STUDIES ON SEASONAL VARIATIONS IN PHYSICO-CHEMICAL PARAMETERS OF MOHAGAVANLAKE, KARANJA (LAD), WASHIM (M.S.) FOR AN ASSESSMENT OF WATER QUALITY

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ABSTRACT

Present work focused on the seasonal variations in the physico - chemical parameters of the Mohagavan lake at Karanja (Lad). This lake is situated 14 km. away from Karanja Tehsil Dist- Washim, and surrounded by many small villages. Mohagavan lake is a lifeline for the people in these areas because the lake is the source of water for household and drinking purpose. The domestic and agricultural waste from the surrounding localities is directly discarded into the lake. To evaluate the water quality of this lake, study was carried out for the period of one year (July 2012 to September 2013). Monthly water samples were collected to analyze different physical and chemical parameters like temperature, humidity, transparency, pH, dissolved oxygen, total solids, free CO_2, alkalinity, hardness, chlorides, sulphate, phosphate and nitrate. Obtained results were compared with standard values.

Key Words: *Physico-chemical parameters, Mohagavan lake, Water quality.*

Introduction

Water is one of the most essential components for the existence of life on the earth and the most valuable natural resources whose quality has vital concern for the human welfare. Growing population, urbanization, erosion of soil, increasing living standards, unscientific management and other anthropogenic activities including unhygienic conditions have severe impact on the quality of limited water resources. As the population increases, the need for water availability and accessibility will keep on growing rapidly. This will extend additional stress on our limited resources. To maintain the availability of water, all necessary efforts are continued in the field of research and development to meet the demand for domestic, agricultural and industrial uses (Bhaisare and Goel, 1992). The water demand is increasing day by day, while the water availability is declining over the years (Kumar *et al*., 2005). Hence, it's imperative to have an effective water resource management system to conserve and protect our natural resources (river basins, lakes, etc.) and help to sustain the communities, agriculture, forest, industries and overall eco-system.

Lakes are the most fertile, diverse, productive and interactive ecosystems in the world. Lake is one of the source of water supply for domestic purpose in the villages as well as rural areas of India. The water quality of lake varies from time to time due to interaction of local factors. To safeguard the long term sustainability of lake water resources, the quality of the water needs to be continuously monitored.

Basically the quality of water is described according to its physical, chemical and biological parameters. The physico-chemical methods are used to detect the effects of pollution on the water quality. Much work has been carried out in India and in Maharashtra also.Sreenivasan (1972) studied the important physico-chemical factors of Odathural tank in Coimbatore district, Tamilnadu.Quadri and Yousuf (1980) described the influence of physico-chemical factors in Manasbai lake near Srinagar, (Kashmir).Gautam *et al*., (1993) reported physico-chemical characteristics of sewage and its impact on water quality of Alkananda at Srinagar.Mathur *et al*., (2008) worked on assessment of physico-chemical characteristics and suggested restoration measures for Pushkar lake, Ajmer (Rajasthan). Krishnamoorthi and Selvakumar (2010) recorded seasonal variation in physico-chemical characteristics of water bodies around Cuddalore district (Tamil Nadu), Tidame and Shinde (2012) studied seasonal variations in physico-chemical parameters of the Temple pond, Nashik (M.S). Khan *et al*., (2012) analyzed physico-chemical parameters of Triveni lake water of Amravati (M.S). Lachure (2013) observed ecological and seasonal changes in physico-chemical parameters in Rui lake, Yavatmal (M.S).

The present study is an attempt to assess the water quality of Mohagavanlake in a rural area of Karanja (Lad), Dist-Washim.

Material and Methods

Mohagavan lake is situated near a village Mohagavan; It is located at 20^0 34' north latitude and 77^0 34' east longitude. Mohagavan lake is also a man-made lake, larger in size. It is irregular in shape and its limit is marked by boundary wall (fig. 1). The soil in the catchment area is red in colour. Mohagavan lake is also the minor irrigation project in Godavari basin. The project is an earthen dam about 1200 meter in length and 14.77 meter in height.

A study was carried out during July 2012 - September 2013 for the period of 15 months on a monthly basis. In the present study the sampling was done during morning hour. The water samples were collected from the depth of 2 feet with the help of Ruttner's sampler in the morning hours at 9 am. Samples were collected from four different spots of the lake (Spot A, B, C and D).Parameters like temperature, humidity, transparency, pH were analysed and recorded at the study site itself, whereas parameters viz. dissolved oxygen, total solids, free CO_2, alkalinity, hardness, chlorides, sulphate, phosphate and nitrate were analysed in the laboratory on the same day.

The various physico-chemical parameters were analysed by using methods as given in APHA, (1998) and Golterman *et al*., (1978).

