phosphate.

It is studied that healthy water should have above 6.5 – 8 mg/L DO value(Wetzel, R. G.

1983). The mean rate of oxygen consumption of fresh water crab *Elamenopsiskempi*for the males varied from 1.20- 22.38 mg/L and for the females from 2.05-20.73 mg/L. (MALIK H. ALI1, 2000)

In this experiment we used BOD (Biological Oxygen Demand) bottle. Study suggests that if BOD value is high, it indicates that water is polluted and if BOD value id low it means that water is less polluted. In our study BOD value is increases by using sodium phosphate and somewhat decreases by using sodium nitrate. So, we can conclude that sodium phosphate has more effects on water than sodium nitrate.

From observation we conclude that DO (BOD) burette reading of sodium phosphate water solution indicates that sodium phosphate increases the BOD value in water. As compared to sodium nitrate and control unit sodium phosphate definitely affects the oxygen content or BOD (DO) value in particular water body.

Also from observing mean DO (BOD) value we observe that as compared to control unit DO mean value and sodium nitrate containing water solution, mean DO value of sodium phosphate water solution is higher than both. Also sodium nitrate DO value is also higher than control unit but less than sodium nitrate water solution

Acknowledgements:

I sincerely thank my supervisor Dr. Vidya.V. Bhoyar for guiding me and helping me to overcome the difficulties during this work and given advice on drawing up the research work appropriately. I even thank the authors of the references I cited in my research paper. I additionally thank my Research Center N.E.S.Science College Nanded for allowing me to do this work.

References

Bruckner, M. Z. (n.d.). *Microbial Life Educational Resources.* Retrieved from https://serc.carleton.edu/microbelife/research_methods/environ_sampling/oxygen.html: https://serc.carleton.edu/microbelife/research_methods/environ_sampling/oxygen.html

Ekambrarantha, A. M. (n.d.). *A maual of Zoology Part- I.*gta. (n.d.). *gov.nt.ca.* Retrieved 2 16, 2024, from httphttps://www.gov.nt.ca/sites/ecc/files/dissolved_oxygen.pdf&sa=u&ved=2ahukewjj-831w7yeaxvvhgmghx2och0qfnoecayqbq&usg=aovvaw0b3ghjqwzlroq8p1ntutaa

MALIK H. ALI1, S. D.-H.-A. (2000). Oxygen_consumption_of_the_freshwater_crab_Elamenopsis_kempi_Chopra_and_Das_1930_from_the_Garmat-Ali_river_Iraq. *Scientia Marina.*

Meiyin Wu, e. (n.d.). *Montclair State University.* Retrieved from https://www.montclair.edu/water-science/environmental-services/dissolved-oxygen/#:~:text=The%20amount%20of%20dissolved%20oxygen,5%20mg%2FL%20of%20DO:https://www.montclair.edu/water-science/environmental-services/dissolved

BIOCHEMICAL ASPECTS OF PROTEOCEPHALIDEAN CESTODE PARASITES IN *WALLAGO ATTU* (BLOSCH, SCHNEIDER, 1801) FROM WASHIM DISTRICT (M.S) INDIA.

Dr. Rahul Khawal,
Dnyneshwar Shimbre,
Dr. Mahesh Tandale
Department of Zoology,
Shri Vyankatesh Art's, Commerce and Science College Deulgaon Raja.

Abstract:

Biochemical studies have revealed important metabolic differences between the host and parasites.Results, after comparison between cestode parasites and host intestine, the protein and glycogen concentration is lower in GangesiaSp. as compare to host intestine (infected and non-infected intestine) and lipid concentration is higher inGangesia Sp. as compare to host intestine (infected and non-infected intestine). But the protein, glycogen, lipid concentration is higher in non-infected intestine as compare to infected intestine.

Keywords: - Biochemical, Parasites,*wallago attu*, *Gangesia*Sp.

Introduction:

Fish are an important component of our diet and a rich source of protein. Fishes contain good quality, balanced, and digestible protein. Protein content in fish meat varied between 16 and 21%. In fish, two types of muscles are present i.e. dark muscles (red) and white muscles. Dark muscles contain low levels of moisture and protein than the white muscle. Proteins are classified based on shape, solubility, and chemical structure. Based on solubility in a salt solution, Proteins are of three groups' Sarcoplasmic protein, Myofibrillar protein, and Stroma. Sarcoplasmic protein (Albumin and Globulin) constitutes 25-30% of protein. Myofibrillar proteins (myosin, actin, tropomyosin, troponin) are structural proteinsthat constitute 65-70 % of total protein. Stroma proteins are also known as connective tissue proteins. It constitutes 3% of the total protein. Proteins are complex organic compounds made up of a Prolong chain of amino acidsbound together by peptide bonds. Fresh fish meat provides a good source of protein for the human diet, about 90-95% of fish protein is assimilated by humans.

Glucose is an important source of energy for thecestodes in the digestive tract of the fish *Wallago attu.* Themetabolism of carbohydrates is an important pathway in vertebrates. Thecestodes respire anaerobically by glycolysis with much amount of glucose stored (Daugretory,

1966,Fairbrain, Wedthein, Harpuret Schiller 1961; Makov, 1939 andRead et. Rothmen, 1957). Most of the polysaccharides storedby tapeworms are glycogen (Read, 1949 and Reid, 1942).

It is revealed that the high content of lipids in the parasites and parasites also takes the most advantage of the host and absorbs most of the nourishing materials. The higher content of lipids is said to be present in older gravid proglottids because of the egg proteins (Brand and Vant,1952). There is considerable variation in lipids contents from species to species in the degree of lipid content. Variation is also seen in the segments and regions of the worms being experimented. Thus, total lipid is somewhat meaningless, unless the degree of maturity is known. The lipid content of some species grown in different hosts may vary substantially. e.g. in *Hymenolepisdiminuta*the lipid tends to be more abundant in the most posterior proglottids (FairbrainWerthim, Harpur and Schiller, 1961 and 1968).

The present investigation deals with the biochemical studies of proteocephalidean cestode parasites in *wallago attu*(blosch, schneider, 1801).

Material And Methods

Sample Collection

The worms were collected from the intestine of *Wallago attu*(blosch, schneider, 1801) and then washed with distilled water. Collected worms were then dried on the blotting paper to remove excess water transferred to watch glass and weighed on a sensitive balance. After 50-60 C for 24 hrs. the dry weight was also taken.

Biochemical estimation

The estimation of protein content in the Cestode parasites was carried out by Lowry's method (1951), the glycogen estimation was carried out by Kemp et al. (1954) method and lipid estimation by Folch et al. (1957) method.

Result And Discussion

In the present investigation, Cestode parasites i.e. *Gangesia*sp. were carried out for biochemical estimation of primarymetabolites such as protein, glycogen, and lipid (Graph No. 1).It shows that the protein content of the worm *Gangesia*sp. Obtained 0.48 ± 0.03 mg/100mg dry wt. of tissue per ml sol. Such infected as well as non-infected intestines of *Wallago attu*(blosch, schneider, 1801) obtained 0.72 ± 0.02 mg/100mg dry wt. of tissue per ml sol and 0.81 ± 0.03 mg/100mg dry wt. of tissue per ml sol respectively. The protein content is lower in cestode parasites as compared to the host.Finding of present study are in agreement with previous finding of (Jadhav, *et. al.*, 2008; Bhure, *et al,* 2011; Nanware, *et. al.*, 2012; Bhure, *et. al.*, 2012,2013; Pallewad, *et al.*, 2014; Bhure, *et. al.*, 2015;Nanware and Bhure, 2019) in terms of the presence of

high protein concentration in the noninfected host compared to the infected host, and also agree with in terms of the presence of theprotein at a lower concentration in worm tissue.The present study indicates, protein is low in Parasite than infected and normal intestinal tissue.The changes associated with Biochemical parameters due to various parasites establish a database,which could be used in diseases diagnosis and in guiding the implementation of the treatment orpreventive measures.

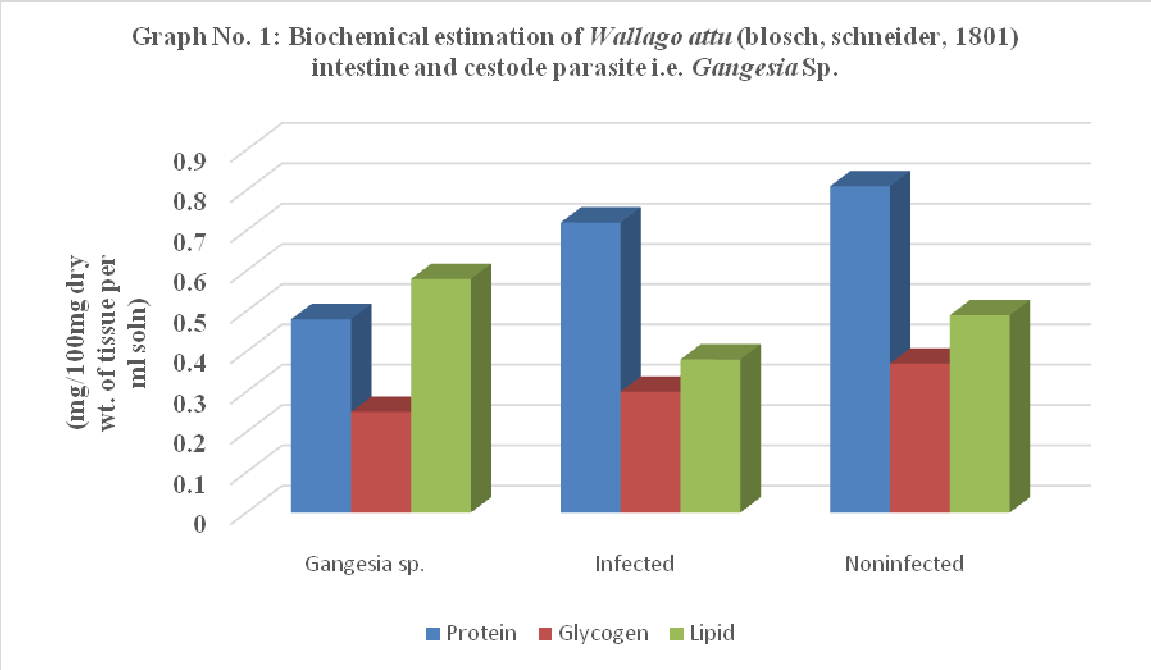
The glycogen content of *Gangesia*sp. obtained 0.25±0.004 mg/100mg dry wt. of tissue per ml sol. Such as infected as well as non-infected intestines of *Wallago attu*(blosch, schneider, 1801) obtained 0.30±0.006 mg/100mg dry wt. of tissue per ml sol and 0.37±0.019 mg/100mg dry wt. of tissue per ml sol respectively.Glycogen content is lower in cestode parasites as compared to infected and non-infected intestines of a host (Rajkumar T. Pawar, 2020 and Asawari Fartade, 2011). Glycogen content is higher in cestode parasites as compared to infected and non-infected intestines of the host (Amol Thosar et al.,2014).

While the lipid content of *Gangesia* sp. obtained 0.58±0.01mg/100mg dry wt. of tissue per ml sol. Such as infected as well as non-infected intestines of *Wallago attu*(blosch, schneider, 1801) obtained 0.38±0.015 mg/100mg dry wt. of tissue per ml sol and 0.49±0.13 mg/100mg dry wt. of tissue per ml sol respectively. Lipid content is higher in Cestode parasites as compared to the host intestine (Rajkumar T. Pawar, 2020 and Asawari Fartade, 2011). Lipid content is lower in Cestode parasites as compared to the host intestine (Amol Thosar et al.,2014).

From the present experimental study, it has been observed that the lipid content is high in cestode parasites as compared to protein and glycogen. These parasites absorb most of the nourishing from the host and fulfill its needs causing hindrance in the proper development of tissue (B. V. Jadhav et al. 2008).

Table No. 1: Biochemical estimation of *Wallago attu* (blosch, schneider, 1801) intestine and cestode parasite i.e. *Gangesia*Sp.

Name of Parameter	*Gangesia*Sp.	Intestinal tissue of *Wallago attu*(blosch, schneider, 1801)	
		Infected	Non-infected
Protein (mg/100mg dry wt. of tissue per ml soln)	0.48 ± 0.03	0.72 ± 0.02	0.81 ± 0.03
Glycogen (mg/100mg dry wt. of tissue per ml soln)	0.25±0.004	0.30±0.006	0.37±0.019
Lipid (mg/100mg dry wt. of tissue per ml soln)	0.58±0.01	0.38±0.015	0.49±0.13



Acknowledgment:

The author is thankful to the principal and also the head of Department of Zoology, Shri Vyankatesh Art's commerce and Science College, Deulgaon Raja, Dist. Buldana for providing the laboratory facilities during this research work.

References:

1. **Amol Thosar, Asha Bidkar and Sunita Borde, 2020.** A taxonomic study of anew cestode *Moniezia*(B) shilae,Sp.Nov. (Cestoda:Anoplocephalidae) in*Capra hircus*(L.) from Aurangabad district. Review of Research (Specialissue). Volume-9, Issue-6. ISSN: 2249-839X. IF-5.7631(UIF).
2. **Amol Thosar, Rahul Khawal, Sushil Jawale and Sunita Borde 2014.** Somebiochemical aspects of Anaplocephalidean Cestode Parasites in *Ovis bharal*(L.). The Ecoscan. Special issue, Vol.V:01-04:2014.
3. **Asawari Fartade and Ravindra Chati, 2016.** Biochemical studies on cestodeparasites in *Gallus gallusdomesticus*in Solapur and Osmanabad district,M.S. (India). International Journal of Fauna and Biological Studies, 2016; 3(4):109-110.
4. **Atul Humbe, Swati Jadhav and Sunita N. Borde, 2011.** Biochemical studies ofgastrointestinal cestode parasites in *Capra hircus*(L.) and *Ovis bharal* (L.)from Marathwada region. International Multidisciplinary Research Journal,1(12): 08-10 ISSN: 2231-6302.

5. B**hure D.B., Kadam Nima, Nanware S.S. and Garad V.B. (2012):** Studies on protein profile of *Ascardia galli* and its host *Gallus gallus*domesticus International Multidisciplinary Research Journal, 2(6): 60-61.

6. **BhureD.B., Kalyankar M.M. and Nanware S.S. (2013).**Studies on Protein contents of *Monieziaexpansa*Rudolphi, 1810 and its host *Capra hircus*. Indian Journal of Applied Research, 4(4): 67-68.

7. **Bhure D.B., Nanware S.S. and Kardile Swati P. (2015):** Studies On Protein Content of *Spinitectus indica* Bhure and Nanware, 2013 and its Host *Mastacembelusarmatus*Lacepede, 1800. Proceeding of National Conference on "Current Trends in Aquaculture". Published as a Special Issue of International Journal of Advanced Research in Basic and Applied Sciences. Special Issue, pp.108-111.

8. **B. V. Jadhav et. al., 2008**. Biosystematic studies of *Davaineashindei,* n. sp.(Cestoda: Davainidae, Fuhrmall, 1907) from *Gallus gallusdomisticus*. NatlAcad Sci Lett, Vol.31, No. 7-8, 2008.

9. **Cheng TC., 1986**. *General parasitology.* 2. California: Academic Press, Inc.;1986.

10. **Dr. Rahul Khawal, Dr. Amol Thosar, Dr. Sunita Borde, 2020**. Biochemicalstudy of fresh water fish *Clarias batrachus*(L.) infected with cestode parasite,*Lytocestus*, sp. From Aurangabad district (M.S.), India Volume-9, Issue- 12,december-2020. Print ISSN NO. 2277-8160.DOI:10.36106/gjra.

11. **John Barrett, 1981.** Biochemistry of parasitic helminths.

12. **Jawale Sushil,** Fartade, Asawari and Borde, Sunita (2011). Biochemical studies on caryophyllidean tapeworms in freshwater fish, *Clarias batrachus. Recent Research in Science & Technology,* **3**(3): 35-36.

13. **Keith Wilson and John Walker, 2006.** Principles and techniques ofBiochemistry and Molecular Biology. Cambridge University press, New York.

14. **Nanware S.S. and Bhure D.B. (2019):** Studies on Protein contents in Cestode of the genus Ptychobothrium and its host Mastacembelusarmatus. Review of Research, 1(3): 32-34.

15. **Nanware S.S., Nazneen Uzma, Bhure D.B. and Garad V.B. (2012):** Studies on protein content of cestode Cotugnia and its host *Gallus gallusdomesticus*. Journal of Experimental Sciences, 3(1): 40-41.

16. **P.Anil Kumar (2014).** Biochemical effects on Protein and Free Amino acid metabolism in Catlacatla and Labeorohita due to *Pallisentisnagpurensis*infection. American International Journal of Research in Formal, Applied & Natural Sciences, 6(1): 82-85.

TAILORING NANOMATERIALS FOR SUSTAINABLE ENERGY AND ENVIRONMENTAL SOLUTIONS: A REVIEW OF RECENT ADVANCES

Mamtaram Kare,
Bapu Sarwade,
Tukaram Gitte,
Shrimant Survase.

Abstract:

The necessity for sustainable environmental solutions and the increasing need for renewable energy have spurred extensive study into utilizing the special qualities of nanomaterials. This review delves into the latest developments in customizing nanomaterials for energy-related applications, such as supercapacitors, batteries, fuel cells, and solar energy conversion. It also looks at the potential application of nanomaterials in environmental remediation, with particular attention on soil decontamination, wastewater treatment, air pollution reduction, and water purification. The review stresses the enormous promise of nanomaterials but also recognizes the difficulties in large-scale production, safety, and environmental effect; responsible development and sustainable implementation are therefore essential.

Introduction: The need for environmentally friendly energy sources and methods of environmental preservation has grown as a result of the rapid depletion of fossil fuels and the negative impacts of climate change. With their remarkable size-dependent characteristics, nanomaterials have become a game-changer in this field. Nanomaterials are superior to their bulk counterparts in terms of their physical, chemical, and biological properties, which makes them perfect for a wide range of energy and environmental applications. This review explores current developments in the customization of nanomaterials for particular applications, highlighting their potential to address global environmental and energy issues.

Applications in Energy:

Nanomaterials in Solar Energy: The incorporation of nanomaterials into solar cells has opened up a world of possibilities for improved affordability, sustainability, and efficiency. Optimising these materials' special qualities enables enhanced light absorption, effective charge transfer, and enhanced cell performance. Here is a closer look at the fascinating uses of nanomaterials in solar energy along with some more reading to get you started:

Light Absorption and Trapping: Materials with nanostructures Researchers may generate complex structures such as photonic crystals, nanowires, and plasmonic nanoparticles by varying their size and shape. These configurations efficiently capture and disperse solar radiation, resulting

in increased light absorption within the solar cell.

Quantum dots: By emitting lower-energy photons and absorbing particular wavelengths, these microscopic semiconductor crystals allow light that would otherwise be wasted in conventional cells to be used.

Improved Charge Transport and Separation:

Materials with nanoporous structure: These materials, which include ZnO and TiO2 nanoparticles, have small holes that provide a significant surface area for charge separation. By doing this, the efficiency of turning absorbed light into electricity is increased and recombination is reduced.

Graphene and carbon nanotubes are highly conductive materials that can be integrated into electrodes to enable effective charge transport in solar cells.

New Technologies:

Perovskite solar cells: With their excellent light absorption and low-temperature manufacturing capabilities, perovskite materials are used in these next-generation solar cells. The performance and stability of perovskites are further improved by nano structuring them.

Dye-sensitized solar cells: These devices combine semiconductors with nanostructures and light-absorbing dyes. The effectiveness and durability of nanomaterials have been enhanced by recent developments, such as TiO2 nanoparticles.

Nanomaterials in Batteries: The market for portable devices is dominated by lithium-ion batteries, however current research is utilizing nanomaterials to investigate other chemistries. Because sodium is abundant, sodium-ion batteries are a sustainable choice, but metal-air batteries have high energy densities because air contains oxygen. Electrode materials can be tailored using nanostructures to increase cycling stability, conductivity, and capacity.

Enhanced Energy Density: By providing a greater surface area for electrochemical reactions, nanoparticles may be able to store more energy. The following is covered in Sigma-Aldrich's "Nanomaterials for Energy Storage in Lithium-ion Battery Applications"

Fuel Cells: Fuel cells provide great efficiency and low emissions by directly converting chemical energy into electrical energy. Nevertheless, they frequently have limited longevity and performance. The activity and stability of electrocatalysts are greatly increased by nanomaterials, which also increases fuel consumption and overall efficiency.

Supercapacitors: With its high-power density and quick charging times, supercapacitors fill the gap between batteries and capacitors. The surface area for charge storage is increased by nanostructured electrodes, such as graphene and carbon nanotubes, which results in noticeably larger capacitances.

Applications in Environment:

Water Purification: Water pollution and scarcity are major global issues. Nanomaterials provide practical water filtration options. Organic pollutants are broken down by photocatalytic

nanoparticles, while bacteria and viruses can be eliminated via nanoporous membranes. Furthermore, desalination systems based on nanomaterials provide seawater with clean drinking water.

Controlling Air Pollution: Nanomaterials present viable ways to absorb and break down air pollutants, which is a serious health risk. While photocatalytic nanomaterials use sunlight to break down dangerous pollutants like NOx and SOx into innocuous compounds, metal oxide nanoparticles effectively adsorb these gases.

Wastewater Treatment: New pollutants such as pharmaceuticals and microplastics are frequently difficult for traditional wastewater treatment methods to handle. Through adsorption, degradation, and filtration, nanomaterials like zeolites and magnetic nanoparticles can effectively remove these contaminants. Furthermore, by facilitating resource recovery from wastewater, nanomaterials can support the circular economy.

Soil Remediation: There are serious environmental dangers associated with contaminated soil and groundwater. Versatile techniques for soil remediation are provided by nanomaterials. By promoting microbial activity, they can accelerate the biodegradation process, break down organic contaminants, and immobilize heavy metals.

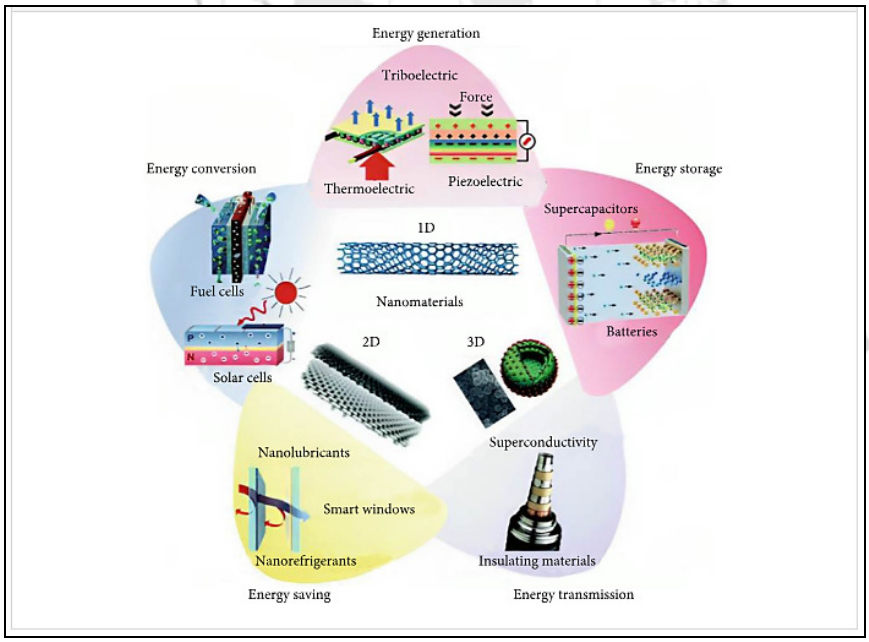


Fig. 1 Showing the utilization of nanoparticles as an energy storage system

(Fig 1 adopted from R. Raj, R. Verma, and J. Singh, "Nanomaterials for energy storage applications," in Bioenergy Research: Integrative Solution for Existing Roadblock, M. Srivastava, N. Srivastava, and R. Singh, Eds., Clean Energy Production Technologies, pp. 135–156, Springer, Singapore, 2021.)

Problems and Future Directions: Although nanomaterials have a great deal of promise, there are still a number of problems. Cost-effectiveness must be maintained while optimizing large-scale

production. Thorough investigation and conscientious development are required to tackle safety issues related to possible threats to the environment and human health. Additionally, comprehensive evaluation and mitigation techniques are required for the environmental impact of nanomaterials over the course of their lifecycle.

Next research should concentrate on:

- Creating scalable and affordable processes for the synthesis of nanomaterials.
- Creating nanomaterials with desired characteristics for intended uses.
- Recognizing the long-term effects of nanomaterials on the environment and human health.
- Encouraging responsible development and application through guidelines and best practices.

Conclusion: The potential for solving global issues through the customisation of nanomaterials for sustainable energy and environmental solutions is enormous. Nanomaterials have the potential to create a future that is healthier, cleaner, and more sustainable by utilising their special qualities and overcoming current obstacles. For the benefit of people and the environment, responsible development, thorough study, and teamwork are essential to ensuring the safe and efficient use of this potent technology.

References:

[1] Liu, M., et al. (2016). Plasmonic nanostructures for efficient light manipulation in solar cells. Nature nanotechnology, 11(12), 1068-1074.

[2] Yu, J., et al. (2015). Vertical Si nanowires for efficient solar energy conversion. Nature nanotechnology, 10(7), 538-543.

[3] Wang, Z., et al. (2014). Three-dimensional photonic crystals for solar cells. Advanced materials, 26(11), 1828-1853.

[4] Nozik, A. J. (2010). Quantum dot solar cells. Nature nanotechnology, 5(3), 153-161.

[5] Khan, M. R., et al. (2020). Metal oxide nanoparticles and their applications in energy conversion devices and sensors. Journal of materials science: materials in electronics, 31(1), 703-759.

[6] Zhu, Y., et al. (2010). Carbon nanomaterials as efficient electrocatalysts and supports for PEM fuel cells. Journal of materials chemistry, 20(30), 6240-6259.

[7] Saliba, M., et al. (2016). Cesium-containing triple cation perovskite solar cells with improved stability. Nature energy, 1(4), 15017.

[8] Hagfeldt, A., & Boschloo, G. (2010). Light-induced charge separation in dye-sensitized solar cells. Angewandte Chemie International Edition, 49(11), 1978-2000.

[9] https://www.sigmaaldrich.com/US/en/technical-documents/technical-article/materials-science-and-engineering/bioelectronics/nanomaterials-for

NATURE AND ENVIRONMENT IN INDIA: CHALLENGES AND CONSERVATION EFFORTS

Mr. Shyam Narhari Kamble
Assi. Prof. Dept. of Geography,
Shivneri College, Shirur Anantpal Dist. Latur.

Abstract:

India, with its diverse ecosystems and abundant natural resources, faces formidable challenges in maintaining the health and sustainability of its environment. This research paper delves into the multifaceted issues confronting the nation, ranging from air and water pollution to deforestation, loss of biodiversity, and the looming specter of climate change. The paper also explores the concerted conservation efforts and initiatives aimed at mitigating these challenges and preserving the unique biodiversity that defines the Indian subcontinent. The geographical expanse of India, encompassing mountains, plains, forests, deserts, and a vast coastline, contributes to its rich biodiversity. However, this diversity is under constant threat from anthropogenic activities. The paper examines the intricate relationship between the diverse geography and the ecological balance within the country. The environmental challenges discussed in this paper include the pervasive issue of air pollution, stemming from rapid industrialization and urbanization, as well as water pollution affecting rivers, lakes, and groundwater. Deforestation, a consequence of expanding agricultural practices and urban development, poses a significant threat to India's ecosystems. Loss of biodiversity, accelerated by habitat destruction and poaching, further compounds these challenges. Additionally, the impacts of climate change, manifested in extreme weather events and shifts in ecosystems, pose an imminent threat to the nation. In response to these challenges, India has implemented various conservation efforts. Wildlife conservation measures include the establishment of sanctuaries and national parks, along with initiatives to protect endangered species. Afforestation and reforestation programs seek to counteract deforestation, while waste management policies and practices aim to address the mounting issue of pollution. Furthermore, the country is increasingly embracing renewable energy sources to combat the adverse effects of climate change. This paper underscores the importance of a holistic and sustainable approach to environmental conservation in India. By analyzing the challenges and examining the ongoing conservation efforts, it aims to contribute to the broader discourse on environmental sustainability and inspire continued efforts to preserve the natural heritage of India for future generations.

Keywords: India, environmental challenges, biodiversity, air pollution, water pollution, deforestation, climate change, conservation efforts, wildlife conservation, afforestation, reforestation, waste management, renewable energy, sustainable approach, ecological balance, anthropogenic activities, natural resources, geographical diversity, habitat destruction, environmental sustainability.

Introduction:

India, a land of unparalleled geographical diversity and ecological richness, faces an array of challenges in preserving and sustaining its environment. The intricate interplay between the diverse ecosystems, ranging from towering mountains and expansive plains to dense forests and arid deserts, forms the backdrop against which environmental issues unfold. This research paper delves into the multifaceted challenges confronting the nation, addressing issues such as air and water pollution, deforestation, loss of biodiversity, and the ominous specter of climate change.

The environmental challenges faced by India are both complex and pervasive. The relentless march of industrialization and urban development has led to alarming levels of air pollution in major cities, affecting the health of both the population and the environment. Simultaneously, water bodies, including rivers, lakes, and groundwater, bear the brunt of pollution from various sources, posing a threat to aquatic life and human well-being.

Deforestation, driven by the expansion of agricultural practices and urban sprawl, emerges as a significant peril to India's ecosystems. The loss of green cover not only diminishes biodiversity but also exacerbates issues like soil erosion and climate change. The paper also addresses the critical issue of biodiversity loss, a consequence of habitat destruction and rampant poaching that further amplifies environmental challenges.

As the global climate undergoes unprecedented changes, India faces the impacts manifested in extreme weather events, altered precipitation patterns, and shifts in ecosystems. Climate change emerges as a looming threat that demands urgent attention and proactive measures to mitigate its effects.

In response to these challenges, India has implemented a range of conservation efforts and initiatives. From the establishment of wildlife sanctuaries and national parks to protect endangered species, to afforestation and reforestation programs combating deforestation, the nation strives to find a balance between development and environmental preservation. Waste management policies and practices, along with an increasing emphasis on renewable energy sources, showcase India's commitment to sustainable practices.

This research paper seeks to unravel the complexities of India's environmental landscape, shedding light on the challenges faced and the ongoing efforts to address them. By examining these issues, the paper aims to contribute to a broader discourse on environmental sustainability and inspire continued efforts to safeguard the natural heritage of India for the well-being of current and future

generations.

Geographical Overview:

India's geographical diversity is a testament to its status as a subcontinent with a wide range of ecosystems, each contributing to the nation's unique environmental tapestry. From the towering peaks of the Himalayas in the north to the expansive Gang etic plains, the lush Western Ghats, the arid deserts of Rajasthan, and the coastal regions surrounding the Indian Peninsula, India encapsulates a wealth of natural landscapes.

1. Himalayan regions:

The northern boundary is marked by the majestic Himalayan mountain range, hosting diverse flora and fauna. Glaciers, alpine meadows, and dense forests characterize this region.

2. Gang etic Plains:

Stretching across the northern and central regions, the Gang etic plains are fertile lands crisscrossed by the sacred Ganges and its tributaries. These plains are crucial for agriculture but face challenges such as pollution and urbanization.

3. Western Ghats:

The Western Ghats, a UNESCO World Heritage Site, run parallel to the western coast, featuring tropical rainforests, unique biodiversity, and high plateaus. The Ghats influence the monsoon climate of the region.

4. Deccan Plateau:

The elevated Deccan Plateau in the central-southern part of India is characterized by hills, plateaus, and volcanic formations. It is home to diverse ecosystems, including deciduous forests and grasslands.

5. Thar Desert:

The northwestern region houses the Thar Desert, one of the world's most densely populated deserts. Extreme temperatures and arid conditions pose significant challenges for both the environment and human populations.

6. Eastern Coastal Plains:

The eastern coast is marked by fertile plains and deltas of major rivers like the Godavari and Krishna. Cyclones and coastal erosion are recurring challenges in this region.

7. Western Coastal Plains:

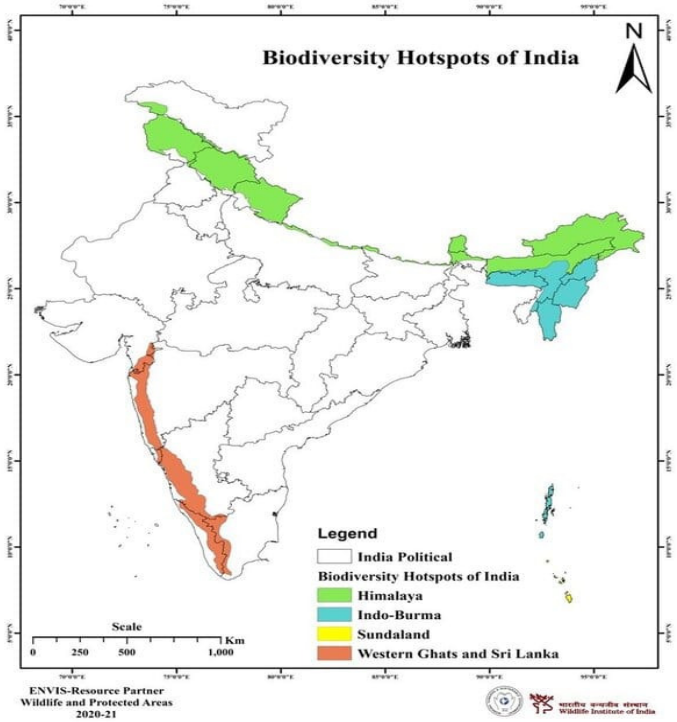
Along the western coast, the plains are narrow but lush, influenced by the Western Ghats. Mangrove ecosystems, estuaries, and sandy beaches contribute to the ecological diversity of this region.

8. Islands:

India is also home to the Andaman and Nicobar Islands in the Bay of Bengal and the Lakshadweep Islands in the Arabian Sea. These islands harbor unique marine ecosystems and

coral reefs.

The geographical diversity of India plays a pivotal role in shaping its climate, biodiversity, and environmental challenges. The varying ecosystems provide habitats for a plethora of plant and animal species, making India one of the world's biodiversity hotspots. However, this diversity is under constant pressure from human activities, leading to challenges such as deforestation, habitat destruction, and pollution. Understanding this geographical context is crucial for comprehending the multifaceted nature of environmental issues in India and formulating effective conservation strategies.



Biodiversity in India:

India stands as a global biodiversity hotspot, boasting a rich tapestry of ecosystems that support an extraordinary array of plant and animal species. The diverse geography, encompassing mountains, plains, forests, deserts, and coastal areas, contributes to the nation's exceptional biodiversity. This section explores the intricate web of life in India and the challenges faced by its diverse flora and fauna.

1. Floral Diversity:

India hosts a staggering number of plant species, ranging from the dense tropical rainforests of the Western Ghats and Northeast to the arid vegetation of the Thar Desert. The country is home to a multitude of endemic and economically significant plant species, including medicinal plants and valuable timber species

2. Faunal Diversity:

The faunal diversity in India is equally remarkable, featuring iconic species such as the

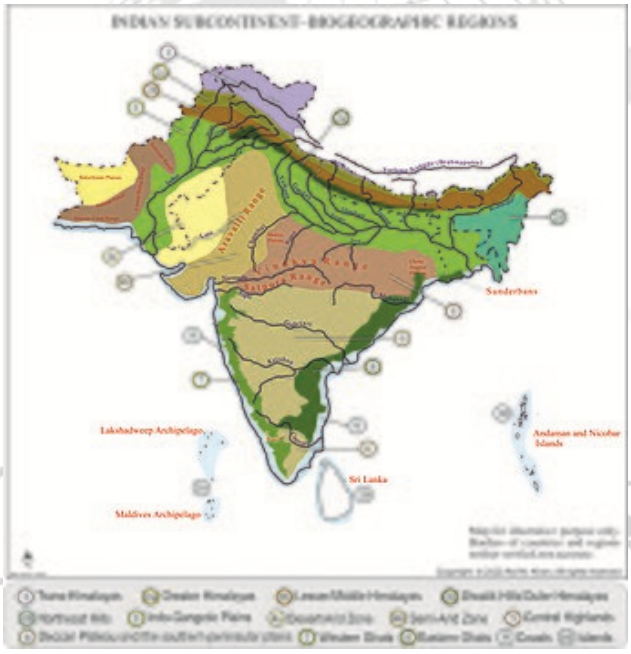
Bengal tiger, Asian elephant, Indian rhinoceros, and Indian lion. The Western Ghats and the Himalayas serve as biodiversity hotspots, harboring numerous endemic species of amphibians, reptiles, mammals, and birds.

3. Avian Diversity:

India's avian diversity is unparalleled, with over 1,300 bird species recorded. The country is a crucial stopover for migratory birds, with diverse habitats like wetlands, mangroves, and grasslands providing essential breeding and feeding grounds.

4. Marine Biodiversity:

The coastal regions surrounding the Indian Peninsula contribute to the marine biodiversity of the country. Coral reefs, mangroves, and diverse marine species, including various fish and marine mammals, thrive in the Bay of Bengal, Arabian Sea, and the Indian Ocean.



Challenges to Biodiversity:

1. Habitat Loss and Fragmentation:

Rapid urbanization, agricultural expansion, and infrastructure development lead to habitat loss and fragmentation, threatening the survival of many species. Fragmented habitats disrupt migration patterns and reduce available living spaces.

2. Deforestation:

Deforestation, driven by logging, agriculture, and urban development, poses a severe threat to biodiversity. The loss of natural habitats contributes to the decline of numerous plant and animal species, disrupting ecological balances**.**

3. Poaching and Illegal Wield Life Trade:

Poaching and illegal wildlife trade persist as major challenges, particularly for endangered species such as tigers, rhinoceroses, and elephants. Despite conservation efforts, the demand for

exotic species and their parts remains a threat.

4. Pollution:

Pollution, including air and water pollution, poses a significant risk to biodiversity. Industrial discharge, agricultural runoff, and untreated sewage impact ecosystems and aquatic life, leading to the decline of many species.

Environmental Challenges:

1. Air Pollution:

Rapid industrialization and urbanization have led to increased air pollution in major cities. Vehicular emissions, industrial activities, and the burning of crop residues contribute to high levels of particulate matter and pollutants like sulfur dioxide and nitrogen oxides.

2. Water Pollution:

Industrial discharge, inadequate sewage treatment, and agricultural runoff have led to the pollution of rivers and water bodies. Contamination of water sources with pollutants poses a threat to both aquatic ecosystems and human health.

3. Deforestation:

The demand for land for agriculture, infrastructure development, and urban expansion has resulted in extensive deforestation. This loss of natural habitats threatens biodiversity and contributes to climate change.

4. Loss of Biodiversity:

Habitat destruction, pollution, and over-exploitation of natural resources have led to a loss of biodiversity in India. Several species are endangered or facing extinction, and ecosystems are under stress.

5. Land Degradation:

Unsustainable agricultural practices, deforestation, and urbanization contribute to land degradation. Soil erosion, loss of fertility, and desertification are significant concerns.

6. Climate Change:

India is vulnerable to the impacts of climate change, including rising temperatures, changing rainfall patterns, and extreme weather events. This affects agriculture, water resources, and overall ecosystem health.

7. West Management:

Rapid urbanization has led to increased generation of solid waste, and inadequate waste management infrastructure has resulted in improper disposal, leading to environmental pollution.

Conservation Efforts:

1. Protected Areas and National Park:

India has established an extensive network of protected areas, including national parks and

wildlife sanctuaries, to conserve critical habitats and provide safe havens for endangered species

2. Wildlife Conservation Programs:

Initiatives such as Project Tiger and Project Elephant focus on the conservation of flagship species, aiming to increase their populations and protect their habitats.

3. Affirmation and Reforestation:

Afforestation and reforestation programs aim to counteract deforestation, enhance carbon sequestration, and provide sustainable habitats for wildlife.

4. Community-Based Conservation:

Involving local communities in conservation efforts helps promote sustainable practices, reduce human-wildlife conflict, and garner support for biodiversity preservation.

5. International Collaboration:

India actively participates in international collaborations and treaties for biodiversity conservation, recognizing the importance of global efforts in addressing Tran's boundary conservation issues.

Despite these efforts, the challenges to biodiversity in India remain formidable. A comprehensive and collaborative approach that integrates conservation with sustainable development is crucial to ensure the continued survival of India's diverse and ecosystems.

6. Renewable Energy:

The government is promoting the use of renewable energy sources like solar and wind power to reduce dependence on fossil fuels and mitigate climate change.

7. Water Conservation:

Initiatives focus on efficient water management, watershed development, and the rejuvenation of traditional water conservation practices. Rainwater harvesting and water recycling are promoted.

8. Air Quality Management:

Measures such as the introduction of cleaner technologies, stricter emission norms, and public awareness campaigns are undertaken to address air pollution in urban areas.

9. West Management:

There is an increasing emphasis on waste segregation, recycling, and waste-to-energy initiatives to manage solid waste effectively.

10. Policy and Legislation:

The government has implemented environmental laws and regulations to address various issues, such as the Water (Prevention and Control of Pollution) Act, Air (Prevention and Control of Pollution) Act, and the Wildlife Protection Act.

Conclusion:

In conclusion, India's nature and environment confront significant challenges due to urbanization, industrialization, and unsustainable practices. Despite these challenges, the country is actively engaged in conservation efforts, emphasizing wildlife protection, afforestation, renewable energy, and waste management. A holistic, collaborative approach involving government, communities, and businesses is essential to ensure sustainable development and environmental resilience. Continued commitment to conservation measures will be pivotal in securing a healthier, more balanced future for India's ecosystems and biodiversity.

References

[1] K. Abbass, M. Z. Qasim, H. Song, M. Murshed, H. Mahmood, and I. Younis, "A review of the global climate change impacts, adaptation, and sustainable mitigation measures," *Environ. Sci. Pollut. Res.*, vol. 29, no. 28, pp. 42539–42559, Jun. 2022, doi: 10.1007/s11356-022-19718-6.

[2] V. K. Soni, "WILDLIFE CONSERVATION IN INDIA: ISSUES AND CHALLENGES," *J. Interdiscip. Cycle Res.*, no. 0022.

[3] P. F. R. Jackson, "The State of India's Environment 1982–A Citizen's Report. Centre for Science and Environment, 807 Vishal Bhavan, 95 Nehru Place, New Delhi 110 019, India: [iii] + 190 pp., illustr., 28.5 × 21 × 1.5 cm, Rs 125, 1982.," *Environ. Conserv.*, vol. 10, no. 4, pp. 368–369, 1983, doi: 10.1017/S037689290001331X.

[4] A. Yadav, "An Empirical Study on Environmental Issues in India".

[5] R. Seymour, "Research on Climate Change".

[6] A. Srivathsa *et al.*, "Prioritizing India's landscapes for biodiversity, ecosystem services and human well-being," *Nat. Sustain.*, vol. 6, no. 5, pp. 568–577, Feb. 2023, doi: 10.1038/s41893-023-01063-2.

[7] D. John and K. M. Francis, "URBANIZATION AND ENVIRONMENTAL," vol. 6, no. 2, 2019.

[8] D. R. Agarwal, "WASTE MANAGEMENT INITIATIVES IN INDIA FOR HUMAN WELL BEING," 2015.

EXPLORING THE DYNAMICS OF ZOOPLANKTON COMMUNITIES IN PIMPARI RESERVOIR: A QUALITATIVE AND QUANTITATIVE ANALYSIS

Dr. R.G. Biradar
Head Department of Botany
SambhajiraoKendreMahavidyalaya, Jalkot, Dist Latur

Abstract:

This study investigates the composition and dynamics of zooplankton communities in the Pimpari reservoir, providing insights into their abundance, species diversity, and ecological interactions. Protozoan, helminth eggs, rotifer, and arthropod populations were examined across three sampling stations and seasonal variations were analysed. Protozoan populations exhibited relatively low abundance levels, indicating a lesser degree of organic pollution compared to other water bodies. Helminth egg populations showed variability, with notable presence of pathogenic species such as Ascarislumbricoides, highlighting potential health risks. Rotifer populations displayed considerable variability, with seasonal fluctuations and associations with particulate organic matter. Arthropod populations exhibited similar patterns, with lowest populations during summer and highest during rainy season. These findings contribute to our understanding of zooplankton dynamics in the Pimpari reservoir, emphasizing the complex interplay between environmental factors and community structure. Further research is warranted to explore long-term trends and ecological implications, informing ecosystem management and public health strategies.

Key words: Dynamics of Zooplankton, Pimpari Reservoir.

Introduction:

Freshwater bodies harbour an incredibly diverse array of life forms, among which zooplankton communities stand out as a cornerstone of aquatic ecosystems. Comprising representatives from various invertebrate phyla, these communities play pivotal roles in the intricate web of life within freshwater systems. As voracious consumers of primary producers, zooplankton organisms serve as vital conduits of energy transfer, effectively channelling nutrients from lower trophic levels to higher organisms in the food chain (Michael, 1973),Reynolds, C. S. (2006),Calbet, A., &Saiz, E. (2005). However, unravelling the functional mechanisms of aquatic ecosystems necessitates a thorough understanding of the dynamics inherent within zooplankton communities.

Historically, researchers have endeavored to shed light on the complex dynamics governing zooplankton populations. Pioneering studies by Ganapati (1943), Dumot (1968), Somashekar et al.

(1988), Biswas and Konar (2000), and Narsimha Rao and Jaya Raju (2001) ,Hutchinson, G. E. (1961),Lampert, W., & Sommer, U. (2007),Dodson, S. I., & Frey, D. G. (1991) have contributed significantly to our understanding of zooplankton ecology, laying the groundwork for subsequent investigations.

In this study, we turn our focus to the Pimpari reservoir, a freshwater habitat of ecological significance, to conduct a comprehensive analysis of its zooplankton communities during the year 2012. Our research aims to elucidate the qualitative and quantitative characteristics of zooplankton populations within this reservoir. Specifically, we examine four key components: rotifers, protozoa, helminth eggs, and arthropods, each representing distinct facets of zooplankton diversity and ecological function.By delving into the intricacies of zooplankton dynamics in the Pimpari reservoir, this study seeks to contribute valuable insights into the broader understanding of freshwater ecosystem dynamics. Through meticulous examination and analysis, we endeavour to uncover the underlying mechanisms shaping zooplankton communities, thereby enriching our comprehension of the intricate interplay between biotic and abiotic factors in freshwater environments.

