



Study of Physico-Chemical Parameters of Sambhaji Lake Solapur, Perspective of Conservation

KEYWORDS

Physico-chemical parameters, Sambhaji lake, contamination.

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ABSTRACT Water is the most important compound of an ecosystem. Various physical, chemical and biological characteristics of water describe the better quality of water. But due to various factors such as human population, industrialization, use of fertilizers in agriculture, man-made activities and unscientific disposal of wastes the water has been polluted i.e. the quality of water has been affected. The present investigation deals with the study of physicochemical parameters of Sambhaji lake during winter season 2015-16, Solapur. Various physical and chemical parameters have been analyzed. It was concluded that the lake water is heavily polluted and various treatments is essential to minimize the contamination.

Introduction:

Water is the only resource which is very essential for all living organisms. Because of its importance in maintaining health of the ecosystem as well as human being, the study of water quality is essential. In India, the various sources of water like lakes, wells, tanks, rivers, etc are used to satisfy the needs of agriculture and domestic purposes. The ever growing demands for water resources coupled with the rate at which much of the earth's fresh water being adversely affected by human activities, demonstrate a developing crisis and horrible future if environmental water resources are not appropriately managed (Hiremath *et al.*, 2011). Not only agriculture and domestic use, it has other uses like washing of clothes, bathing etc. As a result there is an effect on quality of water. This poses an impact on health of ecosystem and human beings. Thus there is a need to study the quality of water.

Due to various anthropogenic factors the natural aquatic resources have been polluted leading to depletion of water quality and aquatic biota. Due to use of such contaminated drinking water the humans are suffering from various water-borne diseases. Hence it is necessary to check the quality of water at regular intervals of time. It is difficult to understand the biological phenomena fully because the chemistry of water reveals much about the metabolism of ecosystem and explain the general hydrobiological relationship (Manjare *et al.*, 2010).

The various physico-chemical parameters are used to check the quality of water. In this study, the quality of the lake water located in Solapur city was studied by determining the physicochemical parameters of the water during winter season in the year 2015-16. The main objective of the present study is to throw light on the importance of the fresh water tank, Sambhaji lake located in the heart of Solapur city which is highly exploited these days for recreation, boating and other human activities.

Materials and Methods:

The water samples were collected for physicochemical analysis from three selected study sites during winter season in the year 2015-16. All three sites are frequently exposed to various human activities. Site 1 is used for boating as well as idol immersion during festival days. Site 2

is located near garden and this site is exclusively used for beautification purpose. Site 3 is also known as dhobighat. This site is used for washing of clothes and bathing. The samples were collected in the clean plastic containers (PVC 1000ml). At the study sites the air and water temperature was noted and collected samples were subjected to physical and chemical analysis. Estimation was done with standard methods as prescribed by APHA (2005).

Result and Discussion:

The result of the physico chemical parameters of Sambhaji lake is shown in Table 1. The present study reports the physicochemical analysis of Sambhaji lake, Solapur during winter season, 2015-16. The study indicates that the maximum atmospheric temperature was 29°C in the month of February at site 2 and site 3 whereas minimum atmospheric temperature was 15°C in the month of December at site 1. The maximum water temperature was 21.5°C in the month of February at site 2 while the minimum water temperature was 17.2°C in the month of January at site 3. The temperature was less in the month of December. Similar observations were made by Bhawankar *et al.*, 2011. The water temperature ranged between 17.2°C -21.5°C. The higher water temperature may be due to early summer season. Similar trends were noticed by Reeta Bajpai, (2012).

The highest pH was found to be 8.1 in the month of January at site 2 and February at site 3 and the lower pH was found to be 7.7 in the month of February at site 2 and in December at site 3. The maximum pH was at site 2 and site 3 in the month of January and February respectively. This indicates the alkaline nature of the water body. The rise in pH might be due to rise in temperature. The pH ranges between 7-8.5. Similar trend was observed by Imam *et al.*, (2012). According to them the fresh water habitats pH fluctuates based on the metabolic activities as well as amount of decomposition of organic matter by the microbes.

