LIMNOLOGICAL STUDIES OF NILJE AND GOVELI PONDS OF KALYAN TALUKA, MAHARASHTRA, INDIA

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ABSTRACT

Water is considered as the elixir of life and is consumed in the greatest quantity throughout the world for drinking, bathing, washing, recreation, irrigation and aquaculture. Rivers, ponds, lakes and tanks are the major resources of the water. Present study undertaken to analyse water quality parameters of Nilje and Gовели ponds in Kalyan Taluka for the period of 12 months i.e. from June 2014 to May 2015. Various parameters like pH, Temperature, total hardness, alkalinity, chlorides, total solids, suspended solids, and total dissolved solids, nitrates, phosphates, silicates, CO₂, dissolved oxygen, biological oxygen demand, chemical oxygen demand, salinity and electrical conductivity were assessed as per the methods given in APHA (2005) and Trivedi and Goel (1984). The results reveal that all the parameters studied are within permissible limit according to Indian Standard specified for drinking water.

INTRODUCTION

Ponds as source of water, are of fundamental importance to man. However pond may have been created for a multitude of different purpose e.g. domestic or agricultural use, transport, defence, ritual and industrial use, swimming, fish farming or the creation of the picturesque (Ress, 1997; Narayan et al., 2007; Bishnoi and Malik, 2008). Hence attempts were made to analyse physico-chemical parameters of these ponds to understand quality of water. These freshwater ponds namely Goveli and Nilje located in Kalyan Taluka (19°41' and 19°24'N and 73° and 73°24' E) of Thane District, Maharashtra, India. The total area of this taluka is 710 Km². The Kalyan Taluka is cubular in form, and in its western part a rich open plain. In the south and east ranges of hills running parallel with the boundary line, throw out spurs into the heart of plain. The climate is not very hot. The temperature ranges between 21.93°C to 31.72°C. It receives average rainfall 2355.2 mm.

So far no scientific study conducted on these ponds hence present investigation will help to create awareness among people in the Taluka and will be helpful to the scientific community in general and government in particular as a database for future investigations.

MATERIALS AND METHODS

For the study of physico-chemical parameters, the water samples were collected from different sites, at the boundaries of ponds and not from the central region of ponds as to reach the spot and sample for DO also collected in BOD bottle and fixed immediately and analysed on the spot. The water analysis was performed as per the methods described in standard methods (APHA, 1992); Trivedi and Goel (1984) and Kodarkar (1992).

RESULTS AND DISCUSSION

pH value recorded in both the ponds was range between 7 to 8.4. The maximum value recorded in Nilje pond in the month of February 2015 while minimum value recorded in the month of September 2015. In Goveli pond maximum pH value recorded in the months of June 2014 and May 2015 while minimum value recorded in the month of August 2015. In both the ponds minimum value recorded in the rainy season while maximum value recorded in towards summer season.
In the present study air temperature was recorded in the range of 24°C (Dec. 2014 and Jan-2015) to 31°C (June-2014 and April-2015) in Nilje pond whereas as in Goveli pond it was recorded in the range of 23°C (Jan-2015) to 30°C (June-214, March and May 2015).

Similar results were observed by Korgaonkar and et.al (2014) in Osargaon pond of Sindhudurga district, Maharashtra.

Temperature is a primary environmental factor that affects and governs the biological activities and solubility of gases in water. Owing to the gases in air, humidity, dust and other colloidal particles, the air temperature is always higher than water temperature (Mohammad et.al., 2015).
The water temperature during study period recorded in the ranged of 23°C (Dec-2014 and Jan-2015) to 28°C (Oct-2014, March, April and May-2015) in Nilje pond whereas in Goveli pond it was observed in the range of 22.5°C (Jan-2015) to 29°C (June-2014). Highest values of temperatures were recorded during June 2014 in both the ponds though it was rainy season ideally but during that year raining was started in the month of July 2014 and summer was prolonged hence highest temperature recorded in the month of June 2014. The minimum values of temperatures were recorded in the winter season in both the ponds. Similar findings were recorded by Jain et.al.(1996) and D.L. Bharamal and D.S. Korgaonkar (2015).

