NUTRIENT ASSESSMENT FROM FRESHWATER RESERVOIR NEAR BHOKAR AND ITS IMPACT ON PLANKTON

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The soluble nutrients are plays vital role in aquatic water bodies. Then micro and macro nutrients both are highly essential in building up of biological life forms. The plankton and nutrient in water bodies have a significant role in setting up the aquatic ecosystem as well as aquatic resources.

In the present research study, the occurrence and distribution of phytoplankton from Sudha reservoir from Bhokar tahsil were undertaken for about two years during 2018 to 2019. Rainwater is the main source for surface water; it includes rivers, lakes, ponds, reservoirs, streams, etc. The dam is surrounded by various types of plants and agricultural land with different types of soil. When rainfall occurs the water from surrounding area and agricultural land containing various organic traces enter into the Sudha reservoir. The observed mean values of parameters like pH, Phosphate, Sulphate, Nitrite-nitrogen, Ammonia, Phytoplankton and Zooplankton etc. All the studied parameters are within the permissible limit. The study showed few phytoplanktonic genera and the good population of mainly five genera of phytoplankton and zooplankton each were observed.

Keywords: Plankton diversity, Nutrients, Sudha reservoir, Pollution studies.

INTRODUCTION:

Water is the chemical substance essential for life on Earth. Its chemical formula is H_2O, one molecule of water has two hydrogen atoms covalently bonded to a single oxygen atom. Life

as we know it could not have possibly existed on Earth without water. The lower density of ice as opposed to water accounts for the fact that ice floats on water (Wetzel, 2001).

Water pollution is one of the main unpleasant situations of the modern world. On the one side we need to conserve and manage nature's resources, but on the other also need to keep the need for further industrial growth. This has resulted in the need for more information regarding the water pollutants that causes effects to the biological systems (Daniel, 2010).

However, other minerals and chemicals are dissolved and carried along. The garbage, sewage, industrial waste, pesticides etc. are all possible contaminants of raw water. Impurities in raw water are either suspended or dissolved. Suspended impurities include diseases organisms, silt, bacteria and algae etc. They must be removed or destroyed before the water is consumed. Dissolved impurities include salts (calcium, magnesium and sodium), iron, manganese and gases (oxygen, carbon dioxide, hydrogen sulphide and nitrogen), these impurities must be reduced to levels acceptable for human consumption.

Water is the most precious resource essential to sustain life on earth. Rapid industrialization and urban development results in inclusion of variety of pollutants into rivers including heavy metals having geological origin and entry into river bodies by weathering and erosion and due to anthropogenic activities like mining, discharge of industrial and domestic effluent (Abbasi et al., 1998).

High rate of organic production results in rapid multiplication of phytoplankton. Taking advantage of the food thus available zooplankton multiply and this in turn attracts primary and secondary carnivores. Production of phytoplankton and zooplankton plays a vital role in the growth and overall production of fishes which feed on plankton. Hence knowledge of the extent of plankton production helps to ascertain the level of fish production likely to be achieved.

Diversity of plankton population is fairly dependent on water quality and climatic factors. Various chemical and biological circumstances must be simultaneously taken into consideration for understanding the fluctuations of plankton population. The aim of the present study deals with chemical analysis of water to determine the nutrient status of the water with reference to phytoplankton.

MATERIAL AND METHODS:

STUDY AREA:

Bhokar is the Tehsil place in Nanded district of Maharashtra, the Sudha reservoir constructed earlier and it is on the way to Kinwat and near Bhokar towards eastern. The reservoir is situated $19_0 15'$ latitude $73_0 43'$ longitude. The catchments area of the reservoir is about 105.67 sq. km. Sudha River is emerging from Sitakhandi near Bhokar on the way to Nanded highways.

Table 1: Showing the Sampling Sites located on the Sudha reservoir.

Sampling Site	Latitude	Longitude
1	19°15'6.55"N	77°43'1.27"E
2	19°14'48.19"N	77°42'51.26"E
3	19°14'32.98"N	77°42'21.03"E
4	19°14'49.76"N	77°41'55.24"E

Fig 1: The Water Sampling Locations of Sudha reservoir, by Google Earth.

Fig 2: Collection of water sample S1.   **Fig 3:** Water sampling at site S2.

Fig 4: Sudha reservoir showing with water supply plant near Bhokar city.

