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Assessment of Physico-Chemical Parameters in Mantrala Lake, Hyderabad

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ABSTRACT

The present paper deals mainly with the study of physico-chemical parameters assessment in Mantrala lake, Hyderabad. Physico-chemical parameters of water are a prime consideration to assess the water quality of a lake for its best utilization. Surface water samples were collected from the lake every month during December, 2013 to November 2014. The physico-chemical parameters studied included pH, chlorides, nitrates, phosphates, total solids, total dissolved solids, total hardness, magnesium, carbonates, bicarbonates, dissolved oxygen and organic matter from 3 different stations. Physico-chemical parameters of the water samples such as pH (8.2 - 8.92), chlorides (344.46 – 396.66 mg/L), nitrates (8.55 – 14.6 mg/L), phosphates (6.22 – 11.2 mg/L) , total solids (840 - 990 mg/L), total dissolved solids (550 - 680 mg/L), total hardness (410.26 – 526.58 mg/L), magnesium (70.42 – 98.24 mg/L), carbonates, (32.18 – 54.58 mg/L), bicarbonates (222.24- 298.56 mg/L), dissolved oxygen (1.2 – 3.2 mg/L) and organic matter (5.4 - 9.2 mg/L) were recorded in the present investigation. The values obtained in the present study were not acceptable according to drinking water quality standards (WHO, 1990).

Keywords: Physico-Chemical Parameters, Mantrala Lake and Water Quality.

I. INTRODUCTION

Water the essence and sustenance of life, is among the biggest and the most crucial natural resource both in terms of quantity and quality. Water pollution caused by plethora of human activities primarily affects physico-chemical characteristics of water leading to destruction of community disrupting delicate food webs, deteriorating lake environments (Chrost and Olson, 1991). When pollutants enter lakes and other water bodies, they get dissolved or lie suspended in water or get deposited on the bed. The discharge of waste from industries, agriculture, and urban communities into water bodies generally stretches the biological capacities of aquatic systems. Chemical run-off from fields also adds nutrients to water. Excess nutrients cause the water body to become choked with organic substances and organisms (Trivedi and Goel, 1987). The aquatic plants and animals bring about changes in the chemical composition of water (Nair et al., 1988). Eutrophication can produce problems such as bad tastes and odours as well as green scum algae (Lendhe, and Yeragi, 2004).

Also, the growth of rooted plants increases, which decreases the amount of oxygen in the deepest waters of the lake. The water quality of all fresh water environments is assessed by the physico- chemical parameters.

II. MATERIAL AND METHODS

The lake under investigation in the present study Mantrala Lake is situated in the Hyderabad of Telangana state. Three sampling stations were identified at Mantrala lake. Surface water samples were collected from each station and analyzed at monthly intervals during December,2013 to November 2014. water samples were collected in clean polythene containers. The three spots identified were S-I, S-II and S-III for the analysis. Analysis of certain physico-chemical parameters were carried out by standard methods (APHA. 1989).

III. RESULTS AND DISCUSSION

Monthly variations in physico-chemical parameters of Mantrala Lake are depicted in Table 1-3.

pH is an important quality parameter which influences the survival and nourishment of biological life. The values of pH in water varied from a minimum of 8.2 in April at S-III and maximum of 8.92 in the month of

March. High concentration of chloride in the water gives an undesirable taste to water. Chloride was found high in the month of November. Chlorides of the lake, during the study period ranges from maximum of 396.66 mg/l to minimum of 344.46 mg/l. In the current investigation, the chloride content was high due to discharge of domestic sewage. Ecological importance of phosphates is significant due to its role in biological metabolism. The major sources of phosphate in the lake are domestic sewage, agricultural eff luents etc. During the study period, the concentration of phosphates recorded from 6.22 – 11.2 mg/l.

Total hardness of the lake, during the study period ranges from maximum of 526.58 to minimum of 410.26 mg/l. High values of hardness may be probably due to regular addition of sewage and detergents. Discharge of the sewage is one of the factors which contribute to the hardness of water (Hosmani, 1999). Lower dissolved oxygen in summer was due to high temperature and low solubility of oxygen in water. A fair amount of dissolved oxygen is always essential to support aquatic life (Trivedy et al., 1989). In Mantrala Lake, the amount of dissolved oxygen recorded ranges f rom 1.2 – 3.2 mg/l.

The values of total dissolved solids (TDS) in water varied from a minimum of 550 mg/L in September and maximum of 680 mg/L in July. Determination of solids is relevant in the present study in view of their ecological significance in an aquatic ecosystem (Tiwari, et al.,. 2004). Concentration of total solids in the water ranged from 840 - 990 mg/l. Carbonates were present in low concentration when compared to bicarbonates. The high values of carbonates may be due to dissolution of calcium carbonate in bottom layer of lake (Wetzel and Likens, 2000).

Oxidizable organic matter is determined as the oxygen consumed by the sample from permanganate and is designated as carbonaceous organic matter. Concentration of organic matter in the water ranged from 5.4 – 9.8 mg/l. Organic matter exhibited an inverse relation with dissolved oxygen this trend confirms the utilization of dissolved oxygen to decomposition of organic matter which is accelerated at high temperatures (Parvateesam and Sudha Gupta, 1994).