The electrical conductivity of water is related to the nature and concentration of ionized substances in the water and to the temperature of the water (Jain, Renu 2008). In present investigation electrical conductivity was recorded in the range between 210us/cm (July-2014) to 550 us/cm (February-2015) in Nilje pond and in Goveli pond it was recorded in the ranged of 140 (August-2014) us/cm to 370 us/cm (March-2015). The fluctuation in electrical conductivity in the both ponds during study may be due to inflow from surface runoff, discharge of sewage waste, washing clothes, bathing, immersion of Idol, discharge of silt and salts from agricultural field and cleaning vehicle any other anthropogenic activities. The maximum values were recorded in both the ponds during winter and summer season. Similar finding were recorded by Dixit et.al.(1989) and Jain Renu (2008).

Total dissolves solids value range between 20 mg/L (Sept-214) to 760 mg/L (December-2015) in Nilje pond whereas in Goveli pond recorded in between 80 mg/L (Feb-2015) to 260 mg/L (March-2015). Study shows that total dissolves solids shows high value during winter season in Nilje pond and in Goveli pond during summer may be due to evaporation rate of water.

Suspended solids value range between 0.0 mg/L (Nov-2014 and March-2015) to 440 mg/L (January-2015) in Nilje pond and 0.0 mg/L (July, September-2014 and January-2015) to 360 mg/L (May-2015) in Goveli pond. The higher fluctuation in the value may be due to torrential rain which through washes down the top soil. This event stops once the rainy season is over leading to a drastic fall in the value (Pandeyet.al., 2014).

Total solids value range between 140 mg/L (September 2014) to 1000 mg/L (December-2015) in Nilje pond and 140 mg/L (September 2014) to 460 mg/L (May-2016). Higher value of total solids recorded in Nilje ponds during winter season.

The Dissolved oxygen values recorded 5.68(April-2015) to 8.06 (August-2014) mg/L in Nilje pond whereas3.7 (June-2014) to 11.237 (March-2015) mg/L in Goveli pond. Fritsch (1907) stated that the oxygen contents would be low considering their high temperature in tropical water. Similar finding were also recorded by Pandey et.al (2014) in the ponds of Bilaspur District C.G.

The total hardness were recorded in Nilje pond between the range of 100 mg/L (July-2014) to 530 mg/L (May-2015) whereas in Goveli pond were recorded in the ranged of 100 mg/L (July-2014) to 350 mg/L (April-2015). The higher value of hardness ascribed to accumulation of dissolved materials due to water pollution by discharging sewage waste like any anthropogenic use like washing clothes, bathing etc. The higher value of hardness recorded in both the ponds during summer season. Hulyal and Kalival (2011) found that higher value in summer and lower in winter season. They attributed to decreases in water volume and increases in rate of evaporation at high temperature.

The chlorides values recorded in the range of 53.19 mg/L (July-2014) to 248.2 mg/L (February-2015) in Nilje pond whereas 35.46 mg/L (Jan, Aug, Sept-2015) to 159.57 mg/L (Feb and May 2015). The highest value recorded towards summer season in both the ponds and lower values in winter and rainy season. The higher concentration of chlorides is considered to be an indicator of higher pollution due to higher organic waste of animal origin (Moundiotiya et al., 2004). The concentration of chlorides in water bodies increases during summer season due to evaporation of water and concentration of salt due to increase in water and atmospheric temperature. Similar findings were also recorded by Jana (1973) at West Bengal and Sehgal (1980) at Surinsar Lake, Jammu. The chloride concentration of lake water depends upon the degree of pollution resulting from the waste materials poured into the ponds.

The total alkalinity values range between 75 mg/L (July-2014) to 525 mg/L (February-2015) in Nilje Pond and 75 mg/L (August-2014) to 300 mg/L (February- 2015). The higher value of alkalinity recorded in the both the ponds during winter season may be due to organic load. Natural water bodies in tropics usually show wide range of fluctuations in their total alkalinity value depending upon the geography and different season (Pandey et al., 2014).

The nitrate is the basic constituent of all organisms and plays a vital role in metabolism growth, reproduction and transmission...
of heritable characters (Mudgal et al., 2013). In the present investigation value of nitrate ranged between 0.15 mg/L (June-2014) to 0.97 mg/L (January-2015) in Nilje pond and 0.04 mg/L (June-2014) to 0.65 mg/L (March-2015) in Goveli pond. Similar fluctuations in nitrates value were found by Pejaver and Minakshi (2008) in Kalwa Lake, Thane.

