Original Research Paper

Study of Physico-Chemical Characteristics of Ganesh Tank, Miraj, District Sangli, Maharashtra

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ABSTRACT

Physico-chemical parameters of Ganesh tank water were studied monthly during December 2007 to November 2009 for determination of water quality. Various parameters such as atmospheric temperature, water temperature, pH, electric conductivity, transparency, DO, free CO_2, alkalinity, hardness of water, chlorides, nitrates and phosphates. The results revealed that there was significant seasonal variation in some physico-chemical parameters and some parameters like hardness, chloride and solids were at higher side of drinking water limits indicating polluted quality of water.

INTRODUCTION

Water resources are of great significance for various activities such as drinking, irrigation, fish production, power generation and many others. Significance of water as a potent ecological factor can be appreciated only by studying its physico-chemical and microbial characteristics. The present investigation deals with the study of physico-chemical parameters of water of Ganesh tank, Miraj. The geographical location of Ganesh tank is 16°40' to 17°43' north latitude and 73°43' to 75°00' east longitude in District Sangli in Maharashtra. The area of Ganesh tank is 15400 square meters, length 140 meters and breadth 120 meters. Ganesh tank is polluted due to domestic use, washing clothes, bathing etc., and especially due to emersion of Ganesh idols during Ganesh Chatturthi festival period and silt was settled down at the bottom of the tank. To find out the changes due to these activities, present investigation was carried out.

MATERIALS AND METHODS

Water samples were collected in clean two-litre black plastic cans from two sampling sites at 9:00 a.m. to 11:00 a.m. regularly every month and immediately brought to the laboratory for the estimation of physico-chemical characteristics. Some of the tests like, temperature, transparency and pH were recorded at sites, while rest of the parameters were tested in the laboratory by using standard methods as prescribed by APHA (1985) and Trivedy & Goel (1984).

RESULTS AND DISCUSSION

The results of the physico-chemical analysis of water samples are given in Table 1. The temperature of the water ranged from 21°C to 32°C. Maximum temperature was recorded in May (summer), and minimum in December (winter). Temperature has both direct and indirect effect on aquatic ecosystem. Variations in water temperature occur both seasonally and daily.

Secchi disc transparency is highly variable and helps to determine the productive zone of water body (Golterman et al. 1978). Transparency values ranged from 35 to 78 cm. The water transparency value was maximum in summer, and minimum in monsoon.

In the present study pH of the water was within a range of 6.3 in December to 8.9 in July. According Swingle (1969) water having a pH range of 6.5 to 9 is most suitable for pond aquaculture. The pH of tank water undergoes seasonal changes. Normally higher pH is recorded during rainy and part of summer days.

The electrical conductivity value in the present study vary from 1797 µmhos/cm in November to 3177 µmhos/cm in June. The high values of electrical conductivity are due to concentration of ionic constituents present in the tank water and reflect the contribution from salinity. The E.C. values were higher than the WHO permissible limit. The electrical conductivity value greater than 400 µmhos/cm may be attributed to a high chloride concentration in water (Davies & Dewist 1966).

The dissolved oxygen in water ranged between 4.72 and 8.20 mg/L. The main source of dissolved oxygen is from atmosphere and by photosynthesis through aquatic flora. Several workers observed similar trends of results in freshwater bodies from Kolhapur and Sangli districts (Angadi 1986, Khabade 2002).

The pH of water is largely governed by carbon dioxide, carbonates and bicarbonates equilibrium (Chapman 1996).

Table 1: Physico-chemical characteristics of Ganesh tank water. Average of two sites from December 2007 to November 2009.

