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Research article

STUDIES ON PHYSICO CHEMICAL CHARACTERISTICS OF KOTEGANGURU TANK, SHIVAMOGGA, KARNATAKA, INDIA

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ABSTRACT: An investigation was carried out in Koteganguru tank near Shivamogga town on physico-chemical characteristics during January to December 2007. The results of physico-chemical parameters were compared with the standard values prescribed by the Bureau of India Standards (BIS) and World Health Organization (WHO). The study revealed that, tank water is polluted as it possesses high BOD, CO_2, phosphate and nitrogen. In the light of standard of water quality recommended by WHO, the tank water should not be used by human beings especially for drinking and cooking.

Key Words: Koteganguru tank, Physico-chemical parameters, Shivamogga

INTRODUCTION

Water is one of the abundantly available substances in nature, which man has exploited more than any other resources for the sustenance of life (Shinde et al., 2011).Ponds and tanks are important multi-usage components, they are sources of irrigation, fishery and other domestic purposes (Hocioglu and Dulger, 2011).Water is an essential component of the environment and it sustains life on the earth. Due to over expanding population and industrial settlements, the demand for fresh water is increasing day by day. In today's scenario, unplanned urbanization, rapid industrialization and indiscriminate use of artificial chemicals cause heavy and varied pollution in aquatic environments leading to deterioration of water quality and depletion of aquatic fauna. Even the stagnation of water in ponds and tanks causes severe problems in aquatic ecosystem and in damaging the water quality. Physico-chemical parameters play a vital role in determining the distributional pattern and quantitative abundance of organisms inhabiting a particular aquatic ecosystem (Santhoshkumar Singh *et al*., 2009). Several investigators have studied the physico-chemical dynamics of varied lentic water bodies with the intent to assess the water quality (Begum et al., 2010; Sayeswara et al., 2010; Begum et al., 2011; Purushothama et al., 2011; Purushothama et al., 2011a; Sayeswara et al., 2011; Sayeswara et al., 2011a; Sayeswara et al., 2011b; Mahesh Anand Goudar & Sayeswara, 2011; Sayeswara et al., 2012; Vasantha Naik et al., 2013; Sayeswara, 2014).

MATERIALS AND METHODS

Water was sampled on monthly basis, between 7 to 9 am from January to December 2007. This water samples were collected in good quality polythene bottles. Water temperature was recorded at the sampling site itself. Dissolved oxygen was fixed on the spot itself in BOD bottles. Various parameters like turbidity, total hardness, sulphate, free CO_2, alkalinity, BOD, TDS, phosphate, nitrate and chloride were estimated as per the standard methods (APHA, 1998).

Study area

Koteganguru tank is an annual water body receiving water from the adjacent paddy fields and rain is the main source of water. The total area of Koteganguru tank is about 18 acres of which water spreads over an area of 15 acres with an average depth of 7 feet. It is located at Koteganguru village, 3.2 km away from Shivamogga town. The water is used for domestic purposes like washing of clothes, vehicles and for domestic animals, etc.

The water has undergone moderate changes in its physico-chemical properties due to ecological degradation, overflowing of water from adjacent paddy fields and other excessive human activities. In the present investigation, an attempt has been made to assess the suitability of water for human consumption and domestic purposes.

RESULTS AND DISCUSSION

The results of monthly and seasonal variation of physico-chemical parameters of Koteganguru tank are given in Table 1 and depicted in Figures 1 & 2.

Temperature: The water temperature is largely influenced by local climatic conditions. The seasonal water temperature ranged from 17.9 to 25.8^{o}C. The minimum value was recorded in June and maximum in April. Turbidity is a measure of cloudiness of water. Turbidity in natural water arises due to the presence of suspended matter such as clay, silts, finely divided organic and inorganic matter, phytoplanktons and other microscopic organisms. The values of turbidity ranged from 9.3 to 59.1 NTU. The highest and the lowest values were recorded in July and March, respectively.

pH: pH values are slightly acidic to slightly alkaline and found within permissible limit of 6.5 to 8.5 as per the Bureau of Indian Standards (BIS, 1993). The minimum value was observed during January (6.3) and maximum during July (7.6). The pH is important since aquatic organisms are well adapted to specific pH range and do not withstand abrupt changes in it.

