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Physico-chemical Parameters Studies on Shiva Sagar Lake, Vikarabad, Telangana

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ABSTRACT

Shiva Sagar Lake which is also called as Shiva Reddy Peta cheruvu or Sir Vikar-ul-Umra is situated at Shiva Reddy Peta village near Vikarabad town in Ranga Reddy which is about 70 kilometers from Hyderabad. It spreads an area of around 93 hectares of land and it is 50-100 meters depth. The present paper deals mainly with the study of physico-chemical parameters in Shivasagar Lake. Detailed Physico-chemical characteristics of this lake were analyzed. The various physico-chemical parameters like Temperature, pH, carbonates, bicarbonates, chlorides, Total hardness, calcium, Magnesium, Dissolved oxygen, , Nitrates, Nitrites, Phosphates and sulphates were analysed. The values of Physico-chemical parameters which were found in the lake always below the drinking water quality standards. Therefore, it can be concluded that the water of the Lake is fit for consumption according to drinking water quality standards (BIS, 2003).

Keywords : Shiva Sagar Lake, Water Quality And Physico-Chemical Parameters.

I. INTRODUCTION

Water has become synonym of life. Life arose in water and more than 90 per cent contents of each functional and dividing cell is water. Lakes form a significant component of inland aquatic resources of India. These lakes also have high conservation values. Oligotrophic lakes are characterised by relatively low productivity and are dominated by cold-water bottom fishes such as lake trout (Misra et al., 1999). Eutrophic lakes, which are relatively shallower, are more productive and are dominated by warm-water fishes such as bass (Arthur, 1947 and Shiva Kumar et al., 2009). Natural processes of lake formation most commonly include glacial, volcanic, and tectonic forces while human constructed lakes are created by reservoirs or excavation of basins. In most townships in many Asian countries big lakes are one of the major sources of drinking water supply to millions of inhabitants of that area (Bharathi and Hosamani, 1975). Such a situation is most common in Indian subcontinent.

The aquatic plants and animals bring about changes in the chemical composition of water (Kaur et al., 1996). Phytoplanktons, which include blue - green algae, green algae, diatoms, desmids, euglenoids etc, are important among aquatic flora. They are ecologically significant as they form the basic link in the food chain of all aquatic floras (Mini et al., 2003 and Sridhar et al., 2006). The water quality of all fresh water environments is assessed by the physico-chemical parameters.

II. METHODS AND MATERIAL

Shiva Sagar lake which is also called as Shiva Reddy Peta cheruvu or Sir Vikar ul-Ulma is situated at Shiva reddy peta village near Vikarabad town in Ranga Reddy which is about 70km from Hyderabad. It spreads an area of around 93 hectares of land and it is 50-100 meters depth. The surace water samples were collected from the selected water body at an interval of one month, from March 2014 to February-2015.

One liter of sample was separately collected and sedimentation was made in acid Lugol's solution. The supernatant was discarded. The phytoplankton sediment was concentrated to 30ml by centrifugation. The different physico-chemical parameters such as Temperature, pH, carbonates, bicarbonates, chlorides, Total hardness, calcium, Magnesium, Dissolved oxygen, Nitrates, Nitrites, Phosphates and sulphates were analyzed following the APHA (1998).

III. RESULTS AND DISCUSSION

The results on the variation of physico-chemical parameters are reported in the tables 1-3.

pH is an important quality parameter which influences the survival and nourishment of biological life. Maximum pH 8.4 mg/ L was observed in September. The monthly variation in pH was significant at both the sites throughout the study period. Maximum temperature 26.5 mg/ L was observed in summer and minimum 22.5 mg/ L was recorded during winter season. The water was comparatively warmer in the May and April months as because of the less rain fall and hot sunny days. At Station –II maximum content of carbonates was 58.06 mg/ L in July and minimum 12.02 mg/L was in month of August at station-I. Maximum bicarbonates was 188.3 mg/ L at Station 3 and minimum 104.02 mg/ L at Station 1 and 2 during present study. Maximum chorides 194.1 mg/ L was observed in summer and minimum 142.35 mg/ L was recorded during winter season. Chloride concentration is the most useful parameter for evaluating the surface water.