As we embark on this journey of exploration, we anticipate that our findings will not only enhance scientific knowledge but also inform conservation and management efforts aimed at preserving the ecological integrity of freshwater habitats like the Pimpari reservoir.In the subsequent sections of this paper, we present the methodologies employed in our investigation, followed by a detailed analysis of our findings. Through rigorous scientific inquiry, we aspire to contribute meaningfully to the collective body of knowledge concerning zooplankton ecology and freshwater ecosystem dynamics.

Materials and Methods:

Sample Collection:

Zooplankton samples were collected monthly over a period of twelve months spanning from January to December 2012 from three designated sampling stations, denoted as S1, S2, and S3, situated across the Pimpari reservoir. At each sampling station, water samples were collected using a standard plankton net with a mesh size of [insert mesh size] to ensure efficient capture of zoo planktonic organisms. Sampling was conducted at consistent depths and locations to maintain consistency throughout the study.

Sample Preservation:

Upon collection, the zooplankton samples were immediately preserved using a 4% formalin solution to prevent degradation and maintain the integrity of the specimens during transportation and storage. Preservation in formalin facilitates long-term storage while minimizing decomposition and morphological alterations.

Laboratory Analysis:

In the laboratory, the preserved zooplankton samples were processed for identification and enumeration using established protocols adapted from previous studies (Edmendson, Scourfield and Hardiling, 1966; Harding and Smith, 1974; Pontin, 1978; Tonapi, 1980; Pennak, 1989; APHA, 1989). The samples were transferred into Sedgwick rafter cells, which provide a standardized platform for microscopic examination and counting.

Identification and Enumeration:

Zooplankton specimens were meticulously identified and enumerated under a compound microscope at appropriate magnifications. Taxonomic keys and relevant literature were consulted for accurate species identification. The identification process adhered to established taxonomic criteria, taking into account morphological features and diagnostic characteristics specific to each zooplankton group.

Data Analysis:

Following identification and enumeration, the abundance of each identified zooplankton species was expressed as the number of individuals per liter of sampled water. Quantitative data obtained from the monthly sampling sessions were subjected to statistical analysis to elucidate temporal variations in zooplankton abundance and community structure across the three sampling stations.

Quality Assurance:

To ensure the accuracy and reliability of the data, rigorous quality control measures were implemented throughout the sampling, preservation, and laboratory analysis processes. Standard operating procedures were strictly followed, and periodic calibration of equipment was performed to maintain consistency and minimize potential sources of error.

Overall, the methodologies outlined above enabled comprehensive assessment and characterization of zooplankton communities in the Pimpari reservoir, providing valuable insights into their spatial and temporal dynamics during the study period.

Results and Discussion:-

The seasonal percentage composition of zooplankton components are given in Table 1. the total number of zooplankton population were found to be varied from 55 to 128 per liter at S1, 53 to 121 number per liter at S2, and 47 to 121 number per liter at S3. The minimum population was during summer while maximum during monsoon season.

The annual rotifer population was 46.05% at S1, 47.634% at S2, and 44.599% at S3 of the total annual zooplankton population followed by arthropods 36.514% at S1, 37.96% at S2, and 39.679% at S3, helminthes eggs 10.6134% at S1, 8.5177% at S2 and 9.625% at S3 and protozoan's 6.816% at S1, 5.888% at S2, and 6.096% at S3 during study about 19 zooplankton species were observed.

Summer Season:-

S1 – Rotifers> Arthropods> Helminths eggs> Protozoans

S2 – Rotifers> Arthropods> Helminths eggs> Protozoans

S3 – Rotifers> Arthropods> Helminths eggs> Protozoans

Monsoon Season:-

S1 – Rotifers> Arthropods> Helminths eggs> Protozoans

S2 – Rotifers> Arthropods> Helminths eggs> Protozoans

S3 – Rotifers> Arthropods> Helminths eggs> Protozoans

Winter Season:-

S1 – Rotifers> Arthropods> Helminths eggs> Protozoans

S2 – Rotifers> Arthropods> Helminths eggs> Protozoans

S3 – Rotifers> Arthropods> Helminths eggs> Protozoans

Table: 1 Seasonal Percentage composition of Microzootic Fauna

Stations	Components	Summer	Monsoon	Winter
S 1	Protozoans	6.66	6.99	6.74
	Helminths eggs	10.74	9.06	12.13
	Rotifers	44.07	50.10	43.39
	Arthropods	38.52	33.93	37.73
S 2	Protozoans	4.74	6.49	6.10
	Helminths eggs	10.27	5.36	10.46
	Rotifers	48.61	51.69	42.73
	Arthropods	36.36	36.44	40.69
S 3	Protozoans	6.72	6.33	5.39
	Helminths eggs	8.82	8.26	11.67
	Rotifers	44.53	49.31	39.52
	Arthropods	39.91	36.09	43.41

Discussion:

The findings of this study provide valuable insights into the composition and dynamics of zooplankton communities in the Pimpari reservoir. The observed variations in protozoan, helminth eggs, rotifer, and arthropod populations across the sampling stations and seasons reflect the complex interplay of environmental factors, nutrient availability, and ecological interactions within the aquatic ecosystem. Protozoan populations exhibited relatively low abundance levels, ranging from 3 to 10 individuals per liter at S1, 2 to 8 individuals per liter at S2, and 1 to 8 individuals per

liter at S3. The presence of three protozoan species, namely Balantidium coli, Entamoeba, and Giardia lamblia, underscores the diversity within this group. Comparisons with previous studies suggest that the protozoan populations in the Pimpari reservoir are relatively low, indicating a lesser degree of organic pollution compared to other water bodies. This finding aligns with the observations of Bhati and Rana (1987), who noted a correlation between higher protozoan abundance and organic pollution levels.

Helminth egg populations exhibited wider variability, ranging from 3 to 17 eggs per liter at S1, 1 to 11 eggs per litter at S2, and 2 to 13 eggs per litter at S3. The presence of five helminth egg species, including Ascarislumbricoides and Fasciola hepatica, highlights the potential health risks associated with waterborne parasites. The prevalence of Ascarislumbricoides eggs across all sampling stations indicates a notable presence of this pathogen in the reservoir. These findings corroborate with previous research by Hiware and Jadhav (2001), underscoring the persistence of helminth eggs in freshwater environments.

Rotifer populations exhibited considerable variability, with densities ranging from 15 to 62 individuals per liter at S1, 18 to 56 individuals per liter at S2, and 14 to 49 individuals per liter at S3. Seasonal fluctuations in rotifer abundance were evident, with minimum populations recorded during the summer season and maximum populations during the monsoon season. The prevalence of six rotifer species suggests a diverse assemblage, with adaptations to varying environmental conditions. The observed association between rotifer abundance and particulate organic matter aligns with the findings of Sarwar and Pravee (1995), highlighting the importance of organic substrates in supporting rotifer populations.

Arthropod populations displayed similar patterns of variability, ranging from 12 to 53 individuals per liter at S1, 10 to 57 individuals per liter at S2, and 7 to 54 individuals per liter at S3. Lowest populations were observed during the summer season, while highest populations occurred during the rainy season, consistent with observations by Hiware and Jadhav (1998). These fluctuations likely reflect seasonal changes in environmental conditions and reproductive cycles of arthropod species.

Overall, the findings of this study contribute to our understanding of zooplankton dynamics in the Pimpari reservoir, highlighting the complex interactions between biotic and abiotic factors shaping community structure and abundance. Further research is warranted to explore the long-term trends and ecological implications of zooplankton dynamics in freshwater ecosystems, with implications for ecosystem management and public health.

Conclusion:

This study provides comprehensive insights into the composition and dynamics of zooplankton communities in the Pimpari reservoir, shedding light on their abundance, species

diversity, and ecological interactions. The observed variations in protozoan, helminth eggs, rotifer, and arthropod populations across sampling stations and seasons underscore the complex interplay of environmental factors, nutrient availability, and ecological processes within the aquatic ecosystem.Protozoan populations exhibited relatively low abundance levels, indicative of a lesser degree of organic pollution compared to other water bodies. The presence of diverse protozoan species highlights the complexity within this group, with implications for ecosystem health and water quality management.

Helminth egg populations exhibited wider variability, emphasizing the potential health risks associated with waterborne parasites. The prevalence of pathogenic species such as Ascarislumbricoides underscores the importance of monitoring and mitigating waterborne diseases in freshwater environments.Rotifer populations displayed considerable variability, with seasonal fluctuations and associations with particulate organic matter. These findings underscore the importance of organic substrates in supporting rotifer populations and highlight their role as indicators of environmental health.Arthropod populations exhibited similar patterns of variability, reflecting seasonal changes in environmental conditions and reproductive cycles. These fluctuations provide valuable insights into the ecological dynamics of arthropod communities and their responses to environmental stimuli.

Overall, the findings of this study contribute to our understanding of zooplankton dynamics in the Pimpari reservoir, emphasizing the complex interactions between biotic and abiotic factors shaping community structure and abundance. Further research is warranted to explore long-term trends and ecological implications, with implications for ecosystem management and public health strategies aimed at preserving the integrity of freshwater ecosystems.

References:

1. APHA standard Methods for analysis of water and wastewater, American public health Association, 17th Edi. Washington D.C.,2-1193.1989
2. Babu Rao M. 1997 Studies on the Ecology and Fish Fauna of an Oligotropic lake Himayatsagar, Hyderabad, Recent Advances in Fresh Water Biology, Vol.II73-97.
3. Biswas ,B.K. and Konar. 2000. Impact of waste disposal on plankton abundance and diversity in the river Ganga at Hathidah. Pollution Research 19(4):633-640.
4. Calbet, A., &Saiz, E. 2005. The ciliate-copepod link in marine ecosystems. Aquatic Microbial Ecology, 38(2), 157-167.
5. Dodson, S. I., & Frey, D. G. (1991). Cladocera and other branchiopod crustaceans. In Ecology and Classification of North American Freshwater Invertebrates (pp. 723-786). Academic Press.
6. Hiware , C.J. and B.V. Jadhav , 1998. Studies on the microzootic fauna of Salim alilake at

Aurangabad, J, Aqua. Biol.13: 18-21.

7. Hiware , C.J. and B.V. Jadhav 2001, Biological studies of Manjara River near Kalam Dist Osmanabad, J, Aqua. Biol.16: 11-13
8. Hutchinson, G. E. 1961. The paradox of the plankton. The American Naturalist, 95(882), 137-145.
9. Jaya Devi. 1985. Ecological studies of limnoplankton of three freshwater bodies of Hyderabad thesis of Osmania University , Hyderabad.
10. Lampert, W., & Sommer, U. 2007. Limnoecology: The Ecology of Lakes and Streams (2nd ed.). Oxford University Press.
11. Narasimha Rao, P.B.Jaya . 2001.Limnological investigation and diversity of plankton in sewage fed fish culture pond at Nambur near Guntur. J, Aqua. Biol.16: 18-20.
12. Reynolds, C. S. (2006). Ecology of Phytoplankton. Cambridge University Press.
13. Sarwar, S.G. and A. Praveen. 1995 Community structure and population density of zooplankton in two interconnecte3d lakes of Srinagar, India. Pollution Res.15:35-38.

STUDY ON PREVALENCE OF THE CESTODE PARASITES OF FRESHWATER FISH, *MASTACEMBELUS ARMATUS* FROM NASIK DISTRICT, (M.S.), INDIA

Gaikwad R. B.
Department of Zoology, MGV's MSG College, Malegaon Dist. Nashik

Bhandare R. Y.
Department of Zoology, MGV's Arts, Science and Commerce College, Surgana, District Nashik

Abstract

The present study deals with the survey of two Piscean cestode parasites viz. Senga sp. and Lytocestus sp.collected from the intestine of Mastacemelus armatus at different collection sites of Nasik district (M.S.) India during June, 2016 to May, 2017. The high incidence of infection of these species Senga sp. and Lytocestus sp. were recorded in summer season(75.00 %, & 65.00 % respectively) followed by winter season (45.83 %, &50.00 %respectively) whereas Infection was low in monsoon season (22.72%, & 31.81 % respectively).The results of present study clearly indicate that environmental factors, quality and quantity of water effect on the seasonality of parasitic infection.

Keywords Cestode Parasites, Mastacembelus armatus, Senga sp. Lytocestus sp., Nasik.

Introduction

Fishes are important components of ecosystem from ecological, medicinal, nutritional and economical point of view. These fishes are parasitized by helminth parasites, which reduce the food value of host fish. Study of helminth parasites is therefore an important needs of nowdays. Helminth infections are very common in people who consume improperly cooked meat, unhygienic habits and poor sanitation. These helminthic infection leads to various disorders. No work has been done on cestodes parasites of freshwater fishes in Nasik district, M.S. India.

Population investigation is necessary to provide data for the prediction of integrated methods to achieve the regulation of numbers of harmful parasites (Kennedy, 1974) Notable contribution made by Dobson (1994), Dogiel et al. (1935, 1958), Anderson (1976). Results of present study, therefore, are expected to be helpful for future research on piscian cestodes in this region. Keeping in view, the importance of these Piscean cestode parasites, present study was undertaken to investigate and evaluate prevalence of cestode parasites of freshwater fish *Mastacembelus armatus* and distribution of two Piscean cestodes of genus *Senga sp. and Lytocestus sp.* collected during annual cycle June, 2016 to May, 2017.

Materials and Methods

Study area

Study was conducted in different collection sites of Nasik district.

In the present study, intestines of *Mastacembelus armatus* were examined for cestode infection during the period of June, 2016 to May, 2017 from Nasik Region, M. S. India. Cestodes were collected, preserved in 4% formalin, dehydrated in various alcoholic grades, stained with Borax carmine, cleared in xylene and mounted in D.P.X. These Cestodes were identified by standard methods (Yamaguti, S.). On taxonomic observations the Cestodes are identified as *Senga sp. and Lytocestus sp.* The data obtained throughout year were recorded; processed to derive biological parameter incidence for study of seasonal variation by using following formula.

$$\text{The \% incidence of infection} = \frac{\text{Infected Host} \times 100}{\text{Total Host Examined}}$$

Results and Discussion

Results of the present study on prevalence of fish cestodes are presented in Table 01 and 02. Two species of cestode parasites was recorded as *Senga sp. and Lytocestus sp.* It was found that, high incidence of infection of all these species were recorded in summer (75.00% &65.00%) followed by winter (45.83% &50.00%) whereas infection was low in monsoon season (22.72% & 31.81%). According to the Kennedy (1971, 1975 and 1977) and Rodhe (1993) the temp, humidity and rainfall, feeding habits of host, availability of infective host and parasite maturation, such factors are responsible for influencing the parasitic infections.

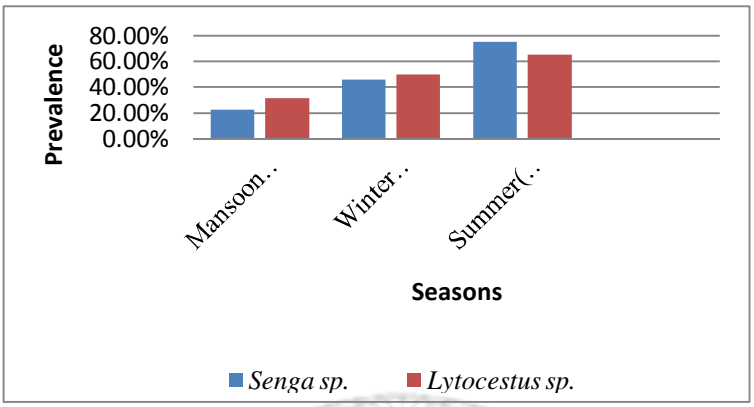
Table 1: Prevalence of *Senga sp.* of *Mastacembelus armatus* during June, 2016 to May, 2017.

Seasons	No. of Host Examined	No. of Host Infected	No. of Parasites Collected	Incidence
Mansoon(June 2016-Sept. 2016)	22	05	07	22.72
Winter (Oct. 2016-Jan. 2017)	24	11	15	45.83
Summer (Feb. 2017-May 2017)	20	15	19	75

Table 2: Prevalence of *Lytocestus sp.* of *Mastacembelus armatus* during June, 2016 to May, 2017.

Seasons	No. of Host Examined	No. of Host Infected	No. of Parasites Collected	Incidence
Mansoon (June 2016-Sept. 2016)	22	07	08	31.81
Winter (Oct. 2016-Jan. 2017)	24	12	14	50
Summer (Feb. 2017-May 2017)	20	13	17	65

Graph showing prevalence of *Senga sp*. and *Lytocestus sp*. from *Mastacembelus armatus*.



Conclusion

In the present research study, recorded data shows high incidence of infections of these two cestode species were recorded in summer (Feb., 2017-May, 2017) followed by winter (Oct., 2016-Jan., 2016) where as low in monsoon season (June, 2016 –Sept., 2016). The results of present study clearly indicated that the environmental factors, quality and quantity of water effect on the seasonality of parasitic infection.

References

R. M. Anderson, (1976): Seasonal variation in the population dynamics of *Caryophyllaeus laticeps* Parasitology, 72, 281-305.

Dobson A. P, Roberts M. G., (1994): The population dynamic of parasitic Helminth Communities. Parasitology 1994; 102(Suppl.):507-510.

V. A. Dogiel, (1958): Parasitology of fishes, Leningrad Unuversity Press olive & boyd, Edinburgh & London.

V. A.Dogiel, (1935): The present tasks of ecological Parasitology. Tud Patergof Biol Inst; 15:2.

B.V. Jadhav, D.B. Bhure, Population dynamics of Helminth parasites in freshwarer fishes from Marathwada region (M. S.)India. Flora and Fauna an Inernational Research Journal 2006; 12(2):143-148.

S. Yamaguti, (1961) Systema Helminthum Vol. 11 Cestodes of Vertebrates. Interscience Publication INC, New York & London.

Kennedy CR, Hine DM. 1970. Population biology of the cestode Proteocephalus torulisus (Bat Sch) in dace Leucisus leucisus (L) of the river Avon. Jr Fish Biol1970; 1(3):209- 219.

Kennedy CR., 1974. A checklist of British and Irish freshwater fish parasites with notes on their distribution. J fish Biol 1974; 6(5):613-644.

Kennedy CR., 1976. Ecological aspects of Parasitology. North Holland publishing company Amsterdam 10x ford, 1976.

STUDIES ON AQUATIC INSECTS FROM GHARNIDAM, GHARNI. DIST-LATUR (M.S.) INDIA.

R. R. Jadhav

Shivneri Mahavidyalaya Shirur Anantpal, Dist – Latur. (M. S.) India.

Abstract

The present investigation deals with the studies on Diversity of Aquatic insectsfrom Gharnidam, Gharni Dist-Latur (M.S.) India.The work was carriedout during the year 2019.The diversity of water insects was studied. The species were found during the study period.

Introduction

Gharnidam is having water total capacity 22, 460KM3 (5,390cumi) is situated in length 956m(3,136ft) and height is 15.24m(50ft). Gharni dam is very well water resource not only for agricultural use but also for aquaculture practices.

Aquatic insects are important group of organisms in freshwater bodies and play an important role in the processing and cycling of nut nets.According to Larrnberti Moore (1948), Aquatic insects belongs to several feeding groups i.e.filter feeders, deposit collectors scrapers, shredders and Predators.Aquatic insectors are bioindicators of water pollution Wieder Holm, 1948: Metcaffe (1989).These insects form a link between the nutritional cycles of aquatic ecosystem. The workers like Sinha and Sinha, Kaushik et al (1990), Pandey et al (1992), Singh (1993).Arvind Kumar (1994), works on seasonal water quality of fresh water bodies.

Material and methods

The Aquatic insects were collected by insect collecting net made upofnyl on cloth having meshsize 40-80cm^2. The samples were cleaned and preserved in5
percent formalin.The identification of insects was done with the help of standard literature of Tonapi (1959), Michael (1973), Macan (1959).

Results and discussions

The following aquatic insect are found in Gharnidam they are as follows in followin table no I

Table No. I List of Aquatic Insects C.L.

Sr. No	Nameof the Aquatic(Insect)	
	Common Name	Scientific Name
1	BackSwimmer	Anisop
2	Dragon flynymph	-
3	Water Stick Insect	Ranatra

4	WaterBoatman	Corixa
5	Olivebettle	Cybister
6	Waterbug	WaterScorpion

Near about seven species of Aquatic insects were found during the period of investigation i.e. Back swimmers, Dragon fly nymph, water stick insect, water boatman, olive beetle, water bug etc.These3 are the harmful to the fishes.

Acknowledgement

Author is thankful to the local fishermen at dam site for providing insect catching facilities.

REFERENCES

- Kumar, Arvind, (1994): Role of Species diversity of aquatic insect in the assessment of population in wetlands of Santhal pargans (Bihar) J. Environment and Pollution, 1 (3and4) : 117-120, J. Freshwater Biol., 8:241- 246.
- Lamberti,G.A.and Moore,J.W.(1984): Aquatic in sectas primary consumers In the ecology of Aquatic insects (Eds). V. H. Resh. and D.M. Rosen berg. Prager Publishers, New York, P 164-195.
- Mocan, T.T. (1959): A Guide to Freshwater Invertebrate animals Lengman Group Ltd. London.
- MicholR.G.(1973):Aguide to fresh water organisms J. Maduroi Univ.Suppl; 7:23-26.
- Singh, U.N(1993): Studies on food and feeding behavior of selected aquatic insect in artificial habitat J. Comp. Physico Ecol., 18(2) : 69-71.
- Sinha, K.K. and Sinha, D.K. (1999): Seasonal variation in biomass and production of aquatic insect in Derlict pond an dmanaged fishpond of Munger Bihar Env. And Ecol. 8(4):1231-1234.
- Tonapi G.T. (1959): Studies on aquatic insect founa of poona (Aquatic – Heteroptera) Proc. Nat Insti Sci. India 25(6): 321-332.
- Trivedy, R. K .Goel P. K. and Trisal C. L. (1987): Practicalmethodsin Ecology and environmental science environ media Publication, Karad.
- Weiderholm, T. (1984): Responses of aquatic insects to environmental pollution in the ecology of aquatic Insects, (Eds) V.H. Resh. and D.M. Rosenbery.Prager Publishers New York P 508-557.

MICROBES THE KEY PLAYERS IN ENVIRONMENTCONSERVATION: A REVIEW

Sunita Ramlu Mukkawar
Dept. of Microbiology, B. Raghunath ACS College,
Parbhani, Maharashtra

Abstract:

Microbesplace a great value on environment, if utilised wisely. They definitely contribute to the sustainable development. Environmental protection has the significant importance intoday's life of mankind. Scientists have been researching for technologies naturally available for enhancement of agriculture and management of huge agricultural waste. This paper aims to focus the role of indigenous microbes in conservation of environment through their versatile applications in agriculture such as bio-fertilizers, bio-pesticides, bio-herbicides, bio-insecticides etc.

Key words: Indigenous microorganisms, bio-fertilizers, bio-pesticides, bio-herbicides, bio-insecticides, sustainable agriculture.

Introduction:

Microbes are omnipresent and often found in huge numbers. Everyone can think of microbes on the far side of the world in which we all live (i.e., from earth to space). Microbes are an inherent part of biogeochemical cycles occurring in nature and are important for our ailment. A large number of these microbes are helpful to plants, animals and humans in somehow or other but some are harmful too. "Microbes give rise to more than half of the oxygen we breathe". It is not an overemphasis to state that life began with microbes and all life is emerged from microbes. Life without higher organisms is possible, but living without microbes is not. The microbiota of an ecosystem has the proficiency to keep its surrounding environment clean, presuming thattoo much pollutants are not burdened. Indigenous Microorganisms acts as Environment preservers. Environmental conservation has the principal importance in the contemporary life of mankind. Scientists have been researching for technologies naturally accessible for improvement of agriculture and the management of huge amount of agricultural waste generated. Indigenous Microorganisms (IMO's)-based technology is one such best technology which is mostly used in the eastern part of the world especially used for the extraction of minerals, improvement of agriculture and waste management. Native microorganisms are a group of inborn microbial consortium that colonize the soil and the surfaces of all living things.These microbes have the prospect in biodegradation, bioleaching, bio composting, nitrogen fixation, improving soil fertility and in the production of plant growth hormones. In the absence of these microbes, the life will be miserable

and downcast on this lively planet for the viability of human race. Hence environmental conservation and protection through then ative microbes in a natural way to turn out the useless waste into best bio resources is the prime concern of this review.

Applications of microbes in Agriculture: Micro-organisms occurring in the soil enhance agricultural productivity. Humans use naturally existing organisms to develop bio fertilizers and bio-pesticides to support plant growth and control of weeds, pests, and plant diseases. Micro-organisms which are inhabitants of the soil literally help plants to absorb more nutrients. Plants and these amiable microbes are involved in "nutrient recycling". The microbes help the plant to "uptake" essential nutrients. In exchange, plants make a donation of their waste by-products for the microbes to availas food. Scientists use these amiable microbes to develop biofertilizers.

Bio-fertilizers: Phosphate and nitrogen are most essential nutrients for the growth of plants. These compounds present naturally in the environment but plants are unable to extract them. Phosphate plays an important role in crop stress tolerance, maturity, quality and directly or indirectly, in nitrogen fixation. A fungus, *Penicillium bilaii* helps to unbolt phosphate from the soil. It produces an organic acid, which dissolves the insoluble phosphatepresent in the soil so that the roots can absorb it. Bio-fertilizers prepared from this organism are used either by coating seeds with the fungus as inoculation, or by putting it directly into the soil. *Rhizobium,* the symbiotic nitrogen fixing bacteriais also used to prepare biofertilizers. This bacterium lives inside the plant's roots in cell collections termed as nodules. The nodules are working as biological factories which take nitrogen from the air and convert it into an organic form that the plant can use. This phenomenon is already existing in nature. By propagating such population of the friendly bacteria from its roots in the buck quantity and applying it with the legume can prove a traditional nitrogen fertilizer. Bio-fertilizers prominently help plantsto use all of the nutrients available in the soil and air, thus assisting farmers to reduce the amount of chemical fertilizers they use. This helps to conserve the environment for the coming generations.

Bio -Pesticides: Some microorganisms occurring in the soil are all not that much helpful to plants. These pathogens cause disease or damage the plant. Scientists developed biological "tools," where these disease-causing microbes are utilised to control weeds and pests without harming the environment.

Bio-Herbicides: Weeds are the mess for farmers. They not only compete with crops for water, nutrients, sunlight, and space but also hide insect and disease pests; clog irrigation and drainage systems; undermine crop quality; and deposit weed seeds into crop harvests. Bio-herbicides controls weeds without environmental damage. The microbes possess invasive genes that can attack the defence genes of the weeds, thereby killing it. The benefit of using bio-herbicides is that it can survive in the environment long enough for the next growing season where there will be more weeds to infect. It is cost effective than chemical pesticides thus could essentially reduce

farming expenses.Again, it is not harmful to the environment as compared to conventional herbicides and will not affect non-target organisms.

Bio-insecticides: Advent of Biotechnology developing alternative controls to synthetic insecticides to fight against insect pests. Indigenous micro-organisms of soil will be the major key players to control insects. Formulas for coatings on the seed (inoculants) which carry these beneficial organisms can be developed to protect the plant during the critical seedling stage. Bio-insecticides do not persist long in the environment and have shorter shelf lives; they are effective in small quantities, safer to humans and animals compared to synthetic insecticides; they are veryspecific, often affecting only a single species of insect and have a very specific mode of action; slow in action and the timing of their application is relatively critical.

Microbes in Sustainable Agriculture: Presently, increasing attention has been paid to the development of sustainable agriculture in which the high productivities of plants and animals are guaranteedby using their natural adaptive potentials, with a minimal disturbance of the environment. The most promising strategy to attain this goal is to replace hazardous agrochemicals (mineral fertilizers, pesticides) with eco-friendly preparations of symbiotic microbes, which could improve the nutrition of crops and livestock, as well as their protection from biotic (pathogens, pests) and abiotic (including pollution and climatic change) stresses. The broad application of microbes in viable agriculture is due to the genetic dependency of plants on the helpful functions provided by symbiotic cohabitants. The agronomic potential of plant–microbial symbioses proceed from the analysis of their ecological impacts, which have been best studied for N fixation. This analysis has been based on 'applied co-evolutionary research', addressing the ecological and molecular mechanisms for mutual adaptation and parallel speciation of plant and microbial partners. For plant–fungal interactions, it has been seen that the host genotype represents the governing factor in the biogeographic distribution of mycobionts. An increased knowledge of microbe-based symbioses in plants could provide promising ways of developing sustainable agriculture so as to make sure human and animal food production with a minimal annoyance to the environment. The effective management of symbiotic microbial communities is possible using molecular approaches based on the continuity of microbial pools which are circulating regularly among soil- plant- and animal-provided niches in natural and agricultural ecosystems. Analysis of this circulation could entitlethe formation of highly productive microbe-based sustainable agricultural system, while addressing the ecological and genetic consequences of the broad application of microbes in agricultural practice. Conclusion With recent advances in biology, materials, computing, and engineering, environmental biotechnologists now are able to utilize microbial consortia for a wealth of services to society. These consists of detoxification of contaminated water, wastewater, sludge, sediment, or soil; capturing renewable energy from biomass; sensing contaminants or pathogens; and protecting the public from dangerous exposure to

pathogens. The uniqueness of microorganisms and their often-uncertain nature and biosynthetic capabilities, given a specific set of environmental and cultural conditions, have made them likely for solving particularly difficult problems in life sciences and other fields as well. The accountable use of microorganisms to get economic, social and environmental benefits is essentially attractive and determines a spectacular evolution of research from traditional technologies to modern techniques to provide a well-organized way to protect our environment.

References:

1. Arnold A.E., Mamit L.J., Gehring C.A., Bidartondo M.I., Callahan H. (2010) Interwoven branches of the plant and fungal trees of life. New Phytologist, 185, 874–878.
2. Franche C., Lindstrom K., Elmerich C. (2009) Nitrogen-fixing bacteria associated with leguminous and non-leguminous plants. Plant and Soil, 321, 35–59.
3. Kupriyanov A.A., Semenov A.M., Van Bruggen A.H.C. (2010) Transition of entheropathogenic and saprotrophic bacteria in the niche cycle: animals– excrement–soil–plants–animals. Biology Bulletin, 3, 263–267.
4. Noble A.D., Ruaysoongnern S. (2010) The nature of sustainable agriculture. In Soil Microbiology and Sustainable Crop Production, pp. 1–25. Eds R.Dixon and E.Tilston. Berlin, Heidelberg, Germany: Springer Science and Business Media B.V
5. Peay K.G., Bidartondo M.I., Arnold A.E. (2010) Not every fungus is everywhere: scaling to the biogeography of fungal–plant interactions across roots, shoots and ecosystems. New Phytologist, 185, 878–882.
6. Yang J., Kloepper J.W., Ryu C.M. (2009) Rhizosphere bacteria help plants tolerate abiotic stress. Trends in Plant Science, 14, 1–4

DIVERSITY OF OSTRACODS IN AMBONA LAKE

Dr . V. V. Bhoyar
Late Babasaheb Deshmukh Gorthekar Mahavidyalaya Umri,
Dist Nanded

Absract:

This paper represents the freshwater ostracods of Ambona Lake.The development of these species is influenced by physical–chemical properties of waters such as salinity, temperature, pH, dissolved oxygen.These species show high sensitivity to pollution like agricultural runoff, industrial pollution etc. Although they occupy only about 1 % of the Earth's surface, both lotic and lentic environments. Bioindicators are organisms whose presence and absence or conditions provides information about the environmental quality. Every organism has different environmental requirements for being healthy and reproduction. The presence or absence of healthy populations of organisms within their habitats is a sign of unique environmental characteristics. The advantage of using bioindicators over chemical and physical tests to evaluate water quality.

Keywords: ostracods, zooplanktons, physicochemical parameter

Introduction:

Life is originated in the water and first organisms were also aquatic. Therefore, water was the important external as well as internal medium for organisms. Water covers about 71% of the earth of which more than 95% exists in gigantic oceans. The most amount of freshwater on earth is very small (covers 2.53% of the earth's water) compared to sea water. Of the Earth's fresh water 69.9% is locked away in the ice, 30.1% is in underground and 0.26% is composed to rivers and lakes. In particular lakes are founded to occupy less than 0.007% of world's fresh water (UNEP, 1994). The presence of a mixed population of healthy aquatic insects or fish usually indicates the water quality has been good for some time. Water quality affects the abundance, species composition, stability, productivity and physiological condition of populations of aquatic organisms. Therefore, the nature and health of aquatic communities is an expression of the quality of the water, Biological methods used for assessing the water quality includes the collection, counting and identification of the aquatic organisms. (APHA, 1985).

Methodology:

Planktons were collected using plankton net made up of bolting silk cloth. (Trivedy and Goel, 1986). Filtered samples were fixed and preserved by adding Lugol's Iodine for phytoplankton and 4% formalin for the zooplanktons.

Results and Discussions:

2018-19	Mean	SD	SE	CV	Range	Max.	Min.
Rotifera	10.250	2.261	0.653	4.533		14.000	6.000
Copepoda	7.333	2.425	0.700	3.025		10.000	2.000
Cladocera	6.000	2.954	0.853	2.031		12.000	1.000
Ostracoda	6.083	2.778	0.802	2.189		10.000	2.000
Total Zoo Plankton	29.667	6.867	1.982	4.320		40.000	19.000

The population of ostracodes was recorded least in number. The monthly population of ostracoda varied from 02 to 08 /mL at Station A, 01 to 09 /mL at Station B, 01 to 09 /mL at Station C and 02 to 09 /mL at Station D in the year 2018-19. The minimum population of ostracodes was found in the month of June and July while the maximum population was found in the month of November. Ostracoda occupied fourth position of zooplankton and represented very low population compared to other groups. The maximum abundance of ostracods in monsoon season may be due to low temp. The densities of various zooplankton thus, in the order Rotifera>Copepoda> Cladocera > Ostracoda. The results indicates that the maximum number of zooplankton occurred during winter season than summer and monsoon season which also reported by Abdus, Saboor &Altaff (1995) and Kumar S. & Datta S.P.S. (1994). less number of zooplankton might be due to fewer nutrients in the reservoir which result in less productivity. The less no. of zooplanktons may be due variation in other physico-chemical factors. The water temperature and the availability of food might be affecting the ostracoda population. The decrease in the population during winter and summer May be due to the feeding of fishes. Tonapi (1980) has reported higher population of ostracodas during monsoon due to the abundance of fine detritus during the period of year.

Referances

A.P.H.A. (1998) : Standard methods of examination of water and waste water 20th Edition, APHA, AWWA and N.W. Washington D.C.

Abdus Saboor and K. Altaff (1995): Qualitative and Quantitative analysis of population of tropical pond during summer and rainy season. Ecobiol 7(4) 269 – 275.

Kumar S. & Datta S.P.S. (1994): Population Dynamics of Cladocera in a subtropical pond. Jamu. India. J.Environ. 41th, 56 (1), Pg. 19 – 23.

Tonapi G.T. (1980*) :* Freshwater animals of India, An ecological approach XVIII Oxford and IBH Publ. New Delhi: Pg. 341.

PASTORAL SCENARIO IN WILLIAM WORDSWORTH'S 'THE SOLITARY REAPER'

Dr. Shrinivas S. Gadhe
Associate Professor, Dept. of English
Late Babasaheb Deshmukh Gorthekar Mahavidyalaya.Umri. Nanded. (M.S.)

Abstract

The present paper is focused on pastoral scenarios in William words worth 'The Solitary Reaper' William Wordsworth (1710-1850) was one of the greatest nature and romantic poet in English literature. He has got some beautiful themes on which he has been written a number of pastoral poems which has related the nature. The idea of the poem came not from an experience of Wordsworth but from a sentence is an account of visit to Scotland written by a friend. The poet asked the readers to look at the single or lonely, highland girl who was reaping corn and is singing to her, in the field. He asked the reader to stop at the spot and listen to the song of the girl or to go away without preparing any sound (gently pass). The researcher want to understand the meaning of the song of the girl, but there was anybody beside him or no one was able to told him the meaning the sings? In the poem the girls was singing while the protagonist was watching her. The present topic pastoral picture of the poem is outstanding and vivid things the researcher has been pointed out from the poem. In the poem, there was almost no detail, and yet it produces a deep though in our mind, and this deep think in turn gave rise in our hearts some indefinable but deep emotional and a secret feeling that finds advent. In the poem, the researcher has been tried to find out, of how the poet displayed man and nature in perfect has many with each other. In words worth's treatment of the events the reapers song became meaningful of a secret harmony between human being and Nature or environment.

Words : Prelude, Scenario, Pastoral, Reaper, Environment, Nature, Harmony, Lake, Mountain, Melancholy, Delicious, Protagonist, Solitary.

Introduction

William Wordsworth (1710-1850) was one of the greatest nature and romantic poet in English literature. He was known for the Prelude, a Romantic epic poem, Lyrical Ballads and deep love for beautiful nature. He has famous for his literary work lyrical Ballads. The present paper is focused on pastoral scenarios in William words worth 'The Solitary Reaper'. In 1803, the poet had undertaken a tour over Scotland, where he was much impressed by the pastoral scenarios there from this tour, he has got some beautiful themes on which he has been written a number of pastoral poems which has related the nature. The pastoral description of the current poem had suggested by some of the scenarios he witnessed there in Scotland. However, Alan Gardiner has written about

the origin of 'The solitary Reaper'. The idea of the poem came not from an experience of Wordsworth but from a sentence is an account of visit to Scotland written by a friend, Thomas Wilkinson said, "Passed a female who was reaping alone, she sang in Erse as she bended over her sickle, the sweetest human voice I ever heard, her strains were tingly melancholy, and felt delicious, long after they were heard no more! (Gardiner page no. 63)

Pastoral Scenario

In this paper, the research has focused on the pastoral elegy through. The poem 'Solitary Reaper'. The poet asked the readers to look at the single or lonely, highland girl who was reaping corn and is singing to her, in the field. He asked the reader to stop at the spot and listen to the song of the girl or to go away without preparing any sound (gently pass), Thus that the girl was not disturbed or distracted. The girl was cutting the stalks of corn (grain) and was binding the stalks in sheave while she was singing a sorrow song, and deep and wide valley, was being pale with the song. The poet said, "Behold her, single in the field, you solitary highland lass" (The solitary Reaper poem line no. 1 to 2). The researcher want to understand the meaning of the song of the girl, but there was anybody beside him or no one was able to told him the meaning the sings? In the poem the girls was singing while the protagonist was watching her. She was walking in the field bending over sickle. The protagonist was listened to her song, keeping himself silent, still and then he mounted up the hill. The protagonist says." 'As I Mounted up the hill, The music in my heart I bore, Long after it was heard no more'(The poem solitary Reaper) The present topic pastoral picture of the poem is outstanding and vivid things the researcher has been pointed out from the poem. In the poem, there was almost no detail, and yet it produces a deep though in our mind, and this deep think in turn gave rise in our hearts some indefinable but deep emotional and a secret feeling that finds advent.

On the other hand, some observed has found 'The solitary Reaper' as yet another example, beside so many others of William words worth's poem. In the poem, the researcher has been tried to find out, of how the poet displayed man and nature in perfect has many with each other. The girl, who has been reaping and singing, was not in any path distributed by the cadence of her song. Again the valley was silent, secret and meditative and it is such an ambience in which one wants homesickness, like the singing girl in the valley does, as is clear from her song that told of, "old, unhappy, far off things/And battle long ago" The great poet Gardiner auto about the poem," In words worth's treatment of the events the reapers song became meaningful of a secret harmony between human being and Nature or environment.

Conclusion

To sum up the researcher has formed out the intimate relationship of Environment and literature. 'The Solitary Reaper' and Resolution and Independence in the feeling that in both the poems the writer described his reaction to a solitary person in the knee of nature. So, the poem is

amazingly common, while its effective bearing was remarkably acute and thus it can surely be taken to be one of William Words worth representative poems. The talkative and melodious song of the girl overpowers the total of the valley. The researcher has been focused on the effect of nature and environment on language through the beautiful pastoral poem 'The solitary Reaper'. The atmosphere of the poem is whole pastoral such as valley, mountain, streams, various trees, flowers and natural climate. Here the poem. 'The solitary Reaper mystical feeling of the relation between life, death and natural objects effects of the poem it's still strength.

Work Cited

Sarker, Sunilkumar. A Companion to William Wordsworth Volume-I, New Delhi: Atlantic Publication.UK: Penguin Publication,2003..

Iyenger. K.R. Srinivasa. *Indian Writing in English.* New Delhi: Sterling Publication Pvt.Ltd.1985.

William,Wordsworth. *100 Selected Poems William Wordsworth Collectable Edition.* London: Finger Print Publication, 2002.

http://en.wikipedia.org

http://www.e.library.com

http://www.google.com

http://www.shodhaganga

EFFECT OF ENVIRONMENT IN GLOBAL SPORTS: A STUDY

Dr. Baliram Hanmantrao Ingle
Director of Sports
L.B.D.G.College Umri

Abstract

The present paper is focused on Effect of Environment in Global Sports and environment is closely related. One has a significant impact on the other. Sports and sporting events can have a negative impact on the environment as sports depend on clean water and a conducive environment for safe and enjoyable play. The field of sports is not only about advancement in competitive sports; So to develop an overall healthy lifestyle. In the current era of stress, our living conditions have changed a lot. As the pace of life on the whole has increased, even though we can walk or cycle for our daily activities, we depend on automobiles. Games, sports, physical exertion and movement are things that are done naturally, we have to take time out of our daily life and decide. Therefore, we cannot get the physical health required for sports only by playing that sport. We have to rethink our lifestyle for the health of the entire society. Environmental conditions can have a significant impact on sports. Sportsmen and women can be affected by environmental conditions such as air and water quality and exposure to harmful substances. Climate change and loss of natural space may make participation in sports more difficult. It has a Sports and Environment Commission to advise on environment-related policy and has developed an Agenda 21 for Sport and Environment to encourage members to play an active role in sustainable development.

Keywords : Environment, Sports, Health , globalization

Introduction

In our education system, we are giving too much emphasis on studies and accordingly giving very little time and importance to games and sports. Due to technological progress, many of the tasks in our daily life are done by this machine. Sports fulfill important functions in our society and are indeed indispensable. It offers opportunities for physical activity in a world where physical activity is increasingly declining; It promotes good health and well-being (when pursued in moderation); And it provides a means of social interaction and ample opportunity for profound experiences. However, at the same time, sports can cause damage to nature and the environment. Losses may be direct as a result of the pursuit of sporting activities or the construction and operation of necessary infrastructure, or they may be caused by indirect factors such as the use of cars to travel to and from sporting activities. The causes of conflict between sport and environment are inherent in sport itself and are the result of deep-rooted social changes; they can only be understood from this perspective. Since the 1970s, higher incomes, more leisure, greater mobility

and increasing personalization have underpinned major and continuing changes in sport. These changes include: An increase in the number of people pursuing sports activities. Sports facilities affect the environment in various ways. In describing and evaluating them, a distinction can be made between indoor and outdoor facilities. Compared to sports halls, outdoor facilities require more space. How this space is managed is important from an environmental perspective. The tendency of today's youth is to get rich quickly by working hard, earning money and being able to buy many comforts. Lack of exercise and hectic lifestyle have also increased mental imbalances and diseases like depression. Due to lack of space, schools do not have playgrounds. It is not financially possible for everyone to choose sports as a career by getting proficient in sports. A healthy life is a balance between physical and mental health. And that's why we have to do physical exercise, walking, running, playing, yoga, pranayama, meditation by deliberately taking time and planning. A healthy life can start from where we live. We can make changes from our homes. Housing culture has led to confinement of houses. Homes should be located where there is plenty of sunlight. At least one ground should be constructed within walking distance from the house in every village and town. At least 100 boys and girls living in the nearby area can play on this ground every evening. They will be taught different games according to their age group. Coaches will teach sports like kho-kho, kabaddi, high jump, long jump in gymnastics that are easy to learn and can be played by anyone. The ground should have walking facilities on the inner side and should have benches to sit inside. Senior citizens can use this ground in the morning and evening to walk and meet other peers. On one side there should be toys for children under 6 years of age. On one side of the same grounds will be an exercise school (gym) where minimum equipment for exercise and sports can be provided. Exercise training, laughter club, yoga classes can be conducted here. The ground will provide a rightful place to exercise, walk, meet people in your neighborhood, chat at a leisurely evening. Sports competitions will be organized in each area with the help of local public representatives. All citizens living in that area will participate in this competition. This will cover sports like cricket, football, kho kho, kabaddi, running, swimming, gymnastics. The purpose of holding such competitions is that people will play the game as much as possible so that automatically steps towards leading a healthy life. The ultimate goal is for every person to play at least one sport or walk or run regularly. To increase the capacity of the boys and girls who will lose physical strength due to age, measures should be taken through nutritional food and medical treatment. Easy to learn sports like Kho-Kho, Kabaddi and Athletics should be taught in primary schools.