Dissolved oxygen: Dissolved oxygen is an important gaseous factor that determines the quality of water and intern regulates the distribution of aquatic organisms. In the present study the DO level fluctuated between 1.6 to 3.8mg/L. The highest and the lowest values were recorded in August and April, respectively. The variations of DO depend on the primary production and respiration of aquatic organisms. The permissible standard of DO is above 5mg/L (Perk and Park, 1980).

Biological Oxygen Demand: BOD is the measure of degradable organic matter present in water. BOD and other microbial activities generally increase by the introduction of sewage (Hynes, 1971). In the present study BOD values ranged between 6.2 to 8.3 mg/L. The minimum value was noticed in the month of July while maximum in September. They were found above the permissible limit of 6.5mg/L (WHO, 1991).

Carbon dioxide: Free carbon dioxide values fluctuated between 11.7 to 29.1 mg/L. The highest and the lowest values were recorded in January and March, respectively. The variation of CO_2 was due to the absorption by plants for photosynthesis and activity of other living organisms.

Alkalinity: Alkalinity in the water samples is primarily a function of carbonate, bicarbonate and hydroxide content. In the present study total alkalinity ranged from 51.7mg/L (November) to 80.1 mg/L (January). It is within permissible limit of 600mg/L (BIS, 1993). Surface alkalinity may result from the discharge of domestic wastes.

Total Dissolved Solids: TDS values ranged from 32.7 to 62.1mg/L, the minimum was recorded in October and maximum in April. The minimum value may be due to the stagnant condition of the water body. The values are within permissible limits of 1500 mg/L (BIS, 1993).

Total Hardness: Total hardness of water is not a pollution parameter but indicates water quality mainly in terms of Ca^{2+} and Mg^{2+} contents. Total hardness values observed are 63 to 127mg/L. The minimum value was recorded in October and maximum in May.

Chloride: Chloride is an important anion found in variable amounts in water bodies. Chlorides increase the degree of eutrophication (Goel *et al.,* 1980). In the present study, chloride values fluctuated between 63.9mg/L (September) to 91.9 mg/L (May). High chloride content indicates the deterioration of water quality usually linked with sewage load (Mini *et al.,* 2003). The most important sources of chlorides in the fresh water are the discharge of domestic sewage and farm drainage. The concentration of chlorides is thus the indicator of pollution.

Phosphorus: Phosphorus occurs in natural water as various types of phosphates. The most important sources of phosphates are the discharge of domestic sewage, detergents and agricultural runoff. Values of phosphates ranged from 0.9 to 2.3 mg/L with the minimum value in February and maximum in November.

Nitrates: Most of the unpolluted sources of water are deficient of nitrates because it exists only in few natural sources (Trivedy and Goel, 1984). In the present study, nitrate values ranged from 4.2 to 7.7 mg/L. The minimum value of nitrate was noticed in the month of October while maximum in May.

Sulphate: Sulphate is one of the major onions occurring in natural waters. It may enter natural waters through weathering of sulphate bearing deposits. The values fluctuated between 6.6 to 11.7mg/L. The minimum value was recorded in July and maximum is January.

The water samples from Koteganguru tank was collected and analyzed for various physico-chemical parameters to study the extent of pollution. Planktonic composition was also studied. DO was very low and BOD, CO_2, phosphate and nitrogen values were significantly higher than the permissible level for domestic consumption. In the light of standard of water quality recommended by WHO, the tank water should not be used by human beings especially for drinking and cooking.

Precautionary measures should be taken before the water is consumed. In order to maintain the health of the tank with respect to water quality it is essential that authorities should take immediate step on the following points.

***** People should not be allowed to discharge domestic wastes directly in to the tank.
***** Washing of clothes and vehicles should be prevented.
***** Awareness should be created regarding the impact of water pollution on the human health.
***** People should be advised at least to boil the water to disinfect the pathogens before used for drinking purpose.

Table 1. Physico-chemical characteristics of Koteganguru tank water.