A fair amount of dissolved oxygen is always essential to support aquatic life. DO is the sole source of oxygen for all the aerobic aquatic life and hence it is considered as an important measure of purity for all waters (Panigrahi et al., 2005 and Zutshi et al., 1980). Maximum dissolved oxygen was 8.2 mg/ L at Station-I and minimum 3.4 mg/ L at Station-II during present study. The low dissolved oxygen value may be due to higher water temperature. Most of the organic matter in natural water consists of humic mater . The amount of organic matter recorded ranges from 8 mg/L to 20 mg/L. In the present investigation accumulation of organic matter in water was observed at high temperature.

Hardness of water is mainly due to the presence of calcium and magnesium ions and is an important indicator of toxic effect of poisonous elements present in water (Kant and Kachroo, 1971 and Wetzel, 1983). Maximum total hardness 246.21 mg/ L was observed in summer and minimum 218.35 mg/ L was recorded during winter season. Maximum calcium was 71.34 mg/ L at Station-I and minimum 47.32 mg/ L at Station-II during present study. The amount of magnesium recorded ranges from 30.93 mg/L to 49.73 mg/L.

Maximum total dissolved solids 190 mg/ L was observed in summer and minimum 470 mg/ L was recorded during winter season. Maximum total suspended solids was 200 mg/ L at Station-I and minimum 390 mg/ L at Station-III during present study. The major limiting nutrients for phytoplankton are nitrogen in the form of nitrate, nitrite and phosphate.The amount of sulphates recorded ranges from 20 mg/L to 29 mg/L. Sulphur is always present in adequate quantities in water to meet the high requirement for protein synthesis.

The major sources of phosphate in the lake are domestic sewage, agricultural effluents etc. The most significant form of inorganic phosphorus is orthophosphate (PO_4^{3-}) (Kaushik and Saxena, 1999). It is the only directly utilizable form of soluble inorganic phosphorus. The amount of phosphates recorded ranges from 0.2 mg/L to 0.9 mg/L. Low value of phosphates was recorded at all the stations. The amount of nitrates recorded ranges from 0.2 mg/L to 0.4 mg/L. The amount of nitriates recorded ranges

from 4.2 mg/L to 6.8 mg/L. Presence of nitrates in water indicates the final stage of mineralization.

IV. CONCLUSION

In the present observation low values of phosphates (PO_4^{3-}) and sulphates (SO_4^{2-}) confirms the lake is oligotrophic nature. Total dissolved solids were lower than BIS permissible limits of 2000 mg/L. The total hardness (TH) of the lake was very low compared to their permissible limit of BIS (2003). The present study on the physico- chemical parameters revealed that in certain sites the physico- chemical parameters were below the desirable limits. It can be concluded that the water of the Lake is fit for consumption according to drinking and irrigation purpose.

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Station-I

	Temp	pH	CO_3^{2-}	HCO_3^-	Cl-	DO	OM	TH	Ca^{2+}	Mg^{2+}	TDS	TSS	SO_4^{2-}	PO_4^{3-}	NO_2^-	NO_3^-
Jan-16	24.0	8.0	13.06	104.02	150.23	5.4	10	232.22	60.12	33.38	200	200	29	0.8	0.2	5.2
Feb	24.5	8.2	24.08	118.22	168.82	8.2	20	236.12	62.34	39.26	250	200	22	0.4	0.2	6.2
Mar	26.5	8.4	38.04	141.23	186.8	5.2	10	228.14	46.35	27.53	210	260	28	0.9	0.3	5.6
Apr	25.0	8.0	18.08	115.21	167.35	5.6	8	222.22	50.12	24.66	230	260	22	0.5	0.4	4.4
May	22.5	8.2	12.02	178.30	176.82	4.4	14	213.12	51.44	36.42	190	260	28	0.3	0.2	4.4
Jun	25.0	8.0	26.02	116.42	181.05	5.2	10	222.22	52.26	32.12	230	260	22	0.6	0.3	5.4
July	24.5	8.2	38.06	127.34	144.1	4.6	8	221.32	51.24	30.29	270	240	24	0.7	0.2	4.4
Aug	23.0	8.2	12.02	186.44	189.1	3.4	12	228.36	46.26	29.74	230	290	20	0.6	0.3	5.8
Seb	24.5	8.4	18.08	120.54	186.55	4.6	18	226.40	44.22	27.56	290	280	22	0.8	0.4	6.2
Oct	23.5	8.0	36.06	112.24	168.55	5.2	8	228.46	45.15	32.54	220	240	28	0.8	0.2	5.4
Nov	23.5	8.4	24.04	180.86	151.05	6.6	12	230.66	46.32	34.22	210	280	26	0.2	0.3	4.6
Dec	24.0	8.2	12.08	168.54	142.35	5.2	20	226.22	42.36	30.66	240	250	26	0.3	0.4	4.4

