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Biology

LIMNOLOGICAL EVALUATION OF LENTIC WATER BODY - SHARMISTHA LAKE OF VADNAGAR TOWN, DIST. MEHASANA, GUJARAT, INDIA.

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ABSTRACT Vadnagar is a historic town located in the Mehsana district of Gujarat, India. The Sharmishtha Lake is primarily influenced by seasonal rainfall, surface runoff from the surrounding urban and semi-urban areas The paper deals with the estimation of physico-chemical characteristics of lake water, phytoplankton and zooplankton. The observations were recorded in December 2025. The water samples were analyzed for their physico-chemical parameters like pH, EC, Salinity, CO2, TDS, Alkalinity, Chloride, Dissolved oxygen, BOD, Hardness, etc. DO was quite high in the pond. Alkalinity and Chloride were comparatively high in lake water. Carbonate and Bicarbonate was quite high in pond where there are human activities, "dhobi ghat" and other biological activities. Phytoplankton sampled and different groups of Phytoplankton were observed. The amount of Oxygen and Carbon dioxide has a significant effect on the growth of phytoplankton. During the investigation period about 24 genera of phytoplankton were recorded. Chlorophyceae, Cyanophyceae and certain Diatoms found indicating the polluted water. Zooplankton belonging to four groups viz., Protozoa, Rotifer, Copepoda and Cladocera were identified. The major species were Cyclops scutifer, Diaptomus Sp., Daphnia Sp., Difflugia Sp.

KEYWORDS : Sharmistha Lake, Limnological, Phytoplankton, Zooplankton

INTRODUCTION

Vadnagar is one of the tehsil of Gujarat. It's known for its glorious history. The Sharmishtha lake is located at 23^0 47' 25.9"N and 72^0 38' 23.5"E. Limnology is the scientific study of inland water bodies, focusing on their physical, chemical, and biological properties. A limnological evaluation helps in understanding the overall health of a lake by assessing parameters such as temperature, pH, dissolved oxygen, turbidity, nutrients, and plankton diversity. These factors are essential indicators of water quality and ecological status. **Phytoplankton** are microscopic, photosynthetic organisms that form the primary producers in aquatic ecosystems. They are responsible for oxygen production and form the base of the aquatic food chain. **Zooplankton** are small, free-floating animals that feed on phytoplankton and organic matter. They act as a vital link between primary producers and higher trophic levels such as fish. The abundance and diversity of zooplankton reflect the biological productivity of the lake and help in understanding the balance of the aquatic food web. Phytoplankton are simple plants inhibiting diverse kinds of habitats, but are prominently and almost invariably present in natural water bodies. Phytoplanktons are also known to indicate the level of pollution (Trivedi & Goel, 1986). Phytoplanktons are primary producers in water bodies. In India, a remarkable contribution is made in limnology of freshwater field and different trends of study observed since the beginning of the twentieth century (Seth *et al*. 2005). Now a day the main problem of many lakes is their eutrophication state, which leads to algal bloom formation. (Premlata Vikal, 2008). The ecological study of phytoplankton of Mini Mahi River was carried out (Solanki, 2007). And in Andhra Pradesh extensive studies have been carried out by Venkateswarlu (1969 a, b, c and 1986), Venkateswarlu and Sampathkumar (1982) Manikya Reddy and Venkateswarlu (1985, 1986, 1987 and 1992),Sudhaker et al. (1991 and 1994) on the ecology of river algae and their significance in assessing the quality of water and pollution. The present paper deals with the evaluation of water quality of this lake.

MATERIAL AND METHODS:

Water samples were collected and analyzed for physico-chemical parameters like pH, EC, Salinity, CO2, TDS, Alkalinity, Chloride, Dissolved oxygen, BOD, Hardness, etc. Samples were analyzed according to standard methods (APHA 1995, Trivedy and Goel 1986). Zooplankton sampled from surface water using plankton net of 50µ mesh size. Phytoplankton were identified using keys followed by Prescott (1954).