Effect of Environment in Global Sports

The researcher has been pointed out the Effect of Environment in Global Sports through this paper the following things are applicable for topic. Those who want to make their career in sports can get a nurturing environment from this academy. The sports for which this academy is

famous will be propagated in other districts through this academy. District level competitions will be conducted by this academy. There should be at least one best academy for cricket, football, tennis, table tennis, swimming. Apart from this, the best sports academies should also be established for carrom, badminton, mallakhamba, kho-kho, kabaddi, skating, athletics. It is the academy of these sports that will send its players to the national and international level. Many sports activities are organized at school level, district level, state level, national level and international level for maximum participation of children and youth of the country. Indian athletes have not reached a standard in international sports but it looks like they will do so soon as the norms and scope of sports have increased in recent years. The government of the country has promoted it extensively in schools and colleges. Indian sportspersons are showing their full participation in every national and international level of sports and are constantly striving to achieve quality and standards. In the last Olympic Games, Indian athletes won only a few gold medals, but they played with full courage and enthusiasm. India is leading in many sports like hockey, wrestling, cricket etc. The best players are selected from students who have performed well at the school or state level. Now the scenario of sports in India has changed and it has become a good field to gain popularity and success. It is not separate from education and if one plays good sports then one does not need good education or if one does well in education one should not join sports. Education and sports are two sides of the same coin - success. Students are forced to play sports in schools; Teachers and parents should encourage children to play sports at their level for their growth and development as well as to shape the future of the country. Sports nourish our lives in many ways. It teaches us discipline and persistence to achieve goals. It keeps us fit both physically and mentally and thus socially, emotionally, mentally and intellectually. It is a great way to have fun and contemplate the mind in such a polluted and stressful environment where everyone is ready to stress and create problems for others. It increases concentration levels and memory and fills the mind with positive thoughts. Sports development is a national priority, sports development falls under the purview of states up to the state level; Physical education is an integral part of organizational learning efforts as a tool for health, fitness, performance and excellence. Public relations is the process by which an organization, organization or business projects its image to the public through media other than the media and receives feedback from the external environment about the effectiveness of its policies and programs. Since publicity is a major tool, public relations is concerned with all the impressions people get rather than just the impressions they get through various media. Public relations also refers to the whole group of relations of various physical education personnel. including teachers, parents, students as well as officers and administrators. People interact within themselves and with the environment. In this process, the relationship between the two develops naturally, consciously or unconsciously. Public relations helps to strengthen bonds between two or more individuals with a sense of cooperation,

understanding and adjustment. The good work going on in the organization should be known to the outside world. Conversely, faculty and administrators should know how people evaluate the programs and activities conducted in the institution. This organization-environment interactive dialogue is very important to enhance the image of the institution/organization and improve the quality of programs and practices. The basic purpose of public relations is to correct mistakes and wrongs and destroy opposing feelings and attitudes. People are unaware of the role of physical education in education; They value education more than sports. For them, physical activity is a pastime, a waste of free-time. Parents are so seriously concerned about their children's standing in science, commerce or literature, not in school education. Their mentality does not allow them to look physically beyond the horizon towards physical education. Lack of public relations i.e. free flow of information between organization and public is responsible for this condition. Public relations includes both performance and communication used to build beneficial relationships with people. Using the term public relations to define certain functional roles such as public city, press-gentry, and organizational advertising is a misnomer. Those roles, however important, do not include full public relations. In reality, these functional roles are merely public relations tools, not equivalents. Therefore, public relations should be seen as a multifaceted activity that underpins efforts to improve the quality of an organization's performance and project it in the right perspective.

If environmental aspects are to be considered regularly and not only sporadically, operators of sports facilities need systematic environmental management. Essential elements of such management include the appointment of an environmental officer, mandatory consideration of environmental aspects in making any decision, introduction of eco-controlling, as well as regular environmental training courses for employees. By saving precious resources, sports facilities designed and operated on an environmentally sound basis can contribute greatly to sustainable development and thus to the implementation of Agenda 21. This applies particularly to climate protection by reducing CO2 emissions. As with other social sub-systems, mobility requirements have grown significantly in sports over the years. The reasons are manifold. The game has not only developed in general. Another important development is the ever-increasing diversity of new types of games that frequently creates a greater range of different facilities. Reaching new places (sports facilities or country areas) requires more mobility. This is especially true in the case of activities that take place in nature and in rural areas, where the number of people has been drawing for many years. Because most people have to travel to pursue their short or long distance activities, sports and tourism are today more closely connected than ever before. Nowadays, sport is often the main reason for travel (eg skiing holidays) and other activities offered are at least one important factor in the choice of travel destination, even in built-up areas, people must be more mobile to pursue sports activities. This is mainly due to geographical segregation of work. Study and rest. In

particular, the fact that sports and leisure centers are increasingly being built on the periphery of cities (in green suburbs) has increased the distance to sports activities. However, sports are not only found in sports facilities, but especially in cities, also in public areas (parks, street play areas, cycle paths, etc.) due to other priorities in urban planning in the past decades, now there is a lack of such options, opportunities for physical activity. Sports and games have been pushed out of city life due to new roads and roads, land sealing etc. and this has led to people looking beyond the cities for the recreational facilities they need. Sustainable development of sports requires not only avoiding unnecessary traffic, but also provision and use of means of transport that are least harmful to the environment. The goal and reality are still far away. Mobility in sports today is primarily an "auto mobility sport" thus contributing heavily to traffic volume and thus climate change. With respect to sports activities played in the country. The two main reasons for the high level of private car use are equipment and transport and the difficulties of using public transport, especially the limited possibility of carrying sports equipment, the lack of transfer facilities between stations and actual destinations, and the insufficient number of bus and train routes given the demand for leisure time.

Future trends of environmental programs

As the sports sector becomes more engaged in reducing its environmental impact, new opportunities will be presented for increased revenue and business ventures. Professional sports teams may look to new environmentally friendly companies as a new avenue for sponsorship. Existing sponsors who want to promote their eco-friendly products can easily access the sport market. New sporting goods can be tied to organizations offering environmentally friendly aspects or other responsible business practices combined to gain market share. Sports organizations improve and create new facilities in an environmentally friendly manner to attract new customers and members. As aspects of environmental management become more prevalent and visible in sport, various environmental behaviors should encourage fans and spectators to act in a more environmentally responsible manner. Smith and Westerbeek (2006) described sport as carrying a “green virus” that can promote social change in populations. The power of sport can inspire more people outside of sports to incorporate environmentally friendly practices into their own lives. Sports have been promoted as a platform for providing social.

Conclusion

To sum up Sports will always be connected to the environment. As environmental problems deepen and emerge, sport must respond to a long history of environmental impacts through immediate action. The evolution of environmental sociology requires a new way of thinking about people's health. Its impact on the environment and human interaction. In response to the degradation of the natural environment, sport has responded to maintain a close relationship with nature. Changes in interactions occur between humans and sports organizations, including the

environment at all levels of sport, from international competitions such as the Olympics to individual participation in sports. The future of sports communication will be determined by the collective efforts of the environment in and outside of sport, but measures must be taken to ensure the sustainability of humankind and the viability of the environment to support sport. Sports can make its own significant contribution to bring about a model of sustainable development and thus implement Agenda 21 in all countries. To achieve this, sports organizations and others involved in sports should discuss the model in depth. These concepts require adaptation of the game type to the characteristics of the natural area. Vulnerable areas should be kept free from harmful activities and sports activities should be moved to less vulnerable but still attractive landscapes. Legal measures should be taken only if necessary for the purpose of protection and if other mechanisms do not work.

REFERENCES

1. Roget's II: The New Thesaurus, Third Edition. Houghton Mifflin Harcourt, 1995, 111. Sarah K. Fields – 2014
2. CA 7661: Department of the Environment, Sport and Territories, Central Office, National Archives of Australia, retrieved 20 November 2013
3. Jain Rachna. Physical Education (A Handbook of Teacher). New Delhi ; Sports publication , 2006
4. Dr. Rokade Pandharinath R.Physical Education And Sports Science Encyclopadia Vol.3. New Delhi. Sports Publication 2013

ENVIRONMENTAL CONVERSES IN ANITA DESAI'S CRY, THE PEACOCK

Dr. Sandeep G. Ladkar
Associate Professor & Head, Department of English,
Late Babasaheb Deshmukh Gorthekar ACS Mahavidyalaya, Umri Dist. Nanded

Abstract:

The Present paper focusses the impact of nature on human psyche. The male dominated society treats woman as mere puppets dancing on the tunes of males. Woman is treated as marginalized and often struggled a lot to find her place in the family. Anita Desai is one of the most outstanding writers in Indian English Literature. Her novels predominantly contain the theme like alienation, lack of communication, inner struggle, man-woman relationship, marital discourses, woman's psyche etc. Most of her novels moves around the theme about the status of woman in contemporary Indian society. The novel, Cry, the Peacock is an illustration of the female psyche who wanders in isolation and craves for fulfilment of sensual pleasures. The novelist portrays the central character in novel, Maya as the symbol of natural instinct/object peacock who craves for attraction from male peacock. Maya is enthusiastic and sensitive young lady married to a man named Gautam. After marriage, her expectation from her husband is like every Indian woman about providing ample time to have interaction with her husband. She realized that Gautam is not a caring husband for her. Maya feels herself isolated from her surroundings as there was no one to interact with her. This situation resulted into Maya's depressed mental state.

Keywords: Ecology, Equality, Exploitation, Marginalized, Womanism, Agony for love etc.

Introduction:

The contemporary Indian English literature is an outcome of the mindset of the society. The literary writers like Kamala Markandeya, Shashi Deshpande, Kamala Das, Rohinton Mistry, Jhumpa Lahiri focused their literary writing on the female psyche and social issues. Most of the dominant themes lies in their novels are about the place of woman in the society. Woman has to struggle a lot to get her independence, her own rights in the patriarchal society. The modern world is known as the age of Information and Technology. Human have researched in innovative ways in many fields. No matter how much progress human have achieved, nature has proven to be superior to humans. Nature has proven its superiority over human beings a many a times in the form of natural calamities like earthquake, flood, drought etc. There is such an inextricable relationship between nature and man. It is almost impossible to separate man from the influence of nature. Humans are neglecting the nature through their methods of research. There is a huge damage to the

nature and it is necessary for the humans to pay attention to it in time.

Maya, the central character in Anita Desai's*Cry, the Peacock*,is the daughter of well-known advocate of the city, Lucknow situated in Uttar Pradesh. She was a very loving daughter of her father who wants to spend most of his valuable time in the company of his daughter.Maya says to herself: "No one, no one else, loves me as my father does".(Desai, 1980, p. 47) Maya's father Rai Sahib wants to give all the luxuries of the life to his daughter to make her life more comfortable. Maya had lost her mother at a very young age since her father has given her the love of mother and father. As the story moves forward, a character named Gautam who was a friend of Maya's father was introduced to Maya. Gautam was very loyal and honest friend of Maya's father. At first, Maya do not like the nature of Gautam because sometimes Gautam behaves like a very rude fellow.

The decision taken by her father proved futile as Maya and Gautam are of different nature but because Gautam was a good friend to her father, she does not want to disobey her father's decision. Rai Saheb has decided to have a marriage of Gautam and Maya. Maya agrees with her father's decision of marriage but later on found that she had made a huge mistake. Gautam is very much older in compare to Maya and failed to fulfill sexual desires of Maya. Maya realized that Gautam is not paying much attention to her. Before marriage she was very happy and independent woman. Maya feels marriage as a big curse to her life which violates her pleasure. Maya finds isolated as there was no one to interact with her. She becomes in the company of Gautam's mother and sister as both of them visited to her house once in a week or sometimes once in a month.

Maya feels happy in the company of her pet dog named Toto as she spends her leisure time with the dog. Maya's sufferings expanded after the death of her pet dog Toto. When she revealed this to Gautam, he says he will bring a new pet dog like Toto. Maya becomes lonely and the loneliness gets increased after the days passed. The loneliness of her life resulted into mental depression as she feels that there was no one to take care of her and the fulfillment of her expectations as of every married woman. Gautam did not fulfil her sexual pleasures in the bed and it turns her life remained more miserable. As a husband, Gautam never cared about Maya's emotions and never gave her ample time and efforts to remove her from depressed mental state.

The novelist, Anita Desai introduced the role of a peacock in the monsoon season as the peacock dances to attract the male peacock. Maya's situation is the same like the peacock as she cries towards her life partner to fulfill all her desires. The peacock symbolizes natural instinct but used as symbol in the novel to give detailed analysis of the central character's mental state. The novelist believes that Maya's mental state will be understood by any other woman character in the novel. Maya had lost her mother at a very young age. It resulted into Maya's helplessness as there was no one with whom she can share her painful story. She wants someone in her life to care for her and who can love her form the bottom of heart to decrease her agonies of her married life.

Maya, the protagonist in the novel never finds any comfort in her life as her husband stays

away from her company. She decided to take the opinion of an astrologer in this case as the astrologer predicts that someone in her family will die in the coming four years. She becomes very unhappy and tells herself she will be the person like the prediction of the astrologer. The novelist shows the mental state of Maya who wants to get freedom from her husband as She went on the top of the roof with Gautam and pushed him from the corner which resulted in Gautam's death. She gets freedom from such a depressed life with her arrogant husband who is not fit for her as a husband.Before Maya pushes Gautama, she draws his attention to the owl: "Listen, I said, stopping at a sound." "Do you hear that? It's an owl" (Desai, 1980, p. 178).After the death of Gautam, his sister and mother had sent Maya to her father's house. The novel ends with the incident that Maya's father send her to the mental hospital for her mental wellness.

The novelist has very clearly revealed the relationship between human beings and nature. The protagonist in the novel, Maya did not find any solace/happiness in the company of her husband and experiences the life of a peacock who dances to get attracted by the male peacock in the monsoon season. Maya wants to get sexual pleasures from her husband but failed in the attempt to get it in time which resulted her into mental depression. The female peacock symbolizes the condition of Maya who calls her husband to give her pleasures in husband-wife relationship. Gautam symbolizes the nature of man in the male dominated society. He expresses his dominance over his wife as he never provides comfort to his wife. She wants to enjoy her married life with her husband but never gets her desires fulfilled.

Thus, the novel highlights on the status of woman in the contemporary society. Woman is behaved as marginalized in the minds of patriarchal nature. Woman have been kept for only household chores. They have not allowed to express and to share their own experiences of their life. The patriarchal mindset has seen woman as the object of exploitation. The loneliness in the central character's life increases the mental agony of searching a partner who will provide perform the role of a perfect companion for her. She never finds a complete happiness in the company of her husband as her husband is always busy in his work.

Conclusion:

Thus, the novel Cry, the Peacock is an illustration of a woman's voice craving to gain happiness in her married life. Maya, the protagonist in the novel suffers a lot in the novel because of getting married to a man not of her choice but of her father's choice. She never finds her husband as a caring nature. The novelist has shown the catastrophe of marriage about the relationship of Gautam and Maya proved futile. The novel is an illustration of Maya's complicated psyche, symbol of a woman's unfulfilled desires and emotional loneliness. Maya's struggle for freedom and self-expression points out the status of woman's psyche in the contemporary society. Her craving like the female peacock which dances to attract the male peacock clearly illustrates the

cultural discourses of the society. The novelist has shown the role of nature in healing the human sorrow.

Works Cited:

1. Desai, Anita. Cry the Peacock. Delhi: Orient Paperbacks, 2010. Print.
2. Bhatnagar K, Manmohanaad. And M. Rajeshwar. The Novels of Anita Desai: A Critical Study. New Delhi: Bhasker, 2000.Print.
3. Garrard, G. (2012). Ecocriticism. Routledge.
4. Mies, M. & Shiva, V. (2014/1993). Ecofeminism (Foreword, A. Salleh). (2nd Ed.). Zed Books.
5. Myles, Anita. Critical Essays on Literature and environment. New Delhi: Sarup, 2012. Print.
6. Narayanan, V. (2001). Water, Wood, and Wisdom: Ecological Perspectives from the Hindu Traditions. In Special Issue Religion and Ecology: Can the Climate Change? (Eds., tucker, M. E. & Grim, J. A.). Daedalus, 130 (4), 179-206.
7. Prachi Priyanka. Ecofeminist Landscapes in Anita Desai's Cry, The Peacock and Where Shall We Go This Summer. E-Tropic: electronic journal of studies in the Tropics. P. 307-325
8. S. Ragapriya. Eco-Criticism on Anita Desai's Cry the Peacock.Indian Scholar An International Multidisciplinary Research e-Journal 22 Vol. 5 Issue II, December 2018 ISSN 2350-109X. P.22-26.

FUNCTIONALIZED BORAZINE FOR HYDROGEN STORAGE: A DENSITY FUNCTIONAL THEORY APPROACH

Ravinder Konda
Dept. of Physics, Late Babasaheb Deshmukh Gorthekar College, Umri, Nanded-431807.

Amol Sandipan Mandle
Dept. of Physics, Sambhajirao Kendre Mahavidyalaya,, Jalkot, Dist. Latur-413532.

Surve Pratisha Parmeshwar
Dept. of Physics, Nanded Education Society's Science college, Nande, Dist: Nanded-431605.

Abstract

Suitability of alkali and transition functionalized $B_3N_3H_6$ for hydrogen storage has been studied using Density Functional Theory met. We found that C_6H_6Li, C_6H_6Ti and $B_3N_3H_6Li$, $B_3N_3H_6Ti$ can interact with maximum two, four and two, five hydrogen molecules. The H_2 uptake capacity of the C_6H_6Li, C_6H_6Ti and $B_3N_3H_6Li$, $B_3N_3H_6Ti$ complexes is found to be 4.45, 6.01 and 4.40, 7.28, wt % respectively. It is found that in case of Ti doped complex the H_2 adsorption increased after substituting of nitrogen and boran. The uptake capacity has been calculated excluding the weight of hydrogen atoms which are bonded to Boron and Nitrogen. The hydrogen adsorption energies, different structural parameters are obtained for these complexes. The hydrogen adsorption energies obtained are in the range of physisorption and chemisorptions which is essential for a material to be ideal for hydrogen storage. H_2 adsorption on C_6H_6Li and $B_3N_3H_6Li$ complexes is energetically unfavourable at ambient conditions whereas it is favourable on C_6H_6Ti and $B_3N_3H_6Ti$ complexes. The results obtained for functionalized borazine are compared with its organic functionalized Benzene.

Keywords: Hydrogen storage, Density functional theory, Borazine, Quantum chemical method

1. Introduction

Hydrogen is one of the best alternatives to the fossil fuels. Suitable material for storing hydrogen with high uptake capacity is the big obstacle for hydrogen economy to be a reality[1-2]. Materials that can store hydrogen with high gravimetric and volumetric density, exhibit fast hydrogen sorption kinetics and that operate under ambient thermodynamic conditions are essential for practical applications in particular for the transportation sector. Therefore, search for the promising hydrogen storage systems has attracted great attention. Practical hydrogen storage for

vehicular application requires materials with high hydrogen capacity, low desorption temperature and fast adsorption and desorption kinetics. Among the present hydrogen storage options, solid-state storage would satisfy the market requirement [3, 4]. Till date, no reversible materials are currently known that possess all mentioned attributes.

Inorganometallic and organometallic complexes are increasingly important in the hydrogen storage and hydrogen fuel cell sector. Hydrogen storage on several small inorganometallic and organometallic complexes has been tested [5-10]. To improve to storage of hydrogen on the nanostructures, decoration of nanostructures with alkali, alkaline and transition metals has been reported. Recent research has demonstrated that some transition metal (TM) based inorganic materials can store maximum hydrogen. Shevlin et al shown that the transition metal doped borazine can enhance the hydrogen storage capacity [11]. Li et al suggested borazine decorated with alkali, alkaline and transition metal doped complexes for hydrogen storage [12]. Patak et al studied Mg and Li functionalized boranes for hydrogen storage and shown that Mg and Li can interact with three hydrogen molecules [13]. Pan et al shown that hydrogen binding energy is improved in closo-dicarboranes due to functionalization of metal atoms [14]. Tavhare et al studied hydrogen adsorption on metal functionalized benzene and B-substituted benzene and concluded that B-substituted benzene Hamel et al [16].

In this work we have compared hydrogen adsorption properties of benzene ring and substituted with boran and nitrogen atoms benzene ring using quantum chemical methods. Also, we have studied up take capacity of $B_3N_3H_6Li$ and $B_3N_3H_6Ti$ and compared with the C_6H_6Li and C_6H_6Ti complexes. The Gibbs free energy corrected adsorption energiess are obtained at different temperatures and pressures to know at what temperature and pressure range H_2 adsorption on these complexes is energetically favourable.

2. Computational details

We optimized the geometries of unsubstituted TM doped borazine and TM doped borazine and benzene using Density Functional Theory with PBEPBE method, alongwith 6-311G(d, p) level basis set. We then added H_2 molecules one by one on each of these complexes and optimized the geometries. All calculations were performed using the Gaussian suite of programs [17].

The averaged adsorption energy without zero point energy correction (ΔE) is calculated as

$$\Delta E = \{E[B_3N_3H_6]+(n*E[H_2])-E[B_3N_3H_6\ (nH_2)]\}/n$$

Here E[X] is the total energy of X without zero point energy correction and IOM is $B_3N_3H_6$

The averaged adsorption energy with zero point energy correction (ΔE_{ZPE}) is calculated as

$$\Delta E_{ZPE} = \{E_{ZPE}[B_3N_3H_6]+(n*E_{ZPE}[H_2])-E_{ZPE}[B_3N_3H_6(nH_2)]\}/n,$$

where $E_{ZPE}[X]$ is the total energy of X with zero point energy correction.

The averaged adsorption energy with Gibbs free energy correction (ΔE_G) is calculated as

$$\Delta E_G = \{E_G[B_3N_3H_6]+ (n*E_G[H_2])-E_G[B_3N_3H_6\ (nH_2)]\}/n$$

where $E_G[X]$ stands for the total energy of X with Gibbs free energy correction [18].

1. Results and discussion

Figure 1 shows optimized structures of C_6H_6M(M= Li, Ti) and $B_3N_3H_6M$(M=Li, Ti) complexes at PBEPBE/6-311G (d, p) level of theory. Two and four H_2 molecules are adsorbed on C_6H_6Li and C_6H_6Ti complexes. Two and five H_2 molecules are adsorbed on $B_3N_3H_6Li$ and $B_3N_3H_6Ti$ complexes. The H_2 uptake capacity of the C_6H_6Li, C_6H_6Ti and $B_3N_3H_6Li$, $B_3N_3H_6Ti$ complexes is found to be 4.45, 6.01 and 4.40, 7.28, wt % respectively. When three of the carbon atoms in a benzene ring are substituted by boron and nitrogen atoms, it is found that in case of Ti doped complex the H_2 adsorption increased after substituting of nitrogen and boran.

Table 1 shows comparison of structural parameters for TM doped benzene and borazine before and after adsorption of H_2 molecules. As can be seen from Table 1, the Ring-M atom bond lengths in $C_6H_6Li[C_6H_6Li(2H_2)]$, $C_6H_6Ti[C_6H_6Ti(4H_2)]$ and $B_3N_3H_6Li[B_3N_3H_6Li(2H_2)]$, $B_3N_3H_6Ti[B_3N_3H_6Ti(5H_2)]$ complexes is found to be 2.26[2.24],2.13[2.31] and 2.53[2.53], 2.51[2.72] respectively. After the adsorption of H_2 molecules o n Ti the bond lenths is elogated, no change is observed in the Li doped complexes. The Ring-M bond lengths for H_2 adsorbed nitrogen and boron substituted Ti doped benzene are longer than those for the H_2 adsorbed unsubstituted Ti doped benzene. The bond between nitogen and boron substituted ring to transition metal becomes weak after maximum number of H_2 adsorption. Two H_2 molecules are adsorbed on C_6H_6Li complex at a distance of 1.57 and 2.02 Å respecively. Four H_2 molecules are adsorbed C_6H_6Ti complex at a distance of 1.83, 1.95, 1.83 and 1.96 Å respectively. After substuting the nitrogen and boran one additional hydrogen molecule is asdorbed on Ti where same number of H_2 molecules are adsorbed on Li. Two H_2 molecules are adsobed on $B_3N_3H_6Li$ complex at a distance of 1.90 Å. Five hydrogen molecules are adsorbed on $B_3N_3H_6Ti$ complex in that one hydrogen molecule is disociated.The H_2 molecules are adsorbed at a ditance of 1.99, 1.87, 1.80, 1.87 and 1.74-1.88 Å respectively.

Calculated averaged H_2 adsorption energies without (ΔE), with zero point energy correction (ΔE_{ZPE}) and with Gibbs free energy correction (ΔE_G) at 298.15 K and 1 atm. pressure are presented in Table 2 for maximum H_2 adsorbed complexes. Table 2 shows the H_2 adsorption on C_6H_6Li and $B_3N_3H_6Li$ complexes is energetically unfavourable at ambient conditions whereas it is favourable on C_6H_6Ti and $B_3N_3H_6Ti$ complexes. It can also be seen from Table 2 that the zero point energy correction for adsorption energy is significant and not negligible. The H_2 adsorption energies for Li doped benzene and borazine are lower than that for the Ti doped benzene and borazine systems indicating weak interaction of H_2 molecules with the former than the latter.

Since adsorption of two H_2 molecules on C_6H_6Li and $B_3N_3H_6Li$ complexes is energetically unfavorable at ambient conditions we have calculated H_2 adsorption energies at different temperatures and pressures to know the suitable temperature and pressure range over which H_2

adsorption is energetically favorable. For obtaining H_2 adsorption energies at different temperatures, the pressure is kept constant as 1 atm. For calculating H_2 adsorption energies at different pressures, the temperature is kept constant as 298.15 K. Figure 3 and Figure 4 show temperature and pressure dependent H_2 adsorption energies respectively for $C_6H_6Li(2H_2)$, $C_6H_6Ti(4H_2)$, $B_3N_3H_6Li(2H_2)$ and $B_3N_3H_6Ti(5H_2)$ complexes. Figure 3 shows that H_2 adsorption on C_6H_6Ti and $B_3N_3H_6Ti$ complexes is energetically favourable at all the temperatures considered here at PBEPBE/6-311G (d, p) level of theory. H_2 adsorption on C_6H_6Li and $B_3N_3H_6Li$ is possible below 55 and 125 K respectively.

The stability of H_2 adsorbed complexes is confirmed by the gap between Highest Occupied Molecular Orbital (HOMO) and Lowest Unoccupied Molecular Orbital (LUMO). The HOMO-LUMO gap with successive adsorption of H_2 molecules for all the four complexes is shown in Figure 4. It can be seen that the HOMO-LUMO gap for the $C_6H_6Li(2H_2)$, $C_6H_6Ti(4H_2)$, $B_3N_3H_6Li(2H_2)$ and $B_3N_3H_6Ti(5H_2)$ complexes maximum is found to be 0.73 , 1.32, 1.90 and 2.50eV respectively. It is observed that the substitution of boran and nitrogen can enhance the stability the complexes. Also HOMO-LUMO gap for the H_2 adsorbed complexes is higher than that for the respective isolated organometallic complexes indicating more kinetic stability of former than the latter.

Conclusions

Density functional theory with PBEPBE functionals and 6-311G (d, p) basis set have been used to study the effect of boron and nitrogen substitution on H_2 uptake capacity of Li and Ti decorated benzene. Boron substitution enhances the H_2 uptake capacity of C_6H_6Ti by about 1.27 wt%. Electronic structure calculations show that two, four, two and H_2 molecules get adsorbed on C_6H_6Li,C_6H_6Ti, $B_3N_3H_6Li$ and $B_3N_3H_6Ti$ complex respectively. The H_2 uptake capacity predicted here for the boron substituted TM doped benzene complexes is satisfying the target set by US DOE-2025.

Acknowledgement:

Thanks to the principal Late Babasaheb Deshmukh Gorthekar Arts, Commerce & Science Mahavidyalaya, Umri, Dist. NANDED.

References

1. G. Walker (Ed), Solid state hydrogen storage materials and chemistry, Woodhead, 2008.
2. http://www.eere.energy.gov/hydrogenandfuelcells/mypp.
3. DP. Broom, Hydrogen Storage Materials The Characterisation of Their Storage Properties, Springer, 2011.
4. M. Hirscher (Ed), Handbook of Hydrogen Storage: New Materials for Future Energy Storage, Wiley-VCH, 2010.

5. V. Kalamse, N. Wadnerkar, A. Deshmukh, and A. Chaudhari, VC_3H_3 Organometallic compound: A possible hydrogen storage material, Int J Hydrogen Energy, 2012 37, 5114-21.
6. E. Durgun, S. Ciraci, W. Zhou and T. Yildirim, Transition metal ethylene complexes as High capacity hydrogen storage media, Phys Rev Lett 2006, 97, 226102.
7. W. Zhou, T. Yildirim, E. Durgun and S. Cirac, Hydrogen adsorption properties of metal-ethylene complexes, Phys Rev B, 2007, 76, 085434-9.
8. N. Wadnerkar, V. Kalamse and A. Chaudhari, Higher hydrogen uptake capacity of C_2H_4Ti+ than C_2H_4Ti: a quantum chemical study Theo Chem Accts, 2010, 127, 285-292.
9. A. Chakraborty, S. Giri and PK. Chattaraj, aromaticity in all-metal annular systems : counter-ion effect, Struct Chem, 2011, **22**, 823-37.
10. AB. Phillips, BS. Shivaram, High capacity hydrogen absorption in transition-metal ethylene complexes: consequences of nanoclustering, Nanotechnol, 2009, **20**, 204020.
11. SA. Shevlin, ZX Guo, Transition metal doping enhanced hydrogen in boron nitride systems, Appl Physics Lett 89, 15310-7, 2006.
12. M. Li, J. Li, Q. Sun, Y. Jia, Hydrogen storage in Li and Ti decorated borazine: A first – principles study, Journal of applied physics, 108, 64326, 2010.
13. B. Pathak, K. Pradhan, T. Hussain, R. Ahuja, P. Jena, Functionlized Boranes for Hydrogen storage, Chemphychem, 13, 300-304, 2012.
14. S. Pan, L. Zhao, G. Merino, Improvement in hydrogen binding ability of closo-dicarboranes via functionalization and designing of extended framework, Journal of molecular modeling, 24, 307, 2018.
15. P. Tavhare, V. Kalamse, R. Bhosale and A. Chaudhari, Interaction of molecular hydrogen with alkali and transition metal doped acetylene –complexes. Struct Chem, 2015, 26, 823-829.
16. S. Hamel, M. Cotel, First principal study of the rotational transition of H2 physisorbed over benzene, Jchem phys, 121,12618-12625, 2004.
17. MJ. Frisch, GW. Trucks, HB. Schlegel, GE. Scuseria, M.A. Robb and JR. Cheeseman, et al. *Gaussian 03. Revision E.01. Wallingford CT: Gaussian, Inc*, 2004.
18. HB, Schlegel, SS. Iyengar, X. Li, JM. Millam, GA. Voth and GE. Scuseria, et al, *J Chem Phys*, 2002, **117**, 8694–704.

Table 1: Structural parameters for $C_6H_6M(nH_2)$ and $B_3N_3H_6M(nH_2)$ (n= 0, 1, 2)(M=Li, Ti) complexes obtained at PBEPBE/6-311G(d,p) level with subsequent addition of H_2 molecules. Bond lengths are in Å

Complex	RING-TM (avg)	TM-1H_2	TM-2H_2	TM-3H_2	TM-4H_2	TM-5H_2
C_6H_6Li	2.26	------	------	------	------	------
$C_6H_6Li(2H_2)$	2.24	1.57	2.02	------	------	------
C_6H_6Ti	2.13	------	------	------	------	------
$C_6H_6Ti(4H_2)$	2.31	1.83	1.95	1.83	1.96	------
$B_3N_3H_6Li$	2.53	------	------	------	------	------
$B_3N_3H_6Li(2H_2)$	2.53	1.90	1.90	------	------	------
$B_3N_3H_6Ti$	2.21	------	------	------	------	------
$B_3N_3H_6Ti(5H_2)$	2.72	1.99	1.87	1.80	1.87	1.88-1.74*

*** Indicates dissociation of hydrogen molecule**

Table 2. Calculated averaged H_2 adsorption energy without (ΔE), with zero point energy correction (ΔE_{ZPE}) and with Gibbs free energy correction (ΔE_G) in eV at 298.15K for $C_6H_6M(nH_2)$ and $B_3N_3H_6M(nH_2)$ (n = 0, 1, 2, 3, 4 and 5)(M=Li, Ti) complexes obtained at PBEPBE/6-311G(d, p) level of theory.

Complex	ΔE	ΔE_G	ΔE_{ZPE}
$C_6H_6Li(2H_2)$	0.10	-0.24	0.02
$C_6H_6Ti(4H_2)$	0.60	0.13	0.43
$B_3N_3H_6Li(2H_2)$	0.19	-0.20	0.08
$B_3N_3H_6Ti(5H_2)$	0.73	0.26	0.56

Caption to Figures

Figure 1. Optimized structures of $C_6H_6Li(2H_2)$, $C_6H_6Ti(4H_2)$, $B_3N_3H_6Li(2H_2)$ and $B_3N_3H_6Ti(5H_2)$ at PBEPBE/6-311G(d, p) level of theory.

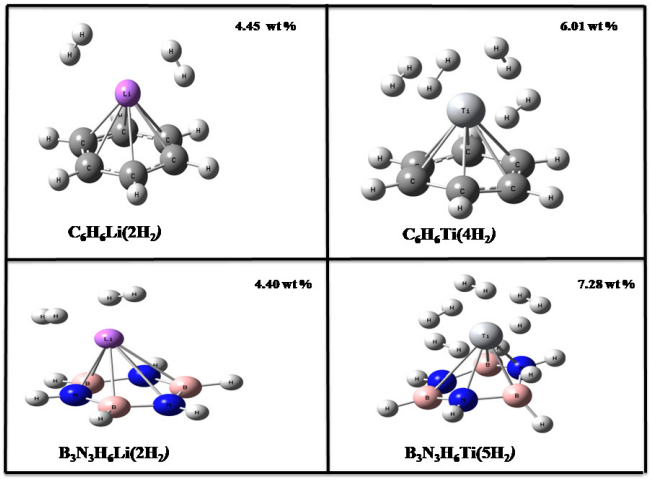


Figure 1

Figure 2. Temperature dependent Gibbs free energy corrected adsorption energies for $C_6H_6Li(2H_2)$, $C_6H_6Ti(4H_2)$, $B_3N_3H_6Li(2H_2)$ and $B_3N_3H_6Ti(5H_2)$ complexes.

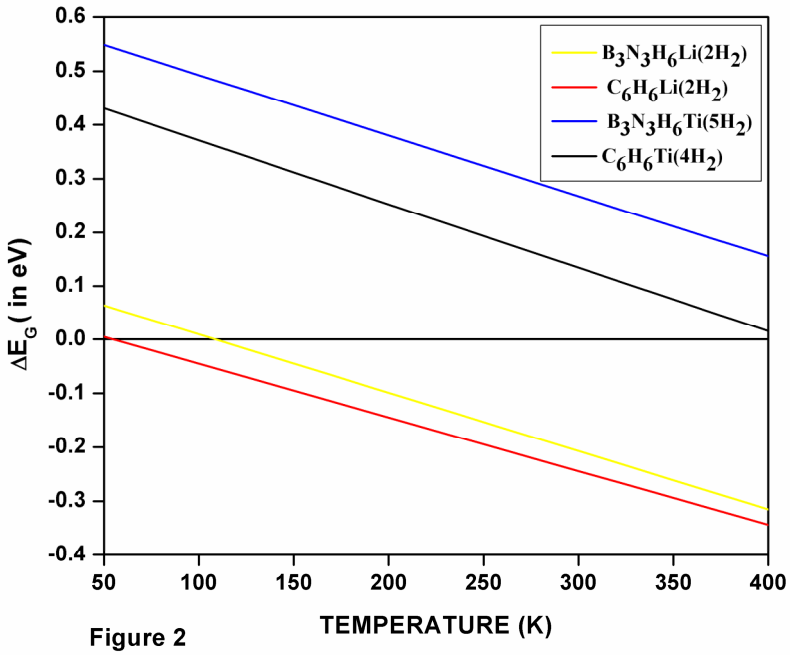


Figure 2

Figure 3-. HOMO-LUMO gap with successive addition of H_2 molecules on C_6H_6Li, C_6H_6Ti, $B_3N_3H_6Li$ and $B_3N_3H_6Ti$ complexes.

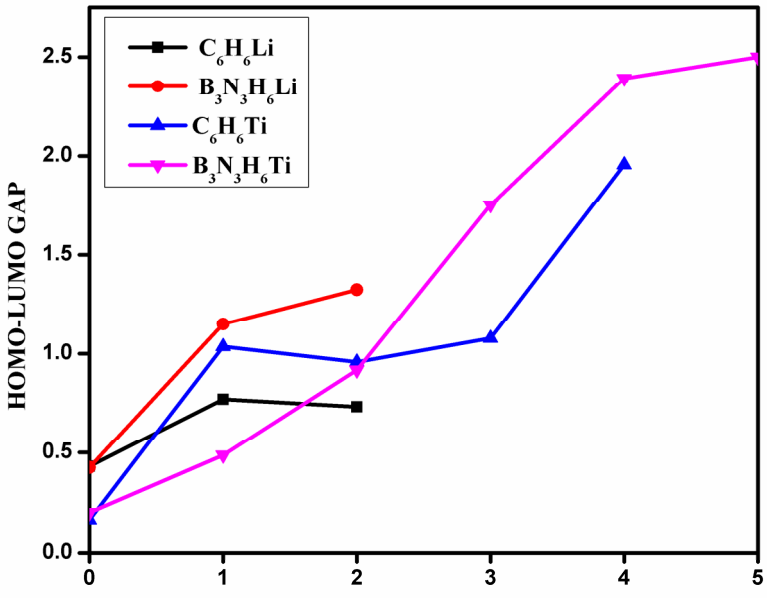


Figure 3

A MATHEMATICAL MODELS AND SIMULATIONS IN ENVIRONMENTAL SYSTEM

B. G. Urekar
Department of Mathematics,
Late Babasaheb Deshmukh Gorthekar ACS Mahavidyalaya,
Umri. Dist- Nanded. (M.S.) India.

Abstract:

Mathematical models and simulations are used to better understand a multitude of ecological issues. Simulations are commonly used to model biogeochemical cycling within aquatic systems. They are used to understand the way that toxic materials move through ecosystems. Currently, a number of environmental problems have a significant impact on the stable economic development of the country. A global problem is the study of air pollution. The solution of such geo-ecological problems should be carried out with the use of modern mathematical apparatus and digital technologies. The paper presents the results of a numerical study of the distribution of gaseous pollutants emitted by motor vehicles in the pedestrian zone of streets.The term Environmental system analysis(ESA) tool is used in the present study to describe methods and tools for theenvironmental assessment of human□made systems using a systems perspective.

Keywords : Mathematical model; simulation, Environment,

1. Introduction:

With the advancement of environmental science, mathematics has become more and more significant in the discipline. Investigating the mathematical laws present in environmental issues is the goal of mathematics research in environmental assessment.The mathematical model isused to study environmental quality problems, we first need to abstract environmental problems intomathematical models in order to study this problem with mathematical tools[1].Simulation and complex control of environmental systemsare two important tools in environmental knowledge about these systems. Therefore, a pure deterministic mathematical simulation and control model gives little chances for a feasible solution[2].The magnitude of the environmental damage caused by humans directly correlates with the significance of modelling such systems.

Environmental management and protection have become a general task on all levels ofsociety. This fact results from global industrialization. After the end of the cold war themilitary budgets were cut. Environmental research caused the military to be eliminated.Advanced environmental technologies, especially information technologies weredeveloped. Sensor technologies have made great progress.The ratio between processors, disk space, and main

memory's price and performance is rapidly decreasing.Most countries have installed sensor networks to monitor the quality of water, air, and the ground.Environmental data is being captured more and more by satellites. Thisenvironmental information technology enables the claimed large and complex data setsto be administered as global systems.

In a description of the course 'Applied Environmental Systems Analysis' (KTH 2006),it is stated that Environmental Systems Analysis treats analysis and assessment of theinteraction between anthropogenic (human□made) systems and their environment(s). It aimsat providing a basis for decisions and planning for a more sustainable behavior at anindividual, organizational and societal level [3].

2. Roles and Stages of Mathematical Modeling

We solve the mathematical problem and interpret its solution in terms of the real-world problem. We will determine the extent to which the solution is valid in the real-world problem.So,the stages involve in mathematical modeling are formulation, solution, interpretation and validation.

2.1 Role of Mathematical Modeling:

Mathematical modeling is essential for scientific research and policy making.The modeling providesan explanation and prediction of the behavior of complex economic and environmentalsystems and helps to obtain new theoretical knowledge about the nature andsociety.The concept of the economic–environmental system assumes the influenceof both the economy and environment on each other and the possibility of humancontrol in the system [4].Mathematical modeling is a method that represent and explains real systems and occurrences using math formulas, descriptions and approaches professionals use mathematical models to examine, analyze and predict behavior and events.

2.2 Stages of Mathematical modelling:

Mathematical modeling and computer simulation are among the most important scientific methods.The advantages of modeling as compared to experimentation are as follows

- Describe and understand the practical aspects of the situation by describing the real-world problem.
- Analysis of structure and functions of the system.
- Goals, controls, restrictions, and regulations.
- Selection of variables, constraints, and objectives.
- Choice of mathematical models and tools.
- Data collection, software choice, model calibration.
- Quantitative support of system management.

3. Complexity of Environmental Systems:

The environment is a classic complex system, composed of multiple interacting agents or variables, which cause emergent behavior. Applying a complex-systems approach to environmental problems such as climate change, landscape evolution, or societal-ecological sustainability can yield valuable insight into risk, potential drivers of change, likely outcomes of perturbation and whether it is even possible to perturbation and it is even possible to manage the system. The complexity of environmental systems is known to all who need to make decisionsin the management of plants, in environmental politics or in the study of global change,etc. (Figure 1).

The complexity is inherent in the nonlinearity of mathematical models, the dynamic and stochastic nature of natural resource problems, the multipurpose, multi-objective attributes of decision problems. The complexity is also caused by the natural coupling and interaction of parts of the biosphere. The complexity depends also on problems of measuring, transmitting, processing and analysing data and the decision-making process under environmental, technical, institutional, economic and political aspects [5].

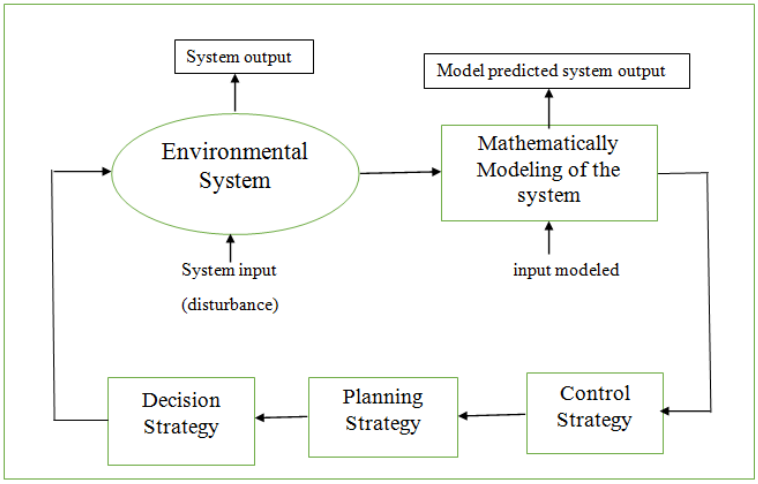


Fig. 1: Modeling and decision making in Environmental system

The systems approach allows for transparency in the interactions among the system's parts.Simulation tools provide numerical insights into the system's behavior. The goal of sustainable development is to treat the biosphere and its parts with consideration for their high complexity.

3.1 Systems Analysis:

Environmental systems analysis (ESA) is a systematic and system-based approach for describing human actions impacting on the natural environment to support decisions and actions aimed at perceived current or future environmental problems.Solving problems and creating

efficiency requires considering the goals of the system with a systems analysis.Systems analysis consists of various steps. Basically, these are described in thefollowing outline:

1. Analyzing the decision problem (goals, decision or control variables).
2. Formulating a model that is adequate in terms of quality and accuracy for the complex problem.(structure, parameter, interconnections).
3. Testing the model (usually by computer simulation) (validity, sensitivity).
4. Solving the decision problems by scenario analysis, optimization (control, decisionstrategies, planning)

The analysis will focus on control, decision, and planning problems on the level of systems or symbolic systems.Modeling on the system level is based on input-output analysis and requires background in mathematics, natural science, and economics.System identification and parameter estimation are the main steps of modeling.

Example: water quality. As an example of the systems approach a control problem of water resources are considered (Figure 2):

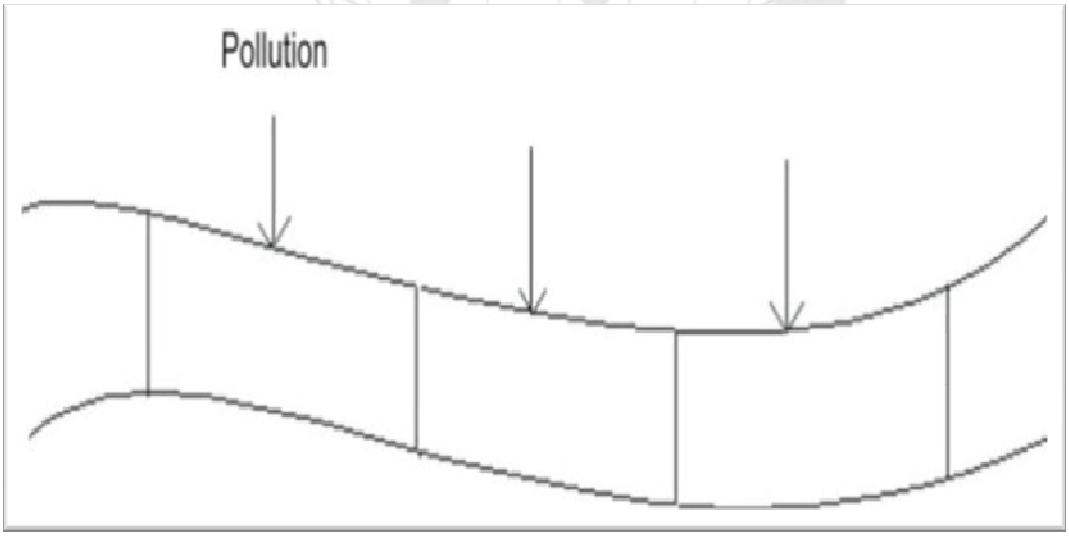


Figure 2: The water quality of a river

- What variable should be measured and controlled?
- How can I control and which variables?

According to the wastewater inflow the river is decomposed into subsystems (Figure 3).