Parameters	Months:2007											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature	22.5	21.6	23.3	25.8	20.1	17.9	20.3	22.1	21.9	22.4	21.8	21.7
pH	6.3	6.7	6.6	7.3	7.1	6.8	7.6	7.4	7.3	7.1	7.1	7.2
DO	2.1	2.2	1.9	1.6	2.6	2.9	3.1	3.8	3.1	2.6	2.3	2.2
BOD	6.1	7.2	6.6	7.5	8.1	7.3	6.2	7.2	8.3	7.1	7.1	7.7
CO_2	11.7	13.7	29.1	21.1	22.5	17.2	16.7	21.5	17.3	17.1	21.2	23.7
Alkalinity	80.1	71.4	61.8	80.5	71.3	68.4	70.1	62.9	60.8	51.9	51.7	60.1
TDS	48.1	32.1	40.9	62.1	41.3	40.2	40.9	41.1	39.2	32.7	43.7	44.7
TH	87	92	99	90	127	82	70	71	69	63	82	77
Chloride	66.7	71.4	83.9	91.4	91.9	92.1	64.5	70.1	63.9	72.1	77.3	82.7
Phosphate	1.1	0.9	1.2	1.0	1.8	1.2	1.6	1.5	1.1	1.1	2.3	1.7
Nitrate	5.3	5.1	6.3	6.1	7.7	6.1	6.1	5.2	5.6	4.2	5.2	6.1
Sulphate	11.7	9.2	7.1	7.3	10.2	8.4	6.6	8.1	8.8	10.1	9.3	7.7

All values are expressed in mg/l except pH, temperature (^oC) and turbidity (NTU)

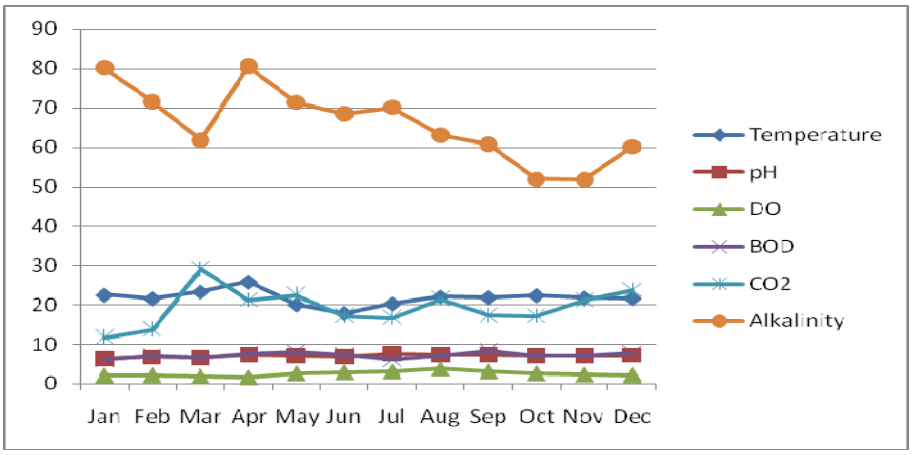

Figure 1. Physico-chemical characteristrics of Koteganguru tank

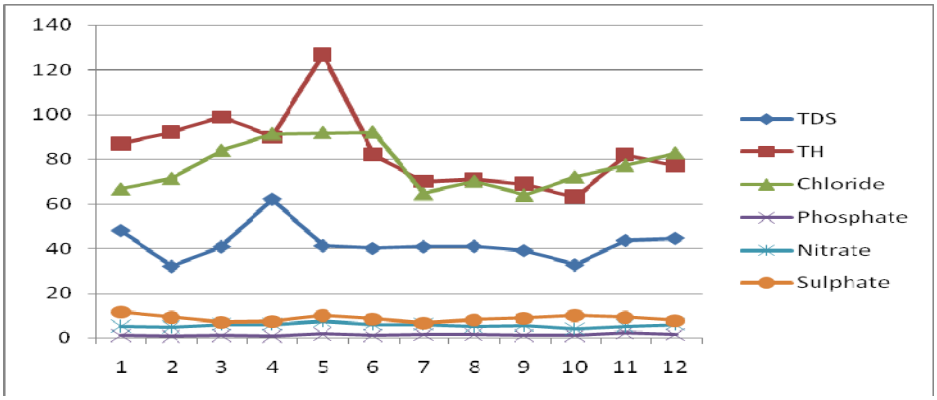

Figure 2. Physico-chemical characteristrics of Koteganguru tank

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