



Research Article

PHYSICO-CHEMICAL CHARACTERISTICS OF OVALI LAKE OF BHIWANDI CITY, DIST-THANE, MAHARASHTRA, INDIA

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ABSTRACT

The present study was conducted to access the physico-chemical parameters of fresh water body, Ovali lake of Thane district, Bhiwandi city, Maharashtra, India. Some of the important water quality parameters like temperature, pH, DO, BOD, COD, alkalinity, chloride, hardness, nitrates and phosphates were investigated for the period of one year (Feb 2019-Jan 2020). The results revealed remarkable seasonal changes in the water quality and were compared with international standards laid down by WHO, CPCB, BIS and CIFE.

Keywords: Fresh water body, Physico-chemical parameters, International standards, Suitability.

INTRODUCTION

Fresh waters are the most suitable and cheapest source of water for domestic and industrial needs. But due to unplanned urbanization, rapid industrialization and indiscriminate use of artificial chemicals cause heavy and varied pollution in aquatic environment leading to deterioration of water quality and depletion of aquatic fauna including fish. Understanding such aquatic life requires a sound knowledge not just for organism themselves but also of those of external influences of the medium that affect them (Sahni & Yadav, 2012). Water quality is first important limiting factor in lake. The since it acts as a favorable habitat for variety of flora fauna and anthropogenic society. Recently lot of work has been done on changing ecological behavior of lakes (Amte *et al.*, 2005; Patel & Patel, 2012; Punitha & Selvarajan *et al.*, 2020). In the present study the attempts has been made to understand the physico-chemical status of fresh water body-Ovalilake, from Bhiwandi city, Dist- Thane, Maharashtra, India. The study was conducted to view the suitability of water for water supply, fisheries and recreation. Biochemical oxygen demand (BOD) is a measure of oxygen required by microbes to degrade the organic matter under aerobic condition. Hence, lowering in dissolved oxygen value has direct correlation with BOD value.

MATERIAL AND METHODS

Study area

Ovalilake is located in Ovali Village in Bhiwandi Taluka in Thane district of Maharashtra state, India. The lake also known as Thakarachapada. Geographically Ovalilake is located between 19.265494 latitude and 73.05596 longitudes. It spreads over 8,165 m² and 2.0 to 3.0 meters deep. The lake is much closed to Bhiwandi Road railway station. Earlier the lake was healthy but the quality is deteriorated with the urbanization and industrialization. However still aquaculture is practiced in this lake. The physico-chemical parameters were studied once in every month at definite interval for the period of one year (Feb, 2019 to Jan, 2020). Surface water samples were collected from the two sampling stations, I and II (Figure 1 and 2). The samples were collected between 8.00 am to 9.00 am. The parameters such as temperature, pH and DO were estimated on the spot at both the sampling stations. Rest of the parameters was estimated in the laboratory within few hours after collection. The estimations were carried out by using standard methods prescribed by APHA, AWWA and WPCF, 1915; Trivedy & Goel, 1984).

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Figure 1. Ovali lake showing Sampling Station - I.



Figure 2. Ovali lake showing Sampling Station - II.

RESULT AND DISCUSSION

Table I comprises of the mean values of monthly variation of sampling station I and II. Comparison of results with standard limits prescribed by various organizations is depicted in table II. Temperature: The values of temperature varied from 26 °C to 31 °C of the Ovalilake. The variations in the water temperature during the present investigation may be due fluctuation in normal climatic condition during different seasons. The temperature range observed during the period of present study is found to be favorable for fish culture. pH, During the present investigation, the pH variation from 7.00 to 7.36. Optimal pH range for sustainable aquatic life is between 6.5 to 8.2 (Murdoch *et al.*, 1996). It indicates that the pH of the lake

water is a good medium for the growth of organisms and is found to be suitable for fish culture. DO: Dissolved oxygen plays an important role in aquatic environment and is essential for growth of fish production. (WHO, 1993) has recommended 4-7mg/L of dissolved oxygen as optimum for fresh water where as DO less than 2.5 mg/L is described to be hypoxic condition. During the present investigation the dissolved oxygen recorded was between 3.4 mg/L to 9.8 mg/L in Ovalilake. Low content of dissolved oxygen assign of organic pollution, is also due to inorganic reductants like hydrogen sulphide, ammonia, nitrates, ferrous ions and other such oxidisable substances (Ara *et al.*, 2003).

Table 1. Monthly variation of physico-chemical parameters of Ovali lake (2019-2020).

