



**STUDY DETERMINED AND CHARACTERIZED THE QUALITY OF WATER
SHAHPURA LAKE OF BHOPAL**

Reena Yadav^{1*} and Dr. Pramod Patil²

¹Department of Botany, Govt. M.L.B. Girls P.G. (Auto) College, Bhopal, India.

²Department of Botany, IEHE, Bhopal, India.

***Corresponding Author: Reena Yadav**

Department of Botany, Govt. M.L.B. Girls P.G. (Auto) College, Bhopal, India.

Article Received on 07/02/2018

Article Revised on 28/02/2018

Article Accepted on 20/03/2018

ABSTRACT

This study determined and characterized the quality of water of Shahpura Lake of Bhopal. The research involved the levels of physico-chemical properties of Lake Water samples. About 40% of the pH values were below the WHO recommended minimum allowable value of 6.5 while most of the physical parameters fell within the recommended values of WHO. In general, the water quality of the studied lakes can be said to be fairly good with respect to the monitored elements and Thus, on the basis of the physico-chemical studies, it can be said that the study of Shahpura Lake in Bhopal district is nutrient rich and suitable for aquatic organisms. Slight alkaline medium and high amount of nutrients provide favorable conditions for aquaculture.

INTRODUCTION

Water is one of the most essential natural resource for sustenance of life gifted to human by nature. The availability of freshwater resources is important to meet the water use demand of rapidly growing population and spreading out of economic activities of any country (Salla and Ghosh, 2014). Water is one of the most essential natural resource for sustenance of life gifted to human by nature. The availability of freshwater resources is important to meet the water use demand of rapidly growing population and spreading out of economic activities of any country (Mishra *et al.*, 2015). Fresh Water is essential to the existence of life. Water of acceptable quality is essential not only for drinking and domestic purposes, but also for agriculture, industrial and commercial uses. Surface water is a collection of water on the ground or in a stream, river, lake, wetland, or ocean (Trivedi and Kataria, 2012).

The Shahpura Lake is situated near Manisha Market region of Bhopal. It is surrounded by hospitals, schools and most importantly the population living around the lake area. It is located in the southern part of the city (Dixit and Rahi, 2017). It is manmade reservoir formed in 1974-75, under the Betwa irrigation project. The waste water inflow keeps the lake perennial and the over flowing water flows through a nala to join kaliyasot river which flows into river Betwa. The global water scenario is very much alarming. It is predicted that if at all a third world war takes place, the reason for it will be water (Ramesh and Krishnaiah, 2014). Today, due to various anthropogenic activities, the lake water usually receives untreated sewage, domestic waste, industrial and agricultural effluents that results in pollution of several

lakes in India and abroad (Jain *et al.*, 2014). Therefore the assessment and monitoring of its water quality is very important. Hence a serious need is felt for the study of the water quality which could prove beneficial for the large number of people.

MATERIALS AND METHODS

Sampling Sites

The Shahpura lake, Bhopal Was subjected to physico-chemical analysis. The main criteria for the selection of reservoir were, it should be approachable and water quality should be best for aquaculture, drinking and irrigation. This sampling stations are located near Manisha Market region of Bhopal.

Sample Collection

Samples were collected in the different seasons. 125ml glass bottles were used to collect and fix samples for estimation of all physico-chemical parameters. Samples were collected in triplicate from for analysis of water parameters.

Analysis

The samples thus collected were analyzed for a number of physico-chemical parameters employing standard methods (APHA, 1998). The parameters include pH, Temperature, Dissolved Oxygen (DO), COD, Total Hardness, Total Solids (TS), Total Dissolved Solids (TDS), Alkalinity, BOD, Chloride ion etc.

RESULTS AND DISCUSSION

Water is one of the abundantly available substances in nature, which man has exploited more than any resources

for the sustenance of life. Water of good quality is required for living organisms (Shinde *et al.*, 2011).

In the present investigation atmospheric temperature varied from 15.33°C to 28.33°C (Figure 1). During the experimental period maximum temperature was found in summer season (April-June) and the minimum in winter (Dec. to Feb.). Rise in temperature, speed up the biochemical reactions and reduce the solubility of gases. Temperature of running water usually varies seasonally and daily and among locations due to climate, elevation, and extent of streamside vegetation and the relative importance of ground water inputs (Singh, 2010). The average of Temperature of water samples in the study area was $25 \pm 2.0^\circ\text{C}$. There was a significant difference in temperature in seasons in the water bodies under the study. Verma *et al.*, 2012 done same work on pond located near Nandani Mines in Durg District Chhattisgarh, India. The present study is in agreement for these findings. The EPA, Ghana (1997), stipulates that water for drinking and domestic purposes should have a temperature not exceeding 30°C .