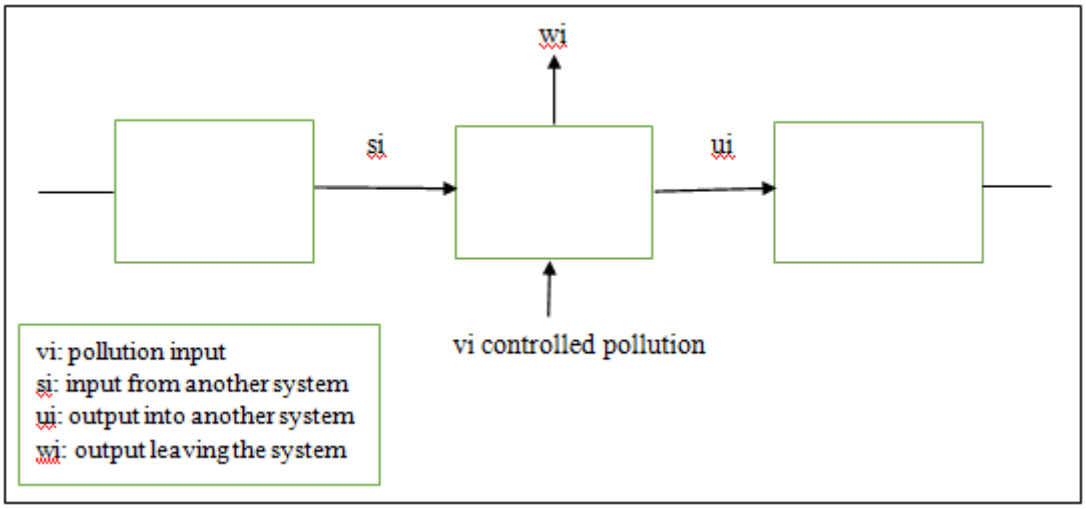


Figure 3: Systems approach description

The pollution is emitted directly into the river or via a wastewater plant. Thecontrol problem for water quality consists in the fulfillment of certain conditions(biological oxygen demand, dissolved oxygen) and optimization of the overall costs,including the costs for the wastewater treatment. The basis of this distributed parameter system is a partial differential equation.The control problem would be considered a multi-criteria optimization problem and solved by hierarchical optimization.

4. Mathematical Modeling and Computer Simulation:

Computer modeling is a complement and extension to traditional analytic forms of mathematical modeling.Modern computers are capable of processing a vast amount of data, including different system evolution choices, in a quick and efficient manner. Therefore, computer simulation has become a common additional or evenprimary modeling technique, especially when analytic solution is challenging orimpossible to obtain. Complex environmental problems, such as weather prediction and global climate change, are frequently modeled interactively by computers.

The main challenge for traditional and computer models is the impossibility of obtaining complete ecological information for modeling purposes.At the same time, the increasing capabilities and reasonable prices of modernComputers lead to the appearance of new modeling concepts entirely based oncomputer information processing, such as the agent-based modeling. The population of these models is made up of millions of computer-simulated agents that act as predicted for living organisms. The possibilities of computer modeling and simulation should not beoverestimated because computer models are also based on original conceptualmodels of specific disciplines. In any scenario, traditional mathematical modelingkeeps its place and relevance in the predictable future, as both a learning anddecision-support tool [6].

4.1 Deterministic and Stochastic Models:

Deterministic models use quantitative characteristics of systems and processes without taking into account their probabilistic nature. Deterministic models are helpful in a variety of realistic situations that have relatively few sources of uncertainty within the system.In modeling practice, deterministic models can deal with the average probabilistic characteristics of processes under study(An average concentration of pollutants instead of the actual concentration. The expected lifetime value of equipment instead of the actual equipment lifetime and so on.) and arebased on the approximation of a real process.Economic and environmental systems belong to complex systems with highdimensionality and uncertainty of the relationships inherent in them.

Stochastic models describe connections among stochastic (probabilistic) characteristicsof systems and processes under study. They are useful for the analysis ofrepetitive processes and usually require a large amount of data to start modeling.Implementation of economic and environmental processes is unique and accompaniedby a shortage of data (especially for large-scale systems). The system analysis process should begin with a thorough examination of all the data that is currently accessible.

4.2 Fuzzy Mathematical Model:

The environment is a complex multi-dimensional system made up of several constituents, each of which can undergo a wide range of qualitative and quantitative changes.Althoughpeople have established some classical mathematical models and methods about the classification,recognition, assessment and prediction of environmental quality, and can also give some quantitativedescription; all of these descriptions are to use the exact mathematical concepts to describe the objectsthat are not exact in nature. Therefore, in environmental science research, it is impossible andunnecessary to be absolutely accurate. In more cases, it is inevitable to use a certain degree of fuzziness [7].

In recent years, fuzzy mathematical modeling has been widely employed as a useful technique to gain a deeper and more comprehensive understanding of a particular medical problem, like cancer. The fuzzy mathematical model makes it possible to use mathematical techniques to study the structure both qualitatively and quantitatively. It also provides a clear tool for analyzing the output of various components and projecting behavior.A fuzzy environment has been developed to address a more precise mathematical tumor growth model, hence reducing the ambiguity of model parameters. Fuzzy differential equations in fuzzy mathematical models represent the entire pattern of tumor growth mechanism.The differential equation is changed into a system of two ordinary differential equations using the idea of the Generalized Hukuhara derivative. The numerical simulation has also been given to support the mathematical tumor growth model in a fuzzy environment [8].

4.3 Mathematical Statistical Model:

The mathematical statistical model is used for environmental quality assessment and its operation is generally completed on the computer by using the existing program. mathematical statistical models and carry out statistical calculation toanalyze and solve environmental problems in addition to qualitative analysis of a large number of dataand monitoring data. So far, all the mathematical statistics methods can be applied to environmentalscience to a certain extent.The process of creating sample data and forecasting the real world using statistical modeling involves using mathematical models and statistical presumptions. A statistical model is a collection of probability distributions on a set of all possible outcomes of an experiment.Statistical modelling refers to the data science process of applying statistical analysis to datasets. A statistical model is a mathematical relationship between one or more random variables and other non-random variables. The application of statistical modeling to raw data helps data scientists approach data analysis in a strategic manner, providing intuitive visualizations that aid in identifying relationships between variables and making predictions.

5. Conclusion:

A System of environmental simulation and control of complex environmental systems has been developed, this technique using both quantitative and qualitative knowledge. The quantitative knowledge is used in the simulation of the controlled environmental processes, while the qualitative knowledge is useful for the knowledge, based control of such systems. The system is useful in the effective simulation and control of actual complex environmental systems and especially for simulation and control of complex ecological systems.

This paper introduces several types of mathematical model commonly used in current environmental quality assessment, these models are mature in application and other assessment models are mostly based on these models.

References:

1. Yunna Han,“Research on Mathematical Model of EnvironmentalAssessment” 2nd International Conference on Air Pollution and Environmental Engineering IOP Conf. Series: Earth and Environmental Science 450 (2020) 012035.
2. Florin S., “Simulation and control of environmental systems using a mathematical-heuristicmodel and algorithm. An application to the Danube Delta system”Environmental Modelling & Software, Vol. 12, Nos 2-3, pp. 211-218, 1997.
3. KTH, 2006. http://www.ima.kth.se/im/3c1387eng/, 2006□02□03. Royal Institute ofTechnology, Stockholm.
4. Zhang Ye, Li Wen, Application of Fuzzy Mathematics in Water Quality Evaluation, Jilin WaterResources, 2006 (5): 10-11.

5. Saaty, T.L., Joyce, M.: Thinking with models: mathematical models in the physical,biological, and social sciences. Pergamon, Oxford (1981).
6. NetaliHritonenko, Yuri Yatsenko "Mathematical modelling in Economics, ecology and the Enviornment" ISSN 1931-6828, ISBN 978-1-4614-9310-5.
7. Rubeena Khaliq, A fuzzy mathematical model for tumor growth pattern using generalized Hukuhara derivative and its numerical analysis, Volume 118, March 2022, 108467.
8. Achim Sydow, ENVIRONMENTAL SYSTEMS – Vol. I - Environmental Systems - Achim Sydow.

पर्यावरण संवर्धन आणि नैसर्गिक आपत्ती व्यवस्थापनरू काळाची गरज

प्रा. डॉ. पांडुरंग पांचाळ
श्री शिवाजी महाविद्यालय,कंधार.
ता. कंधार. जि. नांदेड

प्रस्तावना

पर्यावरण म्हणजे आपल्या सभोवतालची परिस्थिती यामध्ये निसर्गनिर्मित अशा सर्व घटकांचा समावेश होतो. पर्यावरणाचा आणि सामाजिक शास्त्राचा सामाजिक घटना घडामोडीचा अतिशय जवळचा संबंध आहे. याचा थेट परिणाम होताना दिसतो. नैसर्गिक आपत्ती हा निसर्गतील धोक्याचा एक प्रभाव असतो. त्यामुळे वेगवेगळ्या प्रकारची हानी होते, प्रामुख्याने हवामानातील बदलांमुळे नैसर्गिक आपत्ती उद्भवत असते.अशा आपत्ती माणसाला हतबल करून सोडतात.पर्यावरणाचा समतोल बिघडत जात असल्याने दिवसेंदिवस नैसर्गिक आपत्तीला सामोरे जावे लागत आहे. या माध्यमातून पर्यावरण संवर्धन करणे काळाची गरज बनली आहे. आपला भारत देश हा नैसर्गिक आपत्ती येणारा जगातील सर्वात मोठा देश आहे.भारतात दरवर्षी ५०: भागात भूकंप, ३० टक्के भागात दुष्काळ, १० टक्के भागात पूर येत असतो.अशा आपत्तीचा थेट परिणाम सामाजिक जीवनावर होतो. जनजीवन विस्कळीत होते यामुळे एकूणच सामाजिक व्यवस्था कोलमंडताना दिसून येते.

भारतात दिसून येणाऱ्या पर्यावरण असंतुलनामुळे काही निर्माण होणा—या प्रमुख नैसर्गिक आपत्ती भूकंप, दुष्काळ, प्रलय, पूर, सुनामी चक्रीवादळ, गारपीट, ज्वालामुखी, जगतिक तापमान वृद्धी, प्रदूषित हवा, ओझोनचे घटते प्रमाण.

आपत्ती म्हणजे काय ?

आपत्ती म्हणजे ज्या नैसर्गिक संकटामुळे देशाची किंवा समाजाची मोठ्य प्रमाणात आर्थिक जीवित आणि सामाजिक आणि होते.त्या हानीचे देशावर किंवा समाजावर दुरागामी परिणाम होतात असे संकट.

संशोधनाचे उद्देश

१ पर्यावरण व नैसर्गिक आपत्तीचे सामाजिक परिणाम अभ्यासणे.

२ आपत्तीग्रस्तांना मदतीसाठी सामाजिक जबाबदारीचा शोध घेणे.

३ पर्यावरणाच्या दृष्टीने नैसर्गिक आपत्ती व्यवस्थापन समजून घेणे.

संशोधन पद्धती

प्रस्तुत शोधनिबंधासाठी दुय्यम साधनाचा वापर करण्यात आला आहे. या संशोधनासाठी विश्लेषणात्मक संशोधन पद्धतीचा उपयोग केला आहे. यामध्ये दुय्यम माहिती साठी संदर्भग्रंथ,मासिके, शोधनिबंध, साप्ताहिक वर्तमानपत्र,इत्यादीचा वापर केला आहे.

नैसर्गिक आपत्तीचे परिणाम

१ असुरक्षितता

नैसर्गिक आपत्तीमुळे विविध पातळीवर समायोजन करावे लागत असल्यामुळे आपत्तीग्रस्त लोकांमध्ये असुरक्षितता अशी भावना निर्माण होते.

२ कुटुंब विस्कळीत होणे.

नैसर्गिक आपत्ती ही कुटुंब व्यवस्थांवर मोठा आघात निर्माण करते. आपत्ती कोसळल्यानंतर पुष्कळदा कुटुंबातील काही सदस्य हे शहराच्या ठिकाणी किंवा जमेल त्या ठिकाणी स्थलांतरित होतात, त्यामुळे कुटुंब हे विस्कळीत होताना दिसून येतात.

३ संपूर्ण वस्ती नष्ट होणे.

नैसर्गिक आपत्तीमधील पूर भूकंप यासारख्या आपत्तीमुळे समूह वस्ती नष्ट होणे म्हणजेच एकत्र असलेली लोकसमूह विस्कळीत होते.त्याचा परिणाम संपूर्ण त्या जमातीच्या लोकसंख्या कमी होण्यावर होतो. तसेच त्या जमातीच्या एकूण विकासावरच प्रतिकूल परिणाम होतो.

४ भविष्याची चिंता.

आपत्तीमुळे लोकांचे जीवन विस्कळीत होते. यामध्ये कौटुंबिक, आर्थिक, सामाजिक, शैक्षणिक मनुष्याने यामुळे पीडितांमध्ये भविष्याची चिंता ग्रासलेली दिसते. यामध्ये अगदी मूलभूत गरजा कशा भागवायच्या इथपासून भविष्याची चिंता निर्माण होते. असे विविध परिणाम आपत्ती घडल्यामुळे निर्माण होतात.

नैसर्गिक आपत्ती व्यवस्थापन

येणाऱ्या विविध आपत्ती ह्या नैसर्गिक वातावरणामुळे व असंतुलन निर्माण झाल्यामुळे येतात.या आपत्तींना आपण मुळातून नष्ट करू शकत नाही परंतु आपत्ती बाबत पूर्व नियोजन आणि व्यवस्थापन करणे गरजेचे आहे.

१ सदोष बांधकाम रचना.

खाजगी किंवा सार्वजनिक बांधकाम, घर, निवास, कार्यालय हे बिल्डर कडून बांधून घेतले जाते.परंतु ती स्वत:च्या फायद्यासाठी कमी वेळात कमकुवत बांधकाम करतात. यामुळेच

भूकंपा सारख्या आपत्तीत बांधकाम टिकत नाही.हजारो लोकांचा बळी जातो. म्हणून बांधकाम रचना ही निर्दोष असावे व भविष्यातील सुरक्षिततेच्या दृष्टीने मजबूत असावे.

२ पर्यावरण संरक्षण व संवर्धन.

नैसर्गिक आपत्ती ही पर्यावरणातील असमतोल निर्माण झाले की दिसून येतो. अतिवृष्टी, पूर, घरपोडी,दुष्काळ यासारख्या आपत्ती येतात. यासाठी पूर्व नियोजन आणि व्यवस्थापन म्हणून वृक्ष लागवड,प्रदूषण मुक्त व्यवस्था, प्लास्टिक बंदी यासारख्या व्यवस्था करणे अत्यंत आवश्यक आहे.

३ आपत्ती बाबत लोकांना शिक्षित करणे.

निसर्गातील हवामानाचे अंदाजानुसार आपत्ती प्रवण भागात लोकांना वारंवार निर्माण होणाऱ्या आपत्ती बाबतीत माहिती देऊन व प्रशिक्षण देऊन सुरक्षितता बाळगली पाहिजे. अशा आपत्तीबाबत आवश्यक ती काळजी घेण्याकरिता त्याच्या परिणामाची बाजू सर्वसामान्य लोकांना समजावणे गरजेचे असते.

४. पर्यावरण विभाग.

नैसर्गिक आपत्ती रोखण्यासाठी पर्यावरणाचे संतुलन महत्त्वाचे असते.आंतरराष्ट्रीय व भारतातील पर्यावरण विभागांनी एकमेकांशी समन्वय साधून पर्यावरणाचा समतोल बिघडणार नाही व पर्यावरण संतुलन कायम ठेवण्यासाठी प्रयत्न करावा. पर्यावरण संतुलनाबाबत जनतेस जागृती निर्माण करावी या प्रयत्नामुळे नैसर्गिक आपत्तीची तीव्रता कमी करण्यात यश मिळेल.

नैसर्गिक आपत्ती व्यवस्थापन कार्यात शासनाच्या प्रत्येक विभागाची जबाबदारी महत्वाची आहे. यासोबतच लोकांना प्रबोधन करून जाणीव जागृतीतून पर्यावरण संवर्धनात लोकसहभाग वाढवणे अंत्यत महत्वाचे आहे.

५ विविध कार्यक्रमातून लोकांना जाणीव जागृती करणे.

आपत्ती व्यवस्थापन व पूर्व नियोजन याबाबत विशिष्ट कार्यक्रमाचे आयोजन करून लोकांना जागृती निर्माण करणे आवश्यक आहे. यामध्ये पथनाटय व्याख्यान, प्रशिक्षण,कार्यशाळा,प्रबोधन यासारख्या कार्यक्रमातून नैसर्गिक आपत्ती व्यवस्थापन बाबत जागृती केली पाहिजे.

सारांश.

पर्यावरण असंतुलन यामुळेच देशात मागील दहा वर्षापासून नैसर्गिक आपत्तींना जास्तीचा सामना करावा लागत आहे. अनेक ठिकाणी अतिवृष्टी,महापूर,सुनामी ,चक्रीवादळ,

यासारख्या आपत्तींना सर्वसामान्य लोक व शासनयंत्रणा यांना सामोरे जावे लागले आहे. पर्यावरणाचे असंतुलन ,वाढते प्रदूषण, निसर्गातील फेरबदल, मानवाचा निसर्गावर आघात, प्रचंड वृक्षतोड हे सर्व घटक नैसर्गिक आपत्तींना जबाबदार आहेत. म्हणून पर्यावरणाचे संतुलन चांगले ठेवण्यासाठी व संवर्धन करण्यासाठी लोकसहभाग वाढवणे गरजेचे आहे. यामुळे नैसर्गिक आपत्तीचे समाजावर होणारे परिणाम टाळता येऊ शकतात.यासोबत नैसर्गिक आपत्ती बाबत व्यवस्थापन कार्य देखील सर्व स्तरांपर्यंत पोहोचवले पाहिजे, जेणेकरून आपत्तीत होणारी हानी यात घट करता येईल.यामुळे नैसर्गिक आपत्तींना टाळण्यासाठी यश मिळू शकेल.येणाऱ्या काळात पर्यावरण संवर्धन हा अत्यंत गरजेचा विषय असणार आहे. देशातील उद्योजक, कारखानदार, व्यवसायीक, विविध सामाजिक संस्था, शासकीय संस्था, शैक्षणिक,संशोधन संस्था या पर्यावरण संवर्धन कार्यात आग्रही असणे हीच काळाची गरज आहे.

संदर्भसूची

१ अतुल पवारयआपत्ती व्यवस्थापन आणि लोकसहभाग, महान्यूज
२ सुनीता वीरा करंडे (२०१५)य आपत्ती व्यवस्थापनय जीवनयज्ञ प्रकाशन.
३ प्रदीप आगलावेय भारतीय समाज प्रश्न आणि परिवर्तन, साईनाथ प्रकाशन,नागपूर .
४ प्रवीण सप्तर्षय भूगोल व नैसर्गिक आपत्ती ,विधा प्रकाशन पुणे .
५ जितेंद्र अहिररावय पर्यावरण विज्ञान, निराली प्रकाशन औरंगाबाद.
६ पी.पी मराठे, (२०१८) य कृतीबद्ध आपत्ती व्यवस्थापनय डायमंड पब्लिकेशन.

पर्यावरण आणि मानवी आरोग्य एक चिंतन

प्रा. डॉ. चंद्रकांत गजेवाड
कला वाणिज्य विज्ञान महाविद्यालय, शंकरनगर.
ता. बिलोली जि.नांदेड

प्रस्तावना

पर्यावरणाची मानवी जीवनात अनन्यसाधारण महत्त्व आहे. पर्यावरणात काही मूलभूत घटक आहेत हवा, पाणी, भूमी, वृक्ष, ध्वनी नैसर्गिक वातावरणातील ऋतुमानानुसार होत असलेले बदल ही सर्व घटक समाविष्ट आहेत. याचा अनुकूल परिणाम हा मानवी जीवनाला सशक्त करण्यासाठी उपयुक्त आहेत,परंतु जर सभोवतालच्या वातावरणातील प्रतिकूल परिस्थितीजन्य बदल झाले तर याचा घातक परिणाम मानवी जीवनावर झाल्याशिवाय राहत नाही. विज्ञान आणि तंत्रज्ञान या क्षेत्रात होत असलेली प्रचंड प्रगती लक्षात घेता याचा पर्यावरणावर खूप मोठा प्रतिकूल परिणाम होताना दिसून येत आहेत. मानवी जीवनासाठी पर्यावरणात्मक घटकांची मोलाची भूमिका असते तथापि मानवाच्या हव्यासापोटी जंगलतोड, वाढते प्रदूषण, हवामान बदल, वाढती कारखानदारी, टाकाऊ पदार्थ रासायनिक युक्त पाणी यामुळे पर्यावरणाच्या ऱ्हास होत आहे.केवळ मानवाच्याच नव्हे तर पृथ्वीवरील सर्व सजीवांच्या अस्तित्वासाठी पर्यावरणाचे रक्षण करणे गरजेचे आहे.

मनुष्याला सर्वांगीण विकास करावयाचा असेल तर त्यांनी पर्यावरणाचा समतोल राखणे गरजेचे आहे. याच पर्यावरणावर आरोग्य आणि मानवी जीवन अवलंबून असते. पर्यावरणाच्या असंतुलनात लोकसंख्या वाढ,वृक्षतोड, औद्योगिकीकरण, वाढते शहरीकरण या कारणामुळे पर्यावरणाची संतुलन बिघडत चालले आहे हे तितकेच खरे आहे. मानवी जीवनाचा मूलभूत घटकांमध्ये शुद्ध अन्न, पाणी, हवा आणि आरोग्य समावेश याचा समावेश होतो. या घटकाच्या शुद्धतेवर मानवी आरोग्य अवलंबून आहे. सभोवतालचे पर्यावरण तेथील मानवी जीवनाची समृद्धी दाखवून देत असतो.साधारणपणे विचार केला तर भारतीय ऋतू चक्राप्रमाणे निसर्गात होत चाललेलें बदल यावर चिंतन करणे गरजेचे आहे. पर्यावरणावर मानवी अतिक्रमण वाढत जात आहे. याचाच परिणाम सध्याच्या मानवी जीवनावर होत असताना दिसून येतो, म्हणूनच पर्यावरणाची मानवी जीवनात अत्यंत मोलाचे योगदान आहे.

संशोधनाची उद्दिष्टे

१ पर्यावरण आणि मानवी आरोग्य याचा समतोल अभ्यासणे २मानवी आरोग्यासाठी पर्यावरणाचे महत्त्व विचारात घेणे ३पर्यावरणचे मानवी आरोग्यावरील परिणामाचा अभ्यास करणे

गृहीतके.

१ मानवी आरोग्यात पर्यावरणाचे महत्त्व आहे

२ मानवी आरोग्यावर पर्यावरणाचे परिणाम होतात

संशोधन पद्धती

प्रस्तुत संशोधन कार्यासाठी संशोधन पद्धतीतील विश्लेषणात्मक संशोधन पद्धतीचा उपयोग करण्यात आला आहे.यामध्ये दुय्यम माहिती या स्त्रोताचा उपयोग केला आहे. यामध्ये वृत्तपत्रे, मासिके, शोधनिबंध, संदर्भग्रंथ इत्यादी घटकांचा वापर करण्यात आला आहे.

पर्यावरण आणि मानवी आरोग्याचा समतोल

मानवी आरोग्य ही पर्यावरणावर अवलंबून असते. जसे पर्यावरण असेल तसे मानवी आरोग्य असते

निसर्गातील हवा,पाणी, जमीन, भूभाग यानुसार पर्यावरणातील बदल होत असतात. भौगोलिक पर्यावरणातील घटक हे त्या ठिकाणच्या मानवी आरोग्याची क्षमता निश्चित करत असतात पर्यावरण आणि मानवी आरोग्याच्या विशिष्ट असा समतोल आहे. मनुष्य शुद्ध पर्यावरणात सुदृढ व निरोगी असतो तर प्रदूषित पर्यावरणामुळे तो आजारी होतो. लोकसंख्या वाढ, वृक्षतोड, औद्योगिकरण,नागरिकरण या मनुष्याने निसर्गाची संतुलन बिघडवली हे तितकेच सत्य आहे. जसे पर्यावरण असेल त्यानुसार तेथील मानवी आरोग्य राहत असते म्हणूनच मानवी आरोग्यात पर्यावरणाचे महत्त्व राहिले आहे.

मानवी आरोग्यासाठी पर्यावरणाचे महत्त्व

पर्यावरण आणि मानवी आरोग्य हे एकमेकांशी संबंधित आहेत. मानवी आरोग्याच्या सुदृढतेसाठी आणि आरोग्यमय जीवन जगण्यासाठी प्रदूषण मुक्त पर्यावरण असणे आवश्यक आहे. पर्यावरणशास्त्र एक जागतिक विज्ञान म्हणून कार्य करत आहे. यामध्ये आरोग्याच्या दृ ष्टीने अनेक बदल,नवीन संशोधन, औषधी वनस्पती, हवा शुद्धता,प्रदूषणाची मुक्तता यासारख्या क्षेत्रात संशोधन होत आहेत पर्यावरणाचा मानवी जीवनात गरजा भागविण्यासाठी खूप मोठा फायदा आहे म्हणूनच निसर्गाचे रक्षण केली पाहिजे जेणेकरून पर्यावरणाचा ऱ्हास

होणार नाही. औद्योगिक क्षेत्रात वातावरणात सोडल्या जाणाऱ्या वायुवर नियंत्रण ठेवणे आवश्यक आहे कारण अनियंत्रित वायू प्रदूषण उत्सर्जित करतात यामुळे मानवी आरोग्याला धोका पोहोचू शकतो. शुद्ध हवा हीच मानवी आरोग्यासाठी अत्यंत आवश्यक आहे म्हणूनच शारीरिक व भौगोलिक शुद्धतीसाठी पर्यावरणाचे योगदान मानवी आरोग्यासाठी राहिले आहे.

मानवी आरोग्यावर परिणाम

वाढते तापमान उउष्णतेच्या लाटा जंगलातील आग दुष्काळ पूर भूस्खलन चक्रीवादळ यासारख्या समस्या पर्यावरणाच्या असंतुलनामुळे निर्माण होत आहे या समस्येमुळे शेती शेतातील कमी उत्पन्न मानवी जीवनातील जैविक आजारांचे प्रसारण दूषित हवा असे अनेक परिणाम मानवी आरोग्यावर होताना दिसून येतात अवेळी निसर्गात होत असलेले बदल हेच मानवी जीवनावर प्रतिकूल परिणाम करत असतात. अशुद्ध हवा,पाणी यामुळे कित्येक आजार निर्माण होत आहेत. पर्यावरणातील असंतुलनामुळे होत असलेल्या प्रदूषित वातावरणामुळे मानवी आयुष्यमान देखील घटत चालले आहे.

सारांश

मानवी उत्पत्तीच खऱ्या अर्थाने निसर्गाच्या सानिध्यात झालेली आहे. पर्यावरणातील सर्व घटक हे मानवी जीवन सुदृढ करण्यासाठी उपयुक्त आहेत. प्रत्येक प्रांतात तेथील पर्यावरणानुसार व भौगोलिक वातावरणांनुसार जीवनमान घडत असते, म्हणूनच पर्यावरणाची संतुलन काळाची गरज बनली आहे. मानवी आरोग्य सुरक्षित व निरोगी राहण्यासाठी सर्वच स्तरावरून विविध संस्थांच्या माध्यमातून प्रबोधन, कार्यशाळा, चर्चासत्र,समाज प्रबोधन अशा माध्यमातून पर्यावरणाची संवर्धन करणे काळाची गरज बनली आहे.

संदर्भग्रंथ

१. श्री नवनाथ गोरेयपर्यावरण आणि विकास,सह्याद्री प्रकाशन, पुणे.
२. श्री अभिजीतय घोरपडे गाथा पर्यावरणाची, निराली प्रकाशन, औरंगाबाद.
३. अब्दुल मलिकय पर्यावरण आणि मानवी आरोग्य,
४ प्रदीप आगलावेय भारतीय समाज प्रश्न आणि परिवर्तन, साईनाथ प्रकाशन,नागपूर .
५ प्रवीण सप्तर्षय भूगोल व नैसर्गिक आपत्ती ,विधा प्रकाशन पुणे .
६ जितेंद्र अहिररावय पर्यावरण विज्ञान, निराली प्रकाशन औरंगाबाद.
७ पी.पी मराठे य कृतीबद्ध आपत्ती व्यवस्थापनय डायमंड पब्लिकेशन.

हिंदी साहित्य में पर्यावरण चेतना

डॉ अशोक तुकाराम जाधव
प्राध्यपक एवं अध्यक्ष, हिन्दी विभाग

मानव और पर्यावरण का अभिन्न संबंध है। "पर्यावरण उन सभी दशओं, प्राणालियों एवं प्रभावों का योग है जो जीवों एवं उनकी प्रजातियों के विकास जीवन और मृत्यु को प्रभावित करता है। पर्यावरण संतुलन न केवल मानव जाति के लिए बल्कि संपूर्ण पृथ्वी पर पाए जाने वाले समस्त जीवों के अस्तित्व को बनाए रखने के लिए महत्वपूर्ण है।वेदों में एक गायत्री मंत्र है, जिसमें मानवों की शुद्धियों को उत्तम रूप में प्रार्थना की गई है।

"धियो यो नः प्रचोदयात"

स्वच्छ पर्यावरण स्वस्थ मस्तिष्क एवं स्वस्थ विचारों की पहचान है। वर्तमान समय संक्रमण का योग है। पर्यावरण में हो रहे निरंतर असंतुलन एक गंभीर चिंता एवं चिंतन का विषय है। ऐसे कठिन समय में मुक्ति पाने हेतु हमारे भारतीय साहित्य द्वारा लिखे गए मार्ग पर चलना होगा। इस प्रकार भारत वर्ष के आधुनिक समाज परिवर्तन में भारतीय साहित्य का बहुत बड़ा योगदान है।"मनुष्य अपने शब्द असद कार्य से प्रकृति के पर्यावरण का शोषण कर उसे दूषित कर रहा है जिससे प्रकृति में संतुलन एवं विशालता विषमता निर्माण होती है।"**1**

हिंदी साहित्य में आदिकाल से लेकर समकालीन हिंदी साहित्य, प्रकृति, प्रेम, पर्यावरण संरक्षण से भरा पड़ा है।

पर्यावरण शब्द का अर्थ:- "हमारे चारों ओर का आवरण अर्थात ढकना ही पर्यावरण है। हम सभी तथा हमारा यह संसार, आकाश,वायु,जल,पृथ्वी,अग्नि तथा वन वृक्ष, नदी, पहाड़, समुद्र एवं पशु पक्षी आदि से आवृत है। उपयुक्त समस्त तत्वों तथा पदार्थ का समग्र रूप ही पर्यावरण है।"**2** पर्यावरण का महत्व वैदिक साहित्य में भी था। अपितु हिंदी साहित्य के आदिकाल एवं मध्यकाल में भी दृष्टिगोचर होता है। जहां पेड़ पौधे और नदियों सरोवर आदि को महत्व देकर प्रकाश डाला गया है। कबीर अपने दोहे के माध्यम से पर्यावरण के गुना को स्पष्ट करते हुए कहते हैं।-

"वृक्ष् कबहु न फल भखै, नदी न संचय नीर
परमार्थ के कारने साधु न धरा शरीर।"3

अर्थात वृक्ष कभी स्वयं के फल स्वयं नहीं खाते हैं। वह हमेशा ही दूसरों को खिलाते हैं। नदी भी स्वयं का पानी स्वयं नहीं पीती वह दूसरों के लिए हमेशा बढ़ती है। इससे पर्यावरण समतोल कहां जा सकता है। वैसे ही इंसान ने पर्यावरण बचाने हेतु कार्य करना है।

प्रकृति मन को सुख और शांति प्रदान करती है। साथ-साथ हमें जीवन उपयोगी सुविधा भी मुहैया करती है। हिंदी साहित्य के कवि रसखान इन प्राकृतिक सौंदर्य के लिए अपना सब कुछ न्योछावर करने के लिए तत्पर थे।

"नैनन सो रसखान जबे ब्रज के बन बाग तड़ाग निहारौ
कोटिक ये कलघौत के धाम करील की कुंजन ऊपर वालों।"**4**

विद्यापति गंगा की स्तुति करते समय वे क्षमा याचना करते हैं। क्योंकि, नाली का पानी वह रासायनिक पदार्थ डालकर उन्हें जहरीला बना रहे हैं। वर्तमान में जैसे-जैसे हम सभ्य और वैज्ञानिक होते गए अपने जीवन आधार पर को नष्ट करते जा रहे हैं। जल ही जीवन है। यह नारा तो हम सब कहते थे। मानते हैं, फिर भी हम जल का दुरुपयोग भी अधिक करते हैं। इस पर कबीर दास जल पर रहते हैं।

"काहे रे नलिनी तू कुमिलानी
तेरे ही नाली सरोवर पानी
जल में उत्पत्ति जल में बास
जल में नदी ने तोड़ निवास।"5

जिस गंगा जल को हमारे प्राचीन एवं मध्ययुगीन कवियों ने अमृत तुल्य बतलाया है। जल मनुष्य को प्रकृति द्वारा एक ऐसा अमूल्य वरदान है जिसके बिना मानव जीवन के साथ-साथ चराचर जगत के अस्तित्व की भी कल्पना नहीं की जा सकती।

जिंदगी की किताब में शब्दों का जादू है
दिलों को छूने का मेरा यही इरादा है।

छायावादी कवि जयशंकर प्रसाद ने भी कामायनी में इस तथ्य को स्वीकारते हुए कहा है,

"नीचे जल था, ऊपर हिम था एक तरल था एक सघन।
एक तत्व की प्रधानता, कहे उसे जड़िया चेतन॥

निश्चित ही समष्टि का कण-कण जलधारा से स्पन्दित है। संपूर्ण भूमि की पेड़ पौधे से फलित है। प्रकृति चित्रण छायावाद की मूल आत्मा है सुमित्रानंदन पंत की कुछ पंक्तियां

""छोड़ द्रुमों की मृद छाया, तोड़ प्रकृति से भी माया
वाले, तेरे बाल जाल में कैसे उलझा दू लोचन।"6

"पंत जी की प्रकृति के सुकुमार कवि है। उनके लिए वाले कल से ही प्रकृति प्रेरणा की अगस्त स्रोत रही है।"7 वर्तमान में प्रकृति को बचाना मनुष्य का कर्तव्य है कि, उसकी पवित्रता कायम बरकरार रखें। संयम के साथ हमने प्रकृति को बरकरार नहीं रखा तो क्या परेशानी हो सकती है, यह पंत अपने काव्य पंक्तियों में स्पष्ट करते है-

"जन धरनी पर
गंगा की सूची धारा बहती
मुखर लोहारियों से उठ गिर वह
युग युग की जन गाथा कहती
वह आस्था की धारा उज्जवल
उसे ज्ञात मानव राज दुर्बल
प्रकृति विकृतियों को वध धोती।"8

जनमन का हड़ताल सहती सुमित्रानंदन पंत पंत ग्रंथावली भाग 1 पुस्तक संख्या 500 46 छायावाद कवियों की प्रकृति के अंतर्गत एक ऐसी चेतन स्पंदन संपन्न विराट सट्टा विराजमान है जिसके उधर में वन गिरी नदी निर्झर आदि सभी समय हुए हैं रघुवीर सहाय अपने पंक्तियों में मानव समाज को संदेश देना

चाहते हैं नैसर्गिक संसाधन के कारण प्रकृति केवल किताबों या चित्र तथा स्मृति मूछ पात्र बनकर न रह जाए पहाड़ जंगल पेड़ पौधे जीवित रहना प्रकृति हेतु कितना महत्वपूर्ण है यह चेतना जागना चाहते हैं जैसे वह पहाड़ जंगल मिट्टी के मैदान हर छोटे हो गए हैं जो इतिहास में बड़े देश के प्रमाण थे उनकी विशालता का कोई गुणगान आप सुनाई नहीं पड़ता प्रतिनिधि कविताएं रघुवीर सहाय राष्ट्र संख्या 128 प्रवृत्ति हमारे जरूरत को पूरा करती है किंतु मनुष्य की लालसा इतनी बढ़ गई है कि वह प्रकृति नहीं कर पा रही है जंगल काटने से हमारे आयुर्वेद को संबंधित पेड़ पौधों का नुकसान हो रहा है विश्व में आज भी आयुर्वेद पर भरोसा कर उसको मानने वाला वर्ग भी है आयुर्वेद के महक प्रकृति है वनस्पति या तना चल फूल पत्तियां बी और बी के भीतर की क्रिया और खनिज जिम प्रकट आयुर्वेद हर बहेड़ा आंवला शॉर्ट तुलसी पीपल पर्यावरण ही आयुर्वेद जो डूब रहा है सभ्यता के उत्तर औद्योगिक समुद्र में पर्यावरण संतुलन एवं संरक्षण तथा परिस्थितियों को रोकना यह भाभी पीढ़ी के लिए अति आवश्यक है यदि लोग साहित्यकार के रचनाओं में कुदरत पर्यावरण संरक्षण एवं संवर्धन की भावनाओं को अपने जीवन में उतार ले तो पर्यावरण संरक्षण के प्रयास सहज एवं प्रभावी हो जाएंगे अपने विभिन्न भावों से पर्यावरण आदमी को बहुत-बहुत कर देता है हिंदी साहित्य में कबीर से लेकर दिनकर आगे तक समकालीन कवियों तक प्रकृति की चेतना के संदर्भ में काव्य का सृजन किया गया है

1 निबंध तरंग- डॉ रमेश कुरे,पृ सं-103 प्रकाशन वर्ष 2020, राजकमल प्रकाशन, दिल्ली, लेखक- पर्यावरण और सनातन दृष्टि- छगन मोहता

2 WWW.ESSENCE-JOURNAL.COM-VOLUME-VI NO. 12015/29-133.

3 https://hi.quora.com.

4 www.google.com.

5 कबीर ग्रंथावली, सं डॉ श्यामसुंदर दास, पदावली पृ संख्या, 64

6 सुमित्रानंदन पंत, ग्रंथावली भाग 1 पृष्ठ संख्या- 546

7 भारतीय साहित्य में पर्यावरण संरक्षण, डॉ सुमन सिंह पृ संख्या 85, प्रकाशन रोशनी पब्लिकेशन कानपुर, प्रकाशन वर्ष 2011

8 सुमित्रानंदन पंत ग्रंथावली भाग 1 पृष्ठ संख्या- 546

वर्तमान हिंदी कविता में पर्यावरणीय चेतना

डॉ. ज़हीरुद्दिन र. पठाण
प्राध्यापक, हिंदी विभाग,
कै. बाबासाहेब देशमुख गोरठेकर महाविद्यालय, उमरी. ज़ि. नांदेड, (महा.)

डॉ. नूरजहाँ रहमतुल्लाह
सहायक प्राध्यापक, हिंदी विभाग, कॉटन विश्वविद्यालय, गुवाहाटी, असम।

साहित्य और समाज का संबंध अत्यंत घनिष्ठ होता है। समाज के बिना साहित्य की और साहित्य के बिना समाज की कल्पना नहीं की जा सकती। साहित्यकार का जन्म समाज में होता है और वह अपने साहित्य की सामग्री समाज से ही ग्रहण करता है। साहित्य के निर्माण में समाज का अनन्यसाधारण योगदान रहता है और समाज की उन्नति में, संस्कृति एवं सभ्यता के विकास में साहित्य का। साहित्य में सत्यम, शिवम, सुंदरम की प्रतिष्ठा रहती है। लोकमंगल की कामना को साहित्यकार का मुख्य प्रयोजन माना गया है। अतः समाज की पीड़ा उसकी पीड़ा बन जाती है, समाज का दुख उसका दुख बन जाता है। इसलिए साहित्य को समाज का दर्पण भी कहा गया है।

आज साहित्य की विविध विधाओं में दलित, आदिवासी, स्त्री, अल्पसंख्यांक, किन्नर, वृद्ध, बाल, युवा आदि विविध विमर्शों पर लिखा जा रहा है और बेबाक तरीके से लिखा जा रहा है। जिनको, जिन विषयों को समाज ने हाशिए पर रख दिया था, जिनके बारे में लिखना, बोलना ज़रूरी नहीं समझ गया, उनको अध्ययन के केंद्र में लाना ही विमर्श है। विभिन्न विमर्शों के साथ आज पर्यावरण विमर्शभी अध्ययन, साहित्य के केंद्र में आ गया है।वर्तमान साहित्य और साहित्यकार इस समस्या को निरंतर महसूस कर रहा है। हिन्दी में पर्यावरण चिन्तन को लेकर वर्तमान में लिखा भी जा रहा है,किंतु दलित, आदिवासी, स्त्री, अल्पसंख्यांक, किन्नर, वृद्ध, बाल, युवा आदि विविध विमर्शों जैसी स्थिति आज पर्यावरण विमर्श की नहीं है। साहित्यकारों की यह ज़िम्मेदारी भी है कि समाज की विभिन्न समस्याओं के साथ ही पर्यावरण प्रदूषण की समस्या की, पर्यावरण प्रदूषण के कारणों की तह तक जायें और इस समस्या से जन-जन को अवगत कराएँ। जन-जन में जागृति लाए।

हिंदी साहित्य में आदिकाल से ही प्रकृति का चित्रण होता रहा है। कवियों को प्रकृति ने बहुत अधिक प्रभावित एवं आकर्षित किया है।आदिकाल में रासो ग्रंथों, लौकिक साहित्य और विद्यापति के साहित्य में प्रकृति को मनोरम चित्रण हुआ है। भक्तिकाल में कृष्ण-भक्ति साहित्य में सूरदास ने, राम-भक्ति साहित्य में तुलसीदास ने और सूफी साहित्य में मलिक मुहम्मद जायसी तथा अन्य सभी सूफी संतों ने अपने ग्रंथों में प्रकृति का अत्यंत सुंदर चित्रण किया है। सूफी संतों ने प्रकृति का बारह-मासा के रूप में चित्रण किया है, जो अपने आपमें अनूठा है। रीतिकाल के सभी कवियों ने प्रकृति का उद्दीपन रूप में चित्रण किया है। प्रकृति का विभिन्न और नए-नए रूपों में चित्रण पहली बार आधुनिक काल में छायावादी युग में हुआ। सोचता हूँ, प्रकृति या पर्यावरण नहीं रहेगा तो कवियों और शायरों का क्या होगा? कवियों ने सदा से ही प्रकृति से प्रेरणा ली है, प्रतीक लिए हैं, बिम्ब लिए हैं। वर्तमान कवियों ने भी प्रकृति का साथ कभी नहीं छोड़ा, लेकिन उनमें भी पर्यावरण बचाने को लेकर चिंता कम ही दिखाई देती है। हाँ, आदिवासी साहित्य में पर्यावरणीय चेतना बहुत अधिक तीव्र है। क्योंकी आदिवासी अनादिकाल से जंगलों में रह रहे हैं। जंगल ही उनकी दुनिया है।आदिवासी संस्कृति पर्यावरणीय संस्कृति है। आदिवासी हमेशा से ही प्रकृति की गोद में रहे है। प्रकृति के, पर्यावरण के बिना

आदिवासी अपने अस्तित्व की कल्पना नहीं कर सकता।आज कम होते हुए जंगलों ने सबसे अधिक उन्हीं को प्रभावित किया है।

इंसान ने जिस पर्यावरण में जन्म लिया है, जिसकी गोद में खेल-कूद कर बढ़ा हुआ और आगे बढ़ना सीखा है, आज उसी पर्यावरण को वह अपने तुच्छ स्वार्थ के लिए नष्ट कर रहा है। कानून और नियमों को ताक पर रख कर विकास के नाम पर प्राकृतिक संसाधनों का दोहन किया जा रहा है। सरकार और पूँजीपतियों की गठजोड़ के कारण औद्योगिकीकरण, कॉरपोरेटपरस्ती, बड़ी-बड़ी परियोजनाओं, शहरीकरण, विकास के विविध कार्यों के बहाने अनियंत्रित रूप से ज़मीन और जंगल को हड़पा जा रहा है, नदी और नालों को बंद कर पानी के प्रवाह को रोका जाने लगा है। ध्वनि प्रदूषण, वायु प्रदूषण, जल प्रदूषण बल्कि प्राकृति की संरचना के साथ भी छेड़छाड की जा रही है।पर्यावरण को नुकसान पहुँचाकर इंसान सुखी नहीं रह सकता है, यह जानते हुए भी आज विकास और उपभोग की लालसा में मनुष्य प्रकृति का अंधाधुंध दौहन कर रहा है। पर्यावरण के साथ खिलवाड़ कर रहा है। हमारे देश में दिवाली, होली जैसे धार्मिक पर्व और उत्सवों पर, देवी-देवताओं एवं महापुरुषों की जयंती के शुभ अवसरों पर, शादियों में निकाली जाने वाली रैलियों में पर्यावरण को नुकसान पहुँचाने का काम किया जा रहा है। अतः पर्यावरण का संतुलन निरंतर बिगड़ता जा रहा है, और इस बिगड़ते संतुलन ने सारे विश्व के सामने भयंकर समस्या खड़ी कर दी। आज पर्यावरण को बचाने के लिए प्रयास तेज़ कर दिए गए हैं। सरकार, गैर सरकारी संगठन, स्वयंसेवी संस्थाएँ, स्कूल और कॉलेज आदि के द्वारा पर्यावरण को बचाने के लिए विभिन्न प्रयास किए जा रहे हैं। स्कूल, कॉलेज और यूनिवर्सिटी में पर्यावरण विषय पढ़ाया जा रहा है। जनजागरण किया जा रहा है और पूरी दुनिया में 5 जून को पर्यावरण दिवस के रूप में मनाया जा रहा है।

समाज का एक संवेदनशील और जागरूक हिस्सा होने के कारण साहित्यकारों का भी दायित्व है कि वे पर्यावरण को बचाने के लिए आगे आए और अपने साहित्य के माध्यम से जन-जागृति करें। हिंदी की समकालीन कविता अपने इस दायित्व को बखूबी समझती है। अतः समकालीन कविता के कई कवियों ने पर्यावरणीय चेतना की कविताएँ लिखी हैं।

आज वायु विषैली हो गई है, नदियों का पनि ज़हरीला हो गया और कई शहरों के वातावरण में साँस लेना भी मुश्किल हो गया है। हमारी राजधानी दिल्ली शहर सबसे अधिक प्रदूषित है। कारखानों, मोटार-गाड़ियों, दिवाली के पटाखों, डीजे की आवाज़ों ने हमारी सुख शान्ति छीन ली है। प्रदूषण के कारण पर्वत अपनी जगह से खिसक रहे हैं, धरती सिमटती जा रही है, ओज़ोन की परत कम होने से धरती का तापमान बढ़ता जा रहा है और बारिश कम हो रही है। हिंदी के लोकप्रिय कवि **निशांत जैन** जी ने अपनी कविता **'पर्यावरण से अब जागे हिंदुस्तान'** में पर्यावरण को बचाने का महत्वपूर्ण संदेश दिया है-

'जल-जंगल-ज़मीन की रक्षा हो अपना अभियान,
पर्यावरण चेतना से अब जागे हिंदुस्तान।
वायु विषैली, जल ज़हरीला, वातावरण में बेचैनी,
ध्वनि प्रदूषण ने है सारी, सुख-शान्ति अपनी छीनी,
+ + + + + +
गलते पर्वत, धँसती धरती और धधकती ज्वाला,
हुआ क्षरण ओज़ोन परत का, कैसा गड़बड़झाला,
असंतुलित विकास देख है, कुदरत भी हैरान।'[01]

पर्यावरण असंतुलन का एक बहुत बड़ा कारण है जंगलों का कम हो जाना। आज शहरीकरण, औद्योगीकरण, सड़कों का निर्माण और विकास के नाम पर जंगल खत्म किए जा रहे हैं, पेड़ काटे जा रहे हैं। पेड़ काटने की वजह से धरती का तापमान निरंतर बढ़ता जा रहा है। यदि पर्यावरण को बचाना है तो हमें पेड़ लगाने होंगे-

'आओ पेड़ लगाएं जिससे / धरती पर फैले हरियाली।
तापमान कम करने को है / एक यही ताले की ताली।'[02]

कवि ने निम्न कविता में एक महत्वपूर्ण संदेश दिया है कि जीवन की खातिर हमें वृक्ष नहीं काटने हैं। वृक्ष, सिर्फ वृक्ष नहीं है, बल्कि जीवन है-

'न नहर पाटो, न तालाब पाटो,
बस जीवन के खातिर न वृक्ष काटो।'[03]

पर्यावरण हमारे जीवन का अविभाज्य हिस्सा है, नहीं पर्यावरण है तो जीवन है। अतः पर्यावरण को बचना ज़रूरी है। पर्यावरण नहीं बचा तो धरती पर जीवन भी नहीं बचेगा। वर्तमान लोकप्रिय कवयित्री **निधि अग्रवाल** ने अपनी कविता **'यूंही बढता रहा अग़र'**ने इस ओर संकेत किया है-

'यूंही बढता रहा अग़र, / पर्यावरण क़ा विनाश।
तो हों जायेगा धरा सें, / ज़ीवन क़ा सर्वनाश।'[04]

पोलीथीन की थैलियों की वजह किस तरह धरती पर पर्यावरण को क्षति पहुँच रही है, इसका बहुत ही सटीक चित्रण **लीलाधार मंडलोई** जी ने अपनी कविता **'पोलीथीन'** में कुछ इस तरह किया है-

'करोड़ों या अरबों / कितनी हो सकती हैं
पोलीथीन की थैलियाँ / कितनी नदियों का
दम घुट सकता है / इन थैलियों में।'[05]

आज मनुष्य भौतिकता की चकाचौंध में इतना मग्न हो गया कि उसके हाथ से प्रकृति, प्राकृतिक सुख धीरे-धीरे निकलता चला गया। आज इंसान मिट्टी की खुशबू को तरस गया है। कारखानों ने हवा में ज़हर घोल दिया है। वर्तमान में हिंदी और उर्दू की प्रसिद्ध कवयित्री **डॉ. रेशमा अंसारी** ने अपनी एक **ग़ज़ल** में इस बात को तल्ख अभिव्यक्ति प्रदान की है–

'मिट्टी की खुशबू को तरस गए दुनिया वाले रेशमा,
आदमी जी तो रहा, कम से कम यह आस रहने दे।
हवा में ज़हर घोल गए कारखाने, आविष्कार बेहतर
बचा कर पर्यावरण को चलती थोड़ी-सी साँस रहने दे।।'[06]

पर्यावरण असंतुलन के कारण आज सबकुछ बदल गया है। पहले की तरह न पर्वत रहे, न नदियाँ रहीं, न झरने रहे और न पेड़ रहे और न ही चहकने वाले परिंदे रहे। दिल्ली के एक मशहूर शायर प्रो. रहमान मुसव्विर जी ने इस पीड़ा को बड़ी ही मार्मिक अभिव्यक्ति दी है-

'उदास मौसम, उदास झूले, उदास फिरते हैं सब परिंदे,
सो इनकी खातिर मैं बाजुओं से शजर में शाखें बना रहा हूँ।'

पर्यावरण को बचाना सिर्फ साहित्यकार की ज़िम्मेदारी नहीं है। यह हम सबकी ज़िम्मेदारी है। इसलिए हम सबको पर्यावरण को बचाने में अपना सहयोग देना ज़रूरी है। इसके लिए जन-जागृति की बेहद आवश्यकता है।

संदर्भ सूची:

01. निशान्त जैन – पर्यावरण चेतना से अब जागे हिंदुस्तान
(http://kavitakosh.org/kk/पर्यावरण_चेतना_से_अब_जागे_हिंदुस्तान_/_निशान्त_जैन)
02. अज्ञात – बहुत लुभाता है गर्मी में
(https://www.hindipoem.org/poem-about-environment-in-hindi/)
03. अज्ञात - न नहर पाटो, न तालाब पाटो
(https://www.hindipoem.org/poem-about-environment-in-hindi/)
04. निधि अग्रवाल - यूंही बढता रहा अग़र
(https://www.hindipoem.org/poem-about-environment-in-hindi/)
05. लीलाधार मंडलोई – पोलीथीन
(http://kavitakosh.org/kk/पोलीथीन_/_लीलाधर_मंडलोई)
06. डॉ. रेशमा अंसारी – ग़ज़ल (अप्रकाशित)
07. प्रो. रहमान मुसव्विर – ग़ज़ल (अप्रकाशित)

पर्यावरण पूरक योगाचे अभ्यास

डॉ. निरजकुमार एन. उपलंचवार
(शा.शि.संचालक)
देगलूर महाविद्यालय,देगलूर.