RESULTS AND DISCUSSION:

The values of physico-chemical parameters analysed in lake water are given in Table-01. Physico-chemical parameters affect the quality of water which in turn influence the type and growth of algal species (Vikal and Tyagi 2006, 2007). pH in the lake water was quite high indicates alkaline nature of water. The EC of the lake water was recorded 0.82 and similer results were found by Karlikar and Solanki (2012) in the same season. Dissolved Oxygen (DO) in water comes from the atmosphere due to the wind (air) action. A rapid increase in algae such as during eutrophic condition, can lead to depletion of DO (Solanki and Pandit, 2006). Eutrophic pond waters contain very low DO. In present study DO is quite high (4.7) in the lake. Biological Oxygen Demand (BOD) depends on aquatic life. Variation in BOD indicates dynamism in aquatic life present in the water bodies. BOD refers the oxygen used by microorganisms in the aerobic oxidation of organic matter. Data of BOD is measure of active decomposition taking place in water bodies. BOD was quite high because it is polluted. Alkalinity in lake water was high because it is used as "Dhobi ghat", releasing alkaline chemicals in form of Carbonates and Bicarbonates as observed by Solanki and Pandit (2006), for trophic status of five ponds at Vadodara city, Karlikar and Solanki (2012) for limnological evaluation of Vavol lake of Gandhinagar district. Similer results were observed during the present study for total alkalinity of water.

Chloride was very high in lake water. Total Dissolved Solids include calcium ions, bicarbonate, chlorides, nitrates, phosphates, ferrous ions, sulphates, Potassium, magnesium and other ions. TDS also recorded high (440ppm). Hardness was high in lake water. Dwivedi and Pandey (2002) were observed significant positive correlation emerged between calcium and magnesium with cyanophyceae and chlorophyceae in pond A. As per Wetzel (1975) magnesium is required by the flora to build its chlorophyll and enzymatic transformation, especially transphorylation of algae, fungi and bacteria. Total hardness was higher in lake water because of detergent supply from sewage. CO2 was very high (28ppm) indicating respiratory rate is low because there are no thick algal blooms in water body. Biological oxygen demand (BOD) was recorded quite high. It seems that the vegetation in the lake is quite high. The presence of excess phosphorus in water enhanced their growth rates (APHA, 2017; Koistinenet al., 2020)The amount of Phosphorus, Nitrate, Oxygen and Carbon dioxide has a significant effect on the growth of phytoplankton. In present study total 24 genera have been recorded. Algal species belonging to Cyanophyceae, Chlorophyceae and Bacillariophyceae groups were recorded in lake. For Cyanophyceae and Bacillariophyceae in the lake, similar result was observed by Dwivedi B.K. and Pandey G. C. (2002). In present study very few species of Cyanophyceae were observed. Similerly blue green algae ware recorded in very low percentage in the

river Krishna due to presence of high DO and very low organic matter which is not suitable for the development of these algae. (Manikya Reddy P. and Chandrashaker P., 2008). Aquatic plants are good indicators of water quality (Shimoda, 1986). Algae are commonly used for biological assessment of water quality and indicators of eutrophication (Garg *et.al*, 2003; Patrik, 1950). Algae as ecological indicators in assessing the quality of water and pollution have been discussed by Reddy (2007). He observed that the green algae and blue green algae were present in considerable numbers and were also used as indicators.

CONCLUSION

In pond water some values were high and some were low compared to permissible limit. This is because of biotic activities in the pond, like decomposition of living organism after death, which increase these chemicals. The presence of such Cyanophyceae, certain Diatoms and zooplanktons are characteristics of pollution. The result shows that the lake is moderately polluted.