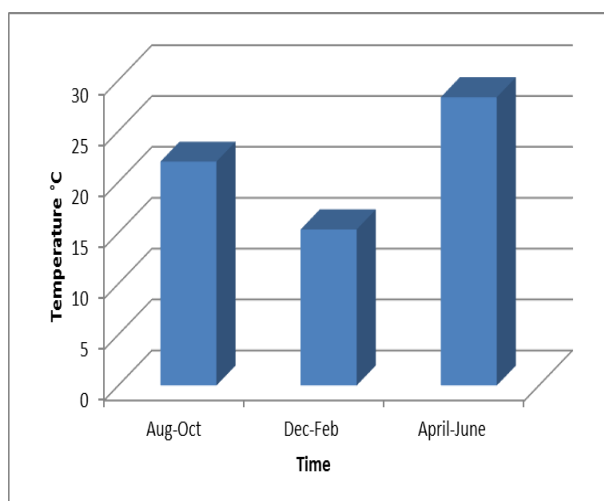


Figure 1: Temperature of Shahpura Lake water in different season.

pH is considered as an important ecological factors and is the result of the interaction of various substances in solutions in the water. It is the scale of intensity of acidity and alkalinity of water and measure the concentration of H^+ ions. In the present investigation, the pH has recorded between 5.89 to 7.10 (Figure 2). Kamat *et al.*, (2006) reported the pH values between 6.7 to 8.1 in Hosalli tank in Shimoga district of Karnataka. Kataria *et al.*, (1996) observe the pH values between 7.2 to 8.2, stated that the maximum pH in the months of May indicates a high rate of photosynthesis. Similar results are found in the present study. Lendhe and Yergi (2004) observed the pH 7.2 to 7.8 in the Phirange Kharbav lake of Thane district, Maharashtra. In the present investigation the maximum pH was reported during summer seasons and minimum during winter.

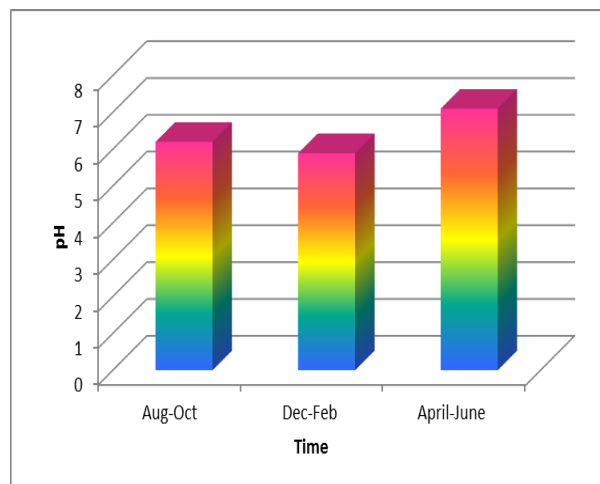


Figure 2: pH of lake water in different season.

The TDS in water is due to the presence of Calcium, Magnesium, Sodium, Potassium, Bicarbonate, Chloride and Sulphate ions. As prescribed limit of TDS for drinking water is 500 mg/l. Davis and Dewiest, (1966) stated that the TDS concentration of fresh water generally ranges between 192-1280 mg/l. Total Suspended Solids in the study area was maximum in monsoon 760.50 ± 10.25 mg/l. (Figure 3), which are high from the standard limit of 600mg/l. Total Suspended Solids in the study area was 186.2 ± 2.3 mg/l. Which is below from standard limit. Devaraju *et al.*, 2005 has made similar observations in Maddur Lake and Garg *et al.*, 2006 has also made similar observations in Ramsagar reservoir.

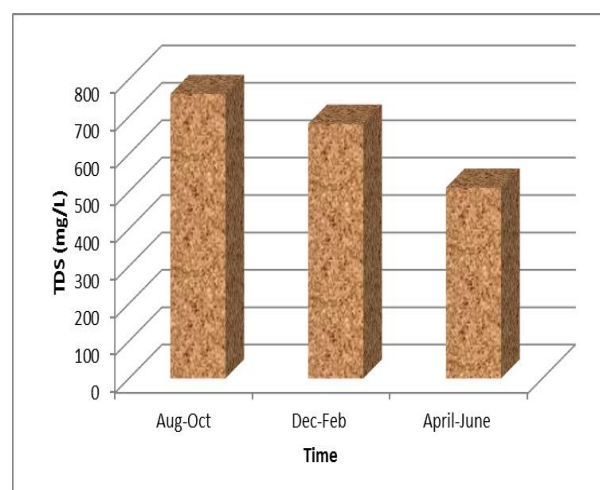


Figure 3: TDS of pond water in different season.