प्रस्तावना

आज अधिक खेळाडू कामगिरीचे अनेक आयाम शिकत आहेत जे त्यांच्या प्रशिक्षणात पर्यावरण पूरक योग जोडून सुधारले जाऊ शकतात. खेळाच्या स्पर्धात्मकतेच्या विरुद्ध योगातील शांत दृष्टीकोनामुळे योग आणि खेळ अनेकदा विरोधात दिसतात.

क्रीडा स्पर्धांमध्ये जसे ऍथलेटिक्स. जिम्नॅस्ट, रग्बी, सॉकर आणि इतर, यशस्वी कामगिरी ही इव्हेंटचे वेगवेगळे टप्पे कोणत्या परिपूर्णतेसह पार पाडले जातात यावर अवलंबून असते, दुसरीकडे विविध खेळांमध्ये यशस्वी सहभागासाठी शारीरिक आणि मानसिक,शुद्ध पर्यावरण आणि कौशल्य अंमलबजावणीच्या विविध संयोजनांची आवश्यकता असते. इतर खेळांप्रमाणे योगा देखील आपल्याला एखाद्या विशिष्ट खेळाशी संबंधित शारीरिक, मोटर, कौशल्य आणि इतर प्रकारच्या गुणांच्या विद्यमान पातळीच्या पलीकडे नेण्यासाठी प्रचंड सचोटी, स्वयं-शिस्त आणि जागरूकता आवश्यक आहे.

खेळामध्ये योगाचे फायदे :-

- योग प्रशिक्षणामुळे तंदुरुस्ती आणि कौशल्याची अंमलबजावणी सुधारते, प्रशिक्षणामुळे मेंदूच्या एंडोर्फिनच्या पातळीत वाढ होते, न्यूरोलॉजिकल फंक्शन्ससाठी आवश्यक असते, ज्यामुळे एखाद्या व्यक्तीची सहनशक्ती आणि सामान्य जोम वाढतो, ज्यामुळे कौशल्य अंमलबजावणीमध्ये सुधारणा होते.
- योगासनांमुळे शारीरिक आणि मोटर फिटनेस सुधारतो. यामध्ये वेगवेगळ्या सांध्यातील विविध स्नायूंच्या गटांचा व्यायाम समाविष्ट आहे आणि शरीराच्या महत्वाच्या अवयवांना संदेश देखील देतात जे त्यांच्या कार्यावर सकारात्मक परिणाम करतात.
- योगिक आसनांमध्ये हळू स्ट्रेचिंग आणि होल्डिंग पद्धती लवचिकता वाढवतात, कार्यक्षमता टिकवून ठेवण्यासाठी आणि दुखापती टाळण्यासाठी आवश्यक गुणवत्ता.
- योग प्रशिक्षण उच्चभ्रू खेळाडूंना ओव्हर-ट्रेनिंग सिंड्रोम टाळण्यास मदत करू शकते जे एक प्रमुख घटक नवशिक्यापासून उच्चभ्रू खेळाडूंपर्यंत विविध खेळांमधील ड्रॉपआउट दरांमध्ये योगदान देत आहे.
- योगामुळे स्पर्धात्मक कामगिरी सुधारण्यास मदत होऊ शकते. तिरंदाजी, रायफल, नेमबाजी, पिस्तूल, शूटिंग स्क्वॅश आणि गोल्फसाठी एकाग्रतेची इष्टतम पातळी आवश्यक आहे.
- श्वासोच्छवासाचा व्यायाम (प्राणायाम) आणि ध्यान केल्याने एकाग्रता चांगली होते आणि गेमरच्या विविध स्तरांमध्ये तणाव आणि चिंता हाताळण्यासाठी सामर्थ्य प्रदान करून सुधारित कार्यप्रदर्शन.

तुम्ही कोणताही खेळ सरावासाठी निवडलात, योगासने व्यक्तीची क्षमता सुधारून आणि वाढवून शकते आणि पूरक ठरू शकते.

- लवचिकता
- संतुलन
- मानसिक फोकस
- तणाव कमी करणे
- शारीर धारणा
- चपळता
- खिलाडूवृत्ती

संदर्भ

1. शारीरिक शिक्षणाचे सैद्धांतिक,ऐतिहासिक आणि सामाजिक पैलू-प्रा.मोहनकुमार खडकीकर.
2. शारीरिक शिक्षणाचे इतिहास-प्रा.श्रीपाल जर्डे.
3. मानव शरीरक्रियाशास्त्र- प्रा.मोहनकुमार खडकीकर.
4. खेळ संचालन विविध खेळाचा इतिहास-प्रा.जुरजार सिंग,डॉ.विठ्ठल सिंग परिहार.
5. योगासन -डॉ.आचार्य देवव्रत

ADVANCES OF NANOMATERIALS FOR AIR AND WATER POLLUTION REMEDIATION

Ashwini Laxmanrao Jakkawad
Sharadchandra Arts,Commerce and Science College,Naigaon(Bz.)
Dist Nanded-431709

Pawde Shubhangi Subhashrao
P.G. Department of Chemistry & Research Center
Shivaji Mahavidhyalaya, Udgir, Dist.Latur,MS-413517

Abstract:

Today, environmental pollution is one of the greatest problems facing the world, causing irreparable damage to our planet. Environmental pollution, primarily caused by toxic chemicals, includes air, water, and soil pollution. This pollution results not only in the destruction of biodiversity, but also the degradation of human health. Pollution levels that are increasing day by day need better developments or technological discoveries immediately. Nanotechnology offers many advantages to improve existing environmental technologies and create new technology that is better than current technology. In this sense, nanotechnology has three main capabilities that can be applied in the fields of environment, including the cleanup (remediation) and purification, the detection of contaminants (sensing and detection), and the pollution prevention Due to their unique physicochemical properties, nanomaterials have garnered considerable attention from researchers as effective tools against Aenvironmental challenges. Nanotechnology offers effective solutions for air pollution remediation through various applications like Nanoadsorbents, Nanocatalysts, nanofiters and nanosensors. In this paper we review and discuss the applications of nanotechnology in water and air pollution treatment.

Keywords: Nanomaterials, Air and water pollution, Nanoadsorbent, Nanofilters

Introduction:

Nanotechnology is one of the most exciting and fast-moving areas of science today. It has been advantageous in many sectors, like medicine, the military, electronics, food, chemicals, energy, and a wide variety of other scientific fields. Exponential population growth and rapid global industrialization result in a significant discharge of pollutants into the environment, posing serious health risks to humans and animals. Both outdoor and indoor air pollution, caused by undesirable gases, bioaerosols, oxides, microbes, soot, heavy metals, and other toxic materials, have detrimental effects on human health and the environment. Similarly, water pollution from industrial and urban sources, including pharmaceuticals, metals, dyes, pesticides, fertilizers,

microorganisms, personal care products, and radionuclides, threatens global water security and impacts socio-economic development

To address these challenges, it is imperative to identify and eliminate primary sources and concentrations of contaminants using advanced, cost-effective technologies that meet environmental standards and regulations. While numerous remediation techniques have been developed over the last few decades, such as physical, chemical, and biological methods, many suffer from significant limitations, including high costs, operational complexity, and secondary contamination.

Nontechnology offers effective solutions for air pollution remediation through nanoadsorbents, nanocatalysts, nanofilters, and nanosensors. Nanomaterials can adsorb contaminants and enable photocatalytic remediation. Nanostructured membranes aid in pollutant separation from exhaust. Nanomaterial-enabled sensors detect harmful gases like hydrogen sulfide, sulfur dioxide, and nitrogen dioxide. Nanomaterials are defined according to the International Organization for Standardization (ISO) and the European Union (EU) as a "material with any external dimension in the nanoscale or having an internal structure or surface structure in the nanoscale". Also, NPs are defined by ISO and EU as a "nano-object with all three external dimensions in the nanoscale", where the nanoscale is the size range from approximately 100 nm. Nanostructured materials are famous for their unique properties that appear when they fall into the nanoscale. In effect**, nanoparticles manifest completely different and novel properties** because of considerable change and increase in their high surface-to-volume ratio making them practically and potentially more reactive than their bulky form. A given material in the nanoscale exhibits properties and distinct physicochemical characteristics when its size decreases to less than 100 nanometers. Furthermore, the elemental properties of materials including color, heat-conducting, light reflecting, strength, magnetic properties, and so forth change rather markedly after they fall in the nanoscopic scale. As an example, some particular plastics possess the strength of steel at the nanoscale. Nano-silicon dioxide crystals are utilized in tennis racket manufacturing to improve the performance of the equipment.

Nanoparticles are classified into four main groups zero-dimensional nanostructures, one-dimensional nanostructures, two-dimensional nanostructures, and three-dimensional nanostructures. The zero-dimensional structures have all three dimensions in the nanometric range. In the case of one-dimensional nanostructures, two dimensions are in the nanoscale and the third dimension remains large and shaped like rods with examples as nanotubes and nanorods. Two-dimensional nanomaterials have only one of their dimensions in the nanoscale the other dimensions are larger than the nanoscopic range showing plane-like structures. Examples of two-dimensional nanostructures are thin films, nanocoatings and nanolayers. The three-dimensional nanostructures have all their three dimensions outside the nanometric range as nanotubes, nanowires different

distributions of nanostructured materials.

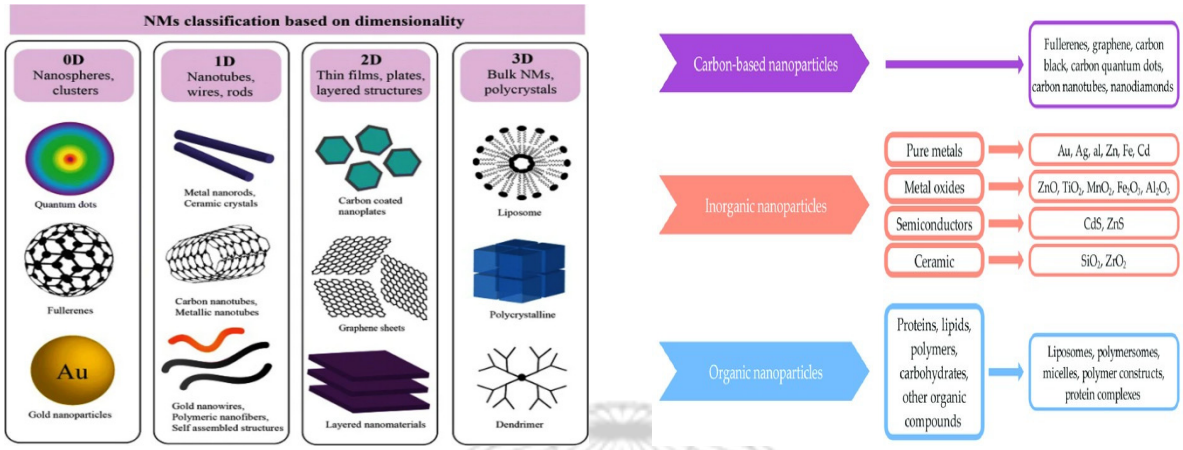


Fig.1: Classification of Nanomaterial based on dimension and material

Remediation Strategies:

1. Conventional strategies:

A wide range of treatment technologies has been developed to minimize the concentration of pollutants in the environment. These technologies are crucial in reducing the negative impact of pollution on the environment and human health. However, despite various treatment methods, their effectiveness varies, and they often have limitations such as low stability and high complexity . In air treatment, several strategies, such as activated carbon adsorption and selective catalytic reduction, wet flue gas desulfurization (WFGD), and activated carbon injection (ACI), have been utilized to reduce the concentration of pollutants . Likewise, water treatment techniques involve chemical, physical, thermal, mechanical, and biological methods. Further techniques include wet oxidation, electrocoagulation, ion exchange, ozonolysis, Fenton, adsorption, extraction, flocculation/coagulation, evaporation, steam stripping, distillation, filtration, floatation, screening, sedimentation, reverse osmosis, forward osmosis, phytoremediation, bioaccumulation, biotransformation, and biomineralization.However, they often involve high capital and operational costs, and their efficiency is limited by membrane fouling, low selectivity, and the disposal of residual sludge. To address the limitations of conventional treatment methods, researchers worldwide have focused on developing NMs as an alternative approach with strong oxidation power that can oxidize and mineralize various organic and inorganic contaminants. NMs have shown promising results in pollutant removal and have the potential to provide a low-cost and environmentally acceptable solution. Therefore, developing and implementing NMs in treatment processes can potentially revolutionize pollution control and management

2. Nanomaterial based strategies:

Nanomaterial-based strategies offer innovative approaches for addressing both air and water pollution. In air pollution remediation, nanomaterials can be utilized as nanoadsorbents, nanocatalysts, nanofilters, and nanosensors. These materials have the ability to adsorb pollutants

from the air, catalyze chemical reactions to degrade pollutants, and detect harmful gases with high sensitivity. Additionally, certain semiconducting nanomaterials can be employed for photocatalytic remediation, utilizing light energy to degrade pollutants into harmless compounds.

Similarly, in water pollution remediation, nanomaterials can be applied in various techniques such as adsorption, photocatalysis, and membrane filtration. Nanomaterials possess large surface areas and unique surface properties, making them highly efficient adsorbents for removing pollutants from water. Additionally, photocatalytic nanomaterials can be activated by light to degrade organic contaminants into non-toxic substances. Nanomaterial-based membranes with nanopores can also effectively filter out pollutants from water, ensuring cleaner and safer water supplies.

Overall, nanomaterial-based strategies provide promising solutions for air and water pollution remediation, offering efficient and environmentally friendly approaches to mitigate the adverse effects of pollution on ecosystems and human health.

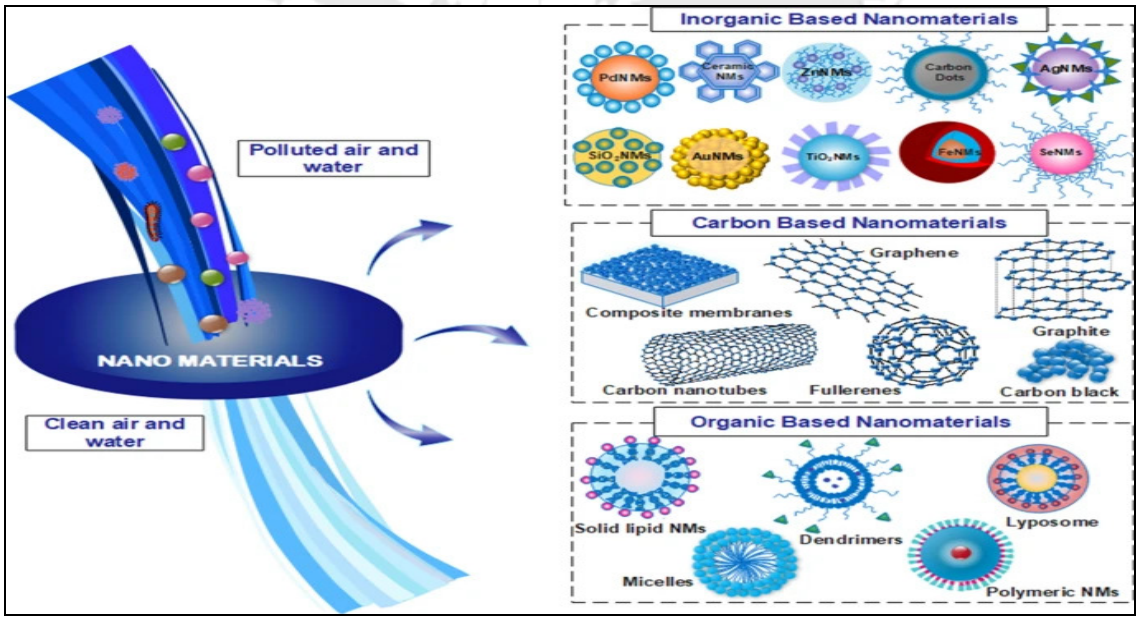


Fig: Schematic illustration of diverse types of nanomaterials based on composition employed for air and water pollutants nano remediation

Application of nanotechnology in Air and water pollution remediation:

Agricultural and industrial activities are major sources of soil, water, and air contamination. Nanostructured materials, with their large surface areas and high reactivity, offer excellent sensing and catalytic absorption capabilities. Nanotechnology has led to the commercialization of various applications such as nanoscale coatings and sensors, replacing thick polymer coatings for corrosion prevention. Nanosensors can detect aquatic toxins, while nanostructured biopolymers aid in heavy metal decontamination. Nanoscale metals can break down hazardous materials at room temperature, and fine particles are used to monitor environmental purification. Nanostructured

materials also play a crucial role in catalytic environmental clean up.

Air pollution is a critical global issue, resulting in significant alterations to the atmosphere and posing severe health risks due to the release of physical, biological, and chemical pollutants. Industrial processes, including heavy metals, chlorofluorocarbons, organic chemicals, and biological substances, contribute to life-threatening illnesses and environmental damage. According to the World Health Organization, air contamination caused nearly 7 million deaths in 2012 alone. Effective technologies and innovations are needed to detect and treat pollutants in the atmosphere. Nanostructured materials offer promising solutions with their small size and high surface-to-volume ratio, enabling the development of accurate sensing devices and environmentally friendly coatings to mitigate pollution

water contamination is a pressing global issue, with only 0.08% of Earth's water reserves being clean. Nanotechnology offers promising solutions for water quality improvement through methods like disinfection, filtration, bioremediation, and separation using reactive media. Remediation technologies, including thermal, biological, and physicochemical methods, utilize nanostructured materials like carbon nanotubes, zeolites, and nanoparticles of zero-valent iron. Iron nanomaterials, particularly nanoscale zero-valent iron (ZVI) and reactive nanoscale iron products (RNIP), are effective for water remediation due to their multifunctional applications. Permeable reactive barriers (PRBs), utilizing zero-valent metals like iron, are capable of removing contaminants from surface groundwater. These nanoscale iron particles, with diameters of fewer than 200 nanometers, offer efficient solutions for large-scale water remediation.

Mechanism for pollution remediation using nanomaterials:

The fundamental principles utilized in remediating environmental pollution encompass three main approaches: physical, chemical, and biological treatments. Each approach operates through specific reaction mechanisms. Physical treatment involves adsorption and radiation mechanisms, chemical treatment employs oxidation and reduction mechanisms, while biological treatment includes disinfection using aerobic and anaerobic microbes, and enzymatic processes.

1. Adsorption:

Adsorption is a widely employed method for eliminating air and water pollutants, offering practicality and eco-friendliness without toxic by-products. Various adsorbents, including polymers, activated carbon, MOF, molecular sieves, zeolites, and other nanomaterials (NMs), are utilized based on their adsorption capacity and affinity for targeted compounds.The choice of a specific adsorbent primarily depends on its inherent adsorption capacity and its affinity for the targeted compound. In the adsorption process, chemicals are separated from one phase and concentrated on the surface of another adsorbent material. This process unfolds in three steps: (1) interaction of the adsorbed species with the absorbent at the interface of liquid and solid phases with different compositions, maintained at constant temperature and pressure over a specific

duration; (2) separation of the adsorbent and liquid layer after the reaction; and (3) the adsorption rate of the adsorbate, primarily influenced by two crucial factors—adsorption isotherms and kinetics—which characterize the adsorbent's adsorption effectiveness and establish the adsorption parameters. Nano adsorbents utilize their small size, high surface area, and multifunctional surface to interact with various chemical species effectively. Factors like pH, temperature, adsorbent amount, and contacting time influence adsorption efficiency, requiring meticulous optimization. Incorporating NMs with adsorbents enhances attraction and effectiveness. These insights can optimize nano adsorbents for efficient pollutant removal from contaminated sources

2. Membrane filtration:

Membrane filtration, a vital technique for pollutant segregation, selectively allows desired substances to pass through while retaining others. Traditional membranes are crafted from petroleum-derived polymers, but their properties can be enhanced by integrating nanomaterials (NMs). NMs like Ag, SiO2, TiO2, CNTs, and metal oxides adjust membrane characteristics, boosting efficacy in removing contaminants. Nanofiltration is a type of membrane filtration process that operates on a nanoscale level, typically between ultrafiltration and reverse osmosis. It utilizes specialized membranes with nanometer-sized pores to selectively separate ions, molecules, and particles based on their size and charge. Nanofiltration membranes have a tighter pore structure compared to microfiltration and ultrafiltration membranes, allowing them to remove smaller particles and ions while allowing water molecules to pass through. This process is commonly used for desalination, water softening, removal of organic matter, and purification of industrial wastewater and drinking water.

Nanofilters, with pores ranging from 1 to 10 nm, offer superior efficiency compared to conventional filters by effectively removing bacteria, viruses, and organic contaminants. Membranes based on carbon nanotubes excel in separating carbon dioxide from other gases, exhibiting a trapping rate over 100 times greater than alternative gas separation technologies. Unlike conventional membranes, carbon nanotube-based membranes do not compromise gas separation quality with increased gas flow, making them suitable for large-scale applications. Nanomembrane technology shows promise for widespread use in gas and pollutant vapor separation and purification across various industries, mitigating environmental release.

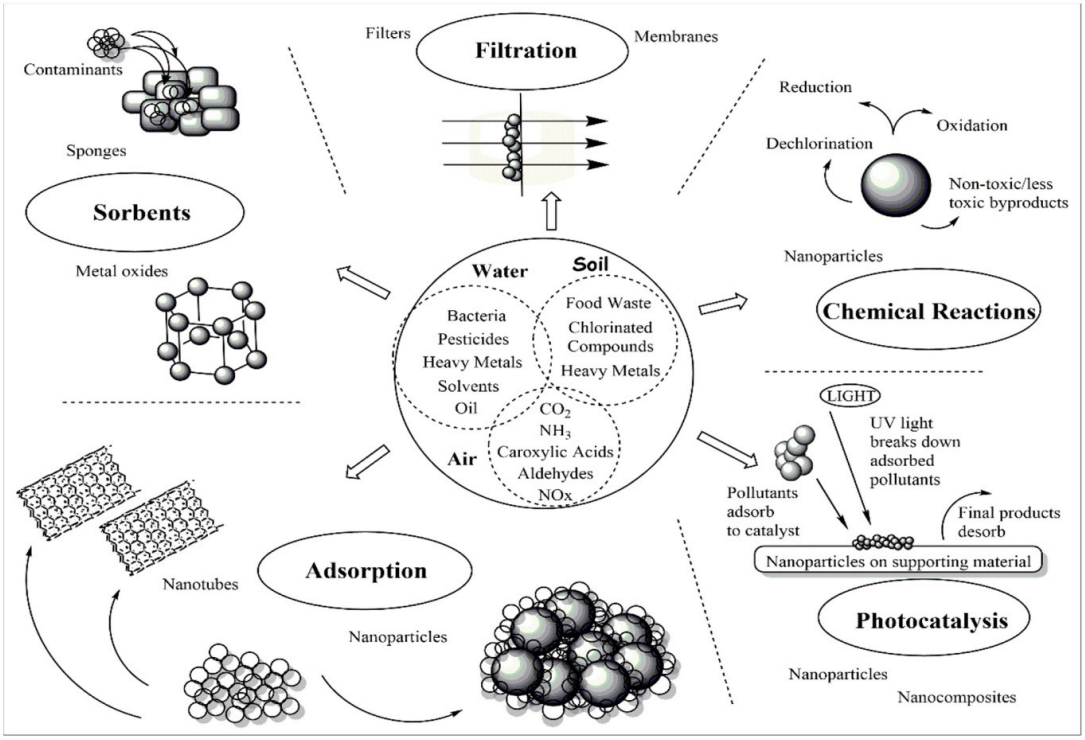


Fig: General overview of environmental remediation approaches with the use of nanotechnology.

3. Oxidation:

The oxidation mechanism for pollution remediation using nanomaterials involves the use of nanocatalysts to accelerate oxidation reactions, breaking down pollutants into less harmful substances. Nanomaterials, such as metal oxides or metal nanoparticles, act as catalysts to facilitate oxidation reactions by providing active sites for chemical reactions to occur. These reactions often involve the transfer of electrons from the pollutant molecules to the nanocatalyst, leading to the formation of reactive oxygen species (ROS) that oxidize the pollutants. For example, in water remediation, nanocatalysts like titanium dioxide (TiO2) are commonly used in photocatalytic oxidation processes. When exposed to ultraviolet (UV) light, TiO2 nanoparticles generate electron-hole pairs, which can react with water and oxygen to produce highly reactive hydroxyl radicals (•OH). These hydroxyl radicals can then oxidize organic pollutants present in the water, breaking them down into simpler, less harmful compounds.

Similarly, in air pollution remediation, nanomaterial-based catalysts can be used to catalyze the oxidation of harmful gases, such as nitrogen oxides (NOx) or volatile organic compounds (VOCs). Metal-based nanoparticles, such as platinum (Pt) or palladium (Pd), can promote the oxidation of these pollutants into less harmful substances like carbon dioxide (CO2) and water (H2O). Overall, nanomaterial-based oxidation processes offer a promising approach for pollution remediation due to their high catalytic activity, efficiency, and ability to target a wide range of pollutant.

4. Photocatalysis:

The photocatalysis mechanism for pollution remediation using nanoparticles involves harnessing light energy to activate nanomaterials, typically metal oxides like titanium dioxide (TiO2), to degrade pollutants. When exposed to light, nanomaterials generate electron-hole pairs, which can react with water and oxygen to form highly reactive species like hydroxyl radicals (•OH). These radicals then oxidize organic pollutants into simpler, less harmful compounds. In the case of air pollutants, such as volatile organic compounds (VOCs) or nitrogen oxides (NOx), the photocatalytic process can lead to their conversion into CO2 and water. Overall, photocatalysis using nanoparticles offers an effective and sustainable method for pollution remediation by utilizing renewable energy sources to drive oxidation reactions.

Conclusion:

The utilization of nanomaterials in air and water pollution remediation holds great promise for addressing environmental challenges effectively. Nanomaterials offer unique properties such as high surface area, enhanced reactivity, and tunable surface chemistry, making them highly efficient in adsorption, oxidation, and photocatalytic processes. In air pollution remediation, nanomaterials enable the development of advanced filters, sensors, and catalytic converters, allowing for the removal and degradation of harmful pollutants such as particulate matter, volatile organic compounds, and nitrogen oxides. Similarly, in water pollution remediation, nanomaterial-based adsorbents, membranes, and photocatalysts exhibit remarkable capabilities in removing contaminants and disinfecting water sources.

Overall, the integration of nanomaterials in air and water pollution remediation represents a promising approach to mitigate environmental pollution, safeguard human health, and promote sustainable development.

References:

1. Amer S. El-Kalliny, et al ‘Nanomaterials: a review of emerging contaminants with potential health or environmental impact’ Discover Nano, 18,68(2023)’
2. Apoorva Sharma, et al ‘Nanomaterials for Remediation of Environmental Pollutants’, bioinorganic chemistry and application,(2021)
3. Sushil Kumar Singh et al ‘Nanoparticles: Novel Approach to Mitigate Environmental Pollutants’,https://www.intechopen.com/books/10681(2021)
4. Pallvi Dariyal, et al ‘Recent trends in gas sensing via carbon nanomaterials: outlook and challenges’,Royal society of chemistry**,3,** 6514-6544(2021)
5. Pooja Goswami et al, ‘Nanomaterials for Water Remediation: An Efficient Strategy for Prevention of Metal(loid) Hazard’,Water,*14*(24), 3998,(2022)
6. Haleema Saleem et al ‘Advances of nanomaterials for air pollution remediation and their

impacts on the environment',Chemosphere,287,part2,(2022)

7. Improving Water and Air Treatment with Nanotechnology,' Nanografi nanotechnology (2023)
8. Rusul Khaleel Ibrahim et al, 'Environmental application of nanotechnology: air, soil, and water',European chemical society, 23, 13754–13788, (2016)
9. Mojtaba Taran et al, 'Benefits and Application of Nanotechnology in Environmental Science: an Overview', Biointerface Research in Applied Chemistry,11 1,7860 – 7870,(2021)
10. Iva Dimitrievska, et al, 'Recent advancements in nano sensors for air and water pollution control', Material Science & Engineering International Journa, Volume 7 Issue 2 – 2023

ICHTHYOFAUNAL STUDY OF KUDALA DAM, DISTRICT NANDED, (M.S.) INDIA

Barve M. B

Dept. of Zoology, L.B.D.G. Mahavidyalaya, Umri Dist- Nanded (M.S) India.

Ovhal S. D

Dept. of Zoology, Anandrao Dhonde College, Kada Dist-Beed

Abstract:

Present Ichthyofaunal study was carried out during January 2022 to Dec 2023. At Kudala Dan Near Umri Diat-Nanded. Thisis fresh water body especially used for drinking, domestic porpose, agriculture and fisheries purposes. The results of present study reveal the ichthyofauna belong to 07orders 09 families, and 20 species, out of 20 species Cyprinidae family was dominant of all with 09 species.

Key words: Ichthyofauna, Variety, Abundance, dominant and Kudaladam.

Introduction:

Maharashtra has a variety of fish species and wealth of freshwater reservoirs including rivers, Irrigation canals,Dams and Lakes,Maharashtra has a significant state for producing Fish (Nagmote et al.2023).

Earth is the blue planet wich holds the precious matter of the universe,water. covered earth,s 2/3 surface,comprises both Marine and fresh water ecosystems.Though fresh water habitats occupy areiatively small portion of the earth,s surface, their importance to man is for greater than their area because they are most conveniant and cheapest source of water for domestic and industrial needs(Odum,1971).

Fishes form one of the most important groups of vertebrate influencing its life in various ways.millions of human beings suffer from hunger and malnutrition and fishes are a rich source food and provide a meal to tide over the nutritional difficulties of man,in addition to serving as an important item of food ,Fishes provide several by products to us.Fishes have formed an important item of human diet from time immemorial and primary caught for this purpose .fish diet provides protens ,fat,and vitamins A and D.A large amount of phosphorous and other element are also present in it.they have good test and easily digestible.Ecomomic importance and scope of Fish and Fishries especially in maharashtra ,it is essential to study the distrubution and availability of fish from freshwater reservoirs and tanks (Shinde et al.,2009).

Biodiversity is essential for stabilization of ecosystem protection of overall environmental quality for understanding intrinsic worth of all species on the earth.(Ehrlich and wilson,1991).Fish

diversity of river essentially represent the fish faunal diversity and ther abundance river conserves a rich varity of fish species.

Fish assemblages have widely been used as ecological indicator to assess and evaluate the level of degradation and health of water bodies at various spatial scales (Vijaylaxmi et al 2010).

The aquatic ecosyatem highly depend on water quality and biological diversity physico-chemical parameters of water play asignificant role in the biology and physiology of fish (A.Dhavan and S.Kaur 2002).

Present study was undertaken to study the fish diversity of Kudla dam,District-Nanded.various types of fishes were found in this dam.

Materials and methods:

The Ichthyofaunal study of the Kudaladam was carried out during the period January 2022 to Dec 2023, Fishes were collected with the help of local fishermen, who uses various fishing crafts, gears with variable mesh size. Identification of fishes was done up to species level at fish landing center to get its natural color, pattern of scales, fins, mouth pattern, identification marks like black spot, bloach on operculum, paired and unpaired fins and body parts with the help of standard literature.

Fish species not identified on the field (landing center) were preserved in 10 % formalin and brought to Fishery Research laboratory, Department of Zoology, L.B.D.G Mahavidhyalaya, Umri Dist-Nanded for identification. The Meristic and Morphometric characters were measured and fishes were indentified up to the species level, with the help of standard key from books.Days, (1967);Jayaram, (1999); Talwar et al., (1991).

Results and Discussion:

During the present study fish varieties have been observed in the Kudaladam at Near Umri District Nanded (M.S.) India. The results showed, the reservoir was rich in fish biodiversity. Fishes belong to 07 different orders; 09 families and 17 genera were collected, indentified and recorded during course of study period January 2022-december 2023. Many collected fish species were of economically important.During study 20 species of 17 different genera, 09 families and 07 orders were recorded (table no.1). The species of order cypriniformes was dominant by 08 species, followed by siluriformes and perciformes with 04 species of each, synbranchiformes, Beloniformes, Osteoglossiformes, Saccobranchidae contribute 01 species each.

Cypriniformes was most dominant with 08 species which included Catla-catla, Labiororhita, cyprinuscarpio, Rasbora daniconius, Puntius ticto, Puntius sophore, Cirrhinusmrigala, Garalamta, out of these Catla-catla, Labiororhita, Cirrhinusmrigala were found most abundant.it,s most abundance may due to more fecundity of fishes and sutable environmental condition relatively higher population density of this species was evident in the water bodies.

Whereas cyprinuscarpio, Rasbora daniconius, Garralamta were recorded abundant and

puntiussophore, puntiusticto were recorded less abundant. followed by siluriformes in which Clariusbatrachus were found abundant and Wallago attu, Ompokbimaculatus, Mystusseenghala were recorded less abundant.

The order perciformes species, Channa gaucha, Channa striatus ,channamarulius, Oreochromis mossambias were recorded abundant form.

In order synbranchiformes the species Mastacembelusarmatus were recorded less abundant. The order Beloniformes the species Xenentotoncancila were recorded abundant. The order Osteoglossifoemes species Notopterusnotopterus were recorded less abundant. Ordersaccobranchidae species Heteropneustus fossils were found less abundant.

Among the collected species order cypriniformes was most dominant constituting 40% followed siluriformes 20% Perciformes 20% and then Beloniformes 5%,Osteoglossifoemes 5% Saccobranchidae 5%.

Order of dominance:-

Cypriniformes>Siluriformes = Perciformes >Synbranchiformes = Beloniformes = Osteoglossiformes = Saccobranchidae.

Sarwade and Khilare (2010) recorded 60 species of 06 orders in which order cypriniformes were dominant in ujani wetland Maharashtra.

Jaylekshmy and sonalkumar (2012) reported 30 fish species belonging to 16 families,cypriniformes was found dominant from pallickal river Kerala ,India. Saha and Patra (2013) recorded 46 fish species belonging to 07 orders. Cypriniformes were dominant from river damodar, West Bengal, India. Ubharhande and Sonawane (2012) reported 21 species belonging to 07 order cypriniformes was dominant from paintaklidam, Buldhana (M.S) India. Nikam et.al (2014) recorded 23 species belonging to 05 orders, cypriniformes was found dominant. Kumar Naik et.at (2013) reported 64 fish species belonging 05 orders.the order cypriniformes was dominant. fromkaranja reservoir, Karnataka,India. Basavaraja et.al (2014) reported 25 fish species belongs to 04 orders; cypriniformes was dominated with 14 species. Jag mohansen (2014) reported 27 species of fish, belonging to 06 order,cypriniformes was dominant from matatila reservoir UP, India. B.Laxmappa et.al. (2015) recorded 30 fish species,12 families and 22genera,in which order cypriniformes was dominant with 13 species in kolisagar reservoir mahbubnagar dist. Telangana, India. Sonawane and Barve (2015) reported 23 species of 20 genera, 10 families and 08 orders in which order cypriniformes was dominant with 09 species from the Lower Dudhana dam district- Parbhani (M.S) India.

Similar result have been reported by Shillewar and Totawar.(2018), Kadam at.al (2022), Tripathi and Singh (2023)&Nagmote et al.(2023)**.**Results reported by earlier workers are more or less similar with the result that has been reported by us.

Summary and conclusion:

A study to explore the fish fauna of Kudaladam dist-Nanded (M.S) India .During the present study 20 species, 17 deferent genera, 10 families and 07 orders were recorded. The result of this study concluded that Kudala dam is an provides a rich diversity of fish with goodeconomic potential. This dam is significant from fisheries and is one of the major sources of livelihood for the fisherman living in its vicinity. The proper utilization and care of this dam is necessary. Thus it is necessary of every individual to play an active role to achieve the goals of sustainable fishery development and handover the resources in healthy conditions to the future generations.

Table 1: The Ichthyofaunal of the Kudala dam during January 2022 – December 2023.

Order	Family	Scientific name	Common name	Groups of food fishes	Status
1. Cypriniformes	Cyprinidae	*Catlacatla*	Catla	Carps	***
		Labeorohita	Rohu	Carps	***
		Cyprinus carpio	Common carps	Carps	***
		Rasbora daniconius	Rasbora	Food fish	***
		Punctiussophore	Dhebri	Miscellaneous fishes	**
		Puntius ticto	Dhebari	Miscellaneous fishes	**
		Cirrhinusmrigala	Mrigala	Carps	***
		Garralamta	Garra	Food fish	*
2. Siluriformes	Siluradae	*Wallago attu*	Balu /lachi	Predatory fish	**
		Ompokbimaculatus	Pobda	Food fish	**
	Clarridae	*Clariusbatrachus*	Mangur /catfish	Predatory fish	**
	Bagridae	*Mystusseenghala*	Singada	Predatory fish	**
3. Perciformes	Channidae	*Channa gaucha*	Dhoke	Predatory fish	**
		Channa striatus	Morrul /banded snakehead	Predatory fish	**
		Channa marulius	Spotted snakehead	Predatory fish	**
	Cichlicdae	*Oreochromis mossambicus*	Tilapia	Food fish	**
4 Synbranchiformes	Mastacembelidae	*Mastacembelusarmatus*	Japanivam /bam	Predatory Fish	*
5 Beloniformes	Belonide	*Xenentotoncancila*	Choch/Tochya	Weed fish	*
6 Osteoglossiformes	Notopteridae	*Notopterusnotopterus*	Potala	Weed fish	*
7.Saccobranchidae	Cyprinidae	*Heteropneustus fossils*	Magur	Food fish	*

*** Most abundant. ** Abundant. * Less abundant.

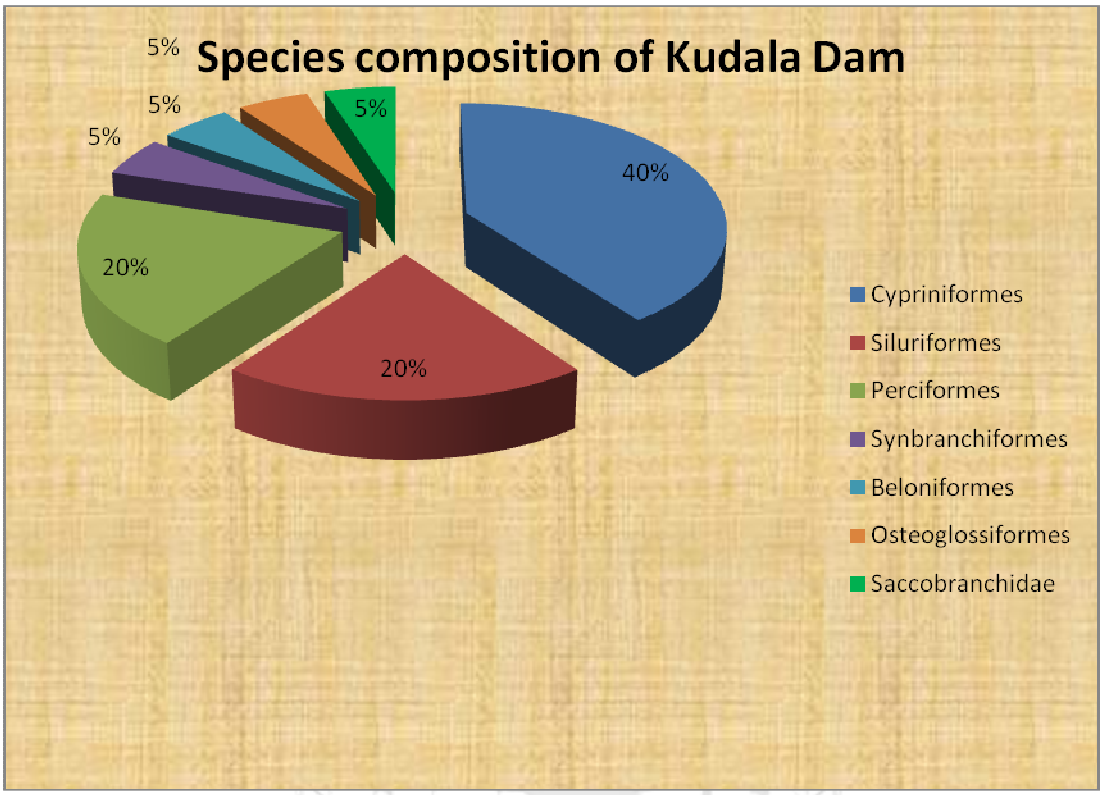


Figure 1. Order wise fish composition at Kudala Dam Dist. Nanded

References:

1. **P.E .Odum (1971)**'Fundamentals of Ecology." Saunders International Studant., 3rd ed.
2. **S.E.Shinde,T.SPathan,R.Y.Bhandare and D.L.Sonawane(2009.)** Ichthyofaunal diversity from HarssoslSavangi Dam, District Aurangabad(M.S) India,World Journal of Fish and Marine Sciences 1(6) :141-143.
3. **Ehrich P.R and E.O.Wilsin (1991).**Biodiversity studies science and policy.sci.253-762.
4. **Vilaylaxmi C, M. Rajshekhar and K. Vijaykumar (2010)**freshwater Fishes distribution and diversity status of Mullameri River ,a minor tributary of Bheema River of GulburgaDistrict,Karnataka.INT J of syst Biol.,2:1-9.
5. **A.Dhavan and S.Kaur**(2002).Pig dung as pond manur:effect on water quality,pond productivity and growth of carps in Polyculture system,Nega(ICLARM Quarterly),vol 25,No.1 pp.11-14,2002.
6. **Day,F.(1967**.)The fishes of india vol.1 and 2 jagamander agency New Delhi.
7. **Jayaram K.C. (1999**.)Thefresh water fishes of the Indian Region, Narendra publishing house. Delhi -551.
8. **Talwar,P.K and A.jhingran,(1991**.) In land fishes of India and adjacent countries Oxford and I.B.H publishing co. New Dehli,12:115-6.
9. **J.P.Sarwade and Y.K.Khillare (2010)** Fish Diversity Of Ujani Wetland ,Maharashtra,India. The Bioscan. Special issue, Vol.:173-179.