Months	Years	Air temp	Water temp	Transp- arency	pH	E. con- ductivity	DO	CO_2	Total alkality	Total hardness	Chloride	Nitrate	PO_4
Dec	07	22.0	21.0	127.75	7.74	2355	4.85	0.95	64.25	805	228.7	0.015	0.345
	08	21.5	19.7	129.91	6.30	2307	6.65	-	71.75	817	300.0	0.034	0.472
Jan	08	24.5	21.0	116.21	7.66	2405	7.2	0.95	64.25	825	262.5	0.048	0.507
	09	25.2	22.0	125.43	7.25	2362	5.22	0.04	93.75	937	318.7	0.009	0.088
Feb	08	29.0	28.0	96.49	7.82	2310	4.82	0.95	64.25	782	300.0	0.057	0.615
	09	29.7	24.4	110.41	7.51	2640	5.85	0.04	82.25	1042	335.0	0.020	0.403
Mar	08	30.5	29.0	67.41	7.47	2620	4.72	0.95	53.25	755	210.0	0.014	0.335
	09	34.3	29.3	74.91	7.55	2587	5.77	0.04	64.00	1105	257.5	0.015	0.269
Apr	08	34.0	30.0	54.54	7.73	2347	4.82	-	64.00	755	172.5	0.012	0.312
	09	35.6	30.0	62.05	7.20	2775	5.70	0.04	79.25	452	100.0	0.080	0.130
May	08	38.2	31.0	62.04	7.31	2242	5.20	-	53.25	835	88.25	0.008	0.021
	09	39.0	32.5	61.91	7.74	2945	6.30	0.04	73.75	1307	335.0	0.082	0.212
June	08	30.2	27.0	47.91	7.69	2345	8.20	-	32.00	815	315.7	0.002	0.440
	09	34.0	29.8	51.77	7.41	3177	6.77	0.06	58.75	1472	390.0	0.077	0.917
July	08	31.0	27.6	45.51	6.74	2397	3.82	0.04	42.00	815	318.2	0.007	0.360
	09	28.2	25.1	44.33	8.92	2925	6.77	0.04	79.00	1410	383.7	0.090	0.974
Aug	08	30.3	26.8	53.37	8.45	2315	6.72	-	105.00	812	292.5	0.008	0.375
	09	29.0	26.0	41.46	8.10	2987	7.25	-	93.25	1442	381.2	0.093	0.866
Sep	08	32.2	28.0	65.43	8.50	2507	6.52	-	62.50	845	266.2	0.010	0.105
	09	33.5	28.8	54.76	8.54	2550	6.80	-	61.75	845	370.0	0.010	0.121
Oct	08	30.1	27.5	79.26	8.92	2400	6.42	-	72.50	852	267.5	0.010	0.220
	09	30.5	27.0	70.22	8.68	2547	6.77	-	71.75	860	347.5	0.014	0.215
Nov	08	27.7	25.0	109.14	7.55	2315	6.77	-	108.75	912	237.5	0.012	0.345
	09	28.0	27.6	106.06	7.83	1797	6.85	0.82	63.00	887	321.2	0.015	0.440

All the values are in mg/L except temperature (°C), Transparency (cm), Electrical conductivity (mmhos/cm) and pH.

In the present study the values of free carbon dioxide ranged from 0.04 to 0.95 mg/L. The growing plants and lime depositing bacteria and other animals may cause a depletion in carbon dioxide resources (Verma & Agarwal 1982). The intense sunlight during winter and summer seem to accelerate photosynthesis by phytoplankton thereby utilizing carbon dioxide and giving oxygen.

Alkalinity of the water samples ranged from 53 to 108 mg/L. Goel et al. (1988) have recorded the total alkalinity in various water bodies of south-western Maharashtra, and the values varied from 52.5 to 182.5 mg/L in Kalamba lake, 115 to 457 mg/L in Ambedkar tank and 100 to 320 mg/L in Aundh pond. Similar type of trend has been found in the present study.

The total hardness of the tank varied from 755 to 1472 mg/L. The acceptable limit for total hardness is 500mg/L. Presence of higher total hardness in the tank may be due to the water receiving calcium and magnesium leached from the rocks and other deposits like limestone, dolomites, calcite, gypsum and also immersion of Ganesh idols. Goldman & Wetzel (1963) correlated hardness with organic productivity.

Chloride occurs naturally in all types of water. Chloride is an important element in plant and animal life. In the present study values of chloride ranged from 100 to 390 mg/L. The WHO and BIS recommended limit for chloride is 250mg/L. The chloride concentration is an indicator of pollution. Goel et al. (1988) reported higher values of chloride ranging from 10.66 to 455 mg/L in some freshwater bodies from southern Maharashtra.

The concentration of nitrate was in the range of 0.002 to 0.093 mg/L. In the present study nitrates were in the lower quantities, which may be due to utilization by phytoplankton and macrophytes. Similar type of range has been reported by Shastri & Pendse (2001).

Phosphorus is required for plant growth and its natural occurrence in lakes is very small. It helps in algal growth and eutrophication. The values of phosphate ranged from 0.0021 to 0.91 mg/L. Shastri & Pendse (2001) have reported the phosphate range from 0 to 0.12 mg/L in Dahikhuta reservoir.

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