IV. CONCLUSION

This study showed detailed limnological characteristics and quality of water in Mantrala Lake, Hyderabad. The summer being the post-monsoon and pre-monsoon seasons showed seasonal fluctuations in various physico-chemical parameters. The values are above the limits of WHO standards. The values obtained in the present study were not acceptable according to drinking water quality standards (WHO, 1990).The water is getting polluted mainly by the domestic wastes and plastic bottles dumped in certain stations of the lake.

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Table 1. Physico-chemical parameters at S-I

Parameters	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	Feb
pH	8.81	8.64	8.81	8.26	8.44	8.28	8.82	8.68	8.42	8.44	8.24	8.64
Chlorides	389.52	392.96	369.22	397.22	388.22	346.58	358.22	366.54	347.22	356.58	369.55	396.22
Nitrates	12.2	14.6	9.22	9.88	11.22	8.9	10.2	8.98	10.28	11.22	13.62	8.55
Phosphates	8.2	6.7	7.89	8.90	7.88	9.20	7.88	6.92	7.22	6.96	6.22	8.46
Total solids	950	920	870	840	880	920	910	920	870	850	910	880
Total dissolved solids	620	640	630	610	680	670	550	580	610	590	660	670
Total hardness	514.36	520.66	488.86	478.49	510.28	498.22	470.45	460.25	410.26	487.56	462.26	510.48
Magnesium	88.52	94.64	86.26	98.24	86.24	72.24	80.89	81.24	92.28	94.89	82.26	88.55
Carbonates	38.26	34.66	54.58	52.24	48.52	44.56	51.24	48.22	39.88	40.22	45.66	46.88
Bicarbonates	258.56	246.24	278.88	289.55	245.66	289.22	284.22	248.55	256.55	289.66	247.66	254.22
Dissolved oxygen	2.2	2.8	2.4	2.2	2.9	1.9	1.8	2.2	2.0	2.2	1.8	1.6
Organic matter	6.9	6.5	7.2	6.2	6.4	6.4	5.8	5.4	5.6	6.2	5.8	5.4

Table 2. Physico-chemical parameters at S-II

Parameters	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
pH	8.72	8.84	8.60	8.5	8.82	8.55	8.26	8.82	8.54	8.88	8.45	8.44
Chlorides	392.24	385.86	386.22	374.56	392.56	366.86	389.22	376.52	396.22	372.28	376.55	368.96
Nitrates	14.2	11.56	11.88	13.22	14.56	12.89	13.24	14.56	11.56	12.22	13.88	12.46
Phosphates	8.7	7.9	6.8	7.6	7.4	8.2	8.6	8.9	7.8	7.4	6.8	7.2
Total solids	970	990	910	950	890	875	950	920	940	910	940	930
Total dissolved solids	660	620	590	610	660	620	650	640	660	590	580	570
Total hardness	490.24	486.88	470.56	510.14	520.86	526.58	214.56	523.26	490.86	480.24	510.28	510.22
Magnesium	88.98	82.26	92.26	91.45	86.54	89.56	92.24	96.86	94.56	91.26	90.24	89.45
Carbonates	42.26	38.96	41.25	36.64	35.56	41.24	40.24	54.56	48.62	38.26	46.58	42.24
Bicarbonates	272.36	286.56	296.24	276.52	286.64	271.56	298.56	254.21	270.58	256.68	254.22	268.66
Dissolved oxygen	2.2	3.2	2.8	2.1	1.8	1.6	2.4	2.8	2.2	1.6	1.8	1.4
Organic matter	6.8	5.8	5.4	6.8	7.2	7.4	7.6	7.2	6.4	6.2	5.8	5.4

Table 3. Physico-chemical parameters at S-III

Parameters	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Jan**	**Feb**
pH	8.92	8.2	8.4	8.62	8.86	8.48	8.88	8.42	8.66	8.48	8.24	8.56
Chlorides	396.65	389.56	382.22	396.66	368.44	372.56	344.46	374.56	344.58	362.22	392.54	374.26
Nitrates	14.2	12.24	12.22	11.74	10.76	11.22	10.24	9.88	9.74	11.24	12.48	12.84
Phosphates	9.80	8.98	11.20	10.82	9.88	9.44	8.98	11.20	10.80	9.40	9.80	9.92
Total solids	982	942	950	945	980	960	922	945	890	820	885	830
Total dissolved solids	450	480	490	510	520	540	490	520	530	490	475	410
Total hardness	485.22	452.22	410.86	440.26	430.22	412.22	452.22	446.22	415.62	427.22	418.22	480.22
Magnesium	96.22	94.22	86.54	82.24	80.26	80.76	79.88	70.42	88.56	84.56	92.24	90.26
Carbonates	44.56	44.52	38.12	32.24	42.26	40.56	34.12	32.18	36.14	46.12	52.24	40.24
Bicarbonates	280.446	279.86	286.64	245.62	278.56	286.64	246.56	254.24	276.66	282.24	222.24	290.58
Dissolved oxygen	1.8	1.2	1.8	2.2	1.8	2.2	2.4	1.6	2.4	2.2	1.8	2.6
Organic matter	8.9	9.2	8.8	6.2	7.8	8.2	8.6	8.4	7.8	7.2	7.4	8.6