10. **V.Jayalakshmy and M.G.Sanalkumar (2010).** Bi-seasonal variation in the piscian Diversity in Relation to physic- chemical parameters of Pallikal River, Kerala, India.International Journal of scientific and Research publications,Volume 2,Issue 11.
11. **Manab Kumar Saha,BidhanC.Patra (2013).** Present status of Ichthyofaunal Diversity of Damodar River at Burdwan District,West Bengal, India.International Journal of scientific and Research Publication,Volume 3,issue 6. 1-11.
12. **Ubarhande and Sonawane S.R.(2012)**. Study of Freshwater Fish fauna and water quality at paintakli dam from BuldhanaDistrict,(M.S).India.Journal of Experimentalsciences 3(7):04-08.
13. **D.S.Nikam,A.L.Shaikh,P.S Salunkhe A.B.Kamble,K.R.Roa(2014).** Ichthyofaunal Diversity of Ashti lake ,Tq-Mohal,Dist-Solapur (M.S).Global Journal for research analysis, volume-3, Issue-12,
14. **Kumar Naik A.S.BenakappaS., Somashekara S.R., Anjaneyappa H.N,Jitendra Kumar.,MaheshV.,Srinivas H. Hulkoti and Rajanna K.B.(2013)**. International Research Journal of Environmental Sciences.Vol-2(2),38-43.
15. **D.Basavraja,J.Narayana,B.R.Kiran and E.T. Pttaiah.(2014).** Fish Diversity and abundance in relation to water quality of Anjanapura Reservoir, Karnataka, India. International journal of current Microbiology and applirdsciences,Vol.3,no.3 pp 747-757.
16. **Jag Mohan Sen. (2014).** Fresh Water Fish Species Diversity in Matatila Reservoir Bundelkhand Region, District Jhansi UP, India. Current Agriculture Research Journal,Vol. (2); 94-97.
17. **B. Laxmappa, S. Jitender Kumar Naik and S.Vamshi(2015).** Ichthyofaunal diversity of Koiksagar reservoir in Mahbubnagar District, Telangana , India. International Journal of fisheries and aquatic studies 2015; 2(3): 23-30.
18. **Sonawane D.L and Barve M.B.(2015).**Ichthyofaunal study Of lower Dudhana dam Dist – Parbhani ,M.S India.Bionano Frontier.Vol.8.Issue 3.28-33.
19. **Battul.P.N,R.A.Rao,NavaleK.R,Bagale M.B. and Shah N.V.(2007).**Fish Diversity From Ekrukh lake near Solapur Maharashtra.J.Aqua. Biol.Vol 22(2): 68-72.
20. **Hiware C.J and Pawar R.T.(2006)**. Ichthyofauna of paithan Reservoir (Nath Sager dam) in Aurangabad District of Marathwada region Maharashtra. Ecology and Environment APH publishing corporation New Delhi.
21. **Sandeep Rathod and Sunil Shinde(2012).** Ichthyofaunal Diversity of Penganga River at Umarkhed, District Yawatmal (M.S.) India, Bionano Frontier Eco evolution 2012 Colombo, Srilanka.
22. **Atul Humbe, Swati Jadhav and Sunita Borde.(2014**.) Diversity of Ichthyofauna from Kolegaon Dam Osmanabad Dist .Mharashtra. Weekly science Research Journal- Vol-

1.issue 40.

23. **R.B.Tripathiand Indu Singh (2023).**Fish Diversity and occurrence from Bariya Talab of District Balrampur, Uttar Pradesh, India.Int.JAdv.Res Biol Sci.10(09);105-118.
24. **K.S.Shillewar and D.V.totawar (2018**).Fresh water Fish Fauna of KaradkhedDam,Deglur,Nanded,India, International Journal of life Sciences Research ,Vol-6,Issue-4,pp291-293.
25. **M.S.Kadam,S.S.Nanware and D.B.Bhure(2022).**Studies of Ichthyofaunal Diversity from Vishnupuri Dam, Nanded, International Journal of advanced and Applied resesrch,Vol-09,No—05 pp-478-481.
26. **NagmoteS.R et al.(2023).**Diversity of Fresh water fishes from the Khadakpurna Reservoir of Maharashtra ,India ,Acta Scientific Microbiology 6.4-92-97.

AN OVERIEWS OF GREEN LIBRARY AND ENVIRONMENTAL SUSTAINABILITY

Mrs. Shinde Maya Udhavrao,
Librarian,
Late Babasaheb Deshmukh Gorthekar Mahavidyalaya, Umri.

ABSTRACT:

The paper highlights the concepts of the Green Library, role of Green Library, role of green practices/ services which are incorporated within libraries towards environmentally sustainable. The role of the library during this worldwide phenomenon is gigantic. Libraries are the platform for lifelong learning and supply users with information and knowledge they have. Environmental challenges like energy depletion and global climate change are influencing the sort of data resources and programs libraries are providing to their communities. The Green Library movement started within the early 1990s as a result of libraries becoming curious about environmental issues generally.

KEYWORDS: Library Environment Green Library, Sustainability, Environmental sustainability, Features of Green Library, Green Library Standards, Green Libraries in India.

INTRODUCTION:

The 'Green Library' movement came out in the 1990s and gained instigation in 2003. A Green Library also called a sustainable library that's designed, constructed, repaired and operated with environmental enterprises in mind. It refers to a structure that certifies the library as an environmentally friendly structure. It's concerted trouble of all mortal warming. The Green Library which is comprising of librarians, libraries, cities, towns, college and university campuses committed to greening libraries and reducing eco-degradation. Environmental destruction sets of a downward spiral of ecological deterioration. The paramount goal of green buildings is to develop and use sustainable energy efficient resources in construction, maintenance and overall life of the structure. Green libraries can serve the way libraries have always served as landmarks in their communities and in a way provide pleasant environment to the user community. Libraries must respond to this increasing focus on green movement and should simultaneously act as role models for sustainability by reeling of suitable and relevant information related to green issues and concerns.

- **LIBRARY ENVIRONMENT:**

The library environment encompasses not only its physical factors-the space, the layout, lighting, accommodation, furniture and visual aspects such as posters and displays- but also its

ethos and atmosphere.

- **ENVIRONMNTAL FACTORS IN LIBRARY**:

The main environmental factors affect physical deterioration of paper based library materials are- light, heat, humidity and moisture and pollutants like dust, dirt, smoke etc.

- **Definitions of Sustainability:**

"Sustainability is the capacity to improve the quality of human life while living within the carrying capacity of the earth's supporting eco-systems." This definition has been provided by the International Union for Conservation of Nature (IUCN), the work of which is driven by the fact that global production and consumption patterns are destroying nature at persistent and dangerously high rates.

- **Environmental Sustainability:**

According to Goodland, Environmental Sustainability "seeks to improve human welfare by protecting the sources of raw materials used for human needs and ensuring that the sinks for human wastes are not exceeded, in order to prevent harm to humans". Goodland's conceptualization of environmental sustainability fits into the resource-limited ecological economic framework of "limits to growth".

An important contribution to the concept of environmental sustainability was made by the OECD environmental strategy for the First Decade of the 21st Century (OECD, 2001).

What is Green Library?

Definition from the IFLA ENSULIB Section Environment means the surroundings or conditions in which human beings, organizations, animals or plants live and operate. Environments can be natural, social or cultural. Sustainable development is development that "meets the need of the present without compromising the ability of future generations to meet their own needs". (Our common future, Brundtland Report, UN.)

Present environments are endangered by climate change and other threats including social inequalities. All organizations should strive to protect the environment through sustainable development. This includes all kinds of libraries, which can play an active and significant role in sustainable development.

A Green and sustainable library is a library which takes into account environmental, economic and social sustainability. Green and sustainable library is a libraries may be of any size, but they should have a clear sustainability agenda which includes:

- Green buildings and equipment
- Green office principles
- Sustainable economy
- Sustainable library services

- Social sustainability
- Environmental management
- Commitment to general environmental goals and programmes.

The consideration of the role of humanity in climate change and the notion of sustainable development are core concerns of society and consequently of libraries".

According to the Online Dictionary for Library and Information Science (ODLID), Green Libraries are "Designed to minimize 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.).

They also focus on related services, activities, events, literature and projects, demonstrating the social role and responsibility of libraries as leaders in environmental sustainability.

WHY BUILD GREEN LIBRARIES?

There are several reasons why libraries would want to build green of incorporate green features into their buildings. First, the cost of constructing green buildings has become affordable. It is now possible for libraries to build green building on conventional budgets. Second, most readily available energy resources are finite resources. It is vital to the health of the planet and our libraries budgets that we use these energy sources prudently.

- **Features of Green Library:**

Green Library are described as environmentally friendly or sustainable libraries. And every green library must have particular characteristics, such as:

1. Use of natural, recycled, and locally available materials;
2. Use of reflecting roof and ground.
3. Use of insulating windows Water, Energy and paper maintenance;
4. Use of energy-efficient lighting to reduce consumption;
5. System for optimized cooling;
6. Appropriate plantation both inside and outside the building;
7. Circulation of fresh and healthy air;
8. Use of environmentally friendly technology.

CONCULSIONS:

Green structures have a veritably important part in environmental protection. Libraries and librarians are directly related to society and their green structures are giving them great openings to educate the citizen. For the coming generation, library professionals should move beyond environmental sustainability instanced by colourful practice of "Greening Libraries" and concentrate on the visionary way to guarantee unborn sustainable development of libraries. Environmental design should be preferred during the construction phase of libraries. The

accoutrements used while constructing the structures, the wastes and feasts that may. Do after the construction is consumed fleetly the world's natural coffers. For this, it has come more. Important to produce green structures with the conception of sustainability each over the world.

REFERENCE:

1. Atton, C. (1993). Green Librarianship: A revolt against change. (electronic version), Assistant Librarian, 86, pp166-167.
2. Bhattacharya, Anindya (2017). Green Library and its utilities in modern day library service: A study. IJNGLT, AUGUST 2017 Vol. 3 Issue 3, ISSN 2395-5201.
3. Brown, B. (2003). The new green standard (electronic version). Library Journal, 128, pp 61-64.
4. Choudhury, Tuhina (2020). Green Library: A resource centre for environmental education. Retrived from http://www.academia.edu/35585168/ Green Library a Source Centre for Environmental Education .
5. Hauke, P., Grunwald, M. & Wilde, A. (2014). Green Libraries Coming Up National and international initiatives fostering environmental sustainable libraries and library services. In BOBCATSSS 2014 (PP. 1-7).
6. Ingole, A. R. and Sweety Kumari (2021). Green Library : Concept, Sustainable Development, Features, Importance, Standards and Overview In Indian Scenario. IJCRT Vol. 9, Issue 12 Dec. 2021./ ISSN:2320-2882. www.ijcrt.0rg
7. Lamis, A.P. (2003). Greening the library: An Overview of sustainable design. In G.B.McCabe and J. R. Kennedy (ed), Planning the Modern Public Building (pp. 31-45).
8. Singh, P. and Mishra, R. (2019). Environmental Sustainability in Libraries through green practices/ services. http://www.researchgate.net/publication/ 332696690.
9. Smith, S. (1991). The library as an environmental alternative (among other things) Wilson Library Bulletin, 65, pp85 & 156.
10. Yudelson, Jerry (2007). Green Building A to Z : Understanding the language of green building. Gabriola Island, BC: New Society Publishers.
11. Wikipedia.

SUSTAINABLE DEVELOPMENT: A GANDHIAN PERSPECTIVE

Dr. Adkine Navnath Govindrao
Head & Professor in Political Science
Late Babasaheb Deshmukh Gorthekar College, Umri
Ta. Umri Dist. Nanded (Maharashtra) Pin- 431807
Affiliated- S. R. T. M. U. Nanded (Maharashtra)

"Nature has the capacity to meet the human need, but not human greed"- M. K. Gandhi

Man has been intervening in nature for a long time however; the growth of Industrialization during the present century has accelerated the process to intolerable levels. If our activities interfere too radically with the working of nature, then nature might no longer be capable of discharging its duties and providing the benefit, which we now take for granted and upon which our survival depends. Hence, the growth-oriented theories must be replaced by theories of sustainable development that will not damage but will guarantee harmonious co-existence of man, development and the eco-system.[1]

Concept of sustainable development:

The concept of sustainable development is not only an ideology but also a movement and a vision. The concept is a synthesis of economic and ecological ideas. It is a collection of concepts, ecological, economic, social and political that have been put together to address what is perceives by many to be world environmental crisis.[2]

Sustainable development is the organizing principle for meeting human development goals while at the same time sustaining the ability of natural systems to provide the natural resources and ecosystem services upon which the economy and society depends. The desirable end result is a state of society where living conditions and resource use continue to meet human needs without undermining the integrity and stability of the natural systems.

While the modern concept of sustainable development is derived mostly from the 1987 Brundtl and Report, it is also rooted in earlier ideas about sustainable forest management and twentieth century environmental concerns. As the concept developed, it has shifted to focus more on economic development, social development and environmental protection for future generations. It has been suggested that "the term 'sustainability' should be viewed as humanity's target goal of human-ecosystem equilibrium (homeostasis), refers to the holistic approach and temporal processes that lead us to the end point of sustainability."

The concept of sustainable development has been- and still is- subject to criticism. What, exactly, is to be sustained in sustainable development? It has been argued that there is no such thing as a sustainable use of a non-renewable resource, since any positive rate of exploitation will eventually lead to the exhaustion of Earth's finite stock; this perspective renders the industrial

Revolution as a whole unsustainable. It has also been argued that the meaning of the concept has opportunistically been stretched from 'conservation management' to 'economic development', and that the Brundtland Report promoted nothing but business as usual strategy for world development, with an ambiguous and insubstantial concept attached as a public relations slogan.[3]

"Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. It contains within it two key concepts. The concept of 'needs', in particular, the essential needs of the world's poor, to which overriding priority should be given; and the idea of limitations imposed by the state of technology and social organization on the environment's ability to meet present and future needs."[4]

Salient Features of Sustainable Development:

1. Intergenerational Equity:This Principle entails equitable use and conservation of natural resources by the present generation, being the trustee for future generation. Future generation have right to develop with a corresponding present generations duty not to overexploit natural resources.
2. Precautionary Principle: States are obliged to take preventive actions against possible environmental harms by human activity. Precaution is to be taken in case of serious and irreversible damage to environment.
3. Polluter Pays Principle: Polluter has to bear the cost of pollution – Polluter is under an absolute liability to compensate harm to person, property or environment caused by his activity.
4. Doctrine of Public Trust: Trusteeship Principle – State is the trustee of natural resources for its subjects and duty bound to protect "public commons". There is no private ownership over natural wealth.
5. Use and Conservation of Natural Recourses and Environmental Protection. These are inseparable constituents of sustainable development and complimentary to it.[5]
6. It considers the equity between countries and continents, races and classes, gender and ages.
7. It includes social development and economic opportunity on one hand, and the requirements of the environment on the other.
8. It is a process which leads to a better quality of life while reducing the impact on the environment.
9. It acknowledges the interdependence of human needs and environmental requirements.

A. Ecological Footprint: It is the area of land required to support a human being, or a group of human beings. If the footprint of a settlement is larger than its area, that settlement is not independently sustainable. A city is unsustainable because most resources such as food,

water, minerals and fuels come from beyond the city.

B. The average foot print in the US-12.5 ha, India-1.1 ha and Bangladesh-0.5 ha.[6]

If implemented with proper spirit, these legal norms would serve the ultimate goal of protection, preservation and conservation of natural heritage, ecosystems, wildlife, biodiversity etc. These norms are instrumental in regulating the developmental activities.

The Sustainable Development Goals (SDGs):

September 2015, the United Nations General Assembly formally adopted the "universal, integrated and transformative" 2030 Agenda for Sustainable Development, a set of 17 Sustainable Development Goals (SDGs). The goals are to be implemented and achieved in every country from the year 2016 to 2030.

1.No poverty, 2. Zero hunger, 3. Good health and well-being, 4. Quality education, 5. Gender equality, 6. Clean water and sanitation, 7. Affordable and clean energy, 8. Decent work and economic growth, 9. Industry, innovation and infrastructure, 10. Reduced inequalities, 11. Sustainable cities and communities, 12. Responsible consumption and production, 13. Climate action, 14. Life below water, 15. Life on land, 16. Peace, justice and strong institutions, 17. Partnerships for the goals.[7]

Agenda 21 refers to the 21st Century:

Agenda 21 is a non-binding, voluntarily implemented action plan of the United Nations with regard to sustainable development. It is a product of the Earth Summit (UN Conference on Environment and Development) held in Rio de Janeiro, Brazil, in 1992. It is an action agenda for the UN, other multilateral organizations, and individual governments around the world that can be executed at local, national, and global levels. The "21" in Agenda 21 refers to the 21st Century.

Agenda 21 is a 350-pages document divided into 40 chapters that have been grouped into 4 sections: **Section I:** Social and Economic Dimensions: is directed toward combating poverty, especially in developing countries, changing consumption patterns, promoting health, achieving a more sustainable population, and sustainable settlement in decision making.

Section II: Conservation and Management of Resources for Development: Includes atmospheric protection, combating deforestation, protecting fragile environments, conservation of biological diversity (biodiversity), control of pollution and the management of biotechnology, and radioactive wastes.

Section III: Strengthening the role of Major Groups: includes the roles of children and youth, women, NGOs, local authorities, business and industry, and workers; and strengthening the role of indigenous peoples, their communities and farmers.

Section IV: Means of Implementation: Implementation includes science, technology transfer, education, international and financial mechanisms.[8]

Sustainable Development: A Gandhian Perspective:

Gandhi's vision is represented by the approach of frugal sustainable society. It is the economic vision of a decentralized commune of post-industrial age. The emphasis is on personal self-sufficiency and voluntary frugality. It links human beings intimately with nature and puts faith in decentralized commune life where needs and wants are reduced to bare minimum and concept of work will significantly change. It is a vision of self-reliance, self-help, decentralization, lab our intensive, localized and small-scale in terms of technology. Qualitative goals of a satisfying and meaningful life are seen as more important than quantitative values.[9]

Gandhi's ideas are also reflected in the total value shift in production, consumption, habits, political structure etc. It places more emphasis on moral responsibility of the individual at personal, social, national and universal level. Gandhiji came up with is extremely relevant today as it was a century ago. His is the most practical approach to building an egalitarian order.

Any approach which limits passion and greed and aims at fulfilling the fundamental needs remains central to the concept and practice of sustainable development Gandhijis movement was based on strong ethical and spiritual principals. Gandhijis approach was holistic which covered not only the political spectrum but also the economic, social, religions and communal life.

Gandhian economics, which has a spiritual orientation, has a holistic approach. It is inclusive in nature and relies on the following: Simple living and high thinking. Ends do not justify the means. Relevance of the Mahatma will be felt more in the years to come when man becomes more and more weak and vulnerable due to his unabated greed and lust. If we cannot retrace and reverse, let us at least try to synthesize science and spirituality to ensure a more balanced approach to define and refine our wants and exercise restraint, which is the quintessence of the Indian Culture.

Gandhiji believes the nature of environment is dynamic and holistic, which continually underwent change. The whole universe is interconnected, inter-related and interdependent. No one is an island; we are interwoven in the intricate tapestry of life. Another proponent of sustainable development, Schumacher has emphasized on meeting human needs and caring for the environment. This would be society where energy would come from renewable sources (like the sun and wind) and all nonrenewable energy would be conserved and recycled and technologies would be appropriate, but not harmful.

In mahatma Gandhi's opinion, in any scheme of development, man should be at the centre. A long term view of development has to be taken, for we owe our debt to prosperity as well. Man has to make a judicious use of natural resources. The ecological balance should not be disturbed. The objective should not be to build the islands of prosperity in the ocean of poverty; but to raise the level of standard of life and to combat poverty.[10]

The real importance of Gandhi as an environmentalist lies not just in his vision and his

understanding of the man-nature relationship, but in the fact that he patterned his personal life on these ideals and set a (then) living example for others to follow. Throughout his life, he continued to give demonstrations on health, hygiene and sanitation.

References:

1. S. V. Prabhath (Editor), Gandhi Today, Serials Publications, New Delhi (India), 2010 Page no. 106.
2. S. V. Prabhath (Editor), Gandhi Today, Serials Publications, New Delhi (India), 2010 Page no. 107.
3. En. M. Wikipedia. Org. sustainable development.
4. World commission on environment and Development, our common future (1987).
5. Panjab Chavhan (Editor), Gandhian Thought, Nirmal Publications, Nanded (India), Page no. 426.
6. En. M. Wikipedia. Org., Environmental Studies, Lesson 24: Social issues and the environment.
7. En. M. Wikipedia. Org., The Sustainable Development Goals (SDGs), UN, September 2015.
8. En. M. Wikipedia. Org., Agenda 21 refers to the 21st Century, UN, September 2015.
9. S. V. Prabhath (Editor), Gandhi Today, Serials Publications, New Delhi (India), 2010 Page no. 108.
10. Dr. Vaidehi Paptardar, Article of Gandhian relevance to environment sustainability, En. M. Wikipedia. Org.

Peer Reviewed Refereed Journal **ISSN : 2278 – 5639**
Global Online Electronic International Interdisciplinary Research Journal (GOEIIRJ)
{Bi-Monthly} **Volume – XIII** **Special Issue – IV** **March – 2024**

CONSERVATION OF BIODIVERSITY: ISSUES AND PRACTICES.

Dr. Pratap V. Deshmukh
Nagnath Arts, Commerce and Science College Aundha Nagnath
Dist- Hingoli.

ABSTRACT

The variations may be linear or cyclic. The variety and variability of organisms and ecosystems is referred to as biological diversity or biodiversity. Similarly, the biological variations initiate at the micro level (bio-molecular level or genes) and become apparent at species and ecosystem level. The biological variations in nature over time and space form the basis of evolutionary processes. Thus, biodiversity is the degree of variety in nature and not nature itself. Similarly, the biological diversity is not the same as biological resource although mutually, they form part of each other. The conservation of biological diversity is distinct but related to biological resources. The conservation of biodiversity is linked with the maintenance of ecological stability and productivity. The concept of biodiversity is very vast and seated at a micro level. In holistic sense, it can be linked with most of the biological processes in nature. Its conservation involves a number of parameters such as number of species. their population dynamics, distribution, habitat, structure, microhabitats,physical environment, climate, present management and past history, Therefore, the efforts for conservation of biodiversity should be in tune with the processes and its occurrence in space and time, from micro level to megalevel.

Key Words : Variation, Evolution, Micro level, Megadeal, Productivity etc.

INTRODUCTION

Variation is the law of nature. It occurs every where and every moment. The variations take place at microlevels at short space and small time period, but these become apparent only over a large space and big a time gap. The variations may be linear or cyclic. The variety and variability of organisms and ecosystems is referred to as biological diversity or biodiversity. Similarly, the biological variations initiate at the microlevel (bio-molecular level or genes) and become apparent at species and ecosystem level. The biological variations in nature over time and space form the basis of evolutionary processes. Thus, biodiversity is the degree of variety in nature and not nature itself. Similarly, the biological diversity is not the same as biological resource although mutually, they form part of each other. The conservation of biological diversity is distinct but related to biological resources. The conservation of biodiversity is linked with the maintenance of ecological stability and productivity. The concept of biodiversity is very vast and seated at a microlevel. In holistic sense, it can be linked with most of the biological processes in nature. Its conservation involves a number of parameters such as number of species. their population dynamics,

distribution, habitat, structure, microhabitats,physical environment, climate, present management and past history, Therefore, the efforts for conservation of biodiversity should be in tune with the processos and its occurrence in space and time, from micro level to megalevel.

Material and Method :

Mostly in the managing forests/wildlife areas need to acquire more knowledge about the species, habitats and the intricate relationship between them. There needs to be more commitment and sincerity for the cause of biodiversity conservation. The working pattern of governmental organisations has become such that maximum time of the PA managers is passed in office works and they find very less time for the field. Unless they pass at least half of their time in field to observe the condition of forests, wildlife and people ,employees& local people), and that too on foot, the mal field problems cannot be properly visualised and solved.

The forest areas surrounded by fields, human habitations. towns and cities, offering hardly any opportunity for the wildlife of the ares to migrate to the adjoining areas. According to the Biogeographic theory, the Islands do support a constant number of species at a state of equilibrium. there is a dynamic balance between the rate at which new species are added, and the rate at which species become extinct, once the equilibrium is attained. However, during the period which will be required to reach equilibrium, it can be anticipated that three quarter of the species of these biomes will become extinct. Therefore, if the diversity of the PAs are to be maintained, it becomes mandatory to network the 500 odd PA islands in the country.

The management practices of forests are selective for promoting only a few species, which hold economic importance given the present circumstances, overlooking the future use of species which are not economically important at present. Lots of important non timber forest species are auctioned to various industries. Several species of medicinal plants are extracted from the forests by pharmaceutical companies without the knowledge or permission of the Forest Department, who is the custodian of these forest resources. Therefore, the forest working plans must have exhaustive lists of species, rather than having routine lists carried over from the previous working plan.

Result and Discussion :

India ranks sixth among twelve mega diversity countries in the world. There are different types of species among flowering plants, gymnosperms, bryophytes, pteridophytes, lichens and fungi. Some species are endemic to India out of which, few are threatened.

Conservation in India has an age old tradition of nature conservation and the same is reflected not only in old literature and cultural ethics, but also in the constitution, policies, legislation and organisations.

Despite the policies, legislations and organisations for implementation, there appears to be some gaps in the application of conservation measures at field level. Vast variety of plant and animal species occur naturally in forests which are managed by the State Forest Departments. The

primary objective of management has been timber and fuel wood, and to some extent, non-timber forest produce. Thus, attention is given to only few species out of a spectrum of species existing in ecosystems whereas, the growth and reproduction of these few species is dependent on several other species present in the respective ecosystems. Studies reveal that all species in an ecosystem are interdependent. Selective exploitation of species (which are economically important and are of other direct use values) for several years does reflect in the imbalance of the ecosystem and less production. This selective management by man has resulted in cultivation of some selected species and gradual elimination of the presently less important ones. Monoculture plantations of tree species have been raised in forest areas. Similarly, in agriculture, several wild varieties have been lost due to cultivation of a few high yielding varieties. In Indonesia, about 1,500 wild

Thus, selection of species by man and selection by nature are altogether different. The former is directly exercising where as the latter, in response to Jermer, is taking indirect course, but both are resulting in loss of biodiversity. This also affects productivity and sustainability.

Rather, the forest cover is continuously shrinking. The main reason attributed to this loss of farest cover is the growing pressure of the ever increasing population. This is apparently true for depletion of forest resources, but may not be equally true for reduction in biological diversity. Although, there has been a tendency of reduction in both the biological resources and biological diversity, yet, the main reasons for depletion of both are different. Most of the biological resources are reduced to meet the growing demand of burgeoning population, whereas, the main reasons for loss in biodiversity are selective over use and selective cultivation of some species, habitat loss. fragmentation, pollution etc.

The reasons pertaining to habitat loss are also applicable for the loss of biological resources as well. The selective use and cultivation of some species enhance resource availability, but this attitude ignores a large number of other species, which constitute the biological diversity.

It is worth while to consider the trend in reduction of forest cover and loss of species. The habitat loss of endemic species also leads to their local extinction. Species loss also occurs due to natural genetic reasons.

The forest areas surrounded by fields, human habitations. towns and cities, offering hardly any opportunity for the wildlife of the ares to migrate to the adjoining areas. According to the Biogeographic theory, the Islands do support a constant number of species at a state of equilibrium. Le, there is a dynamic balance between the rate at which new species are added, and the rate at which species become extinct, once the equilibrium is attained. However, during the period which will be required to reach equilibrium, it can be anticipated that three quarter of the species of these biomes will become extinct (Terborgh 1992). Therefore, if the diversity of the PAs are to be maintained, it becomes mandatory to network the 500 odd PA islands in the country.

The instances of wild animals invading agricultural fields, villages and human habitation

are prevalent in areas surrounding the PAs. We must realise that the humans have invaded their habitat, and not the wildlife who ere invading the human habitat. A glowing example is that of the destruction caused by migratory herds of elephants who cause extensive damage to property and even human life every year. Instead of attempting to avert the migratory passage of these elephants, the efforts should concentrate on rehabilitating the villages which lie in the migratory passage, which have been used by the elephant herds since centuries.

A list of endangered species, their distribution and status must be well documented, updated and maintained for all areas (management units) Similar information regarding species which are commercially exploited (legally or illegally) must be well documented and their illegal exploitation must be curbed. There are several instances of unrecorded over exploitation of medicinal plants which have even lead to local extinctions of some species which were otherwise abundant in the concerned area.

Aawareness among people is necessary.Even though the local people have been the practicing resource managers till the forests were declared as stale property and came under government control, yet, the local people lack a general awareness of the benefits of the forests in the long run and the importance of conservation and sustainable utilisation of the forest resources. The traditional practices of Non Timber Forest Produce (NTFP) collection and logging are unscientific and damage the forest areas to a great extent. Instances of whole trees being felled for the collection of NTFPs like Aonal (Emblica officinalis). Chiranji (Buchananialanzan), etc. by the local people are common. This practice has considerably reduced the population of these species in the natural forests. Sach practices stem from the philosophy of the people of 'living on a day- to-day basis, thus neglecting the implications of these practices in the long run. In the light of the above, the generation of awareness regarding environment and importance of formats becomes a necessary ingredient for the conservation of biodiversity.

In the past, forest areas were being solely protected by the people. But with the onset of legislations, people have been alienated from the forest resources and there is a general shift from the belief of "Our forests, we will protect it" to "Government forest, they should protect it. This tendency coupled with increasing population is the root cause for over exploitation and a general sense of apathy among the masses for the forest resources, as against the sense of the Indian Constitution to have compassion for all living creatures.

In the past, there were plenty of natural resources, but various information’s and knowledge about them were scanty. The human development has brought about a virtual reversal of the past. Now we have plenty of informations and knowledge, but scanty natural resources.

It has been felt that the threats to species increase when their uses become known to man. The threats arise due to inherent human tendency to know, use and possess unique and rare things. The concept of district botanical gardens to preserve all plant species of the district concerned was

good, but it has increased the threats of extinction on several species. Near natural areas were selected to develop them as botanical gardens and in the process of development of such gardens, lot of naturally occurring species were finished from the areas. In a bid to plant the species from neighbouring areas, many species were dislocated from their natural habitats. Collapse of the scheme due to financial reasons have rendered the so called botanical gardens akin to wastelands.

The forest fires occur practically every year in the country and the incidences are on the increase. Almost all the forests get burnt every year. The main reasons for the burning of forests are due to shifting cultivation and grazing, fuelwood and minor forest produce collection, and the passage of humans through forest areas in general. The practice of burning of forest areas to promote the growth of young and tender Tendu leaves is widely prevalent. Similarly, collection of Mahua and Sal seeds also involve the use of fire which, at times, becomes uncontrollable and assumes the form of forest fire. In some tribes, the practice of pledging to burn forests a specific number of times in case an ailing person is cured, is also prevalent. In other cases, local people set forests on fire to protest against the strictures against collection of timber, fuelwood and the like, or due to personal rivalry. Burning of agricultural slash on fields neighbouring forest areas without proper monitoring also is one of the causes of forest fires.

Biodiversity Conservation in Managed Forests and Potected Areas

The efforts and facilities available to prevent and control the forest fires are not adequate and effective. This results in burning of valuable resources, degradation of habitat and loss of some species. Therefore, adequate measures to prevent forest firms and fighting them are urgently required. There is an urgent need to meticulously and earnestly document the incidences of forest fires.

Conclusion

The problem of biodiversity conservation has become a global issue. It is being realised that the forests existing in a country is not a resource just for that country, but for the whole of the world. The Amazonian Rain Forests have been called the "Lungs of the world" as they serve to purify the global atmosphere by release of oxygen and absorption of pollutants. The rate of deforestation is several times higher in the developing countries than the developed countries, as the forests are being felled to generate funds and space for development. There needs to be intervention from the developed countries in the form of developmental funds for forests and environment.

The fact has to be reconciled with, that the conservation of biodiversity cannot be achieved just by signing treaties, conventions and agreements at international level, or by enacting legislation at national and state levels. Although, these things considerably reduce the losses and help conserve biodiversity for present and future benefit of mankind, yet, a lot of other practical measures, as suggested above, are also required. Unless rules and these practical measures are

strictly observed by all implementing organisations, biodiversity cannot be conserved.

Above all, there needs to an awakening among the masses towards the cause of protection of environment and conservation of biodiversity.

REFERENCES

1. Brain Groombridge. 1992. Global biodiversity: Status of Earth's Living Resources. World Conservation Monitoring Centre, Cambridge.
2. Govt. of India. 1994. Conservation of Biological Diversity in India: An Approach. Ministry of Environment and Forests (MOEF), New Delhi.
3. Mc Neely, J.A. 1988. Economics and Biological Diversity. IUCN. Switzerland.
4. Rodgers, W.A. & H.S. Panwar. 1988. Planninng A Wildlife Protected Area Network in India. Vol. I & II, Wildlife Institute of India, Dehradun.
5. Terborgh, John. 1992. Diversity and the Tropical Rain Forests. Scientific American Library, NY.

ANTICATARACT POTENTIAL OF *ENICOSTEMMA*: A REVIEW

Rahul V. Zade
Department of Botany,
Shankarrao Chavan Mahavidyalaya, Ardhapur, Dist., Nanded.

Saheb L. Shinde
Department of Botany,
Yeshwant Mahavidyalaya, Nanded.

Abstract:

Inside human eyes, there is a natural lens. The lens refracts light shafts that come into the eye to support us know. A person with cataract, this lens becomes cloudy, and unreality gets vague, foggy. Enicostemma possesses a significant anticataract activity in vitro and its anticataract eventuality could be related with its ar inhibitory effect. The study was aimed to understand the positional suitability of hydroxylation in the flavonoid altar for maneuvering it as an anticataract agent. Monohydroxylated flavonoids rataining hydroxylation were estimated for their effect on glycation induced lens nebulosity, protein aggregation. The named flavonoids also estimated for their aldose reductase inhibition a crucial enzyme intertwined in cataractogenesis. Glycation induced cataractogenesis and visual impairment is a major ophthalmic concern of altered sugar homeostasis in humans as well as creatures. The present work offers a review addressing the detailed anticataract potential of Enicostemma plant.

Keywords: Cataractogenesis, flavonoids, glycation, protein aggregates , aldose reductase (AR)

1. Introduction

Cataract the leading cause of blindness worldwide is associated with affecting the body and diabetes is one of the main lawbreakers that is associated with it. (World Health Organization (2007). Diabetic cataract is a late stage complication in diabetic case and one which dramatically affects the quality of life (Kiritikar et al. 1999,Gacche et al. 2015, Vishwakarma et al. 2010). Accumulation of sorbitol, an osmolyte, in the cells due to its reduced penetration through cellular membranes and slow metabolism by sorbitol dehydrogenase, leads to colourful natural revision like bibulous lump, change in membrane permeability, leakage of glutathione and myo- inositol, in addition the generation of free revolutionaries and hydrogen peroxide leading to generation of oxidative offense (Vasu et al. 2005). The accumulation of polyol in eye lens filaments, affluence of water and generation of bibulous stress has been intertwined as some of the early events in diabetic cataracts which are substantially due to the increase in AR activity (Srinivasan et al. 2005). Therefore, the inhibition of AR enzyme is thus one of the implicit pharmacological approaches that have been proposed to treat the secondary complications of diabetes causing cataract complication.

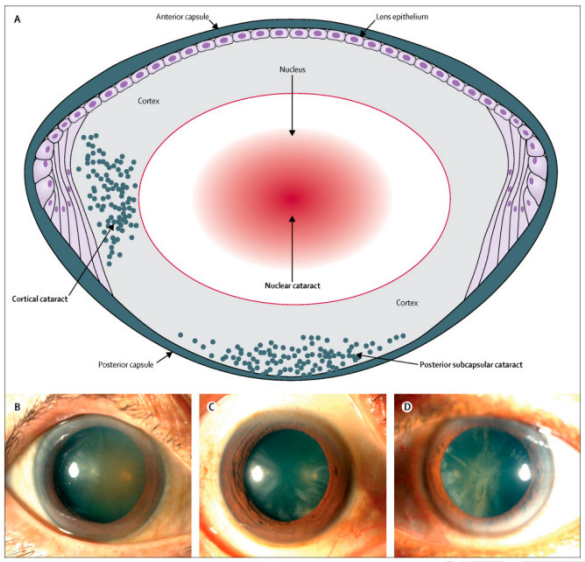


Fig.1:Characteristics of lens structures and major types of cataracts for location-based classification. (A) A schematic view of lens structures and corresponding types of cataracts. (B) nuclear cataract, (C) cortical cataract, and (D) subcapsular posterior cataract. (Source: Segewkal et al. 2020).

Enicostema sp. is an imperishable condiment belonging to family Gentianaceae. Generally known as "Naai". This ingredients were low toxin, environmental benevolence, and no side effects (Murali et al. 2002; Upadhyay and Goyal, 2004; Vasu et al. 2005). Monoterpene alkaloids similar as Enicoflavin, Gentiocrucine and seven different flavonoids have been uprooted from the alcoholic exractst and the structures have been categorised as Apigenin, Genkwanin, Isovitexin, Wertisin, Saponarin, 5-o-glucosylwertisin and 5-o-glucosylisowertisin (Goshal et al. 1974). The circumstance of catechins, steroids, triterpenoids, flavonoids, and xanthones and a new flavonous C-glucoside called verticilliside was insulated (Jahan et al. 2009).

2. Materials and methods

Reagents Reduced Nicotinamide Adenine Dinucleotide Phosphate (NADPH), lithium sulfate, d-xylose, Quercetin, sucrose, maltose, RPMI-1640, l-glutamine, sodium bicarbonate, glucose, 4-2-hydroxyethyl-1-piperazine ethanesulfonic acid (HEPES), sodium pyruvate, fetal bovineserum, streptomycin, penicillin, and 3-(4,5-dimethylthiazolyl-2)-2,5-diphenyltetrazoliumbromide (MTT) was carried from Hi Media, Mumbai, India. Dexamethasone (DEX), streptozotocin (STZ) and 8-(4-chlorophenylthio) adenosine 3′,5′- cyclic monophosphate sodium swab (pCPT-cAMP) was bought from Sigma-Aldrich Corporation, Bangalore, India. (Vasu et.al. 2005, Michael et al. 2011, Gacche et al. 2015).

2.1 Lens organ culture study

Fresh eyeballs were attained from the city and transferred to a vessel containing KRB buffer (pH 7.5). The insulated lenses were incubated collectively in KRB buffer with the extension of 30 mM glucose (a supraphysiological attention for converting glycation) and 50 mM existent flavonoids. A set of positive (lens in KRB buffer without farther extension of 30 mM glucose) and inhospitable control (lens in KRB 30 mM glucose) along with a reference emulsion (Aminoguanidine 50mM) were also arranged contemporaneously for comparison purpose (Gacche et al. 2015, Michael et al. 2003). The lenses in colourful sets were incubated in CO_2incubator(with

95 air, 5 CO_2 and at 37 C temperature). The antibiotics penicillin and streptomycin were appended to the KRB buffer to help impurity. After 2 week of incubation, the lenses were observed for the evolution of generalized nebulosity, dislocation and morphological changes (Stefek et al. 2011).

2.2 Catalase(CAT) Assay.

Lens catalase exertion was determined by colorimetric system, in which lens homogenate was incubated in H_2O_2 substrate and the enzymatic response. 10 μL of sample was appended to the response admixture containing 50μL of 30mM hydrogen peroxide (in 50mM phosphate conciliator, pH 7.0), 25μL of H_2SO_4, and 150μL of $KMnO_4$. After mingling completely, the absorbance was measured at 490nm. A system devoid of the substrate (hydrogen peroxide) was served as the control (Michael et al. 2011). The disparity in absorbance per unit time was ventilated as the exertion. One unit was outlined as the quantum of enzyme needed to putrefy 1.0 M of hydrogen peroxide per nanosecond at pH 7.0 and 25°C.

2.3 Determination of Aldose Reductase (AR) Activity.

$$\% \text{ AR Inhibition} = \frac{\Delta\text{Abs. (Negative Control)} - \Delta\text{Abs. (Extract)}}{\Delta\text{Abs. (Negative Control)}}$$

Aldose reductase activity was determined utilizing spectrophotometric system. The determination was performed by measuring the drop in NADPH absorbance at 390 nm over a 4-nanosecond period, utilizing DLglyceraldehyde as a substrate. Each 1.0 mL cuvette containing equal units of enzyme 0.1 M sodium phosphate buffer (pH 6.2) and 0.3 mM NADPH either with or without substrate and asset was prepared. One set of fusions prepared with an original measure of sodium phosphate conciliator rather of tried slices was exercised as control (Patel et al. 2009). Quercetin was exercised as a positive control of AR asset grounded on its aldose reductase repression activity and the anticataractogenesis. (Shanmugam et al. 2015, Zhao et al. 2015).

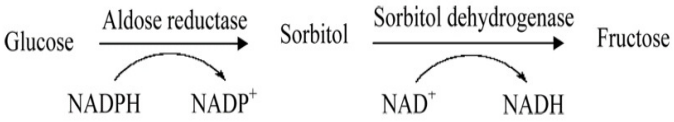


Fig.2: enzyme activity of AR and SD

2.4 Lens AR activity along with plant extract

Dehydrated excerpts were reconstituted in phosphate conciliator saline to prepare stock results. To determine their AR restraining exertion, colourful attention of two extract ranging from 25g/ mL to 300g/ mL were prepared (Pullaiah et al. 2003). The response was founded by the extension of 0.1 mL DLglyceraldehyde with 0.1 mL extract and the rate of response was measured as described over. For standard-issue quercetin the attention was set ranging from 1.25 to 10g/mL. ΔOD/min/mg protein was calculated for each sample. Percent inhibition of AR exertion was also

calculated esteeming the exertion of usual lens as 100. IC50 value for each excerpt and standard-issue quercetin were attained from a cure-reaction wind calculated by conniving attention versus percent inhibition (Patel et al. 2009).

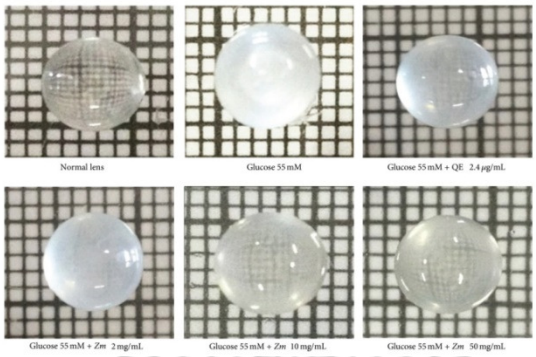


Fig.3: The photograph of animal lenses after 72 hrs incubation period.

3. Conclusion

The introductory end of the review study was to charge the efficacity of the named set of monohydroxylated flavonoids and their positional sequel of hydroxylation with the anticataract-related conditioning in glycation- convinced lens model. It is clear from the standard images digitized after 15 days of incubation, the 7-hydroxy flavone has maintained the translucency and morphology of the lens significantly as assimilated to inhospitable control and all other test flavonoids. 7- hydroxy treated lens translucency seems to be at par with that of the aminoguanidine a known as antiglycating agent. All flavonoids were set up operative in maintaining the structural veracity of the lenses.

Thus, developing new AR impediments has remained a significant stop gap for the amelioration of diabetic complications involving cataractogenesis. The present-day disquisition was aimed for gathering the structural demand of monohydroxylated flavonoids with their efficacity in the amelioration of glycation-convinced lens nebulosity, inhibition of protein aggregation, carbonyl group conformation, nontryptophan time luminescence and AR. Farther, extraction guided separation may leads to insulation of patch responsible for AR inhibitory and their use in vivo and clinical effectualness remain to be estimated.

4. Acknowledgement

The authors are grateful to Dr. J.C. Pathan, I/C Principal, S.C.M. Ardhapur, Dist. Nanded, Maharashtra for providing the necessary facilities.

5. **Conflict of interest:** Nil.