Fig 5: Water sampling from site S3.   **Fig 6:** A view of water sampling site 4.
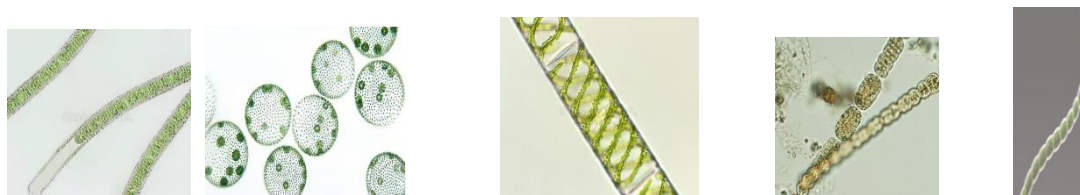
Paramecium   Keratella   Daphnia   Cyclops   Brachionus

Fig 6: Few selected Zooplankton were observed and noted from Sudha reservoir.

Oscillatoria   Volvox   Spirogyra   Anabaena   Nostoc

Fig 7: Few selected Phytoplankton were observed and noted from Sudha reservoir.

The flow of water is from west to east in the direction. The area covered by this project is about 175.385 hectares. This project is highly benefited by several villages along with the entire city of Bhokar. Several villages are benefited by this dam in various sections.

METHODOLOGY:

Sampling Method: Different water sampling sites were fixed for the present work. Water samples were collected during morning hours and were placed in plastic containers. All the water samples along with plankton collected and brought in the laboratory and studied in detail. Apart from several nutrients, few nutrients were selected for the present investigation. Nearly all the selected parameters were analyzed as per Standard Methods for the Examination of Water and Wastewater (APHA, (2000). Sampling was carried out every month during entire year of 2019. The pH, Temperature, DO and TDS were determined on the spot simply for knowing the water quality status, remaining water parameters were analyzed in the laboratory by applying standard methods.

Identification of Plankton: A typical conical shaped plankton net is used for sampling of plankton which is highly useful selective method (Verlencar and Desai, 2004). The plankton sample taken on the slide with cover slip and was observed under the research microscope with different magnifications like (10x, 40x). The phytoplankton, zooplankton were compared and identified with taking standard manual help. Mix well the given water sample by slightly shaking with careful. Take a drop of water on a clean slide, place the cover slips on it or with the help of zero-point brush take the material and put it on the slide. Now cover it with the cover slip. Adjust the microscope observe under 10x. Identify and note the characteristics of individual species of both plankton (Trivedi and Goel 1998).

RESULTS AND DISCUSSION:

In the present study of Sudha reservoir, we have selected different water sampling sites and were collected every month during study period. The number of chemical parameters like pH, phosphate, sulphate, nitrite-nitrogen, ammonia, Phytoplankton and Zooplankton was performed. The data revealed that there were considerable variations in the quality of water with respect to their chemical characteristics and its analysis. chemical analysis of Sudha Reservoir water was studied in year 2019. The observed mean values of parameters like pH, phosphate, sulphate, nitrate-nitrogen, ammonia, Phytoplankton and Zooplankton were noted.

The parameters of water quality undertaken they were found within the permissible limit. The study of few plankton was undertaken only by qualitative analysis such as phytoplanktonic genera and good population of mainly five genera of phytoplankton namely *Spirogyra, Volvox*, *Oscillatoria, Anabaena* and *Nostoc* observed in this dam water. Few zooplankton genera also studied and found as *Daphnia, Cyclops, Keratella, Paramecium* and *Brachionus* respectively.

Anitha and Singara (2007), did a survey of phytoplankton in lower Manair dam and Kakatiya canal, Karimnagar, Andhra Pradesh during July 1999 to June 2001. They found phytoplankton belongs classes Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae from both the water bodies.

Bahura (2001), found phytoplankton community comprised of algal groups; Bacillariophyta and Chlorophyta represented by total 22 genera. Banakar et al. (2005), obtained

phytoplankton communities in Chandravalli tank at Chitradurga, Karnataka belonging to 4 groups of algae viz., Chlorophyceae during October 2004 to March 2005.