Station-II

	Temp	pH	CO_3^{2-}	HCO_3^-	Cl-	DO	OM	TH	Ca^{2+}	Mg^{2+}	TDS	TSS	SO_4^{2-}	PO_4^{3-}	NO_2^-	NO_3^-
Jan-16	25.0	8.2	22.06	114.02	140.32	6	11	230.12	62.21	43.38	200	300	29	0.8	0.2	5.2
Feb	26.0	8.2	22.08	128.22	187.28	5.8	20	246.21	65.24	39.78	250	300	22	0.4	0.2	4.2
Mar	25.0	8.4	38.04	121.23	158.70	6.2	15	238.13	66.35	37.53	210	360	28	0.9	0.3	5.6
Apr	26.0	8.2	38.08	118.13	167.45	7.6	10	232.32	50.31	34.56	230	360	22	0.5	0.4	5.4
May	26.5	8.2	42.02	108.31	166.58	6.4	15	233.12	61.34	36.42	290	360	28	0.3	0.2	5.4
Jun	23.0	8.4	48.02	146.42	171.25	5.2	10	232.32	67.36	43.13	230	360	22	0.6	0.3	5.4
July	23.0	8.2	58.06	118.22	149.12	4.6	8	221.32	61.34	36.79	270	340	24	0.7	0.2	4.4
Aug	23.5	8.2	48.02	127.23	169.12	5.4	10	229.38	57.34	39.72	230	390	20	0.6	0.3	6.8
Seb	24.0	8.4	36.08	110.46	176.66	6.6	20	225.42	57.32	47.56	290	380	22	0.8	0.4	5.2
Oct	24.5	8.2	36.06	122.43	148.24	5.2	10	218.36	65.45	36.55	220	340	28	0.8	0.2	4.4
Nov	24.5	8.2	42.04	116.68	141.25	6.6	10	232.26	58.34	39.78	210	380	26	0.2	0.3	4.6
Dec	25.0	8.2	36.08	118.45	122.65	5.2	11	224.22	62.34	30.93	240	350	26	0.3	0.4	4.4

Station-III

	Temp	pH	CO_3^{2-}	HCO_3^-	Cl^-	DO	OM	TH	Ca^{2+}	Mg^{2+}	TDS	TSS	SO_4^{2-}	PO_4^{3-}	NO_2^-	NO_3^-
Jan--16	25.0	8.2	42.06	164.02	150.23	6 .2	10	220.22	62.21	33.38	400	200	26	0.6	0.3	4.2
Feb	54.0	8.2	42.08	178.22	178.82	6.2	11	236.21	65.24	39.78	450	300	20	0.8	0.2	3.2

Mar	25.0	8.4	38.04	181.32	168.8	6.0	11	228.14	66.35	37.53	410	260	24	0.7	0.2	3.6
Apr	26.0	8.2	36.08	165.31	176.35	6.6	11	230.36	60.31	44.56	430	260	22	0.5	0.2	4.4
May	25.5	8.2	54.02	188.31	176.82	5.4	12	234.22	61.34	46.42	390	260	24	0.4	0.3	5.4
Jun	23.0	8.4	34.02	166.42	181.05	5.2	12	236.42	57.36	33.13	430	260	20	0.7	0.4	4.4
July	23.0	8.2	38.06	157.34	194.1	6.6	8	220.66	61.34	46.79	470	240	26	0.5	0.2	5.4
Aug	23.5	8.2	18.02	166.34	179.1	5.6	11	239.48	47.34	39.72	430	290	22	0.4	0.2	4.8
Seb	24.0	8.4	42.08	180.64	186.55	5.6	14	226.44	47.32	37.56	390	260	22	0.6	0.3	3.2
Oct	24.5	8.2	56.06	172.34	168.55	6.2	20	238.36	55.45	36.55	420	240	24	0.6	0.2	3.4
Nov	24.5	8.2	52.04	160.86	151.05	5.8	11	242.46	68.34	49.78	410	280	24	0.4	0.3	3.6
Dec	25.0	8.2	32.08	158.54	142.35	6.0	20	244.22	52.34	50.93	440	250	28	0.4	0.4	3.4