

Water quality status of physico-chemical parameters of Moharlylake Chandrapur District, Maharashtra, India.

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Manuscript Details

Available online on <http://www.irjse.in>
ISSN: 2322-0015

Cite this article as:

Puppalwar BA et al. Water quality status of physico-chemical parameters of Moharlylake Chandrapur District, Maharashtra, India., *Int. Res. Journal of Science & Engineering*, February, 2020, Special Issue A7 :878-882.

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ABSTRACT

This paper deals with the Physico-chemical parameters of Moharly Lake, Chandrapur district Maharashtra, India. Monthly changes in Physical and chemical parameters such as temperature, pH, conductivity, transparency total alkalinity, total solids, total hardness, free O₂ CO₂ BOD, COD, chloride, sulphate, phosphate and nitrate was carried out for 24 months from February 2014 to January 2016. All parameters were within permissible limits. The result indicate that the lake is non polluted and can be used for domestic, irrigation and fisheries.

Keywords: Lake, Physico-chemical parameters. Moharli Lake, BOD, COD.

INTRODUCTION

Water has unique place on planet as it support life on earth. The entire fabric of life is woven around it. The entire living organism on the earth needs water for their survival and growth. Without water no life is possible to sustain on their planet earth, hence it is termed as 'Natural liquid gold. Water is perhaps the most important natural resources required by the entire living organism. Rapid growing population and improved living standard, the pressure on water resources is increasing day-by-day [1]. According to Reece [2] the property of water is important for the survival of aquatic life. According to Shafiqet al., [3] water is necessary for all living organism, ecological system, human health, food production and economic development. People obtain their consumable water from surface water mostly. According to Brown and Barnwell [4]

a healthy lake ecosystem could conserve natural and social balance by contributing healthy environments of its location. It is therefore necessary that the quality of water should be checked at regular time of interval, because due to use of contaminated water, human population suffers from varied of water borne disease.

METHODOLOGY

Water samples were collected for present study from all four sites, started from February 2014 and completed in the month of January 2016. Monthly samples of surface water were collected during first week of each month for in early hours of the day 8.30 a.m. to 10.30 a.m. with help of double Stoppard polyethylene bottles. The physical parameter like temperature, pH, and transparency were determined using mercury thermometer, water analysis kit developed by EIPRODUCTS, (MODEL-161-E). Measurement of transparency was done by Seechi disc. For the analysis of chemical parameter the sample were collected in plastic cans and transported to the laboratory. Physico-chemical parameter were analyzed with help of the procedures given by APHA [5], NEERI [6], Kodarkar [7].

RESULTS AND DISCUSSION

1. Temperature: In present study, water temperature was recorded maximum 25.10 ± 02.50 °C during summer season. Water temperature was high due to low water level and high atmospheric temperature and minimum 19.70 ± 01.15 °C during winter season, lowering of temperature was recorded which might be due to the low atmospheric temperature and high water level. Telkhadeet *al.*, [8] observed minimum water temperature was 23.20 °C and maximum was 29.60 °C at Tadoba lake in district Chandrapur.

2) Ph: pH is an important factor that determines the solubility of water for various purposes, including toxicity to animal and plant water pH was recorded maximum 8.43 ± 0.38 during Summer season and minimum pH 7.24 ± 0.25 was recorded during Winter season. pH of water is influenced by geology of catchment and buffering capacity of water. In Summer months pH fluctuated due to low water level and high temperature. Similar observations are reported by

Wankhede *et al.*, [9] observed 7.7 in the month of December and pH 8.3 in the month of May in Sawangalake of Amrawati. Manjare *et al.*, [10] observed minimum pH 7.3 in the month of September and maximum 8.8 in the month of May Tamdalge Tank in Kolhapur.

3. Conductivity: That means conductivity depends on ionization of solute dissolve in water and it is the best tool to assess the purity of water [11]. Maximum conductivity was 0.45 ± 0.05 $\mu\text{mhos cm}^{-1}$ during monsoon season. The maximum conductivity in monsoon may be due to excess influx of domestic effluents and organic matter. Minimum conductivity was 0.36 ± 0.02 $\mu\text{mhos cm}^{-1}$ recorded during winter season. The minimum conductivity in winter due to low contamination of dissolve solid and.