Table 2: Mean values of different water quality parameters observed (mg/L) during year 2019.

| Month & Parameters	pH	Phosphate	Sulphate	Nitrite-nitrogen	Ammonia
January	7.4	0.51	151	4.1	0.13
February	7.2	0.48	163	3.8	0.12
March	7.4	0.44	158	3.5	0.14
April	7.3	0.49	165	3.3	0.23
May	7.3	0.52	167	2.9	0.26
June	7.5	0.45	172	3.1	0.35
July	7.5	0.47	179	3.5	0.27
August	7.6	0.48	168	3.4	0.29
September	7.5	0.52	168	4.3	0.23
October	7.5	0.55	177	4.2	0.18
November	7.6	0.61	169	4.4	0.17
December	7.4	0.63	165	3.3	0.19
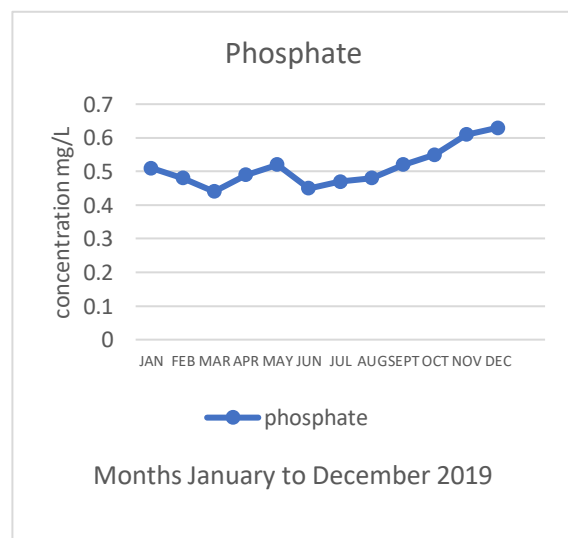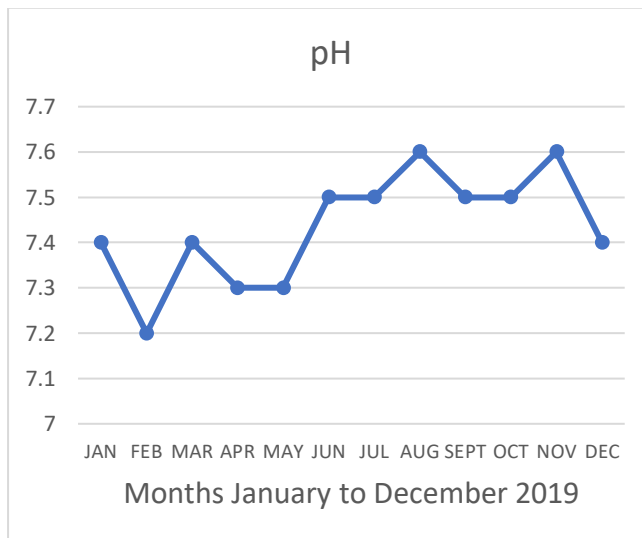
Fig 8: The pH values noted during work　　**Fig 9:** The Phosphate values observed during 2019
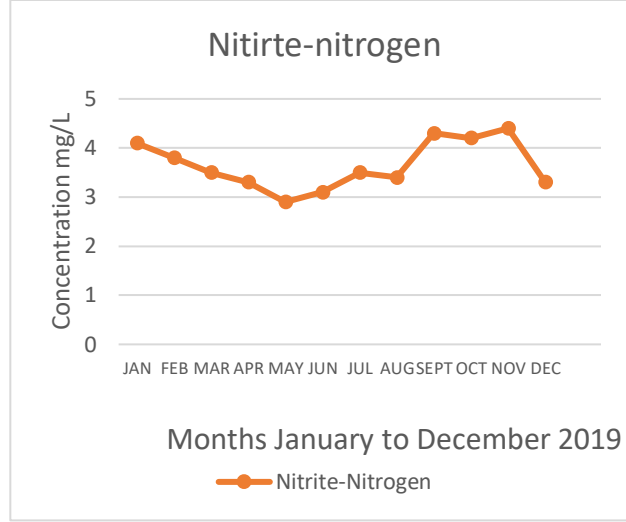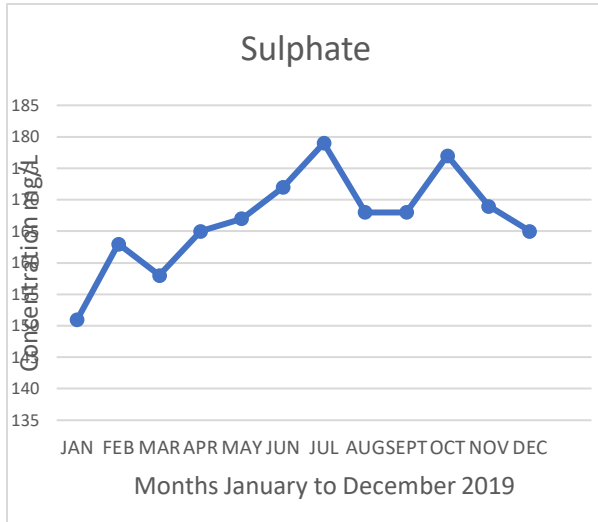
Fig 10: The Sulphate values noted during 2019   **Fig 11:** Nitrite-nitrogen values recorded
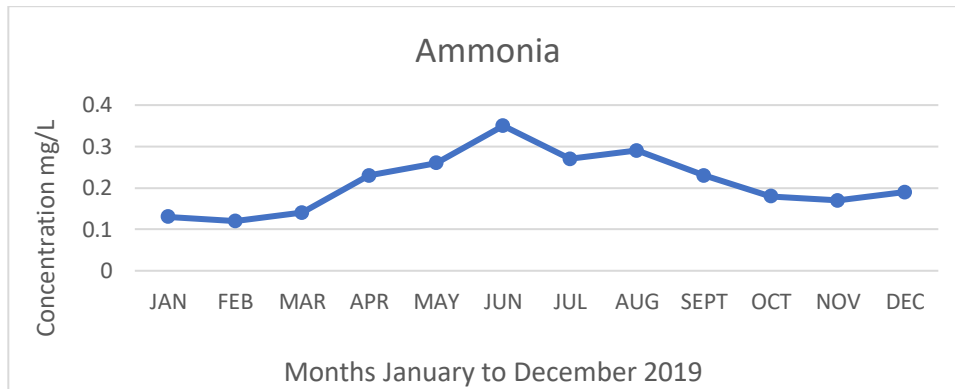
Fig 12: The values of Ammonia observed during 2019.