Fig. 1 - Map showing location of Mohagavan Lake

Results and Discussion

During the present investigation water temperature varied 21.75^0C (February 2013) to 32.5^0C (May 2013). The highest values of temperature were noted during the summer season and the lowest during the winter. Similar observations were recorded by Qureshimatva *et al*., 2015 while studying Sarkhej Roza lake, at Ahmedabad (Gujarat). Generally, water temperature was corresponding with air temperature. Our results are well in agreement with those of Verma *et al*., (2011) and Lachure (2013). The atmospheric humidity of the Mohagavan lake site was ranged between 31.5% (April 2013) to 70.5% (August 2013). Maximum humidity was recorded in monsoon and minimum in summer season. This is an agreement with the finding of Ahmad and Krishnamurthy (1990), while studying the Wohar reservoir, Aurangabad (M.S.). pH remained on the alkaline side throughout the period of investigation and fluctuated between 7.8 (July 2012) to 8.7 (August 2013). Similar findings were observed by Rani and Sivakumar (2012), Ganai and Parveen (2013) and Wani and Subla (1990). They reported that the value above 8 in natural water was produced by the photosynthetic rate that demands more CO_2 than quantities furnished by respiration and decomposition. This parameter did not show any definite seasonal variation, as also reported by Kadam *et al*., (2007) in Masoli reservoir, district Parbhani. Transparency of Mohagavan lake water ranged from 8.35cm (July 2012) to 43.5cm (November 2012). Minimum transparency was observed in monsoon, while maximum in winter. The transparency (turbidity) showed that water was more turbid in monsoon and least turbid in winter, this finding is supported by Kedar *et al*., (2008), Verma *et al*., (2011) and Tidame and Shinde (2012). Total dissolved solids were recorded between 90.5mg/l (June 2013) to 211.25 mg/l (May 2013). The maximum amount of total dissolved solids was recorded during summer season and minimum monsoon. A similar trend has shown by Verma *et al*., (2012), while analyzing the water quality of Chandola lake, Ahmedabad. Free CO_2 values were fluctuated between18.5mg/l (September 2013) and 38mg/l (June 2013). High values of free CO_2 were recorded during the summer and low during winter. Ganai and Parveen (2014), recorded high free CO_2 during the summer, which can be attributed to higher decomposition rate and enhanced respiratory activities of plants and animal. The total value of alkalinity gives an idea of natural salts present in the water (Gawas *et al*., 2006). During the present study average value of alkalinity varied from 73.75mg/l (June 2013) to 181.5mg/l (March 2013). The high value of alkalinity was recorded during summer season and the low during monsoon. This is an agreement with the findings of Krishnamoorthi and Selvakumar (2010), Koli and Ranga (2011). Abdar (2013) also stated that, higher concentration of

bicarbonate during summer season is attributable to the decrease in water level by evaporation. Water bodies having total alkalinity above 50 mg/l can be considered productive (Moyle, 1946). The amount of dissolved oxygen indicates water quality and its relation to the distribution and abundance of various algal species. Wetzel, 1983 stated that oxygen content is important for the direct need of many organisms and affects the solubility as well as the availability of many nutrients and therefore productivity of the aquatic ecosystem. Seasonal mean values of dissolved oxygen ranged between 4.9mg/l (April 2013) to 8.8mg/l (July 2012). Maximum dissolved oxygen was observed during monsoon season and minimum during summer season. Similar findings were also recorded by Verma *et al*., (2011) while studying seasonal variation of Kankaria Lake, Ahmedabad (Gujarat). Vijayan (1991) reported that the measurement of dissolved oxygen is a primary key parameter for all pollution studies. The total hardness recorded in the water of Mohagavan lake ranged between 75mg/l (June 2013) to 172mg/l (March 2013). The maximum amount of total hardness was recorded during summer season and the minimum during monsoon. Verma *et al*., (2011) stated that, the high value of hardness during summer season may be due to evaporation of water and the addition of calcium and magnesium salts by mean of plants and living organisms. Presence of chloride in water is usually due to salts of sodium, potassium and calcium. It has been heavily relied as an indicator of pollution. Hence, it is one of the key parameters in assessing the water quality. Munawar (1974) stated that, higher concentration of chloride indicator of higher degree of organic pollution. His opinion has been supported by Ramakrishna (1990). In the present study concentration of chloride was fluctuating between 11.25mg/l (June 2013) to 63.25mg/l (May 2013). Seasonally, Chloride was found to be high during summer season and low during monsoon season. A similar trend has shown by Ahmad and Krishnamurthy (1990), Sumitra *et al*., (2007), Sharma *et al*., (2011). The average value of sulphate fluctuated between 0.0575mg/l (December 2012) to 0.16mg/l (May 2013). The highest content of sulphate was recorded during the summer; higher value might be due to low water level during summer supported by Agarkar and Garode (2000), Shinde *et al*., (2010). Welch *et al*., (1978) stated that phosphate is considered as one of the important nutrients limiting growth of the phytoplankton. The amount of phosphate recorded in Mohagavan lake ranges between 0.095 mg/l (July2013) to 0.282 mg/l (May2013). The maximum values were recorded during summer and winter, while minimum during monsoon. A similar trend has been shown by Verma *et al*., (2011) and Paliwal and Bhandarkar (2015). The nitrate values observed between the range of 0.035 mg/l (October 2012) to 0.237mg/l (December 2012). Maximum concentration of nitrates was during summer. . Sharma (2007) noted nitrate content to be maximum in summer and minimum in winter. According to Kumar and Ravindranath (1998) nitrate concentration more than 5mg/l in water usually indicate pollution made by human and animal wastes or fertilizer runoff.

Conclusion

On the basis of physico-chemical analysis results of Mohagavan lake water (July 2012 to September 2013), it may be concluded that most of the physico-chemical parameters studied were in potable range prescribed by WHO and BIS. Nevertheless, it's recommended to utilize the lake water on for irrigation and domestic purpose and requires an adequate filtration process for drinking application.

This lake posses high amount of organic waste and therefore the lake is organically polluted and mesotrophic in status, but is progressing towards the Euthophication. The results indicated that water quality of Mohagavan lake is deteriorating day by day. Hence, periodic monitoring and preventive measures are required to save this aquatic system from further contamination. Therefore, this study emphasizes on restoring the lake trophic status in terms of water quality by reducing the external loading of nutrient from the catchment.

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