4. Transparency: According to Jhingran [12] transparency indicate the concentration of suspended solids, it is also light penetration capacity of the water, which can be determined by the weight method. Maximum transparency was recorded in 49.75 ± 7.75 cm during summer season while minimum during monsoon season 21.75 ± 2.87 cm the low values of transparency were recorded during monsoon season, which might be due to influx of rain water from catchment area, less penetration of light and high turbidity due to suspended inert particulate matter, exclusive addition of sewage adversely affecting the transparency.

5. Alkalinity: Alkalinity of water is due the presence of weak acid salt, strong bases. Total alkalinity is the sum of hydroxides, carbonates and bicarbonates [13]. Total alkalinity was found to be maximum during summer season 264.70 ± 17.25 mg/l while minimum in winter season 197.00 ± 26.50 mg/l. Higher values of total alkalinity are due to increase the rate of organic decomposition when CO₂ is liberated. Similar finding observed by Manjare *et al.*, [10] observed alkalinity minimum value was 121.25 mg/l in the month of January and maximum was 200 mg/l in the month of May.

6. Total Hardness: Total hardness is defined as the sum of calcium and magnesium hardness. Normally water content dissolved magnesium and calcium

bicarbonate, sulphate chloride in considerable amount along with traces of different cation and anion which introduced hardness of water. Seasonally, maximum value of hardness was recorded during summer season 113.00 ± 7.00 mg/l while minimum during winter season 151.50 ± 8.50 mg/l. Seasonal variation in hardness of water seems to be induced by temperature and evaporation of water during summer months. This might have resulted in high concentration of calcium and magnesium, Anita *et al.*, [14] reported maximum total hardness 360 mg/l in the month of May and minimum value 152 mg/l recorded in the month of October and November respectively and stated that highest hardness during summer season due to the low water volume and increase rate of evaporation of Nagral Dam.

7. Calcium hardness: Calcium is required usually as a micronutrient for algae as well as it is an important component in the exoskeleton of arthropods and shells in mollusca, [15]. Seasonally, maximum value of Ca-hardness was recorded 113.0 ± 5.50 mg/l during summer season while minimum 84.25 ± 5.50 mg/l during winter season. The higher values of Ca-hardness during summer season could be due to discharge of effluents and untreated wastes, minimum values recorded in winter may be due to dilution and more water levels. Salve and Hiware [16] reported that the calcium hardness was higher in winter, moderate in monsoon and lower in summer, Wanaparkalpa reservoir, Nagpur.

8. Magnesium hardness: Seasonally, maximum value of Mg-hardness was recorded 37.25 ± 2.25 mg/l during summer season while minimum during winter season 28.75 ± 1.75 mg/l. The higher values of Mg-hardness during summer season could be due to discharge of effluents and untreated wastes, minimum values recorded in winter may be due to dilution and more water levels. Pulugandi [17] recorded minimum magnesium hardness during winter season and maximum value of magnesium hardness during summer.

9. Total solids: Total solids are very useful parameter describing the chemical constituents of the water. In the present investigation, the maximum total solids were 357.70 ± 31.87 mg/l found during monsoon

season and minimum 283.20 ± 12.75 mg/l during summer seasons. High TS values in monsoon surface mud and sand inflow in lake, heavy precipitation from catchment. Salve and Hiware, [16] also reported high total solid during monsoon season then summer and winter in Wanparakalpa reservoir, Nagpur.

10. Total Suspended Solids: It is a useful parameter to describe the chemical constituents of the water and contribute to productivity within the water body. In the present investigation, the maximum total suspended solids 268.20 ± 23.62 mg/l found during monsoon season. Minimum were 209.00 ± 11.50 mg/l during summer seasons and Minimum range recorded in summer than winter may be due to the evaporation of water. High TSS values in monsoon surface run off precipitation and decaying matter from catchment. Kadam *et al.*, [18] recorded the total suspended solids reported minimum values during winter and maximum during monsoon.

11. Total Dissolved Solids: The maximum total Dissolved solids were 89.50 ± 08.25 mg/l found during monsoon season and minimum 72.75 ± 3.25 mg/l during summer seasons. High TDS values in monsoon surface inflow, deterioration and heavy precipitation. Gayatriet *al.*, [19] reported minimum TDS 225 ± 50 mg/l during summer season while maximum 425.0 ± 125.83 mg/l during monsoon season of Shoolkerelake.