In the present investigation the values of dissolve oxygen recorded ranges between 1.04 ± 0.71 mg/L to 8.10 ± 1.11 mg/L in Shahpura Lake, Bhopal (Figure 4). The maximum dissolve oxygen was recorded during the winter and minimum during the monsoon season. High values of dissolve oxygen during winter seasons was due to low temperature and high photosynthetic activities and low values of dissolved oxygen was due to high temperature and high rate of oxidation of organic matter. The variation of DO in water depends upon the

temperature of the water body, which influences the oxygen solubility in water. A good water quality should have solubility of oxygen 7.6 mg/l and 7.0 mg/l at 30°C and 35°C respectively (Toufeek *et al.*, 2009). Rani *et al.*, (2004) was also reported lower values of Dissolved oxygen in summer season due to higher rate of decomposition of organic matter and limited flow of water in low holding environment due to high temperature.

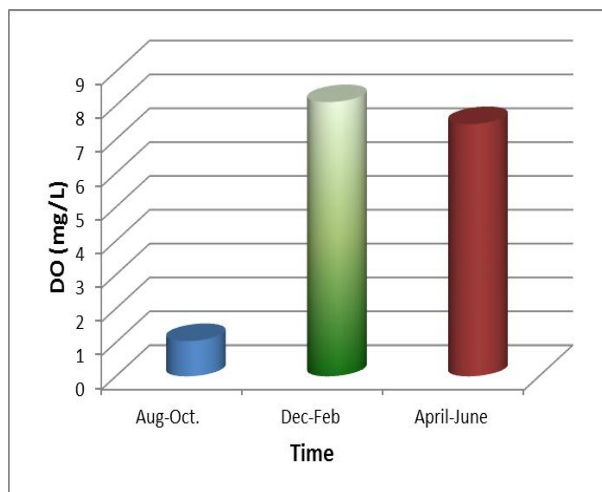


Figure 4 DO of lake water in different season.

The low BOD value of water showed good sanitary condition of the water. In the present study, BOD was around 5.58 ± 1.0 mg/l in rainy season, that was highest due to rain water. The BOD value was obtained maximum due to high temperature. The BOD test measures the oxygen demand of biodegradable pollutants whereas the COD test measures the oxygen demand of oxidizable pollutants (Admoroti, 1996). Unpolluted waters typically have BOD values of 2mg/l or less. The normal range of BOD for good water quality is 5-6 mg/l (Huq and Alam, 2005).

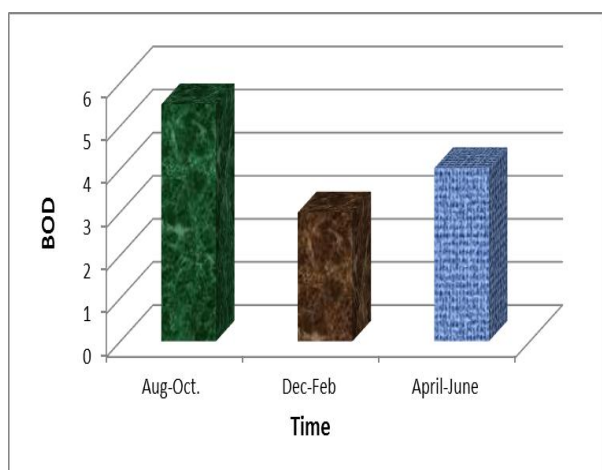


Figure 5: BOD of lake water in different season.

In the present investigations, the total hardness value was maximum during summer and minimum in winter season (Figure 6). Kataria *et al.*, (1996) also recorded maximum

value of total hardness in summer, moderate in monsoon and minimum in winter at Kolar reservoir in Bhopal, Madhya Pradesh. Magnesium is one of the main constituents in natural water is vital components of chlorophyll. In the present investigations the total hardness was recorded in the range of 114.5 ± 0.61 mg/L. to 170.7 ± 0.42 mg/L in the pond.

Patil *et al.*, 2011 recorded maximum calcium and magnesium hardness during winter season from Pitamahal dam from Rourkela. Mohanta and Patra (2010) observe the maximum value of magnesium during summer and minimum during winter in the river Sanamahhakandana at Keonijhar Garh.

