Physico-Chemical Parameters of Water in Madiwala Lake of Bangalore

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ABSTRACT

The Physico-Chemical studies of Madiwala lake have been studied. The water samples were collected from a point near the middle of the lake and analyzed for important water quality parameters like total dissolved solids, pH, dissolved oxygen, biological oxygen demand, nitrate, orthophosphate and Common water quality parameters like turbidity, temperature, total hardness, sulphates, total alkalinity, electrical conductivity. The results were compared with the values stipulated by WHO for drinking water quality. The pH exceeded the maximum limit of 9.0 recommended in the standards for treated wastewater. BOD exceeded permissible limit of 6 mg/l said by the WHO standards. The nitrate levels were within limits prescribed by all drinking water standards. All other parameters were all well within permissible limits. The water is safe based on most of the chemical parameters examined, the water may be unsafe due to poor microbial quality. The present study was carried out from March, 2012 to February, 2013. The study provided the much needed baseline data to review the problems associated with the water quality.

Keywords: Physico-chemical parameters, Lake, Madiwala, Eutrophication

1. INTRODUCTION

Water is an essential component for survival of life on earth, which contains minerals, important for humans as well as for earth and aquatic life [1]. Lakes and surface water reservoirs are the planet's most important freshwater resources and provide innumerable benefits. They are used for domestic and irrigation purposes, and provide ecosystems for aquatic life especially fish, thereby functioning as a source of essential protein, and for significant elements of the world's biological diversity .Water is one of the important source, to sustain life and has long been suspected of being the source of much human illness. Source of surface water and ground water have become increasingly contaminated due to increased industrial and agricultural activity. The quality of surface water is largely affected by natural processes (weathering and soil erosion) as well as anthropogenic inputs (municipal and industrial wastewater discharge).The anthropogenic discharges represent a constant polluting source, whereas surface run off is a seasonal phenomenon, largely affected by climatic conditions [2-4]. The public desires water that is low in hardness and total solids, non- corrosive and non- scale forming. To provide such water, chemists,

biologists and engineers must combine their efforts and talents. Chemists, through their knowledge of colloidal, physical and organic chemistry are especially helpful in solving problems related to the removal of colour, turbidity, hardness, harmful metal ions and organic compounds and to the control of corrosion and scaling. The biologists is often of great help in taste and odor problems that derive from aquatic growths. The present study was carried out water quality of Madiwala lak, From March 2012 to February2013 the water quality survey of Madiwala Lake was conducted. The study provided the much needed baseline data to review the problems associated with the water quality.

2. MATERIALS AND METHODS

The Madiwala lake is located at 12^0 55.4'' N latitude 077^0 29', 14.6" E longitude near the BTM Layout, which is towards South of Bangalore. With elevation of 900m. Sampling was made once during the study period between 11.00 AM to 17.00 PM on each sampling day. The water samples for physical and chemical water quality were taken from a point near the middle of the lake.The samples for the routine analysis of parameters were collected in 500ml polyethylene bottles. The DO samples were collected in 250ml glass bottles and fixed in field with Winkler's reagent. The samples for determining the BOD were collected in 250ml dark bottles. The temperature (^{0}C), pH and conductivity (micromhos/cm) were determined in the field. The methods used for determining Total hardness, Total alkalinity, COD, Nitrate, Phosphate, Sulphate, Total dissolved solids were adopthed from APHA 1995[5]

3. RESULTS AND DISCUSSION

The Water temperature was taken as a routine measure and varied 23.5 to 28.6^{0}C depending on the time of sampling. Temperature influences the process behavior in lakes [6] and its measurement was necessary to get overall view of temperature regime during the sampling period.

Table 1 Summarizes the range of values determined for six important parameters and compares this against the most stringent drinking water standards available. The factors of concern here were the pH, dissolved oxygen (DO) and biological oxygen demand (BOD). The undesirable pH levels are likely to be associated with eutrophication and also exceeded the maximum limit of 9.0 recommended in the standards for treated waste water.

The pH measurements were done during the day. The photosynthesis and respiration of algae in eutrophic waters are known to influence the pH [7]. Dissolved oxygen (DO) is not specified in drinking water standards since it influences all biological and chemical processes, it must be measured during water quality assessments [8].Dissolved oxygen below 5mg/l affects the functioning of aquatic communities [9]. Although there is no specific water quality standards set

for biological oxygen demand (BOD), it has been traditionally used as an indicator providing an approximate measure of degradable organic matter present in the water. Unpolluted water usually have BOD of 2 mg/l or less [9] and WHO standard indicated as 6 mg/l, although Madiwala lake exceeded this limit, the lake also exceeded permissible limit of 6 mg/ l said by the WHO standards.

The nitrate- N levels were within limits prescribed by all drinking water standards. None of the standards recommended the maximum limit of orthophosphate or total phosphorus. The levels determined for both parameters indicated the Madiwala Lake was eutrophic [10].Nitrate in excess of 0.2 mg/ l tends to stimulate algal growth and a little as 0.01mg/l of phosphorus can trigger algal blooms. Phosphate is largely responsible for eutrophic condition and if it is not limiting. Cyanobacteria can fix nitrogen from the atmosphere and develop algal blooms [11]. During the study period, Madiwala and around villagers were seen washing clothes in the lake and the detergents used were promoting algal blooms.

Table 2, presents the range of six common parameters used for assessing water quality. There are no guidelines for alkalinity in standard compared, but these are good indicators of productivity [12] all other parameters were all well within permissible limits. The aquatic macrophytes was not cleared at all from the Madiwala lake, tend to accumulate vast quality of organic matter and this could account for the differences in sulphate.

While the water is safe based on most of the chemical parameters examined, the water may be unsafe due to poor microbial quality. Considering the significant contamination of lake by animal feces and unacceptable levels of DO and BOD seems in the lake, this explanation seem plausible. The aesthetic quality water, especially its green colour and the undesirable odour associated with algae is a strong deterrent for drinking, although the water quality managers parameters. This lake mainly used for watering animals and domestic purposes other than drinking

4. CONCLUSION

The pH exceeded the maximum limit of 9.0 recommended in the standards for treated wastewater. BOD exceeded permissible limit of 6 mg/l said by the WHO standards. The nitrate levels were within limits prescribed by all drinking water standards. All other parameters were all well within permissible limits. The water is safe based on most of the chemical parameters examined, the water may be unsafe due to poor microbial quality. The aesthetic quality water, especially its green colour and the undesirable odour associated with algae is a strong deterrent for drinking, although the water quality managers parameters. This lake mainly used for watering animals and domestic purposes other than drinking.

Table 1. Important Water Quality Parameters of Madiwala Lake

PARAMETER	RANGE	STANDARD	SOURCE
TDS(mg/l)	338-753	500	WHO
pH	7.4-9.2	6.5-9.2	WHO
DO(mg/l)	2.7- 7.0	5.0-10.0	CHAPMAN & KIMSTACH
BOD(mg/l)	17.7-53.0	6.0	WHO
Nitrate(mg/l)	0.4-8.4	10.0	UPSH
Orthophosphate(mg/l)	1.6-13.0	0.1	--

Table 2. Common Water Quality Parameters of Madiwala Lake

PARAMETER	RANGE	STANDARD	SOURCE
Electrical Conductivity (micromhos/cm)	553-1221	400	European std.
Total Alkalinity (mg/l)	141-346	120	WHO
Sulphates (mg/l)	10.2-28.4	250	WHO
Total Hardness(mg/l)	344-518	500	WHO
Temprature (^{o}C)	22.4-28.6	---	----
Turbidity(FAU)	5.0-24.0	<5 FAU	WHO

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