The value of DO was 4.8ppm in the month of January at site 1 whereas the low value of DO was 0.9ppm in the month of February at site 2. The high value of DO was observed in the month of January. The high concentration of DO might be due to the low water temperature and increase in the photosynthetic activity of the weeds formed on the water surface. Similar observations were done by

Dhirendra *et al.*, (2009).

The BOD of lake ranged from a minimum of 3.3mg/lit in the month of December at site 3 to a maximum of 16.5mg/lit in the month of December at site 2. BOD is nothing but the required amount of oxygen to decompose organic matter present in the water. Higher value of BOD indicated that the surface water resources like rivers, lakes and ponds gets affected by pollution Kistan *et al.*,(2013). BOD gets increased during study period which indicated that the organic and inorganic matter influence entering from near by area of lake.

The COD of lake had a minimum value of 10.6mg/lit in the month of December at site 3 and a maximum value of 46.7mg/lit in the month of December and February at site 2. The oxygen required for chemical oxidation of organic matter is determined by COD. The COD values show the amount of dissolved oxidisable matters present in it. Around site 2 of lake more grass is present which might be the organic matter in lake. Minimum value at site 3 might be due to low concentration of organic matter and pollutants. Similar findings were observed by Mahananda *et al.*, (2010).

The maximum value of total alkalinity was 395mg/lit in the month of January at site 2 while minimum value was 260mg/lit in month of December at site 2. The maximum alkalinity was observed in the month of January and minimum in the month of December. Bhalerao, (2013) reported that the maximum value may be due to increase in bicarbonates and minimum value may be due to high photosynthetic rate.

The higher value of total hardness was 1100mg/lit in the month of December at site 3 and lower value was 758mg/lit in the month of February at site 3. Hardness refers to the calcium and magnesium in water. The maximum hardness was noted in the month of December at site 3. According to Raghunathan *et al.*, (2000), too much hardness is detrimental to human health. The minimum hardness was noted in the month of February at site 3. The reason for minimum hardness may be due to decrease in water level and increased rate of evaporation of water. Similar observations were made by Basavaraja *et al.*, (2011).

The high level of calcium was 800mg/lit in the month of December at site 3 and low level of calcium was 170mg/lit in the month of February at site 3. The maximum calcium was noted in the month of December at site 3. Thus it contributes to the hardness of water. According to Savitha *et al.*,(2011), higher concentration of calcium increases total hardness of water. The high concentration of chloride was 495mg/lit in the month of January at site 3 and low

concentration was 350mg/lit in the month of December at site 2. The high concentration of chloride was in the month of January at site 3. This indicates the high amount of pollutants. It might be higher due to human faeces and sewage inflow. According to Istifanus *et al.*, (2013), at high concentration water tastes salty and will become increasingly objectionable. High chloride levels may render fresh water unsuitable for agricultural irrigation.

The maximum value of nitrate was 4.7mg/lit in the month of December at site 1 and minimum value was 1.6mg/lit in the month of December at site 3. The productivity of phytoplanktons is regulated by nitrates. It represents the final product of the biochemical oxidation of ammonia. According to Elayaraj *et al.*, (2014), high nitrate concentration can result in excess algal blooms in water body. It is not beneficial for potability of water.

The highest value of phosphate was 4.3mg/lit in the month of December at site 2 whereas the lowest value of phosphate was 2.0mg/lit in the month of January at site 1. Ahmed *et al.*, (2015) also reported that the high concentration of phosphate might be due to nutrient input that may occur anthropogenically or naturally through physical, chemical and biological processes.