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Table – 01 Physico-chemical characteristics of Lake water

Sr. No.	PARAMETERS	VALUE
1	pH	7.5
2	Electrical Conductivity	0.82
3	Free Carbon Dioxide	28
4	Salinity	0.04 %
5	Total Dissolved Solids (TDS)	440
6	Dissolved Oxygen (DO)	4.07
7	BOD	3.05
8	Alkalinity	135
9	Chloride	113
10	Hardness	135

Parameters are in ppm except pH, EC=m.mho.cm^{-1}

Table – 02 No. of Zooplankton Recorded in Present Study

Species No.	NAME
01.	***Difflugia lebes***
02.	***Vorticella Sp.***
03.	***Chilomonas paramecium***
04.	***Cyclops scutifer***
05.	***Diacyclops thomasi***
06.	***Diaptomus Sp.***
07.	***Daphnia Sp.***

Table – 03 No. of Phytoplankton Recorded in Present Study

DIVISION	Species No.	NAME
CYANOPHYCEAE	1	*Anabaena sp.*
	2	*Nostoc sp.*
	3	*Microcystis sp.*
	4	*Gleocapsa sp.*
CHLOROPHYCEAE	5	*Pandorina sp.*
	6	*Volvox sp.*
	7	*Chlorococcum sp.*
	8	*Palmella sp.*
	9	*Chlorella sp.*
	10	*Chlamydomonas sp.*
	11	*Scenedesmus sp.*
	12	*Cladophora sp.*
	13	*Spirogyra sp.*
	14	*Zygnima sp.*
	15	*Closterium sp.*
	16	*Cosmarium sp.*
BACILLARIOPHYCEAE	17	*Synedra sp.*
	18	*Navicula sp.*
	19	*Pinnularia sp.*
	20	*Gomphonema sp.*
	21	*Cymbella sp.*
	22	*Rhopalodia sp.*
	23	*Eunotia sp.*
	24	*Pseudonitzschia sp.*

REFERENCES:

1. APHA (1989). *Standard methods for the Examination of Water and waste Water*, American Public Health Association, Washington DC.
2. APHA (2017). Standard Methods for the Examination of Water and Wastewater (23rd ed.). American Public Health Association. Bowser, P. R., Falls, W. W., Vanzandt, J., Collier, N., & Phillips, J. D.
3. Dwivedi B. K. and Pandey G. C. (2002). Physico-chemical factors and Algal diversity of two ponds (Girija kund and Muqbara pond), Faizabad, India. *Poll. Res.* 21 (3):361-370.
4. Garg, J., H. K. Garg & J. Garg. (2003). Algae as indicators of eutrophication: A microsomalapproach. *Environment and Ecology* 21: 313-316.
5. Karlikar and Solanki (2012). Limnological Evaluation of Vavol Lake of Gandhinagar district with reference to phytoplankton. *Lifesciences Leaflets:* 66 – 72.
6. Koistinen, J., Sjöblom, M., & Spilling, K. (2020). Determining inorganic and organic phosphorus. In Spilling, K. (Eds.), Biofuels from Algae (vol. 1980, pp. 87–94). Humana Press New York. https://doi. org/10.1007/7651_2017_104.Manikya Reddy P. & P.
7. Chandrashaker (2008). Ecophycological studies in the river Krishna (A.P.) with refrence to water quality. *J. Indian bot. soc* vol.87 (1&2) 111-115.
8. Manikya Reddy P & Venkateswarlu V (1985). Ecological studies in the paper mill effluents and their impact on the river Tungabhadra: Heavy Metals & algae, *Proc Indian Acad Sci (plant Sciece)* **95** 139-146
9. Manikya Reddy P & Venkateswarlu V (1986). Ecology of Algae in the papermill effluents and their impact on the river Tungabhadra, *J Eviron Biol* **7** 215-223.
10. Manikya Reddy P & Venkateswarlu V (1987). Assessment of water quality & pollution in the river Tungabhadra near Kurnool Andhra Pradesh.*J Environ Biol* **8** 109-119.
11. Manikya Reddy P & Venkateswarlu V (1992) The impact of paper mill effluents on the algalflora of the river Tungabhadra, *J Indian Bot Soc* **71** 109-114.
12. Patrick, R. (1950). Biological measure of stream conditions. Sewage and Industrial Wastes **22**: 926–938.
13. Prescott, G. W. and W. C. Vinyard (1965) Ecology of Alaskan freshwater algae V.
14. Limnology and flora of Malikpur Lake. *Trans. Amer. Microsc. Soc*. **84** 427-478.
15. Seth A., M. K. Sheth and P. K. Misra, (2005) Review of literature on algal flora of Himachal Pradesh. Phytotaxonomy. **5** : 35-57.
16. Shimoda, H., Etaya, M., Sakata, T., Goda, L. and Stelczer, K. (1986). Water quality monitoring of Lake Balaton using Landsat MSS data. In Remote sensing for resources development and envi- 42 Quantification of shallow water quality parameters ronmental management. Proceedings 7th ISPRS Commission VII symposium, Enschede, 1986, Rotterdam: Balkema, 2, 765–70.
17. Solanki H A and Pandit B R (2006) *Trophic Status Of Lentic Waters Of ponds water of Vadodara, Gujarat*, Int. J. of "*Bioscience Reporter*" 4 (1).
18. Solanki H. A. (2007) Ecological studies of Phytoplankton of Mini Mahi River, Gujarat, *Vidya Vol. II, No. 1*: 47-57.
19. Sudhakar, G, B Jyothi & Venkateswarlu V (1991) Impact of paper mill effluents on the distribution of cyanobacteria in the river Godavari, India *Waste Mannagement* **11** 263-269.
20. Sudhakar, G, B Jyothi & Venkateswarlu (1994) Role of diatoms as indicators of gradients Environ Monitor Assess **33** 85-99
21. Trivedy R. K. and P. K. Goel (1986) In, *Chemical and Biological Methods for water*
22. *pollution studies*. Published by Environmental Publication, Karad.
23. Venkateswarlu V (1969a) An ecological study of the algae of the river Moosi, Hyderabad (India) with special reference to water pollution 1 Physico-chemical complexes, *Hydrobiologia* **33** 117-143.
24. Venkateswarlu V (1969b) An ecological study of the algae of the river Moosi, Hyderabad(India) with special reference to water pollution II factors influencing the distribution of algae, *Hydrobiologia* **33** 352-363.
25. Venkateswarlu V (1969c) An ecological study of the algae of the river Moosi, Hyderabad(India) with special reference to water pollution III The algal periodicity
26. *Hydrobiologia* **34** 533-560.
27. Venkateswarlu V Sampath Kumar PT (1982) Chemical and biological assessment of
28. pollution in the river Moosi, Hyderabad (AP), India *Biol Bull India* **4** 23-30.
29. Vikal P. & Tyagi S (2006) A case study of lake Jaisamand with special reference to algal flora, India. *Indian J Environ & Ecoplan* **12**(3) 553-558.
30. Vikal P. & Tyagi S (2006) Studies on the physico-chemical characteristics of Lake Pichhola, Rajasthan. *Indian J Environ. & Ecoplan.* 12(3) 797-800.
31. Vikal P. & Tyagi S (2007) Assessment of water quality of Lake Pichhola before and after rains in August, 2005 in Udaipur, Rajasthan (India). Poll. Res. 26(2) 249-252.
32. Vikal, P (2008) Limnobotanical Investigation of lake Pichhola with special reference to Algal Biodiversity, *J. Indian bot. soc. Vol*. 87 (1&2): 116-119.
33. Reddy, M. P. (2007). Algae as ecological indicators in assessing the river water quality. *Poll.Res.* 26 (1): 33 – 37.
34. Wetzel, R. G. (1975). *Primary Production river ecology* Blackwell Scientific publication, Oxford.