References:

1) A. B. M. Reddy, R. Tammali, R. Mishra, S. Srivastava, S. K. Srivastava, and K. V. Ramana, (2011), "Aldose reductase deficiency protects sugar-induced lens opacification in rats," ChemicoBiological Interactions, vol. 191, no. 1–3, pp.346–350.
2) A. G. Chandorkar, M. V. Albal, P. M. Bulakh, and M. P. Muley (1981),"Lens organ culture. (Methodology and preliminary observations on viability and maintenance of transparency)," Indian Journal of Ophthalmology, vol. 29, no. 3, pp. 151–152.
3) A. Spector (2000),"Review: oxidative stress and disease," Journal of Ocular Pharmacology and Therapeutics, vol. 16, no. 2, pp. 193– 201.
4) A. Vejux, M. Samadi, and G. Lizard (2011),"Contribution of cholesterol and oxysterols in the physiopathology of cataract: implication for the development of pharmacological treatments," Journal of Ophthalmology, vol. 2011.
5) Abirami P., Gomathinayagam M. (2011), A review on Enicostemma littorale. Pharmacologyonline; 1: 75-83.
6) Abirami P., Gomathinayagam M., Panneerselvam R. (2011), Antioxidant activity of the medicinal plant Enicostemma littorale Blume. IJGP; 5: 342-345.
7) Abirami P., Gomathinayagam M., Panneerselvam R. (2012), Preliminary study on the antimicrobial activity of Enicostemma littorale using different solvents. Asian Pacific journal of tropical medicine.; 5(7):552-555.
8) Augusteyn R.C. (2007), Growth of the human eye lens. Mol Vis 13: 252–257.
9) B. V. Magno, M. B. Datiles III, and S. M. Lasa, (1993),"Senile cataract progression studies using the Lens Opacities Classification System II," Investigative Ophthalmology and Visual Science , vol. 34, no. 6, pp. 2138–2141.
10) Baynes J.W. (1991), Role of oxidative stress in the development of complications in diabetes. Diabetes 40: 405–412.
11) Bettelheim F.A. (1985), Physical basis of lens transparency. In: Maisel H. (ed.). The ocular lens, structure, function and pathology. New York: Marcel Dekker, 265–295.
12) Bhatt N.M., Barua S., Gupta S. (2009), Protective Effect of Enicostemma littorale Blume on Rat Model of Diabetic Neuropathy. American J Infect Dis; 5: 99-105.
13) Birla S.S., Gaikwad S.C., Gade A.K., Rai M.K. (2013), Rapid synthesis of silver nanoparticles from Fusarium oxysporum by optimizing physicocultural conditions. Scientific World J;2013:796018.
14) Broekhuyse R.M. (1973), Membrane lipids and proteins in ageing and cataract. In: Elliot K & Fitzsimons DW (eds). The human lens – in relation to cataract: CIBA foundation Symposium 19. Amsterdam: Elsevier, 135– 149.
15) C. L. Lai, W. Y. Shau, C. H. Chang, M. F. Chen, and M. S. Lai, (2013),"Statin use and

cataract surgery: a nationwide retrospective cohort study in elderly ethnic Chinese patients," Drug Safety, vol. 36, no. 10, pp. 1017–1024.

16) Chaudhuri R.K., Singh A.K., Ghosal S. (1975), Chemical constituents of Gentianaceae. XVIII. Structure of enicoflavine. Monoterpene alkaloid from Enecostimmahyssopifolium. Chemical Industry (London) 3, 127–128.

17) Chen M., Curtis T.M., Stitt A.W. (2013), Advanced glycation end products and diabetic retinopathy. Curr Med Chem;20:3234–40.

18) Deore S.L., Khadabadi S.S., Bhagure L., Ghorpade D.S. (2008), In vitro antimicrobial and antioxidant studies on Enicostemmaaxillare (Lam.) Raynal. leaves. Natural product radiance.; 7(5):409-412.

19) Drinkwater J.J., Davis W.A., Davis (2019), A systematic review of risk factors for cataract in type 2 diabetes. Diabetes Metab Res Rev; 35: e3073 [PMID: 30209868 DOI: 10.1002/dmrr.3073].

20) Duindam J.J., Vrensen G., Otto C. & Greve J. (1996):, Aging effects the conformation of cholesterol in the human lens. Ophthalmic Res 28(S1): 86–91.

21) Duindam J.J., Vrensen G., Otto C. & Greve J. (1998), Cholesterol, phospholipid and protein changes in focal opacities in the human eye lens. Invest Ophthalmol Vis Sci 39: 94–103.

22) Gacche R.N., Meshram R.J., ShegokarH.D.(2015), Flavonoids as a scaffold for development of novel anti-angiogenic agents: an experimental and computational enquiry. Arch Biochem Biophys;577-578:35–48.

23) Ghosal S., Jaiswal D.K. (1980), Chemical constitution of Gentianaceae XXVIII: Flavonoids of E. hyssopifolium (Wild) Verd. J Pharm Sci 1: 53–56.

24) Ghosal S., Singh A.K., Sharma P.V., Chaudhuri R.K. (1974), Chemical constituents of Gentianaceae. IX. Natural occurrence of erythrocentaurin in Enicostemmahyssopifolium and Swertia lawii. J Pharm Sci, 63, 944–945.

25) Gond D.S., Meshram R.J., Jadhav S.G.,et al. (2013), In silico screening of chalcone derivatives as potential inhibitors of dihydrofolate reductase: assessment using molecular docking, paired potential and molecular hydrophobic potential studies. Drug Invent Today;5:182–191.

26) Gopal R., Gnanamani A., Udayakumar R., Sadulla S. (2004), Enicostemma littorale Blume – A potential hypolipidemic plant. Natural Product Radiance, 3, 401–405.

27) Govindachari T.R., Sathe S.S., Vishwanathan N. (1966), Gentianine, an artifact in Enicostemma littorale. Indian J Chem, 4, 201–202.

28) Hassan N., Ahamad J., Amin S., Mujeeb M., Mir S.R.(2015), Rapid preparative isolation of erythrocentaurin from Enicostemma littorale by medium□pressure liquid chromatography,

its estimation by high□pressure thin□layer chromatography, and its α□amylase inhibitory activity. Journal of separation science.; 38(4):592- 598.

29) Hayman S., Kinoshita J.H. (1965), Isolation and properties of lens aldose reductase. J Biol Chem, 240, 877–882.

30) Head K.A. (2000), Natural therapies for ocular disorders, part two: Cataract and glucoma. Altern Med Rev 6: 141– 166.

31) Ikeda I., Tanaka K., Sugano M., Vahouny G.V., Gallo L.L.(1988), Inhibition of cholesterol absorption in rats by plant sterols. Journal of Lipid Research.; 29(12):1573- 1582.

32) International Diabetes Federation. IDF Diabetes Atlas 7th Edition. Brussels, Belgium. 2015; Available from: https://idf.org/e-library/epidemiology-research/diabetes-atlas/13-diabetes-atlas-seventh-edition.html

33) J. H. Kinoshita,(1965),"Cataracts in galactosemia. The Jonas S. Friedenwald Memorial Lecture," Investigative ophthalmology , vol. 4, no. 5, pp. 786–799.

34) J. H. Kinoshita,(1974),"Mechanisms initiating cataract formation. Proctor lecture," Investigative Ophthalmology, vol. 13, no. 10, pp. 713–724.

35) Jaishree V., Badami S., Krishnamurthy P.T.(2010), Antioxidant and hepatoprotective effect of the ethyl acetate extract of Enicostemmaaxillare (Lam). Raynal against CCl4- induced liver injury in rats. Indian Journal of Experimental Biology.; 48:896-904.

36) Javadi M.A., Zarei-GhanavatiS.(2008), Cataracts in diabetic patients: a review article. J Ophthalmic Vis Res; 3: 52-65 [PMID: 23479523].

37) Kadam A., Dawane B., Pawar M., et al.(2014), Development of novel pyrazolone derivatives as inhibitors of aldose reductase: an ecofriendly one-pot synthesis, experimental screening and in silico analysis. BioorgChem;53:67–74.

38) Kavimani S., Manisenthlkumar K.T. (2000), Effect of methanolic extract of Enicostemma littorale on Dalton's ascitic lymphoma. J Ethnopharmacol, 71, 349–352.

39) Kinoshita J.H.(1974), Mechanisms initiating cataract formation. Proctor Lecture. Invest Ophthalmol; 13: 713-724 [PMID: 4278188].

40) Kiritikar K.R., Basu B.D.(1999), Indian medicinal plants. Dehradun: International Booksellers and Publishers.

41) Klein B.E., Klein R., Lee K.E.(1998), Diabetes, cardiovascular disease, selected cardiovascular disease risk factors, and the 5-year incidence of age-related cataract and progression of lens opacities: the Beaver Dam Eye Study. Am J Ophthalmol; 126: 782-790 [PMID: 9860001 DOI: 10.1016/S0002-9394(98)00280-3].

42) Kumar S., Pandey A.K.(2013), Chemistry and biological activities of flavonoids: an overview. Scientific World J;2013:162750.

43) L. Shetty, H. Harikiran, and A. Sharma (2010),"In vitro prophylactic cataract prevention

study on glucose induced cataract by quercetin and alpha tocopherol," International Journal of Pharmaceutical Sciences and Research, vol. 1, no. 7, pp. 41–45.

44) L.V. Prasad Eye Institute, Hyderabad, India (2008): Strategic action plan 2008–2012. Available at: http://www.lvpei.org.

45) Lee A., Chung S. (1999), Contributions of polyol pathway to oxidative stress in diabetic cataract. Fed Am Soc Exp Biol; 13(1): 23-30.

46) Leelaprakash G., Dass S.M. (2011), In vitro anti-inflammatory activity of methanol extract of Enicostemmaaxillare. International Journal of Drug Development and Research.; 3(3):189-196.

47) M. Stefek, (2011),"Natural flavonoids as potential multifunctional agents in prevention of diabetic cataract," Interdisciplinary Toxicology, vol.4, no.2, pp. 69–77.

48) Mansuri M.M., Goyal B.R., Upadhyay U.M., Sheth J., Goyal R.K. (2009), Effect of long term treatment of aqueous extract of Enicostemma littorale in Type 2 diabetic patients. Orient Pharm Exp Med; 9: 39-48.

49) Maroo J., Vasu V.T., Aalinkeel R., Gupta S. (2002), Glucose lowering effect of aqueous extract of Enicostemma littorale Blume in diabetes: A possible mechanism of action. J Ethnopharmacol 81: 317–320.

50) Michael R., van Marle J., Vrensen G.F. & van den Berg T.J. (2003), Changes in the refractive index of lens fibre membranes during maturation – impact on lens transparency. Exp Eye Res 77: 93–99.

51) Saxena S., Mitchell P., Rochtchina E. (2004), Five-year incidence of cataract in older persons with diabetes and pre-diabetes. Ophthalmic Epidemiol; 11: 271-277 [PMID: 15512989 DOI: 10.1080/09286580490510733].

52) Shabi M.M., Uthrapathy S., Raj C.D., Krishnamoorthy G., Ravindhran D., Joseph J., Rajamanickam V.G. (2014), Analgesic and Anti-Arthritic Effect of Enicostemma littorale Blume. Advances in Bioscience and Biotechnology.; 5(13):1018.

53) Sivakumari K., Rathinabai A., Kaleena P.K., Jayaprakash P., Srikanth R.(2010), Molecular docking study of bark-derived components of Cinnamomum cassia on aldose reductase. Indian J Sci Technol; 3(8): 1081-1088.

54) World Health Organization (2007), Global initiative for the elimination of avoidable blindness: action plan 2006–2011.

AN INTEGRATED OVERVIEW OF BIRD-WATCHING TECHNIQUES: FROM RECREATIONAL PRACTICE TO SCIENTIFIC RESEARCH

Mr. Sachin Dadarao Jadhav
Assistant Professor
Department of Zoology, Shri Pundlik Maharaj Mahavidyalaya,
Nandura, Dist. Buldana (MS), India,

Dr. Vidya Bhoyar
Assistant Professor
Department of Zoology
Late Babasaheb Deshmukh Gorthekar, Arts, Commerce and Science Mahavidyalaya
Umri, Dist. Nanded, Maharashtra, India

Abstract:

This paper explores the multifaceted world of bird-watching, presenting an integrated overview that spans from its recreational roots to its significance in scientific research. Bird-watching, as a bridge between the enjoyment of nature's beauty and the rigorous study of avian ecology and behaviour, offers unique insights into biodiversity and environmental stewardship. Through a detailed examination of various bird-watching techniques, tools, and ethical considerations, we underscore the activity's evolution and its role in promoting conservation and enhancing our understanding of avian life. This comprehensive review not only serves as a valuable resource for both novice and experienced bird-watchers but also highlights the contribution of bird-watching to ecological research and public engagement in wildlife conservation.

Keywords*:* Bird watching, avian behaviour, biodiversity, observation techniques, ornithology, ethical considerations, ecosystem analysis, bird-watching tools, conservation practices, wildlife appreciation

Introduction

Bird watching, an activity that marries the beauty of the natural world with the intricacies of avian behaviour, offers a unique lens through which we can observe the richness of biodiversity surrounding us. This review paper aims to provide a comprehensive overview of bird-watching techniques, tracing its evolution from a leisurely pastime to a vital component of scientific research. By integrating insights from various studies and expert observations, we embark on an exploration of the tools, methods, and ethical considerations that define bird watching. From the casual observer in the backyard to the dedicated ornithologist in the field, bird watching

encapsulates a spectrum of engagement that reflects our deep-seated fascination with birds. As we delve into the comparative analyses, lifestyle impacts, and ethological contributions of bird watching, we uncover the multifaceted role it plays in our understanding of avian species and their ecosystems. This paper aims to equip aspiring avian enthusiasts with the knowledge to enhance their bird-watching experience, promoting a greater appreciation for this accessible yet profound connection to nature.

Binoculars:

Bird-watching enthusiasts often use binoculars and spotting scopes for distant observation of birds in their natural habitat. Here's how to use both of these optical tools effectively while bird watching:

Choose the Right Binoculars: Select binoculars with an appropriate magnification and objective lens diameter. Common choices for bird watching are 8x42 or 10x42, where the first number represents magnification, and the second is the objective lens diameter in millimetres.

Proper Handling: Hold the binoculars with both hands, keeping them steady. Use a neck strap for convenience.

Focus Adjustment: Use the central focusing knob to adjust focus. Binoculars usually have a diopter adjustment for one eyepiece to compensate for any differences in your eyesight.

Scan the Area: Scan the area systematically, moving your binoculars slowly. Start from a wider view and then zoom in for details when you spot a bird of interest.

Fig: **Binoculars**

Spotting Scopes:

Select the Right Spotting Scope: Spotting scopes offer higher magnification and are ideal for distant observation. Choose a spotting scope with appropriate magnification (usually 20x to 60x) and a high-quality objective lens.

Use a Tripod: Spotting scopes are typically mounted on tripods for stability. A stable setup is crucial for steady viewing.

Adjust the Focus: Most spotting scopes have dual focus knobs, one for coarse adjustments and another for fine-tuning. Use these knobs to achieve a sharp image.

Spotting Scope Angles: Spotting scopes come in straight and angled configurations. Angled scopes are often preferred for bird watching as they are more comfortable for extended viewing, especially when birds are in the sky or perched high in trees.

Share the View: Spotting scopes are great for group bird watching. Use an eyepiece with a comfortable viewing angle, and let others enjoy the view.

In summary, binoculars are versatile for quick scans and handheld use, while spotting scopes provide higher magnification and are ideal for distant observations, especially when mounted on a tripod. The choice between them depends on your preferences and the specific bird-watching scenario.

Field guides and bird identification apps are valuable tools for bird watchers to identify species while in the field. Here's

Fig: **Spotting Scopes**

Field Guides:

Choose the Right Field Guide: Select a field guide that covers the birds in your region or the area you'll be bird watching. There are many field guides available for different locations.

Study the Layout: Familiarize yourself with the field guide's layout. It typically includes illustrations or photographs of birds, along with written descriptions, range maps, and additional information.

Observe Key Features: When you spot a bird, observe its key features such as size, color, markings, and behavior. Note any distinctive characteristics.

Use the Index: Field guides often have an index or a table of contents. Use these to quickly find the bird you are trying to identify.

Compare: Compare the observed features of the bird with the images and descriptions in the field guide. Start with the family or group the bird belongs to and narrow it down.

Bird Identification Apps:8

Install the App: Download and install a bird identification app on your smartphone or tablet. Popular ones include the Audubon Bird Guide app and the Merlin Bird ID app.

Launch the App: Open the app and use its interface to start identifying the bird. Most apps offer a variety of features, including image recognition and audio recordings of bird calls.

Take Photos or Record Sounds: If the app supports image recognition, take a clear photo of the bird and submit it to the app. If you hear a bird call, use the app to record it for identification.

Receive Identification: The app will analyze the photo or sound recording and provide you with potential bird species matches. Review the results and compare them to the bird you observed.

Additional Information: Many apps also offer additional information about the identified bird, including its habitat, range, and behaviour.

Both field guides and bird identification apps can enhance your bird-watching experience by helping you identify and learn more about the species you encounter.

Using bird calls and playback to attract or communicate with birds while bird watching can be an effective technique, but it should be done responsibly and ethically to avoid causing harm to the birds or disrupting their natural behaviors. Here's how to use bird calls and playback properly:

Fig: **Bird Identification Apps**

1. **Choose the Righ quipment:**

Obtain a high-quality bird call or playback device. There are various apps and physical devices available that can reproduce bird calls accurately.

2. **Research and Practice:**

Familiarize yourself with the calls and songs of the birds in your area of interest. Practice mimicking the calls using your equipment.

3. **Timing Matters:**

Use bird calls sparingly and at appropriate times. Avoid using them excessively or during sensitive periods such as nesting season.

4. **Be Mindful of the Species:**

Be aware of the specific species you are targeting. Some birds are more responsive to playback than others. Use calls that are relevant to the area and species you're observing.

5. **Keep a Safe Distance:**

Maintain a respectful distance from the birds. Do not approach too closely, as this can cause stress to the birds.

6. **Monitor the Bird's Response:**

Observe how the birds react to your calls. If they appear agitated, cease playback immediately. The goal is not to disturb or stress the birds.

7. **Avoid Habituation:**

Be cautious about habituating birds to playback. Overusing playback can disrupt their natural behavior and affect their survival skills.

8. **Respect Local Regulations:**

Be aware of local laws and regulations regarding the use of bird calls and playback. Some areas may have restrictions to protect bird populations.

9. **Record Observations:**

Keep records of your bird-watching observations, noting the species you encounter and the calls or playback used, if any.

10. **Educate Others:**

Share responsible bird-watching practices with fellow enthusiasts to promote ethical birding.

In summary, bird calls and playback can be valuable tools for bird watchers, but they should be used with caution and respect for the well-being of the birds. Responsible and ethical use of these techniques can enhance your bird-watching experience while minimizing any negative impact on the avian species you are observing.

Setting up bird feeders and baths is an excellent way to attract birds to specific areas for bird watching. Here's how to use them effectively:

Bird Feeders:

1. **Choose the Right Location:** Place bird feeders in strategic locations where you can easily observe them from a comfortable distance. Consider placing them near windows or in a garden.
2. **Select the Right Feed:** Use appropriate bird feed for the local bird species. Different birds prefer different types of seeds, so offering a variety can attract a diverse range of birds.
3. **Regular Maintenance:** Keep feeders clean and regularly refill them, especially during the winter when food is scarce. Cleanliness is essential to prevent the spread of diseases among birds.
4. **Observe Quietly:** When bird watching, be patient and quiet. Birds may take some time to become comfortable with the feeder. Use binoculars or a spotting scope for a closer view without disturbing them.

Bird Baths:

1. **Place Near Cover:** Position bird baths near shrubs, trees, or other natural cover. Birds feel safer when they can quickly escape to shelter if needed.
2. **Fresh Water:** Ensure the birdbath always has fresh water. Clean and refill it regularly to prevent the buildup of dirt and contaminants.
3. **Consider Heated Baths:** In colder climates, using a heated bird bath can provide water to birds even during freezing temperatures, making it a year-round attraction.
4. **Use Perching Spots:** Add perching spots like branches or bird feeders around the birdbath area. Birds often use these spots to rest and groom after bathing.
5. **Patience Pays Off:** Birds may take time to discover and start using the birdbath. Be patient and observe from a distance to avoid scaring them away.

By setting up bird feeders and baths thoughtfully and maintaining them properly, you can create a welcoming environment for birds to visit regularly. Remember to watch them quietly and respect their space to enjoy the beauty of bird watching.

Fig: **Bird Feeders**

Fig: **Bird Baths**

Patience and stealth are crucial when bird watching to avoid startling birds and enhance your observation experience. Here's how to effectively use these qualities while bird watching:

1. **Choose a Strategic Location:**

- Select a quiet and concealed spot where you can have a clear view of the birds without being too close. Natural hides, blinds, or areas with good visibility are ideal.

2. **Move Slowly and Smoothly:**

- Avoid sudden or jerky movements that can startle birds. Walk slowly and deliberately, lifting your feet gently to minimize noise.

3. **Dress Appropriately:**

- Wear earth-toned or camouflaged clothing to blend into the environment. Avoid bright colors and shiny accessories that can catch the birds' attention.

4. **Use Binoculars or a Spotting Scope:**

- Invest in quality optics like binoculars or a spotting scope. These tools allow you to observe birds from a distance, reducing the need to get too close.

5. **Stay Quiet:**

- Speak in hushed tones or use hand signals when communicating with fellow bird watchers. Avoid loud talking, sudden noises, or the use of electronic devices with loud sounds.

6. **Mind the Wind:**

- Pay attention to wind direction. Approach the birds with the wind at your back, so your scent doesn't reach them before you do.

7. **Time Your Visits:**

- Visit birding locations during the quieter times of the day, such as early morning or late afternoon when bird activity is high, but human traffic is low.

8. Blend with Natural Cover:

- Use natural features like trees, bushes, or rocks as cover. Position yourself behind such obstacles to break up your silhouette.

9. Maintain a Respectful Distance:

- Keep a safe and respectful distance from the birds. Use your optics to get a close-up view without encroaching on their space.

10. Exercise Patience:

- Bird watching requires patience. Allow birds to acclimate to your presence. Stay still and quiet, and the birds may resume their natural behaviors.

11. Learn Bird Behavior:

- Study the behavior of the birds you are observing. Knowing their habits can help you predict their movements and actions.

12. Record Observations:

- Take notes or use a birding journal to document your observations, including bird species, behaviors, and any noteworthy events.

Remember that bird watching is about enjoying and respecting the birds in their natural habitat. By practicing patience and stealth, you can observe and appreciate these beautiful creatures without causing them stress or disturbance.

The practice of bird-watching, or birding, encompasses both recreational and scientific aspects. This article aims to provide an integrated perspective on bird-watching techniques, drawing insights from various studies.

1. Bird Watching Techniques: A Comparative Study in Suzhou, China

In Suzhou, China, a study compared community birdwatching with professional bird monitoring. This extensive survey used various tools including telescopes, drones, binoculars, cameras, and GPS to study bird species and distribution. The study highlighted the different species observed by both community and professional methods, emphasizing the importance of combining both approaches for comprehensive avian diversity research.

2. Birdwatching as a Lifestyle: Characteristics and Preferences

Another facet of bird-watching research focuses on the participants themselves. Birdwatching varies in intensity from casual observers to highly skilled practitioners. Studies have examined birdwatchers' demographics, environmental preferences, and their economic impact on avitourism. These insights are crucial for understanding birdwatching as a multifaceted recreational activity with significant lifestyle implications.

3. Ethological Perspectives in Bird Watching

The observational practices developed by ethologists, or scientists who study animal behaviour, have significantly influenced bird-watching techniques. This includes the use of socio-

technical devices and the development of a disciplined habit of observation. These methods have not only advanced scientific understanding but have also impacted natural-history filmmaking and photography, highlighting the role of visual technologies in bird behaviour studies.

4. Diverse Studies in Birdwatching

A broad range of research on bird-watching is available, covering topics from bird biodiversity and avian fauna to birdwatching tourism and specific ecological behaviours. These studies offer comprehensive insights into the ecological, economic, and social impacts of birdwatching

Bird-watching is a dynamic field that blends recreational enjoyment with scientific inquiry. By understanding both the techniques used in bird-watching and the characteristics of those who partake in it, we gain a richer appreciation of this activity's impact on both natural ecosystems and human society.

Embarking on the enthralling journey of bird watching becomes accessible with the insights shared into many articles by an experienced enthusiast. these articles will delve into the valuable tips and guidance provided for beginners eager to immerse themselves in the captivating world of birds.

Many articles open with the enthusiast enjoying a backyard encounter with a cardinal, expressing an evident love for birds traced back to childhood. The underlying theme invites readers to join in exploring the fascinating and diverse world of bird species.

Getting Started: For those new to bird watching, the initial steps involve observations from a window or balcony, progressing to outdoor locations rich in vegetation. The enthusiast encourages patience and emphasizes the interconnection between birds, plants, and insects, fostering a deeper understanding.

Optics and Equipment: To enhance the bird watching experience, readers are introduced to the use of binoculars and spotting scopes. A practical tutorial on adjusting binoculars is provided, accommodating individuals who wear glasses. The emphasis is on the accessibility of bird watching, whether with donated or budget-friendly equipment.

Identifying Birds: Guidance is offered on observing and identifying birds based on color, size, behavior, and vocalizations. Enthusiasts are encouraged to document sightings through checklists and photographs, with a nod towards citizen science by contributing observations to platforms like eBird and iNaturalist.

Resources and Learning Opportunities: To aid in bird identification, a variety of field guides are recommended. The enthusiast highlights the abundance of resources available, including birding clubs, online platforms, and community initiatives. The importance of observation is emphasized, along with suggestions to reach out to local organizations for learning opportunities.

In conclusion, many articles serve as an invaluable guide for aspiring bird watchers. By

providing practical tips, encouraging patience, and emphasizing the joy of observation, the enthusiast inspires individuals to explore the avian world around them. Aspiring birders are invited to embark on this enriching journey, armed with knowledge, curiosity, and a newfound appreciation for the diverse and captivating realm of birds.

"The article from Wild Bird Lady provides an insightful guide into birdwatching, emphasizing the distinction between casual birdwatchers and dedicated birders. It highlights the importance of connecting with nature, the educational aspects of bird identification, and the social benefits of birdwatching. Key techniques discussed include understanding bird behaviours, the necessity of appropriate gear, and adherence to birdwatching etiquette for a respectful and safe experience. The guide emphasizes the value of patience, scouting, and learning bird sounds in birdwatching. It also offers advice on choosing optimal locations and lists useful resources for birdwatchers."

The article from the "British Journal for the History of Science" delves into the evolution of observational practices in ethology, particularly focusing on bird watching. It explores the methods and devices early ethologists used for observing birds in their natural habitats, such as hides, optics, and photography. The article also examines how these practices influenced the broader field of natural-history filmmaking and photography. It discusses the impact of socio-technical devices and observational techniques on understanding and visualizing bird behaviour, contributing to the popularization of the 'ethological eye' in both scientific and cultural practices.

The article "How to Get Started in Bird Watching? A Beginner's Guide!" on Learn Bird Watching provides comprehensive guidance for beginners in birdwatching. It covers the basics of starting the hobby, including the selection of gear like binoculars and bird identification tools. The article emphasizes the importance of learning bird identification techniques, using technology to enhance these skills, and finding good birdwatching locations. It also highlights the role of birdwatching clubs in learning and social engagement. The guide aims to help beginners embrace and enjoy the world of bird watching.

The article on Learn Bird Watching provides a comprehensive guide for beginners interested in bird watching. It highlights the hobby's health benefits and joy, offering tips on getting started, choosing the right gear, and identifying birds. It suggests starting with local birding spots, investing in binoculars, joining bird watching clubs, and using apps or field guides for bird identification. The guide also emphasizes the importance of respecting wildlife and enjoying the tranquility nature offers through bird watching.

The article from All About Birds emphasizes the value of incorporating sketching and nature journaling into birdwatching to enhance observational skills and create a deeper connection with nature. It suggests starting with a "sit spot" for focused observation, using gesture drawing to capture the essence of birds, and adding notes to document behaviors and context. The piece

encourages practice to build confidence and highlights that every drawing, regardless of its outcome, is a step towards improvement.

The article on Wild Bird Lady outlines birdwatching techniques focusing on observation, identification, and recording of bird behaviour. It differentiates between casual birdwatchers and dedicated birders, highlighting the hobby's popularity due to its ability to connect people with nature and offer learning opportunities. Essential gear includes binoculars, field guides, and appropriate clothing. The guide covers bird behaviours, the importance of choosing the right location, and etiquette for minimizing disturbance to wildlife.

The article from the Association of Animal Behaviour Professionals offers insider tips and techniques for aspiring birdwatchers. It emphasizes patience as a key virtue, outlines essential equipment like quality binoculars and field guides, and discusses the importance of research for identifying birds by appearance and calls. It also suggests choosing the right time and place for birdwatching and highlights the benefits of joining birdwatching communities. For those looking to enhance their birdwatching skills, the article provides guidance on taking the hobby to the next level with advanced observation techniques and conservation practices.

References

S, V. (2024, January 7). How to Get Started in Bird Watching? A Beginner's Guide! | Learn Bird Watching. Learn Bird Watching. https://learnbirdwatching.com/how-to-get-started-in-bird-watching-hobby/

Hakim, M. A., & Hakim, M. A. (2023, May 29). The ultimate guide to birdwatching techniques: tips and tricks. Wild Bird Lady. https://wildbirdlady.com/what-are-some-common-birdwatching-techniques/

Nixon, S. (2023). Watching birds: observation, photography and the 'ethological eye.' The British Journal for the History of Science, 1–19. https://doi.org/10.1017/s0007087423000353

Gbbcbp. (n.d.). Great Backyard Bird Count – Join us each February when the world comes together to watch, learn about, count, and celebrate birds. Great Backyard Bird Count. https://www.birdcount.org/?utm_campaign=GBBC%202024&utm_source=AAB&utm_medium=lightbox&utm_content=GBBC

Gina, B. (2023, October 19). Secrets of birdwatching with expert tips and techniques. - Prof As-Behavior of ANI. Prof As-Behavior of Ani.

https://www.associationofanimalbehaviorprofessionals.com/birdwatching-mastery-insider-tips-and-techniques-for-aspiring-avian-enthusiasts/

Arizaga, J., Alonso, D., Crespo, A. et al. Yearly variation in the structure and diversity of a non-breeding passerine bird community in a Mediterranean wetland. Avian Res 11, 29 (2020). https://doi.org/10.1186/s40657-020-00215-8

Powell, H. (2023, May 18). Nature Journaling and Sketching: Tips for birders. All About Birds. https://www.allaboutbirds.org/news/nature-journaling-and-sketching-tips-for-birders/

Huang, J.-B., Caruana, R., Farnsworth, A., Kelling, S., & Ahuja, N. (2016). Detecting migrating birds at night. Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR), 2016, 230-238. https://dx.doi.org/10.1109/CVPR.2016.230

Vas, K., & Eagles, P. Utilizing the Product Club Approach for Birding Trail Planning. No journal or conference provided.

Tsai, W.-H., & Xue, Y.-Z. (2014). On the use of speech recognition techniques to identify bird species. Proceedings of the 25th International Conference on Computational Linguistics: Technical Papers, 2004-2012. https://www.aclweb.org/anthology/O14-2004

Marmor, K. (2008). Bird watching. Proceedings of the ACM Symposium on Applied Computing, 2008, 1238-1244. https://dx.doi.org/10.1145/1401615.1401623

Shashikala, M., & Perera, P. (2019). A preliminary study on the impacts of recreational disturbances on selected water-birds in Bundala Ramsar Wetland. Proceedings of the Faculty of Agriculture Symposium, University of Peradeniya, 23. https://dx.doi.org/10.31357/FESYMPO.V23I0.3787

Sivaranjani, B., & Karpagavalli, S. (2023). A survey and analysis of deep learning techniques for bird species classification. Proceedings of the International Conference on Smart Computing and Systems for Sustainable Solutions, 2023. https://dx.doi.org/10.1109/ICSCSS57650.2023.10169573

Boruah, I., Hasin, S., Popradit, A., Sawasdee, V., &Cheentam, S. (2021). Biodiversity of birds in urban green space for support ecotourism activities in Valaya Alongkorn Rajabhat University Thailand. Journal of Environmental Management and Tourism, 12(4), 1201-1210. https://dx.doi.org/10.14505//jemt.v12.4(52).25

Asrianny, A., Saputra, H., & Achmad, A. (2018). IDENTIFIKASI KEANEKARAGAMAN DAN SEBARAN JENIS BURUNG UNTUK PENGEMBANGAN EKOWISATA BIRD WATCHING DI TAMAN NASIONAL BANTIMURUNG BULUSARAUNG. Perennial (Makassar), 14(1), 17. https://doi.org/10.24259/perennial.v14i1.4999

Sibley, D., & Yoshida, J. (2002). Spotting patterns on the fly. Harvard Business Review, 80(11), 45–49, 132. https://www.ncbi.nlm.nih.gov/pubmed/12422788

Nixon, S. (2023). Watching birds: observation, photography and the “ethological eye.” British Journal for the History of Science, 1–19. https://doi.org/10.1017/S0007087423000353

Honeycutt, W. T., & Bridge, E. S. (2022). Use of the LunAero open-source hardware platform to enhance the accuracy and precision of traditional nocturnal migration bird counts. Integrative and Comparative Biology, 62(4), 1085–1095. https://doi.org/10.1093/icb/icac053

NANOPARTICLES-NANO CATALYST- A BOON FOR GREEN CHEMISTRY

Pawde Shubhangi Subhashrao
P.G.Department of Chemistry & Research Centre.
Shivaji Mahavidhyalaya, Udgir, Dist. Latur, MS-413517

Jakkawad Ashwini Laxmanrao
Sharadchandra Arts Commerce and Science college,
NaigonBz, Dist Nanded-431709

Abstract

In recent times there is a growing interest in applying green chemistry for Nano catalysis applications. It can be seen that green chemistry applied to Nano-catalysis is a relatively sizzling area with much scope for growth. This paper discuss about the use of Nano catalysts for green reactions, studies involving the synthesis of green Nano catalysts and application of metal Nano catalysts in green reactions. This Paper consists of discussions of green reactions by the type of green reaction that is being conducted. Overall, this review article discusses developments in green catalytic reactions.

Keywords: Nano catalyst, nanoparticles, green chemistry, nanotechnology

Introduction:

The term "Nano" means dwarf in Greek.Nanomaterials are substances that are of the in the range from 1 nm to 10nm. At this particle size the properties of materials can be altered dramatically. Properties such as physical (solubility), optical (spectroscopy), chemical (reactivity), mechanical, electrical and magnetic, transport through membranes etc. are significantly distinct from their related materials with large particle size.[1] Nano materialsare classified based on size, shape, and composition. The size of NMs depends on various parameters such as preparation technique, concentration, time, pH, temperature, and pressure As per their functionality, NMs exist in different shapes, like spheres, rods, flakes, sheets, wires, dots, fibers, tubes, etc.

Classification of Nano materials:

Nano materials can be categorized as inorganic-based nanomaterial, carbon-based nanomaterial, organic-based nanomaterial and composite-based nanomaterial[2]. Generally, inorganic-based nanomaterials include different metal and metal oxide nanomaterials. Examples of metal-based inorganic nanomaterials are silver (Ag), gold (Au), aluminum (Al), cadmium (Cd), copper (Cu), iron (Fe), zinc (Zn), and lead (Pb) nanomaterials, whereas examples of metal oxide-

based inorganic nanomaterials are zinc oxide (ZnO), copper oxide (CuO), magnesium aluminum oxide ($MgAl_2O_4$), titanium dioxide (TiO_2), cerium oxide (CeO_2), iron oxide (Fe_2O_3), silica (SiO_2), and iron oxide (Fe_3O_4), etc. Carbon-based nanomaterials include graphene, fullerene, single-walled carbon nanotube, multiwalled carbon nanotube, carbon fiber, an activated carbon, and carbon black. The organic-based nanomaterials are formed from organic materials excluding carbon materials, for instance, dendrimers, cyclodextrin, liposome, and micelle. The composite nanomaterials are any combination of metal-based, metal oxide-based, carbon-based, and/or organic-based nanomaterial, and these nanomaterials have complicated structures like a metal-organic framework. Nanostructured materials are classified as: zero-dimensional (0D), one-dimensional (1D), two-dimensional (2D), and three-dimensional (3D). The 0D NMs include Nano clusters and Nano spheres. 1D NMs include needle-shaped nanofibres, nanotubes, Nano rods, and nanowires. 2D Nano scale materials involve nanotubes, nanowires, Nano coatings, and Nano films, while 3D NMs are particles, Nano-dots, and hollow spheres.

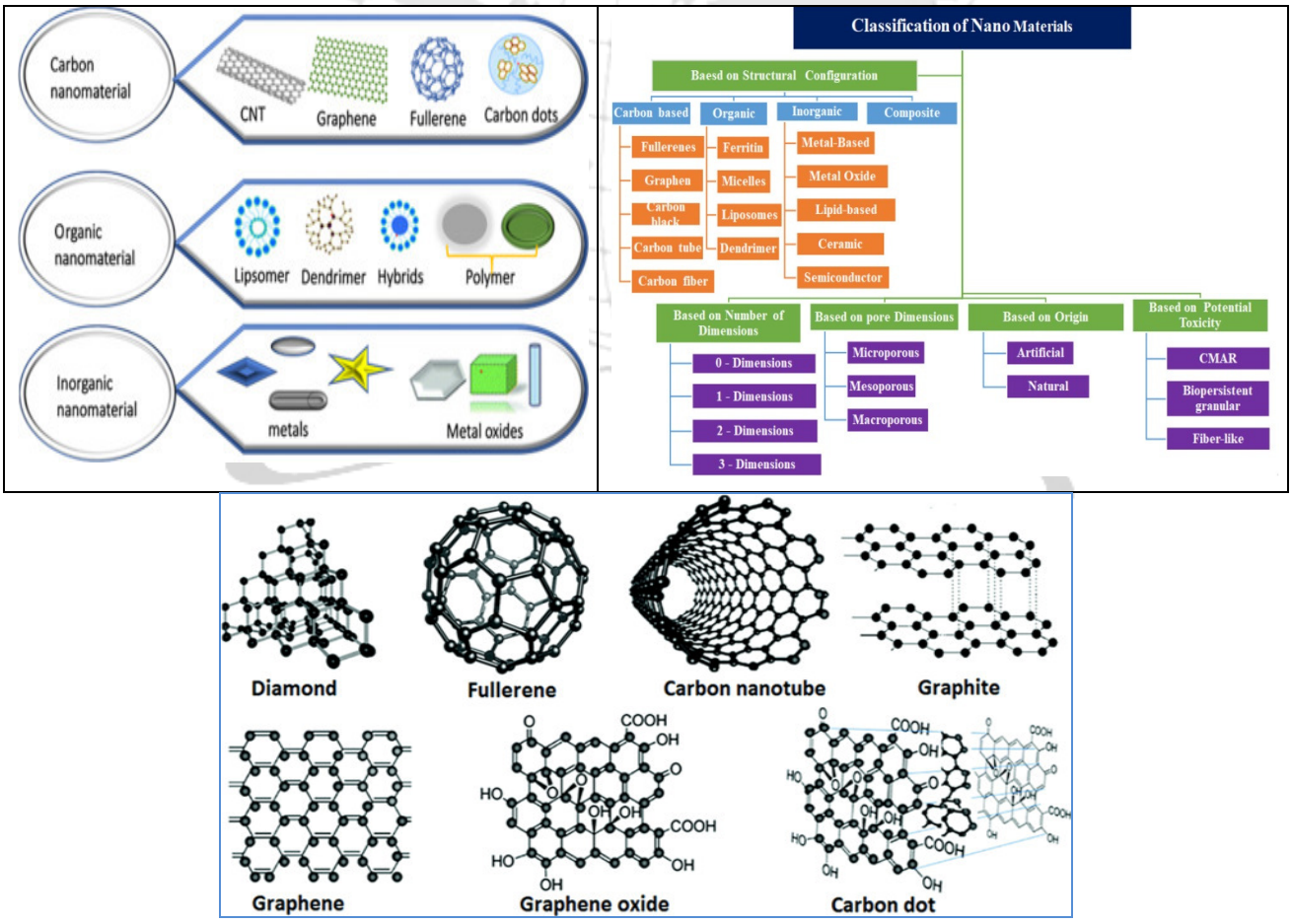


Fig: Different types of Nanomaterials

Contribution of Nano catalyst to green Chemistry

Nano catalysis has various fields and applications in green chemistry[3].Nanomaterial have unique physical and chemical properties, such as high surface area, enhanced reactivity, tunable

shape and size, and multifunctionality, that make them superior catalysts compared to conventional materials. Nano catalysis can improve the performance and efficiency of various chemical processes, such as energy conversion, pollution control, organic synthesis, and bio catalysis.

Nano catalysts contribute to green chemistry by enhancing the efficiency, selectivity, and safety of chemical reactions. They also help reducing waste, energy consumption, and environmental impact. Furthermore, they can produce high-value products such as fuels, pharmaceuticals, or materials with high yield and purity. Moreover, they can degrade or recycle themselves after use without generating toxic byproducts or residues. Finally, they can be integrated into smart and responsive systems like sensors, actuators, or self-healing materials that are capable of adapting to changing environments or needs.

Green Nano catalyst

In green chemistry, Nano catalysis is considered a productive technology due to the exceptional properties of nanoparticles with enormous surface areas and expanded catalytic efficiencies. nanoparticles are perceived as catalysts with extensive applications from energy transformation to chemical manufacturing fields. Nano catalysis has applications in almost all spheres of life, such as personal care products, environmental remediation (removal of heavy metals and treatment of industrial effluents), pharmaceuticals, biomedical and biosensors, and food processing. Thus, the latest scientific and technological research on eco-friendly catalysis has attracted global attention to alleviating the problem of industrial pollution. Nano catalysts may be suitable for green synthesis as they permit swift chemical conversion, greater yield, and ease of catalyst separation and recovery.

Green synthesis for nano catalysis

Biological sources for Nanoparticles synthesis provide a simple green method and easy increase in biomass, providing a uniform particle size and multiplication. Among the natural approaches to Nanoparticles synthesis[4], one of the most well-known methods is using microbes like bacteria, algae, and fungi. Bacteria can synthesise various Nanoparticles under optimal temperature, pH, and pressure . The Nanoparticles [5]produced by microorganisms have many potential applications in biomineralisation, bioremediation, bioleaching etc

Relative competence of Nano catalysts

Transition metals, such as Ru, Au, Ag, Pt, Rh, and Cu, are commonly used as homogeneous and heterogeneous catalysts in most chemical reactions due to variable oxidation states and good adsorption properties for heterogeneous catalysis. Even though heterogeneous catalysts are preferable to homogeneous ones owing to their easier recovery and reuse, currently, nanocatalysts are substituting conventional heterogeneous catalysts at a rapid rate .Nano catalysis is a growing field encompassing nanomaterials for various homogeneous and heterogeneous catalysis applications. The constructive features of homogenous and heterogeneous catalysis are

integrated in nanocatalysis, decreasing their shortcomings . For instance, homogenous catalysis offers excellent selectivity, better yield, and easy optimisation of catalytic systems by modifying ligands . However, the complications in isolating the catalyst from the final product create environmental and economic barriers that restrict their scope. On the other hand, a disadvantage of traditional heterogeneous catalyst systems is the curtailed surface area available to reactant molecules, thereby restraining their efficacy and leading to the high requirement for exclusive catalyst materials . Nanocatalysts provide a solution enhancing the active material's surface-to-volume ratio (S/V) Most industrial heterogeneous catalysts provide a high-surface area attached to an active component. Accessibility to all active sites is essential to achieve rates and selectivity comparable with homogenous catalysts. Since active sites are available only on the catalyst surface, it decreases the overall reactive efficiency.

Nano catalysts used in green chemistry

Nanoparticles of gold, platinum, or iron can catalyze the conversion of carbon dioxide[6] into fuels like methane, methanol, or ethanol with solar energy or electricity. Nanoparticles of titanium dioxide or zinc oxide can catalyze the degradation of organic pollutants[7], such as dyes, pesticides, or drugs, using sunlight or ultraviolet light. Nanoparticles of palladium or nickel can catalyze the coupling[8] of organic molecules like alkenes, alkynes, or halides to form complex molecules such as drugs or polymers with high selectivity and efficiency. There are number of new emerging reactions performed using nanocatalysts.

Nano reactors

Nanoreactors are nanoscale devices that can create and manipulate the reaction conditions, such as temperature, pressure, concentration, pH, and light, to influence the outcome of a chemical reaction. Nano reactors can also confine and transport reactants and products, to increase their contact and interaction, and to isolate them from unwanted side reactions. Nanoreactors can be made of various materials, such as metals, polymers, carbon, or biological molecules, and can have different shapes and structures, such as nanoparticles, nanotubes, nanoshells, or vesicles. Nanoreactors can mimic natural systems, such as enzymes or cells, or create artificial systems, such as nanofactories or nanomachines. Nanotubes of carbon or boron nitride can act as nanoreactors to synthesize nanoparticles of metals or semiconductors with precise control over their size and shape.

Limits of nanocatalysts

Though nanocatalysts exhibit improved selectivity, reactivity, and optical sensitivity, increased uptake and interactions with tissues can affect biological functions. The side effects may be observed as toxicity to human health and the environment. Consequently, a catalytic system that allows highly selective and rapid transformation of the reactant into a product with excellent yield through a green process is greatly desired. Many approaches have been recently explored to obtain

the ideal catalyst with properties like excellent stability, selectivity, and activity, but green nanocatalysis remains less explored. In this view, the current review describes the latest emerging trends in nanocatalysis for green chemistry and their potential applications.

Other Applications of Nanomaterials

1. Biological and biomedical applications (Nanomedicines)

Nanoparticles have extensive applications in biomedical[9] and other fields as shown in figure. Many studies have reported the potential applications of gold and silver Nanoparticles in the biomedical field. They are used as anti-microbial, antiviral, antifungal, and antimalarial agents and in anti-cancerous[10] activities. Using the cytosolic abstracts of *Candida albicans* the authors biogenically synthesised gold NPs and evaluated their potential for anti-cancer properties against liver cancer cells.

2. Environmental protection

Environmental pollution due to the release of toxic pollutants has affected all living systems directly or indirectly. So, developing pollution-detecting techniques is essential to minimise their adverse impacts before dispersing into the surroundings. Several conventional methods, such as chromatography (gas chromatography, high-performance liquid chromatography, ion exchange chromatography, and size exclusion chromatography), have been used to detect environmental pollutants nowadays nanoparticles and different nanomaterials are performing a better role in different formats to help in environmental protection. [11,12,14]. Nano TiO2is used in different kind of Nano coating with very high results related to the degradation of organic pollutants.

3. Agriculture

This field is also not left with the inventions of nanotechnology.nanocensors are being used for biological detection of plant species, improved crop production is also gained by the use of nanotechnology. Nanoshells of silica or gold can act as nanoreactors to encapsulate enzymes or DNA and protect them from denaturation or degradation while allowing them to perform biocatalysis or biosynthesis.vesicles of lipids or polymers can act as nanoreactors to mimic cellular functions such as metabolism, communication, or differentiation and create artificial tissues or organs.

4. **Consumer Goods and electronics**

Nanoparticles are being used in optics,electronic and each and every area related to consumer goods. Conducting polypyrrole nanotubes are being used in electronics[13].

There are many more applications of nanoparticles. Some of which are mentioned in figure here.