Dash et al. (2012) studied seasonally as well as monthly plankton diversity of river Kharasrota in Jajpur district of Orissa for two years period of January 2005-December 2006. The phytoplankton population constituted of eleven species belongs to both.

Dwivedi and Pandey (2002), found diversity of phytoplankton belonging to Cyanophyceae, Chlorophyceae and Bacillariophyceae classes from Girija Kund and Maqubara pond, Faizabad, India during May 1999-June 2000.

Kamble and Meshram (2005), recorded zooplankton from three different stations at Katijapur tank, Amravati belongs to four groups, Protozoa, Rotifera, Copepoda and Cladocera during August 2004 to January 2005.

Kumavat and Jawale (2003), reported the phytoplankton diversity with their percent contribution of different classes from a fishpond at Anjale Dist. Jalgaon (Maharashtra) during January 2000 to December 2000.

Rajalakshmi and Shakila (2007), observed zooplankton like Cycops, Paramecium, Pleurotrocha, Amoeba, Daphnia, Uronema and Keratella from Kendikulam pond at Peravurani, Thanjavur. Also, they found some phytoplankton.

Rajashekhar et al. (2009), focused on the taxonomic composition of zooplankton in three freshwater lakes named Sharanabasaveshwara Lake and Gobbur Lake, Bosga Lake of Gulbarga district during October 2005 to September 2006. In this investigation 39 species of zooplankton were noted at different sites.

Rao and Jaya (2001), recorded phytoplankton and zooplankton from different classes in sewage-fed fish culture pond at Numbur near Guntur, Andhra Pradesh, India during November 1998 to August 1999. The abundance of phytoplankton population was in order of Myxophyceae > Eugleninae > Bacillariophyceae > Chlorophyceae and the zooplankton, Rotifera > Copepoda > Cladocera.

Raut and Pejaver (2005), found variety of phytoplankton to be attached to aquatic macrophytes from two lakes Ambeghosale and Rewale, Maharashtra. About 25 species of phytoplankton attached to Lemna sp. while 18 species were found to be attached to Pistia sp. belongs to Chlorophyceae, Cyanophyceael, Bacillariophyceae, Euglenophyceae and Cryptophyceae. Total number of zooplankton classes attached to aquatic macrophytes were Copepoda, Rotifera, Cladocera and Ostracoda observed during October 2002 to September 2003.

Sadguru et al. (2002), found zooplankton like Brachinous, Keratella, Notomate, Lecane and Polyarthra belong to Rotifers. Cladocerans included Bosmina, Diaphnasama, Ceriodaphnia, Daphnia, Bosminopsis, Sida, Chydorus, etc. Also, they found Copepods like Mesocyclops, Heleodiaptomus, Allodia and Ciliates like Paramecium and Vorticella from a Freshwater Pond of Brick-Kiln during July 1999 to June 2000.

