



EUTROPHICATION STATUS IN RELATION TO PHYSICO –CHEMICAL CHARACTERISTICS OF SAGAR TALAO BHANDARA

¹Khune, C. J., ²Thakur, P.P., ³Kalbande, S.G., ⁴Dongre, V.R.

¹P.G.Department of Zoology, M. B. Patel College, Sakoli

^{2,3,4}P.G.Department of zoology, J.M. Patel College, Bhandara

cjkhune@yahoo.com, punamrchoudhary@gmail.com

Abstract:

Anthropogenic inputs of nutrients to the Earth's surface and atmosphere have increased greatly during the past two centuries. This nutrient enrichment, or eutrophication, can lead to highly undesirable changes in ecosystem structure and function. However, the present study was undertaken in Sagar Talao of Bhandara Town to investigate the Eutrophication status in relation to physico – chemical parameters through different months during the period of January 2014 to December 2014. During the present study the most pollution causing species of weeds, Ipomoea and Pistia were recorded with highest values of nitrates i.e. 20 mg/L, phosphates 25 mg/L and chlorides 92 mg/L. The species composition and species diversity study also points towards the polluted nature of reservoir water. There is no earlier study on the Eutrophication status of this reservoir and that is why the present work is planned.

Key words: Chloride, Eutrophication, Nitrates, Phosphates, Sagar Talao

Introduction:

Freshwater is an important resource and essential for life. Freshwater constitutes only 2.5 % of all freely available water on earth's surface, of which, only 0.3 % is readily accessible in lakes, reservoirs and rivers. Some major problems that humanity is facing in the twenty-first century are related to water quantity and water quality issues. The anthropogenic activities results in to large-scale contamination or pollution of water.

"Eutrophication" is the excessive enrichment of surface water with nutrients corresponded by high production of autotrophs, especially algae and cyanobacteria. The high productivity leads to high respiration rates, resulting in hypoxia or anoxia in poorly mixed waters. Low dissolved oxygen (DO) causes the loss of aquatic organism. The undesirable overgrowth of phytoplankton and their subsequent death forms a greenish slime layer over the surface of water body, which restricts the light penetration (Khan and Ansari 2008). The industrial revolution, humankind's activities have caused strong alterations in the structure and function of their environment, since from several centuries there is dramatically change in the globe by land clearing, agriculture, forestry, animal husbandry, urbanization, and by altering hydrological cycles. Run off from fertilizers used in commercial, agriculture or private yards adds large amounts of nitrates and phosphorus to freshwater ecosystems.

Phosphorus and nitrogen inputs owing to excessive use in agricultural practices, their cycling in the water bodies and seasonal variability are the main causes of

Eutrophication (Khan and Ansari 2008). Nitrates from fertilizers account for nearly 50 % of the surface water acidification in watershed. Non-point source pollution of surface water by nitrate from agricultural activities is a major environmental problem (Hargreaves 1998).

The present study has been under taken on the Sagar Talao of Bhandara Town. The pond water is also used for irrigation purpose in the surrounding agricultural fields. Due to regular dumping of domestic sewage, the pond has become highly eutrophic. The domestic waste (rich in phosphate and nitrate) when discharged in water bodies makes them highly productive or "eutrophic".

Material and methods:

During the present study, water samples were collected in a sampling bottle, to assess their physical and chemical qualities at monthly intervals. The samples were collected in thoroughly cleaned 5 liter inert plastic containers. In the present investigation, the water chemistry of Sagar –Talao has been studied for a period of one year i.e. from January 2014 to Dec 2014 and analyzed for physical and chemical parameters. All the parameters like pH, Temperature, Turbidity, Do, CO₂, BOD, COD, Hardness, Chloride, Phosphates, Nitrates were analyzed according to the standard methods (APHA 2005 and Trivedi and Goel 1986).

Observation:

Table 1. Showing Range and Average values of Physical and Chemical Parameters With Seasonal Variations in Sagar Talao

S. N.	Parameters	Summer	Winter	Monsoon	Range	Average
1.	pH	7.8	9.0	7.5	7.5 - 9.0	8.33
2.	Temperature (°C)	34	32	34	32-34	33
3.	Turbidity (NTU)	143	125	114	114-143	128.5
4	DO (mg/lit.)	4.5	6.7	5.6	4.5 - 6.7	5.6
5.	CO ₂ (mg/lit.)	9.45	6.7	6.5	6.5 - 9.45	7.89
6.	BOD (mg/lit.)	16.7	14.6	15.2	14.6 - 16.7	15.65
7.	COD (mg/lit.)	9.5	10	9.7	9.5 - 10	9.75
8.	Hardness (mg/lit.)	220	175	150	150-220	185
9.	Chlorides (mg/lit.)	95	89	80	80-95	87.5
10.	Phosphates (mg/lit.)	24	10	25	10-25	17.5
11.	Nitrates (mg/lit.)	18	13	20	13-20	16.36

Results:

The pH ranges between 7.5 to 9.0. The minimum pH was recorded in monsoon i.e. 7.5 and maximum pH was recorded during winter i.e. 9.0. The maximum temperature was recorded in summer and monsoon 34°C and minimum in winter 32°C. In the present investigation maximum values of turbidity 143 NTU were recorded in summer, where as 114 NTU was reported in monsoon. In the present study the Dissolved Oxygen ranged from 4.5 to 6.7 mg/L and average to 5.6 mg/L maximum value recorded in winter and minimum value recorded in winter.