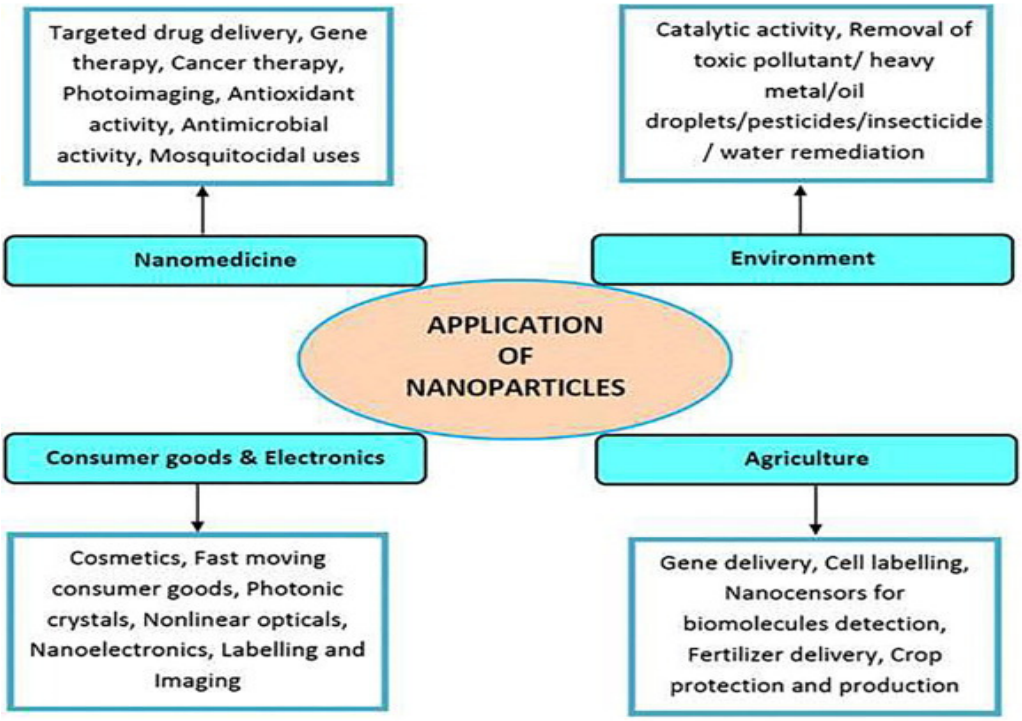


Fig:Applications of Nanoparticles

Conclusion:

Present times we are challenging many environmental, atmosphere, and energy-related issues. Efficient catalysts and eco-friendly materials could provide apt solutions for such problems.As discussed above; Nano catalysts have emerged as a fertile field for research and innovation with multiple eco-friendly applications. Nano composites offer the high activity of homogeneous catalysts and the easy recoverability of heterogeneous materials. Transition metal nanoparticles have also emerged as suitable alternatives to conventional materials in organic synthesis, attracting the interest of researchers. A broad range of Nanomaterials has various characteristics like adsorption, high surface area, catalysis, and high reactivity. Several types of research are being pursued in the domain of Nanomaterials globally with proven applications in several fields like catalysis, biology, medicine and sensing. Nanotechnology is an ever growing science and applications of Nano-materials. The technology has broad applications in performance materials, health, food, consumer products, water, information technology and energy. Nano science and nanotechnology is developing explosively as the awareness and usefulness of materials at the Nano scale is becoming evident.

References

1. Maria Benelmekki,An introduction to nanoparticles and nanotechnology
2. Savita Kumari et al ‘A Review on Nanoparticles: Structure, Classification, Synthesis & Applications’, Journal of Scientific Research, 65, 8, (2021)

3. Didier Astruc, 'Introduction: Nanoparticles in catalysis' *Chemical Reiews,* 120 2, 461–463,(2020)
4. Radha Narayanan 'Synthesis of green nanocatalysts and industrially important green reactions', Green Chemistry Letters and Reviews, 5,4, 707-725, (2012)
5. Atsushi F. et al 'sustainable green catalysis by supported metal nanoparticles' The Chemical Record, 9, 224–235 (2009)
6. García, A.C .et al 'Conversion of Carbon Dioxide into Methanol Using Cu–Zn Nanostructured Materials as Catalysts'. *Nanomaterials* , *12*, 999, (**2022)**
7. *Mohammed Nazim,et al 'Exploring Rapid Photocatalytic Degradation of Organic Pollutants with Porous CuO Nanosheets: Synthesis, Dye Removal, and Kinetic Studies at Room Temperature'ACS Omega 6* ,4, 2601-2612**,(2021)**
8. Sasadhar Majhi et al 'Recent developments of nanocatalysts for Stille coupling reaction', Synthetic Communications, 53,24, 2061-2087(2023)
9. Bayda S et al 'The History of Nanoscience and Nanotechnology: From Chemical-Physical Applications to Nano medicine', Molecules,27;25(1),112. (2019)
10. Arun Chavan et al 'Fungus medicated biological synthesis of gold nanoparticles:potential in detection of liver cancer'International Journal of Nanomedicine,6, 2305–2319,(2011).
11. Javed, R, 'Role of capping agents in the application of nanoparticles in biomedicine and environmental remediation: Recent trends and future prospects' *Journal of Nanobiotechnology, 18*, 172,*(* 2020).
12. Alonso, A.et al 'Critical review of existing nanomaterial adsorbents to capture carbon dioxide and methane', *Science of Total Environment*, *595*, 51–62, (2017)
13. Stejskal, J.et al 'Conducting polypyrrole nanotubes: A review' *Chemical Papers*, *72*, 1563–1595 (2018)
14. Yahya, N, et al. 'Visible light-driven perovskite-based photocatalyst for wastewater treatment. In *Handbook of Smart Photocatalytic Materials'*,Elsevier, 265–302. (2020)

CLIMATE CHANGE IN MAHARASHTRA: CAUSES, IMPACTS AND POTENTIAL SOLUTIONS

Dr. V. A. Pawale
Asst. Professor
Department of Commerce
S.M.B.P.K. College, Shankar Nagar, Tq.Biloi, Dist. Nanaded

Abstract:

This research paper explores the impact of Climate Change on Maharashtra state, examining rising temperatures, changing precipitation patterns, and their implications for agriculture, water resources, and urban areas. It also delves into potential solutions, emphasizing the importance of regional strategies for adaptation and mitigation.Climate change is a pressing global issue with significant implications for Maharashtra, India's third-largest state by area and second-most populous state. This abstract provides an overview of the causes, impacts, and potential solutions to climate change in Maharashtra.This abstract serves as a succinct overview of the key issues and considerations surrounding climate change in Maharashtra, informing further discourse and action on this critical issue.

Keywords: Greenhousegases,Deforestation, Renewable energy, Temperature etc.

Introduction:

Climate change is a global phenomenon characterized by long-term shifts in temperature, precipitation patterns, sea levels, and extreme weather events. It is primarily driven by human activities, including the burning of fossil fuels, deforestation, and industrial processes, which release greenhouse gases into the atmosphere, trapping heat and altering the Earth's climate system.Maharashtra, located in the western part of India, is particularly vulnerable to the impacts of climate change due to its diverse geography, dense population, and significant economic activities. Understanding the relevance of climate change to Maharashtra requires examining its various manifestations and implications for the state. Climate change presents significant challenges and risks for Maharashtra, affecting various aspects of its environment, economy, and society. Addressing these challenges requires concerted efforts at the local, national, and global levels, including mitigation measures to reduce greenhouse gas emissions and adaptation strategies to enhance resilience to climate impacts.

Objectives of Research Study:

1. To Study Climate Change Vulnerabilities in Maharashtra State.
2. To Study Climate Change impacts helps in assessing the risk to human health.
3. To Understand how Climate Change affects key Economic Sectors.

4. To Study Climate Change impacts helps in devising Conservation Strategies.
5. To develop effective policies, regulations and programs aimed at disaster risk reduction and sustainable development.

Causes of Climate Change in Maharashtra:

The Causes of Climate Change in Maharashtra are multifaceted and interconnected, driven by both global phenomena and local human activities. Some key factors contributing to climate change in Maharashtra include:

1. **Greenhouse Gas Emissions**: Maharashtra, like other industrialized regions, contributes to climate change through the emission of greenhouse gases (GHGs) such as carbon dioxide (CO2), methane (CH4), and nitrous oxide (N2O). These emissions result from various sources, including industrial processes, energy production, transportation, and agriculture. The combustion of fossil fuels for electricity generation, industrial manufacturing, and transportation is a significant contributor to CO2 emissions in the state.
2. **Deforestation and Land Use Change**: The conversion of forests, grasslands, and other natural ecosystems for urbanization, agriculture, and infrastructure development leads to deforestation and land use change, which contributes to climate change. Deforestation reduces the capacity of forests to absorb CO2 from the atmosphere, while land use change alters local climate patterns and contributes to the loss of biodiversity and ecosystem services.
3. **Agricultural Practices**: Agriculture is a significant economic activity in Maharashtra, but certain agricultural practices contribute to climate change. For example, the use of synthetic fertilizers in intensive agriculture releases nitrous oxide, a potent greenhouse gas, into the atmosphere. Additionally, practices such as rice cultivation in flooded fields generate methane emissions, contributing to climate change.
4. **Urbanization and Industrialization**: Rapid urbanization and industrialization in Maharashtra lead to increased energy consumption, waste generation, and pollution, all of which contribute to climate change. Urban areas, particularly cities like Mumbai and Pune, are major sources of GHG emissions due to their dense populations, industrial activities, and transportation infrastructure.
5. **Water Management Practices**: The management of water resources in Maharashtra, including dam construction, irrigation schemes, and groundwater extraction, can have implications for climate change. Alterations to natural hydrological systems disrupt the water cycle, leading to changes in precipitation patterns, groundwater recharge rates, and river flows, which can exacerbate droughts and floods and impact local climates.
6. **Waste Management and Landfills**: Inadequate waste management practices, including open burning of waste and improper landfill management, release GHGs such as methane

and CO2 into the atmosphere. Municipal solid waste decomposition in landfills generates methane, a potent greenhouse gas, contributing to climate change.

In summary, climate change in Maharashtra is driven by a combination of global factors such as greenhouse gas emissions and local activities such as deforestation, agriculture, urbanization, and water management practices. Addressing these underlying causes requires comprehensive mitigation strategies, sustainable land use planning, and policies aimed at promoting renewable energy, conservation, and resilient development practices.

Impacts of Climate Change:

The impacts of climate change on Maharashtra are diverse and far-reaching, affecting various sectors of the economy, ecosystems, and human well-being. Some of the key impacts of climate change in Maharashtra include:

1. **Changing Rainfall Patterns**: Climate change has altered rainfall patterns in Maharashtra, leading to more erratic and intense rainfall events. This has resulted in increased frequency of droughts in some regions, such as Marathwada and Vidarbha, leading to water scarcity, crop failure, and loss of livelihoods for farmers.
2. **Heatwaves and Temperature Rise**: Rising temperatures associated with climate change have led to more frequent and severe heatwaves in Maharashtra, particularly in urban areas. High temperatures increase heat-related illnesses and mortality rates, strain energy and water resources, and affect agriculture by reducing crop yields and livestock productivity.
3. **Coastal Erosion and Sea Level Rise**: Maharashtra's extensive coastline is vulnerable to the impacts of climate change, including coastal erosion and sea-level rise. Coastal communities face increased risks of inundation, loss of property, displacement, and damage to infrastructure due to storm surges, erosion, and saltwater intrusion into freshwater sources.
4. **Water Scarcity**: Climate change exacerbates water scarcity in Maharashtra by altering precipitation patterns, reducing groundwater recharge rates, and increasing evaporation rates. This has significant implications for agriculture, industry, and domestic water supply, leading to conflicts over water resources and challenges in water management and distribution.
5. **Agricultural Productivity**: Climate change affects agricultural productivity in Maharashtra through changes in temperature, rainfall, and the frequency of extreme weather events. Erratic rainfall patterns, prolonged droughts, and heat stress impact crop yields, reduce soil fertility, and increase pest and disease outbreaks, threatening food security and rural livelihoods.
6. **Biodiversity Loss**: Climate change poses a threat to Maharashtra's rich biodiversity, including its forests, wetlands, and coastal ecosystems. Changes in temperature and rainfall

patterns, habitat degradation, and invasive species disrupt ecosystems, leading to loss of biodiversity, extinction of species, and disruptions in ecosystem services such as pollination, soil fertility, and water purification.

7. **Health Impacts**: Climate change affects public health in Maharashtra through increased incidences of heat-related illnesses, vector-borne diseases, and respiratory ailments. Heatwaves, floods, and droughts exacerbate health risks, particularly among vulnerable populations such as the elderly, children, and marginalized communities, leading to increased morbidity and mortality rates.
8. **Infrastructure Vulnerability**: Climate change poses risks to infrastructure in Maharashtra, including roads, bridges, buildings, and utilities. Extreme weather events such as floods, cyclones, and storms damage infrastructure, disrupt transportation networks, and strain emergency response systems, leading to economic losses and human displacement.

In summary, climate change impacts in Maharashtra are multifaceted and interconnected, affecting water resources, agriculture, coastal communities, biodiversity, public health, and infrastructure. Addressing these impacts requires integrated adaptation and mitigation strategies, sustainable development practices, and policies aimed at enhancing resilience and reducing vulnerability to climate change.

Adaptation and mitigation strategies:

Adaptation and mitigation strategies are essential for addressing the impacts of climate change in Maharashtra and building resilience to future changes. Here are some key strategies for adaptation and mitigation:

Adaptation Strategies:

1. **Water Management**: Implementing water conservation measures, such as rainwater harvesting, groundwater recharge, and efficient irrigation techniques, to address water scarcity and ensure sustainable water use in agriculture, industry, and urban areas.
2. **Climate-Resilient Agriculture**: Promoting climate-smart agricultural practices, including drought-tolerant crop varieties, agroforestry, soil conservation, and crop diversification, to enhance resilience to changing climate conditions and reduce dependence on rainfall.
3. **Coastal Zone Management:** Developing and implementing coastal protection measures, such as mangrove restoration, beach nourishment, and construction of coastal defenses, to mitigate the impacts of coastal erosion, sea-level rise, and storm surges on coastal communities and infrastructure.
4. **Ecosystem Restoration**: Restoring and conserving natural ecosystems, including forests, wetlands, and mangroves, to enhance biodiversity, regulate water flows, sequester carbon, and provide ecosystem services that support adaptation efforts and livelihoods.
5. **Urban Resilience**: Implementing climate-resilient urban planning and infrastructure

projects, such as green roofs, permeable pavements, and flood management systems, to reduce the vulnerability of cities and towns to heatwaves, floods, and other climate-related hazards.

6. **Community-Based Adaptation**: Engaging local communities in participatory decision-making processes, capacity-building initiatives, and livelihood diversification programs to enhance their adaptive capacity and resilience to climate change impacts.

Mitigation Strategies:

1. **Renewable Energy Promotion**: Scaling up the deployment of renewable energy sources, such as solar, wind, and biomass, to reduce reliance on fossil fuels, lower greenhouse gas emissions, and transition towards a low-carbon energy system in Maharashtra.
2. **Energy Efficiency Measures**: Implementing energy efficiency measures in industries, buildings, transportation, and appliances to reduce energy consumption, improve resource efficiency, and lower carbon emissions.
3. **Afforestation and Reforestation**: Expanding afforestation and reforestation efforts to enhance carbon sequestration, conserve biodiversity, and restore degraded landscapes, thereby mitigating the impacts of deforestation and land use change on climate change.
4. **Waste Management**: Implementing sustainable waste management practices, such as recycling, composting, and waste-to-energy technologies, to reduce methane emissions from landfills and mitigate the carbon footprint of waste disposal in Maharashtra.
5. **Green Transport Initiatives**: Promoting sustainable transportation solutions, including public transit, cycling infrastructure, electric vehicles, and carpooling programs, to reduce emissions from the transportation sector and improve air quality in urban areas.
6. **Policy Interventions**: Enacting policies, regulations, and incentives to promote low-carbon development pathways, carbon pricing mechanisms, emission reduction targets, and climate-resilient investment strategies at the state and local levels.

By implementing a combination of adaptation and mitigation strategies, Maharashtra can effectively address the impacts of climate change, enhance resilience to future challenges, and contribute to global efforts to combat climate change. These strategies require collaboration and coordination among government agencies, civil society organizations, private sector stakeholders, and local communities to achieve meaningful and sustainable outcomes.

Conclusions and Recommendations:

Conclusions:

- Maharashtra faces significant impacts from climate change, including changing rainfall patterns, heatwaves, coastal erosion, and water scarcity, affecting various sectors.
- Adaptation and mitigation measures are crucial for reducing vulnerability and transitioning towards a low-carbon, climate-resilient development pathway.

Recommendations:

- Strengthen water management, promote climate-smart agriculture, and implement coastal protection measures.
- Invest in renewable energy, enhance urban resilience, and prioritize ecosystem restoration and conservation efforts.
- Strengthen policy frameworks, regulatory mechanisms, and community participation to support climate action and sustainabledevelopment in Maharashtra.

Reference:

1. **Acharya, S.S.** (2006)Sustainable Agriculture and Rural Livelihoods, Agricultural Economics Research Review, 19, pp 205-217
2. **Agarwal P K** (2009) Global Climate Change and Indian Agriculture
3. Vulnerability of Indian Agriculture to Climate Change, Indian Council of Agricultural Research, New Delhi
4. International Panel on Climate Change. Forth Report of the International Panel on Climate Change.
5. UNFCC (2009) Climate Change: Impacts, Vulnerabilities and adaptation in developing Countries.
6. Dash S K and Hunt J C R (2007), " Variability of Climate Change in India", Current Science, Vol. 93 No. 6, pp. 782-788.
7. GoI(Various Issues), Economic Survey, Government of India.
8. JayantSathaye , P R Shukla and Ravindranath N H (2006), " Climate Change, Sustainable Development and India: Global and National Concerns", Current Science, Vol. 90, No. 3, pp. 314-325.
9. Assessing Climate Change Vulnerability and Adaptation Strategies for Maharashtra: Maharashtra State Adaptation Action Plan on Climate Change (MSAAPC)
10. www.mumbaimonsoon.com

APPLICATION OF GEOSPATIAL TECHNOLOGIES FOR LAND USE LAND COVER [LULC] MAPPING in NANDED, INDIA.

Shinde Tarun A.,
ResearchScholar

Lolage Yogesh P.,
Research Guide and Assistant ProfessorS.R.T.M.University Nanded.

ABSTRACT :

Land Use and Land Cover (LULC) have been among the most important perceptible to investigate land use pattern. Land use refers to man activities and various use, viz. carriedon land. Land cover refers to natural vegetation, rock, water bodies, soil, artificial cover and others resulting to land transformation. The knowledge of land use and land cover changesis very important in understanding the utilization of land. The attempt has been made tostudy the land use and land cover of Nanded having a total geographic area of 412.70 Sq. Km. which is one of the fastest growing city of Maharashtra. The present study was therefore undertaken to analyse the land use and land cover of Nanded using Remote Sensing Data and GIS by mapping land use and land cover. The main objective of the study was to analyse and interpret satellite data for land use land cover mapping to generate geodatabase of the district in GIS format. Land Use Land Cover categories identified in these area were Water body, Agriculture, Fallow land, Barren land, Settlements, Dense forestand Sparse Vegetation.

Keywords : Land Use Land Cover (LULC), Geodatabase, GIS

INTRODUCTION

The terms land use and land cover are often used interchangeably, but each term has its ownunique meaning. Land Cover refers to the surface cover on the ground like vegetation, urban infrastructure, water, bare soil etc. Identification of land cover establishes the baseline information for activities like thematic mapping and change detection analysis. Land use refers to the purpose the land serves for ex. recreation, wildlife habitat agriculture.

The term land use Land cover generally refers to the categorisation or classification of human activities and natural elements on the landscape within a specific time frame basedon established scientific &statical methods of analysis of appropriate source of materials i.e., land use is the description of how people utilize the land for the socio-economicactivities and land cover is the is the physical material at the surface of the earth. (satpalda.com 2018)

Land use and land cover changes apart from changing the physical dimension of the spatial extent of the land use and land cover classes. also influence many of the eventual degradation of the ecosystem of the earth (Degree and chow, 1992)

Land cover refers to the physical characteristics of earth surface, captured in the distribution of vegetation water. Soil and other physical features. Land use refers to the way in which land has been used by human and their habitats (such as agriculture, settlement. industry, etc.) although land use is generally inferred based on the cover, yet both the terms land use and land cover doing closely related are interchangeable for example settlement is cover but if we include building weather it is being used for residence or industrial activity it showsthe land use component (Choudhary et al, 2008). terms land use and land cover are often used interchangeably, but each term has its own unique meaning. Land Cover refers to the surface cover on the ground like vegetation, urban infrastructure, water, bare soil etc.Identification of land cover establishes the baseline information for activities like thematic mapping and change detection analysis. Land use refers to the purpose the land serves for ex. recreation, wildlife habitat agriculture.

Materials and Methods

Geographical Location of the Study Area

Nanded tahsil is part of Nanded district in Marathwada region of Maharashtra state. Nanded District has 16 tahsils out of which Nanded tahsil occupies larger area. Nanded tahsil was selected for the present study to assess the land use and land cover mapping. Nanded city is located on the bank of Godavari River, which originates from Nashik. Nanded tahsil is situated between 19° 00' and 19°18' North latitude and 77°9' to 77°24' East longitudes (Fig 1). It has a geographical area of 412.70 Sq. Km. Nanded is one of the fastest growing cities of Maharashtra (Yannawar and Waghmare, 2013).

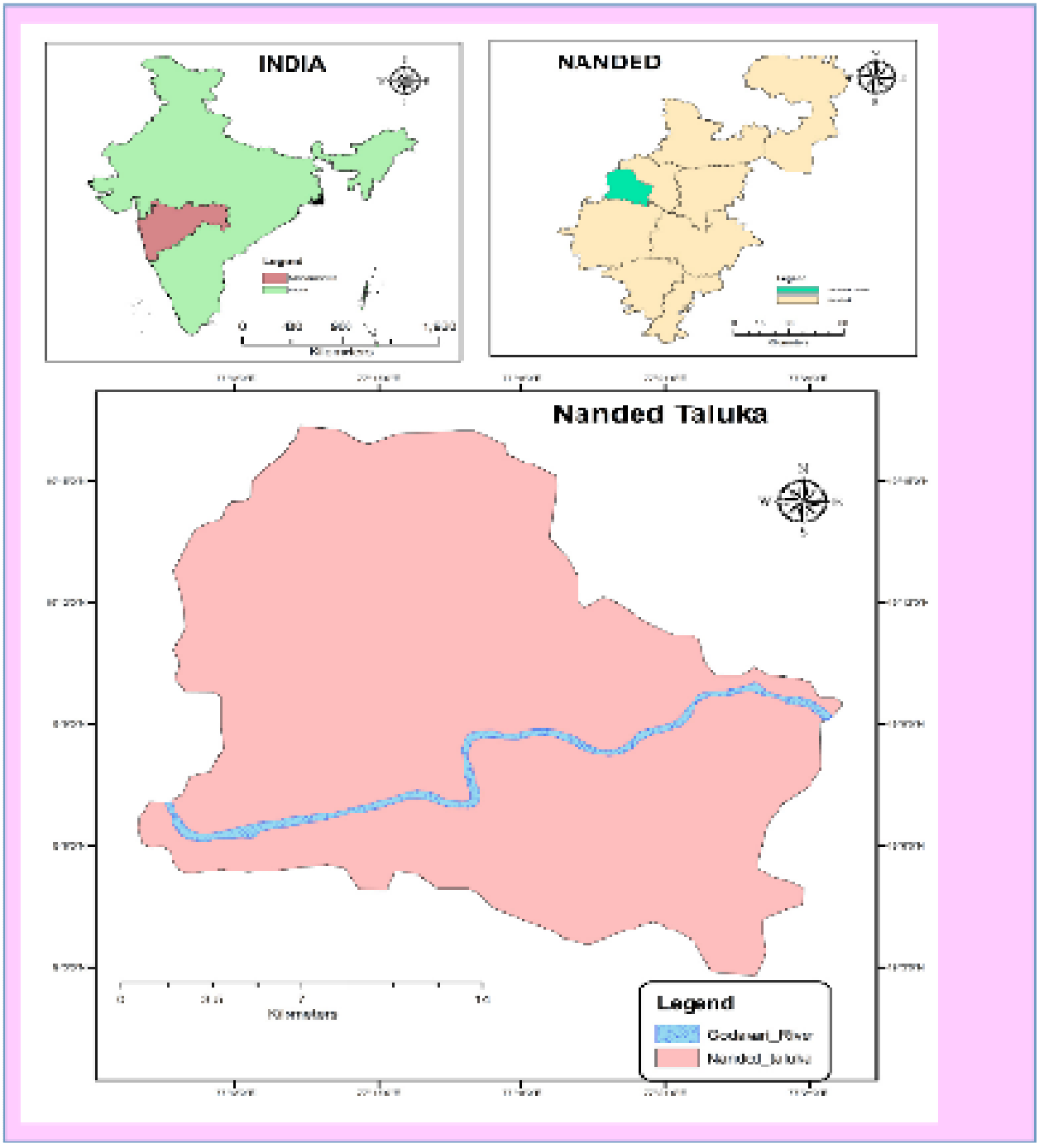


Fig 1. Location Map of Nanded Tahsil

Data Collection Database Organisation:

The integrated development database has basically two components, i.e., Spatial and Non spatial data also known as Spatial and Attribute data. The Geographical Information System software package is the heart of the data for handling and analysis the two sets of data. In the present study a standard GIS package has been employed as the main tool to organize, design, organization, storage, retrieval, analysis, and generation of cartographic outputs in the form of various maps. As two type's data sets to be organized in GIS environment, it wasfelt necessary to

evolve a set of designed parameters that would have to be adopted for the database organization. The database design not only helps for a systematic database organization but also provides a level of flexibility to improvement. The element wisedesign considerations adopted for the project are as under.

Spatial Data

Spatial data is the only unchangeable information related to the map i.e., the coordinates. It involves projection systems, line and polygon attributes, and other related information.There are two main classes of spatial data: vector data and raster data. Vector data representation is the recording of features based on the interaction between arcs and nodes, represented by lines, points, and polygons. A point is a single node, a line includes twonodes with an arc between them, and a polygon is a closed group of three or more arcs having common first and last node. These three elements, record most of the topographical information like road, infrastructure, drainage etc.

The spatial data is mainly obtained from remotely sensed data secondary sources. Maximumspatial data sources follow the SOI polyconic co-ordinate system. The entire Nanded tahsilis covered in four survey of India topographic map at 1:50000 scale. A standard registration procedure has been adopted to register the topographic map first.

Non-Spatial Data

Data without spatial information is a non-Spatial data. Spatial information includes itsgeographical co-ordinates. It is a set of data records, each record containing multiple data fields. Survey of India toposheets on 1:50000 scale of number 56 E/3, E/4, E/7, E/8 & E/11. GIS and image-processing software's are used for the purpose of image classification andfor delineating drainage and other features in the study area. Number of peripheral devices such as scanner, plotter, printer etc. has also been interfaced with the software and hardware system.

Table No.1 Satellite data used from National Remote Sensing Centre

Sr. No.	Season	Satellite/Sensor	Date of Pass
1	Rabi	IRS P6 LISSIII	28October 2009

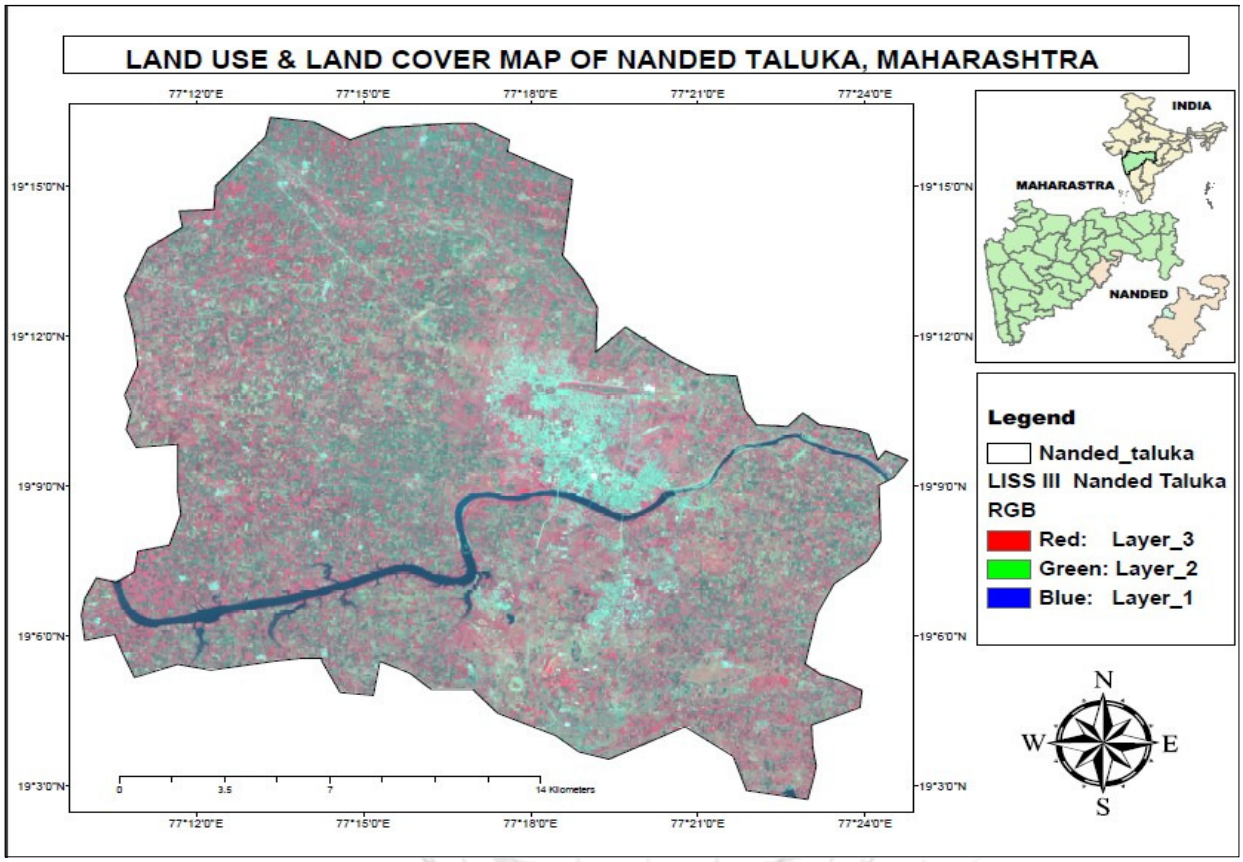


Figure. Satellite imagery of the study area

Image Classification

Supervised Image classification technique was used to prepare Land use / Land Cover Classification. Supervised classification requires thorough knowledge of the study area. Sample clusters or sets were taken for a particular class all over the satellite image and merged together. Merged group was then identified using its tonal characteristics and was cross checked on google earth and toposheets. Supervised classification is the technique of using samples of known individuality to classify pixels of unidentified identity. Post field visit was done to verify prepared LU/LC map and also verification of doubtful areas or unidentified features.

Land Use LandCover Class	Description	Characteristics on LISS III False ColorComposite (FCC)
Water Body	River and lakes	Dark blue tone shows deep water while Cyan blue or light blue tone shows less deep water

Agriculture	Crops	Dull red and smoothappearance
Fallow land	Agricultural fieldwithout crops or harvested land	Bluish/ Greenish greywith smooth texture
Barren Land	Exposed rocks	Yellow tone
Settlements	Towns and villages, geometrical appearance	Bluish tone
Dense forest	Dense trees	Dark red tone withrough texture
Sparse vegetation	Low vegetation density with exposed ground surface	Dull red top pinkish

Result and Discussion

The classification of landsat image resulted in a LULC map as shown in figure which deplicts the distribution of the six classes in the study area. Table 1 shows the area statistical distribution of LULC and percentage of the area covered. The findings indicate that water body is the smallest class has an area percentage of 2.07%.

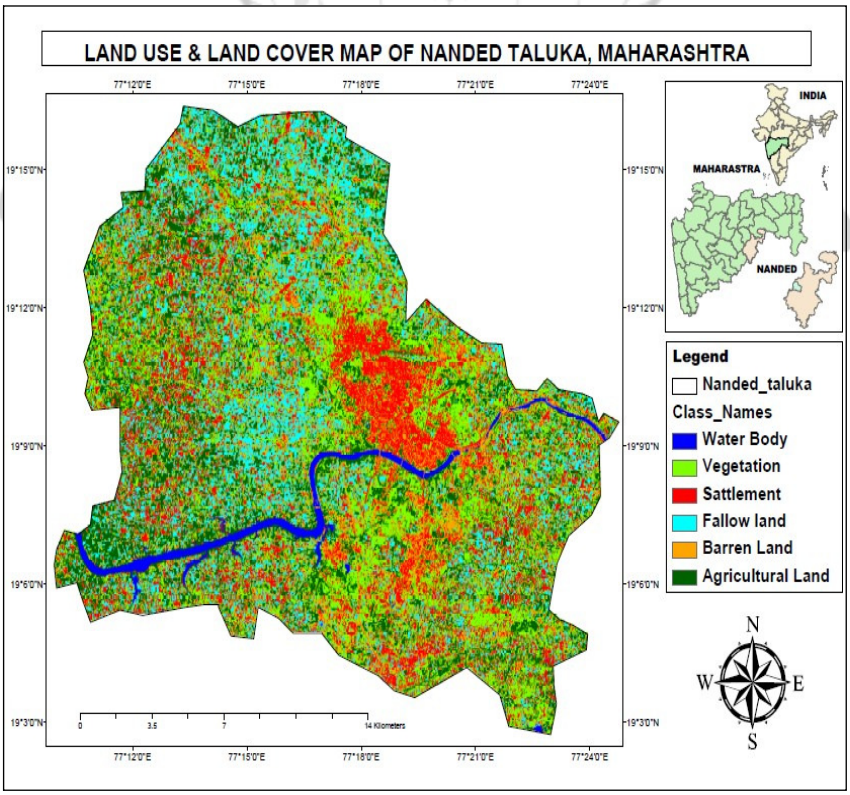
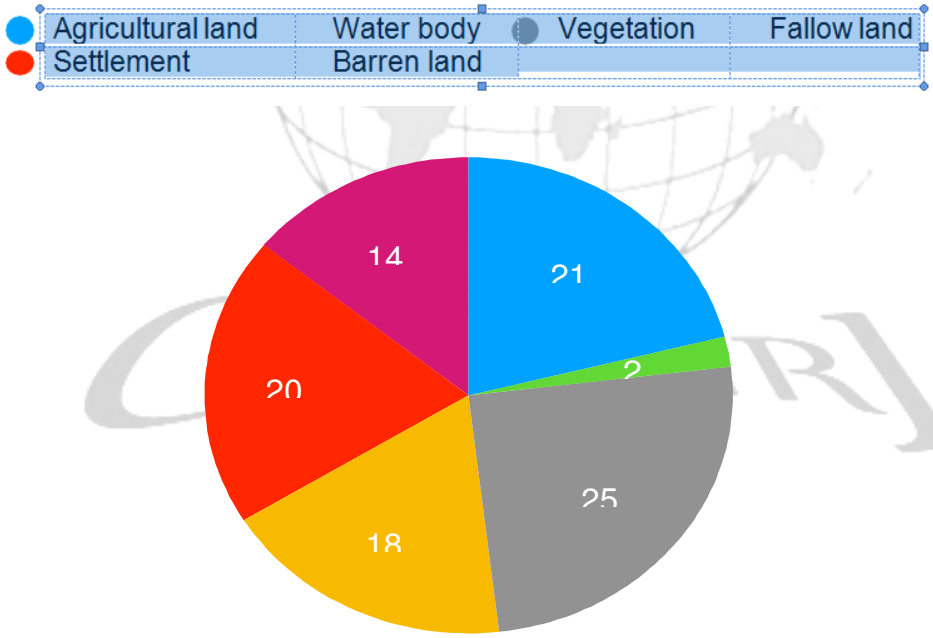


Figure. Shows land use / land cover map of the study area

Table 1 General Land use of Nanded Tahsil (2009)

Sr. no.	LULC	Area Covered 2 per Class (m)	Percentage of area covered
1	Agricultural land	77176385.25	21.01
2	Water Body	77176385.25	2.07
3	Vegetation	77176385.25	25.07
4	Fallow Land	66284910.75	18.05
5	Settlement	72286763.75	19.68
6	Barren Land	51882230.75	14.12
Total		367315833.5	100



References

Yannawar V.B., Bhosle A.B., Khadke P.A. and Waghmare P.B (2013): ‘‘Monitoring physical growth of Nanded City by using Geoinformatics techniques’’, Researcher 2013, 5(2), PP. 80-86.

P. B. Tamsekar, Dr. S. B. Thorat ,2017, Land Use and Land Cover (LULC) Identification and Analysis Using Satellite Imagery, IJSRSET | Volume 3 | Issue 2 | Print ISSN: 2395-1990.

Rutuja P. Shinde (2022) Land Use and Land Cover Change Detection Mapping of Mula River Basin Using Geospatial Technology. volume 04.

Shuang Hao, Fengshun Zhu , Yuhuan Cui (2021) Land use and land cover change detection and spatial distribution on theTibetan Plateaul doi.org/10.1038/s41598-021- 87215.

Ranjeet Kumar Singh , Manmohan Singha1 , Shailendra K. Singh1 , Debjeet Pal1 , Nimisha Tripathi2 * and Raj Shekhar Singh1, Land use/land cover change detection analysis using remote sensing and GIS of Dhanbad district, India ,June 2018

Prabuddh Kumar Mishra, Aman Rai , Suresh Chand Rai , 7 March 2019 Land use and land cover change detection using geospatial techniques in the Sikkim Himalaya, India, P.K. Mishra et al. / Egypt. J. Remote Sensing Space Sci. 23 (2020) 133–143.

P. B. Tamsekar, Dr. S. B. Thorat (2017) Land Use and Land Cover (LULC) Identification and Analysis Using Satellite Imagery IJSRSET173230,p.g. 68-70.

Harshika A. Kaul and Ingle Sopan (2012)Land Use Land Cover Classification and Change Detection Using High Resolution Temporal Satellite Data Vol. 01, Issue 04, pg.. 146-152 ISSN 2049-8373

M Kafi , H Z M Shafri , A B M Shariff An analysis of LULC change detection using remotely sensed data; A Case study of Bauchi City doi:10.1088/1755- 1315/20/1/012056

P. S. Roy and Arijit Roy (2010) Land use and land cover change in India: A remote sensing & GIS perspective Journal of the Indian Institute of Science · VOL 90:4

Ashangbam Inaoba Singh, Kanwarpreet Singh (2021) Remote Sensing and GIS based Land Use Land Cover Analysis in Chandel District, Manipur, India doi:10.1088/1755-1315/889/1/012046

Prabuddh Kumar Mishra , Aman Rai , Suresh Chand Rai (2019)Land use and land cover change detection using geospatial techniques in the Sikkim Himalaya, India doi.org/ 10.1016/j.ejrs.2019.02.001

Dires Tewabe & Temesgen Fentahune (2020) Assessing land use and land cover change detection using remote sensing in the Lake Tana Basin, Northwest Ethiopia:doi.org/ 10.1080/23311843.2020.1778998

SVM Shivpuje, Prakash R., Dr. Deshmukh Nilesh K (2017) Analysis of Land Use and Land Cover Classification (LU/LC) Using Matching learning Algorithm Volume 4, Issue 11 JETIR (ISSN-2349-5162)

DIVERSITY OF ICHTHYOFAUNA AND SEASONAL OCCURRENCE OF CHIRAG SHAH DARGA LAKE OF DISTRICT HINGOLI, MAHARASHTRA, INDIA

Priyanka Patode

Shree Renukadevi Arts, Commerce and Science Mahavidyalaya,

Mahur - 431721, Dist. Nanded (M.S.), India.

ABSTRACT

Ichthyofauna diversity of Chirag Shah Darga lake studied during the study period of January 2016 to December 2017 with respect to seasonal occurrence in district Hingoli. Fishes will be collected with the help of local fishermen by using different nets cast net, gill net, ghagrajal and hooks, etc. Total 23 fish species identify from 5 orders and 6 families. Diversity of fish in seasonal occurrence shows difference in before and after monsoon. During monsoon more fish diversity found. Some fishes like Labeo rohita, Labeo calbasu, Catla catla, Cirrhinus mrigala and Puntius sarana sarana found in all season.

KEYWORDS: Ichthyofauna diversity, Chirag Shah Darga lake , Hingoli, Maharashtra,

INTRODUCTION

Fish are constant living components of water bodies. These organisms are important food resources also indicators of the ecological health of the waters they populate. Diversity of fishes is represents the range of life telling the number, variability in relation to ecosystem which they are occurs. According to Khan et.al; (1999) reservoir fishery in India is important for social and economic point of view as it has the ability to provide employment to about 2 million people. In Maharashtra is gifted with an area, the state. Fisheries Corporation was operating in 6,272 ha. , marketing the catches of reservoir Sreenivasan(1993). Also fish diversity studied by from different fresh water bodies of India have been carried out during the last few decades Hamilton Buchanan (1822); Day (1951); Jayram (1981); Talwar&Jhingrah (1991); Menon (1992). India has a large system of river, canals, lakes and ponds. They give more than 30% of the total fish production. So, Fish is being used as food, economically a very important group of animals.

MATERIALS AND METHODS

Diversity of ichthyofauna and Seasonal occurrence studied in Chirag Shah Darga lake in Hingoli City during study period from July 2021 to June 2022, it situated at 190 34’40N and 770 06’10E. For the study of ichthyofauna diversity fishes will be collected with the help of local fishermen by using different nets like cast net, gill net, ghagrajal and hooks, etc. after noting down the colours and other external characters of the fishes were preserved in 4% formaldehyde and

identified by the literature cited by Jayram, (1999); Day, (1878); Talwar and Jhingran,(1991) during the study period of January 2016 to December 2017 from Chirag Shah Darga lake .

RESULT AND DISCUSSION

A large number of dams, reservoir has been constructing in the recent year which to provide water for irrigation and power production. Ahirrao and Mane (2000), Hiware and Pawar (2006) recorded the fish diversity from different reservoirs. Total 23 fish species identify in the study period from 5 orders and 6 families. About 13 species belongs to order Cypriniformes, 4 from Channiformes, 3 from Siluriformes, 2 from Clupeiformes and 1 from Perciformes shows in the following table. All species identified with gives their common name and seasonal occurance. More ichthyofauna diversity found in monsoon season *Labeo rohita, Labeo calbasu, Catla catla, Cirrhinus mrigala and Puntius sarana sarana* found in all season (WSM).

Table No. 1: Ichthyofauna observed at Chirag Shah Darga Lake from January 2016 to December 2017

Order	Family	Species name	Common name	Seasonal occurrence
1.Clupeiformes	1.Notopteridae	1.*Notopterus Notopterus*	Asiatic knifefish	W
		2.*Notopterus chitala*	Clown knifefish	W
2.Cypriniformes	2. Cyprinidae	3. *Labeo rohita*	Rohu	WSM
		4.*Labeo calbasu*	Orange- fin labeo	WSM
		5. *Catla catla*	Catla	WSM
		6. *Cirrhinus mrigala*	Mrigal	WSM
		7. *Cyprinus carpio*	Commoncarp(EC)	WS
		8. *Chela phulo*	Chela	WS
		9. *Chelas aldoni*	Chela	WS
		10.*Discognathus lamta*	Garralambta	MW
		11.*Discognathus modestus*	Red garra	MW
		12.*Puntius sarana sarana*	Olive barb	WSM
		13. *Puntiusjerdoni*	Jerdon's carp	SM
		14.*Thynnichthys sandkhol*	Sandkhol carp	MW
		15.*Rasbora daniconius*.	Black line Rasbora	M
3. Perciformes	3. Cichlidae	16.*Oreochromis niloticus*	Nile tilapia	WS
4.. Siluriformes	4. Bagridae	17. *Mystus cavasius*	Genetic mystus	WS
		18. *Mystus vittatus*	Striped dwarf catfish	W

	5. Clariidae	19. *Clarias batrachus*	Waking catfish	SM
5.Channiformes	6. Channidae	20. *Channa stratus*	Snakehead murrel	SM
		21. *Channa punctatus*	Green snakehead	SM
		22. *Channa marulius*	Bullseye snakehead	SM
		23. *Channa gaucha*	Dwarf snakehead	SM

REFERENCES

1. Ahirrao S.D. and A. S. Mane (2000) *The diversity of Ichthyofauna and fisheries from some freshwater bodies of Parbhani district* (MS). J. Aqua. Biol. 15(1&2): 40-43

2. Day FS. (1951) *The fishes of India.* William and Sons Ltd., London.

3. Day, F.S. (1878). "The Fishes of India" William and Sons Ltd., London. |

4. Hamilton B.F. (1822) - *An account of fishes found in the river Ganga and it branches Edinburg and London* VIII + 400 p.p. plate 39

5. Hiware C.J. and Pawar R.T. (2006) *IchthyofaunaPaithan reservoir (Nathsagar dam) in Aurangabad District of Marathwada Region (MS) state*. Ecology and Environment. APH Publishing Corporation New Delhi. Ch. 22 pages 209-215.

6. Jayaram KC (1981) The*fresh water fishes of India, Pakistan, Burma and Sri-Lanka. Handbook Zoological Survey of India*, No.2. xii + 475

7. Jayaram, K. C. (1999): *The fresh water fishes of the Indian region- Narendra Publishing House,* Delhi, India. 551 pp

8. Khan A.A., Kartha K. N., Percy Dawson and George (1991) - *Fish harvesting system in Indian* reservoir proc. Of Nat. workshop on 1000 energy fishing 8-9 August 1991.

9. Menon, A.G.K. (1994). *Criteria for determining the status of threatened categories of Indian freshwater fishes*. 1-5. In: Threatened Fishes of India. Natcon Publication No. 4, UP, pp.384.

10. Srinivasan (1993) - *Reservoir fishery of India*, fishing chimes 13(1) : 18-21

11. Talwar PK, Jhingran AG. (1991) Inland *fishes of India and adjacent countries.*Vole 1 & VII. Oxford & IBH Publ. Co. Pvt. Ltd; New Delhi.