Tiwari and Shukla (2007) recorded various algal members of different classes representing cyanophyceae with 14 genera, Bacillariophyceae with 9, Chlorphyceae with 21 and

Euglenophyceae with 7 genera from five different rain-fed ponds of Southern Kanpur namely, Panki, Meharban, Singh Ka Purva, Gujaini, Naubasta and Barra during October 2003-March 2004.

CONCLUSION:

In this study nearly four water sampling sites were fixed for systematic studies of also with Phytoplankton and Zooplankton. As per our results received with minute observations, we come to conclusion that this Sudha reservoir is having good density of both planktons. It is a indication of a healthy waterbody. Compared with other results this body represent the other selected chemical parameters are within the permissible limit as compared with standard permissible limits.

In conclusion, with our study and careful analysis of all the selected parameters for the present investigations it is found that no pollution indication were observed. Hence, this study specially for nutrients present in water along with both planktons have significant role in supplementation of aquatic food for several systems.

ACKNOWLEDGEMENT:

REFERENCES:

1. Abbasi S.A, Abbasi N and Soni R (1998), Heavy metals in the Environment, Mittal Publications, New Delhi, India.

2. Anitha U. Devi and Singara M. A. Charya, (2007), Phytoplankton in Lower Manar Dam and Kakatiya canal, Karimnagar, Andhra Pradesh, Nature environment and Pollution Technology, 6(4), 643-648.

3. APHA, (2000), Standard Methods for the Examination of Water and Wastewater, American Public Health Association, Washington, D.C., 20th edition.

4. Bahura C. K (2001), Phytoplanktonic community of a highly eutrophicated temple tank, Bikaner, Rajasthan, Journal Aquatic Biology, 6 (1&2), 1- 4.

5. Daniel D. Chiras (2010), Environmental science, John and Bartlett India Pvt. Ltd., New Delhi, 1st Indian edition.

6. Dash Supriya, Patra A. K. and Adhikari Subhendu (2012), Spatial and temporal planktonic analysis of river Kharasrota, Orissa, Indian Journal of Environmental Protection, 32 (5), p.p. 415-423.

7. Dwivedi B. K and Pandey G. C (2002), Physico-chemical factors and algal diversity of two ponds (Girija Kund and Maqubara pond) of Faizabad, India, Pollution Research, 21(3), p.p. 361-370.

8. Kamble B. B and C. B. Meshram (2005), A preliminary study on zooplankton diversity of Khatijapur tank, near Achalpur, district Amravati, Maharashtra, Journal of Aquatic Biology, 20 (2), p.p. 45-47

9. Kumavat D and Jawale A. K (2003), Phytoplankton ecology of a fish pond at Anjale, District Jalgon (Maharashtra), Journal of Aquatic Biology, 18 (1), p.p. 9-13.

10. Rajalakshmi M. C and Shakila P (2007), Study on the ecology of a pond at Peravurani, Thanjavur, Tamil Nadu, Nature Environment and Pollution Technology, 6 (2), p.p. 381-362.

11. Rajashekhar M., Vijaykumar K and Zeba Parveen (2009), Zooplankton diversity of three freshwater lakes with relation to trophic status, Gulbarga district, North-East Karnataka, South India, International Journal of Systems Biology, 1 (2), p.p. 32-37.

12. Rao Narasimha P and Jaya Raju P. B (2001), Limnological investigations and diversity of plankton in sewage-fed fish culture pond at Numbur near Guntur, A. P., India, Journal Aquatic Biology, 16 (1&2), p.p.11-14.

13. Raut Narayana S and Madhuri Pejaver, (2005), Survey of diversity of plankton attached to macrophytes from weed infested lakes, Journal of Aquatic Biology, 20 (1), p.p. 1-7.

14. Sadguru Prakash, Khalid K., Ansari and Mukul Sinha (2002), Seasonal dynamics of zooplankton in a freshwater pond developed from the waste land of Brick-Kiln, Pollution Research, 21 (1), p.p. 81-83.

15. Tiwari and Shukla M (2007), Algal biodiversity and trophic status of some temporary water bodies of Kanpur, Nature Environment and Pollution Technology, 6 (1), p.p. 85-90.

16. Trivedi R. K and Goel P. K (1998), Practical methods in Ecology and Environmental science, Enviro media publications, Karad, India.

17. Verlencar X. N and Desai Somshekar (2004), Phytoplankton Identification Manual, National Institute of Oceanography, Goa, 1st edition.

18. Wetzel Robert G (2001), Limnology (Lake and river ecosystems), Academic Press, USA, 3rd edition, p.p. 291-294.