The maximum value of turbidity was 64.4NTU in the month of January at site 3 while the minimum value of turbidity was 9NTU in the month of December at site 3. The maximum value of turbidity was observed in the month of January. It might be due to human activities, presence of suspended particulate matter and decrease in water level. Similar findings were observed by Reddy *et al.*, (2012). Minimum value was observed in the month of December.

Conclusion:

Our result indicated that due to anthropogenic and natural factors the various physico-chemical parameters of the lake has been affected. The reason for high physico-chemical parameters at certain selection sites may be due to unscientific disposal of wastes. It may not only cause laxative effects on health of humans but also on the health of ecosystem. In the present study it has been concluded that the water has been highly polluted. It is not suitable for various uses like agriculture, industrial, domestic, etc. Recycling or other treatments is necessary to minimize the contamination of water. So we need to take special care for lake water. More pollution should be avoided in and around lake water. People should be made aware of the ill effects of contaminated water. As per the recent concept of government of India Solapur city is short listed for smart city development funds. It is now necessary to take appropriate measures for controlling the pollution load of this tank.

Table No. 1 : Physico-chemical parameters of Sambhaji lake, Solapur.

Parameters	Site-1			Site-2			Site-3		
	Dec	Jan	Feb	Dec	Jan	Feb	Dec	Jan	Feb
Air Temperature(°C)	15.0±0.2	25.0±0.2	26.0±0.2	24.0±0.3	24.0±0.3	29.0±0.3	27.5±0.2	25.0±0.3	29.0±0.2
Water Temperature(°C)	17.5±0.3	18.5±0.2	21.0±0.2	18.0±0.2	19.5±0.3	21.5±0.2	17.5±0.2	17.2±0.2	21.0±0.3
DO(ppm)	3.8±0.2	4.8±0.3	3.2±0.2	2.6±0.3	1.7±0.2	0.9±0.3	3.0±0.2	3.9±0.2	2.5±0.2
pH	7.9±0.2	8.0±0.2	7.8±0.2	7.8±0.3	8.1±0.2	7.7±0.2	7.7±0.2	7.9±0.2	8.1±0.3

BOD (mg/lit)	10.4±0.2	10.6±0.2	10.3±0.2	16.5±0.2	10.2±0.2	16.3±0.3	3.3±0.3	16.1±0.3	14.0±0.2
COD (mg/lit)	33.0±0.2	31.0±0.2	28.9±0.2	46.7±0.3	28.0±0.3	46.7±0.2	10.6±0.3	44.4±0.2	42.7±0.2
Total Alkalinity (mg/lit)	280.0±5.0	389.0±5.0	390.0±5.0	260.0±6.0	395.0±5.0	394.0±4.0	290.0±4.0	394.0±5.0	367.0±5.0
Total Hardness (mg/lit)	955.0±5.0	776.0±5.0	793.0±5.0	1040.0±6.0	764.0±4.0	805.0±5.0	1100.0±6.0	798.0±6.0	758.0±6.0
Calcium (mg/lit)	525.0±2.0	180.0±2.0	182.0±2.0	775.0±3.0	172.0±2.0	188.0±2.0	800.0±2.0	186.0±3.0	170.0±3.0
Chloride (mg/lit)	450.0±2.0	492.0±2.0	477.0±2.0	350.0±3.0	480.0±3.0	489.0±2.0	355.0±2.0	495.0±2.0	480.0±3.0
Nitrate (mg/lit)	4.7±0.2	3.9±0.2	3.3±0.2	3.8±0.2	3.2±0.2	4.0±0.2	1.6±0.3	1.9±0.3	2.7±0.2
Phosphate (mg/lit)	2.5±0.2	2.0±0.2	2.4±0.2	4.3±0.3	3.5±0.3	3.0±0.2	2.2±0.2	2.6±0.2	2.7±0.2
Turbidity (NTU)	11.5±5.0	10.5±5.0	11.2±5.0	22.0±6.0	18.3±6.0	15.0±5.0	9.0±4.0	64.4±6.0	59.2±6.0

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