In the present study maximum CO₂ was recorded i.e. 8.5 mg/L in summer and minimum in monsoon i.e. 6.4 mg/L. Minimum BOD value 14.8 mg/L and maximum value 16.2 mg/L COD value ranges from 9.5 to 10.0 mg/L minimum value observe in summer 9.5 mg/L and maximum in winter 10mg/L. The value of hardness ranges between 150 to 220 mg/L and average 185 mg/L, it is maximum during summer 215 mg/L and minimum during monsoon 170 mg/L. In the present investigation chlorides ranges between 80 to 95 mg/L and average to 87.5 mg/L. The lowest values were recorded in monsoon 80mg/L and the highest values recorded in the summer 95 mg/L. Phosphate ranges from 10 – 25 mg/L and average to 17.5 mg/L during the study period. In monsoon season its concentration was 25 mg/L and in summer 24 mg/L. In the present investigation nitrates ranges between 13 to 20 mg/L and average to 16.36 mg/L. Maximum values were recorded in the monsoon 20 mg/L and minimum value recorded in winter 13 mg/L. In the present study two species of aquatic weeds *Ipomoea aquatica* and *Pistia* are abundant throughout the year.

Discussion:

The water quality parameters have a direct influence on ecology of lake. The density of aquatic weeds were found to be highest in summer. This coincides with high value of hardness, chlorides, nitrates, phosphate, pH and turbidity similar results were found by Saxena *et al.*, (1966). The increase in concentration of Nitrates and phosphates have important effects on the structure of weed community. (Sudha 1998) and similar observations are made by Kodarkar *et al.* (1989). Rai and Shrivastava (2006) reported the high value of chlorides which is one of the important factor for uncontrolled growth of weeds of this Talao due to various

anthropogenic activities in the surrounding land area and these may serve as good indicators of these activities. Human-induced pollution through the impacts of excessive fertilizer use, untreated wastewater effluents, and detergents significantly increases nutrient loading into lakes, accelerating eutrophication. This is because of the inflow of rainwater mixes with domestic sewage from the surrounding residential colonies along with the used water declining the water quality of this reservoir and excessive growth of aquatic weeds.

Conclusion:

During the present study the most pollution causing species *Ipomoea aquatica* and *Pistia* were observed. It is because of the water quality of this Talao having higher values of chlorides, nitrates and phosphates, due to this organic pollution causes Eutrophication of this Talao. We conclude that there are several reasons for the deterioration of the Sagar Talao of Bhandara Town. These findings will help in the future studies for biomonitoring of these area.

Acknowledgement:

We express our sincere gratitude towards Principal J.M. Patel College, Bhandara for providing library and laboratory facilities.

References:

- [1] APHA, (2005): Standard Method for the Examination of Water and Waste Water. 21st Edn., Washington DC.
- [2] Ansari, A.A, Khan F.A. (2008): Remediation of eutrophic water using *Lemna minor* in a controlled environment. *Afr J Aqua. Sci* (33):Pp. 275– 278.
- [3] Hargreaves, J.A. (1998): Nitrogen biochemistry of aquaculture ponds. *Aquaculture* (166):Pp.181–212.
- [4] Kodarkar, M.S., Vasant Rao and E.V. Muley. (1989): Kukatpally- Hussainsagar (Ecological studies on industrially polluted stream and its impact on a freshwater lake in Hyderabad). Indian Association of Aquatic biologists. (IABB) publication no.(1): Pp. 1.1-8.21.
- [5] Saxena K. L., Chakraborti R. N., Khan A. G., Chattopadhyaya S.N. and Chandra H., (1966): Pollution studies of river Ganga near Kanpur, *Env.Health*, Vol. (8):Pp. 270-285.
- [6] Sudha, J. G (1998): Impact of man on the ecology of two fresh water lakes of Hyderabad. Ph.D. Thesis, Osmania University, Hyderabad.
- [7] Rai, M. and Shrivastava, R.M. (2006):Effect of fertilizer industry on source and ground water quality. Raghogarh , Madhyapradesh, *Journal of Aqua.Bio.vol* (21) :Pp.101-104.
- [8] Trivedi, R. K. and Goel P. K. (1986): Chemical and Biological methods for water pollution studies, Environmental publications, Karad, Maharashtra : Pp. 64-66.