Parameters	Feb	March	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Jan
Temp °C	26	28	29	31	31	30	28	28	29	30	28	27
pH	7.28	7.32	7.36	7.35	7.15	7.05	7.00	7.20	7.25	7.26	7.28	7.29
DO (mg/L)	8.4	7.7	6.5	4.8	3.4	4.8	5.5	7.8	8.5	9.4	9.8	9.6
BOD (mg/L)	23	15	12	10	30	35	40	46	50	10.5	7.8	7.5
COD (mg/L)	95	110	120	160	55	48	56	20	115	52	45	90
Alkalinity(mg/L)	174.0	173.2	172.1	168.0	164.0	161.0	162.0	166.0	172.0	173.0	176.0	176.4
Cl(mg/L)	43.65	44.48	50.85	55.75	58.50	57.80	40.45	36.00	28.55	30.25	31.95	37.75
Hardness(mg/L)	288.0	310.0	365.0	360.0	325.0	325.0	297.0	285.0	275.0	265.5	260.0	276.5
Nitrate (mg/L)	4.25	5.60	7.30	8.20	9.15	9.95	10.35	10.80	11.10	11.12	10.85	3.65
Phosphate(mg/L)	1.75	1.90	2.25	3.30	3.60	3.25	2.70	2.65	2.20	1.85	1.60	1.70

Table 2. Comparison of results with standard limits prescribed by various organizations.

Sr. No	Parameters	WHO	CPCB (Class-A)	BIS	CIFE	Results
1.	Temp ^o C	NA	NA	NA	-32	26 ^o C-31 ^o C
2.	pH	6.5-8.5	6.5-8.5	6.5-8.5	6.5-258.5	7.00-7.36
3.	DO (mg/L)	4-6	6.0	4-6	5-10	3.4-9.8
4.	BOD (mg/L)	28-30	2.0	NA	NA	7.5-50
5.	COD (mg/L)	10.0	NA	NA	NA	20-160
6.	Total Alkalinity (mg/L)	200	NA	50-200	50-300	161.00-176.45
7.	Chlorides (mg/L)	250	NA	250	NA	28.55-58.50
8.	Hardness (mg/L)	100-500	NA	300	NA	260.00-365.00
9.	Nitrate (mg/L)	20-50	20	45	0.1-4.5	3.65-11.12
10.	Phosphate (mg/L)	5.0	NA	NA	0.3-0.5	1.60-3.60

BOD value showed distinct variation ranging from 7.5 mg/L to 50 mg/L in Ovalilake during the study period. Chemical oxygen demand determines oxygen required for chemical oxidation of organic matter with the help of strong chemical oxidant. During the present study chemical oxygen demand of Ovalilake was observed in the range of 20 mg /L to 160 mg/L. The increase in COD levels may be due to high temperature and increased evaporation of water. WHO suggested the value of chemical oxygen demand should be 10mg/L, but in the present investigation the value is higher than the permissible limit. So, the water of the Ovalilake is not suitable for drinking purpose.

Alkalinity may cause due to evolution of CO₂ during decomposition of organic matter. The value of alkalinity during the present investigation ranged between 161.00 mg/L to 176.45 mg/L in Ovalilake. The high alkalinity is a function of ions exchange, that calcium ions are replaced by sodium ions are later contributed to alkalinity (Sharma, 2009) Chlorides: Chloride is a common component of most water and is useful to fish in maintaining their osmotic balance. Chloride content in the Ovalilake varied from 28.55 mg/L to 58.50 mg/L during the present investigation. Chloride content in fish lakes is important to know the quality of water and sources include fertilizers from surrounding areas and animal waste (Rana *et al.*, 2020). Hardness is the measure of alkaline earth element such as calcium and magnesium in an aquatic body along with other ions such as aluminium, iron, manganese, strontium, zinc and hydrogen ions (Murdoch *et al.*, 1996). Hardness value ranged between 260.00 mg/l to 365.00 mg/l during the study period. Nitrate: During the present investigation nitrate values were found ranging between 3.65 mg/L to 11.12 mg/L. Good lake water for fish cultivation should have a concentration of nitrate-nitrogen as 0.06-0.7 ppm. Nitrate content recorded during the study was high during post monsoon season and may be responsible for the process of eutrophication that leads to ultimate environmental degradation. Phosphate: Phosphate value recorded during the period of investigation was ranged between 1.60 mg/L to 3.60 mg/L. Phosphate is one of the

most important nutrient and limiting factor in the maintenance of lake fertility. Higher concentration of salt may be due to acidic and basic salt in water from the soap and detergents being used by local people around the lake (Kataria *et al.*, 1995).

CONCLUSION

From the analysis of the water quality of Ovalilake, it can be concluded that the water quality is not suitable for drinking or domestic use. Some of the parameters are found within limits as per standard limit laid down by different organizations. The presence of aquatic weeds, phytoplankton and zooplankton indicate that water is productive and suitable for fish culture.

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