12. Dissolve oxygen: Diffusion of oxygen from the air into the water called dissolve oxygen. Photosynthetic activity of aquatic autotrophs and inflowing streams are also source of dissolve oxygen Anita *et al.*, (2018) [14]. Maximum concentration of dissolved oxygen 6.50 ± 0.15 mg/l in winter season while minimum 5.05 ± 0.15 mg/l in summer season. Minimum dissolved oxygen was recorded in summer month may be due to high metabolic rate of organisms and maximum during winter season due to the low temperature and high photosynthetic activity. Similar trend was reported by Munawar, [20] have recorded maximum value dissolve oxygen in winter due to the low atmospheric temperature of fresh water lake of Hyderabad.

13. Free carbon dioxide: According to Gayatriet *al.*, [19] the main sources of free CO₂ in water bodies are respiratory activity of aquatic organism and process of decomposition. Maximum value of free CO₂ was 5.07 ± 0.43 mg/l in monsoon season. Minimum CO₂ was 3.66 ± 0.34 mg/l in winter season, High values recorded during monsoon season may be due to increase in biological oxidation of organic matter. However, low values of free CO₂ during winter may be due to decreased water temperature and maximum utilization of CO₂ by more algal blooms in winter.

14. Biological oxygen demand: It is the measure of the amount of oxygen that would be needed by the microorganism to decompose the organic and chemical oxidation of inorganic matter, which can support increasing of microbe organism Kistan *et al.*, [2]. In the present investigation, seasonally maximum B.O.D was 14.93 ± 2.26 mg/l recorded in the summer season. The minimum B.O.D 7.69 ± 0.75 mg/l during winter and Higher value of BOD during summer season due to higher microbial activity of various aerobic and aerobic microorganisms increased with the higher water temperature as well as considerable decrease in the water level.

15. Chemical oxygen demand:seasonally C.O.D. maximum values were 44.07 ± 6.13 mg/l during summer while minimum 23.02 ± 1.58 mg/l during winter season. The maximum values in monsoon may be due rate of oxidation in monsoon season. Gayathriet *al.*, [19] in Shoolkerelake observed maximum COD 8.85 ± 0.95 mg/l during summer season and minimum 4.45 ± 0.95 mg/l during winter season.

16. Chloride:Chloride is present in all natural surface water from low to high concentration. In the present investigation, seasonally Chloride values were 61.67 ± 3.58 mg/l maximum in summer while 61.67 ± 6.45 mg/l minimum during winter season. Maximum value of chloride observed during summer season due to evaporation of water of lake and minimum value observed during winter season due to the dilution effect.

17. Sulphate: In present investigation, the maximum concentration of sulphate was 18.39 ± 0.70 mg/l during

monsoon season while minimum 14.94 ± 0.42 mg/l during winter season. Higher concentration of sulphate in monsoon may also input of sulphate from catchment area and discharge of domestic wastes and minimum during winter season might be due to high water levels and abundance of phytoplankton. Similar trends reported by Yeole and Patil, recorded the sulphate fluctuated between the range of 0.08 to 0.33 mg/ltr in the JagtungaSamudra reservoir.

18. Phosphate: The maximum phosphate recorded 0.79 ± 0.12 mg/l during monsoon and minimum 0.37 ± 0.02 mg/l during winter and Higher concentration of phosphate in monsoon may also input of phosphate from catchment area and discharge of domestic wastes and minimum during winter season might be due to high water levels and abundance of phytoplankton. Yewale and Patil recorded the range between 0.03 mg/l to 0.12 mg/l in Yedshilake.

19. Nitrate: In present investigation, maximum nitrate concentration was 01.37 ± 0.07 mg/l during monsoon season and minimum 0.81 ± 0.05 mg/l observed during winter season. In monsoon maximum of nitrate is Nitrate show maximum value during monsoon season it may be due to nitrogen rich flood water, runoff from agricultural field and domestic water Minimum during winter due to consumed by the growing plankton. Similar trends reported by Munawar [20] had recorded an increase in nitrate concentration during monsoon.

CONCLUSION

The conclusion from the present investigation may be drawn that most all of the physico- chemical parameters were found within the permissible limit of ISI, ICMR and WHO for domestic use. But in future Moharly Lake is going to be contaminated day by day with increase in human activities and ultimately eutrophication affects aquatic life, excessive silting reducing depth of the lake. Therefore take the action for conservation by scientific methods to maintain the lake status. Lake water is unsafe for drinking but useful for wildlife drinking domestic purpose, agriculture and fisheries.

Acknowledgement: I am thankful to Mr.Pravin M. Telkhade, Head and Associate Professor, P.G. Department of Zoology, Arts, commerce and science college Tukum,Chandrapur.

Conflicts of interest: The authors stated that no conflicts of interest.

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