In the present study values of phosphates range between 0.04 mg/L (March and April-2015) to 0.18 mg/L (January and February-2015) in Nilje pond whereas in Goveli pond values of phosphates found in the ranged of 0.12 mg/L (September and December-2014) to 0.63 mg/L (July-2014). The highest values recorded in Nilje pond in the winter season whereas in Goveli pond highest value recorded in the month of June-2014. Highest value of phosphates recorded in Goveli pond in the month of July 2014. Agricultural runoff during rainy season discharging phosphates into water bodies (Korgaonkar et al. 2014). Inflow of fertilizers and detergents into water body are responsible for high concentration of the phosphates, is stated by Tuzen et al (2002).

Silicates are an important chemical parameter of any water body which helpful to enhance the growth of diatoms and having the growth of silica shell (Pejaver and Minakshi, 2008). During present investigation, the range of silicates found in Nilje pond was between 4.8 mg/L (June-2014) to 13.88 mg/L (November-2014) while in Goveli pond it was between 5.18 (June-2014) to 19.38 mg/L (August-2014). Similar results finding also recorded by Pejaver and Minakshi (2008) in Jail and Kalawa Lake, Thane, Maharashtra.

In present study Salinity was recorded in the range of 0.128 ppt (June to September-2014) to 0.45 ppt (February-2015) in Nilje pond and 0.064 ppt (June to September-2014) to 0.96 ppt (April-2015) in Goveli pond. Salinity found higher in winter season to summer may be due to evaporation of water and concentration of salts and minerals. Similar findings were also recorded by Pejaver and Minakshi (2008) in Jail and Kalawa Lake, Thane, Maharashtra.

Biological Oxygen Demand is dissolved oxygen required by micro-organism for aerobic decomposition of organic matter present in water (Pandey et al., 2014). Jain and Dhamija (2000) found that Biological Oxygen Demand as an important parameter in aquatic ecosystem to establish the status of pollution. BOD value in present investigation recorded in the range of 2.4 mg/L (August-2014) to 7.8 mg/L (May-2015) in Nilje pond whereas in Goveli pond between 2.1 mg/L (November-2014) to 6 mg/L (May-2015). The maximum BOD value recorded in both ponds during summer season. Similar findings were reported by Yadav et al., (2013) they found highest value of BOD in early rainy season. Seasonally, the Biological oxygen demand was highest during late summer/early rainy season. High BOD during late summer/early rainy season may be due to the presence of several microbes in water bodies (Pandey et al., 2014).

In the present investigation COD value recorded in the range of 20 mg/L (August and December-2014) to 80 mg/L (May-2015) and in Goveli pond it was recorded in between the range of 16 mg/L (December-2014) to 152 (June-2014). Lowest value of COD recorded in the winter season whereas highest value recorded in the summer season but in Goveli pond it was recorded in the month of June though its falls in monsoon season but during 2014 raining was started from the month of July-2014 hence June-2014 may be considered as summer for this study. The higher value of COD recorded in summer may be due to higher organic load in the ponds and also because of higher evaporation rate of water during summer which leads concentration of all the chemical constituents, compounds, minerals and salts and may help to increase COD level of pond water. Similar results were observed by Pandey et al. (2014) in pond water of Bilaspur district, Dakshini and Soni (1979) stated that domestic sewage and industrial waste are main factors responsible for increase in COD values which they studied in Yamuna river.

The concentration of CO2 recorded in the range of 0.0 mg/L (February-2015) to 17.6 mg/L (July-2014) in Nilje pond whereas in Goveli pond it was recorded between 0.0 mg/L (November-2014) to 22 mg/L (June2014). The released of Carbon dioxide in the atmosphere reduces concentration of CO2 in water. Some amount of CO2 also consumed by photosynthetic organisms like aquatic flora (Phytoplankton and macrophytes) which may decrease the concentration of CO2 in aquatic ecosystem.

CONCLUSION

According to present study we can conclude that all the physico-chemical parameters of Nilje and Goveli ponds were within permissible limit as per Indian Standard for drinking water but above the permissible limit as per WHO standards for drinking water hence water of these ponds may be utilize for domestic use and human consumption with some precautionary treatment. The present study may also help to provide baseline data to stakeholders and government officials to plan conservation strategies and monitor these water bodies.

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