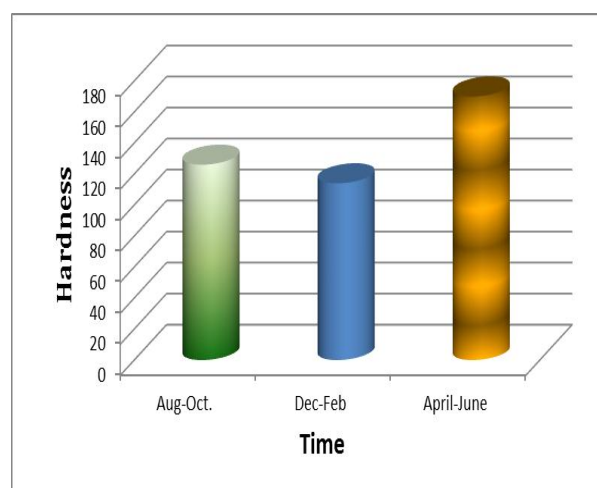


Figure 6: BOD of lake water in different season.

The observation of alkalinity was recorded maximum 298.66 ± 4.57 in monsoon and minimum in summer 90.75 ± 10.59 . In the present investigation, maximum values of alkalinity during monsoon may be due to household detergents products added in the pond only in monsoon season due to flooding of city channels after their saturations in summer and minimum values during winter and summer is be due to use of bicarbonates by the pond biota directly for their load which leads to the depletion of bicarbonates in water resulting in low values of total alkalinity. Hujare, 2008 is also reported similar results that it was maximum in summer and minimum in winter due to high photosynthetic rate. Moderately alkaline water (less than $350 \text{ mgCaCO}_3/\text{l}$) in combination with hardness forms a layer of calcium or magnesium carbonate that tends to inhibit corrosion of metal piping (Krishnan R *et al.*, 2007).

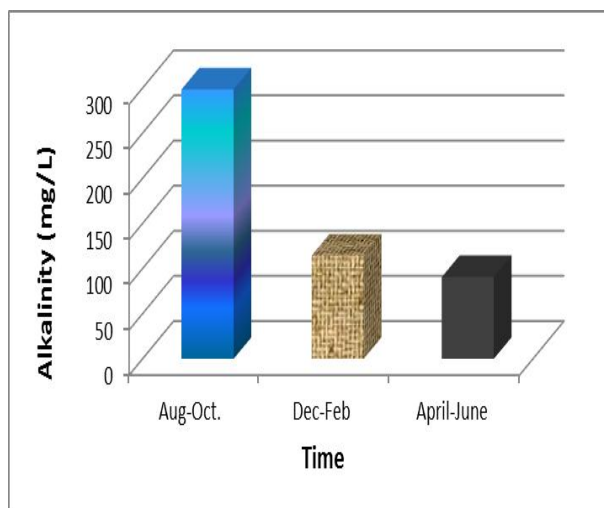


Figure 7: Alkalinity of pond water in different season.

COD is the oxygen required by the organic substances in water to oxidize them by a strong chemical oxidant. The observed value of COD in samples were between the range of 3.95 ± 0.62 to 6.1813 ± 0.25 mg/l Figure 8. In the present investigation, maximum chemical oxygen demand was recorded during the monsoon and minimum during the summer season.

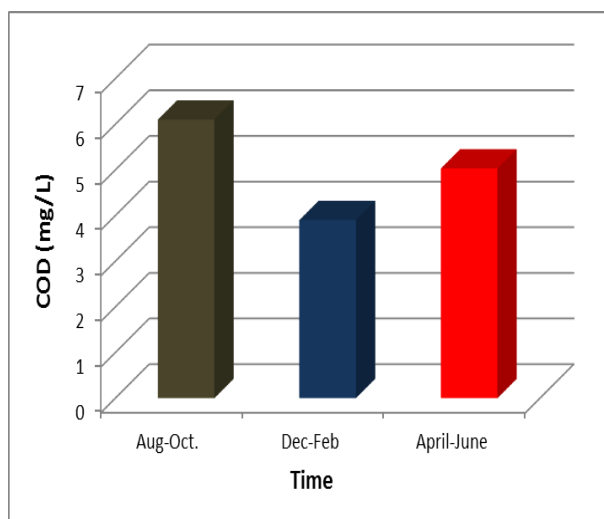


Figure 8: COD of lake water in different season.

CONCLUSION

The study assessed the evolution of water quality of Shahpura Lake, Bhopal. A comparative study of lake water was carried out by taking certain important parameters like temperature, pH, total suspended solid, total dissolved solid, alkalinity, dissolved oxygen, chemical oxygen demand. In this present investigation, it was found that the maximum and minimum parameters were at the level of pollution. It can be said that the comparative study of water from different season is nutrient rich and suitable for aquatic organisms.

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