

Assessment of physico-chemical parameters of Sagar lake, India

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The aim of this study was to determine physicochemical parameters of Sagar lake. This study was undertaken in Sagar lake, India, from January 2004 to June 2004. Samples were collected from three sampling sites and transported to the laboratory for analysis of physicochemical parameter of interest was carried out following the standard methods for water and waste water. The CD at 0.05 of DO nitrate, BOD, COD, phosphate, CO₂ alkalinity and chloride were 7.288, 28.22, 27.32, 56.17, 0.219, 2.55, 101.17, 278.26, respectively. From the parameters analyzed in this study, it is evident that Sagar district residents threatened the ecological integrity of Sagar lake by discharging organic waste into it without any form of treatment. Consequently, aquatic weeds now cover the major portion of the lake area leading to progressive eutrophication. The investigation shows that Sagar lake water is not safe for household purpose.

Key words : Sagar lake water, Physico-chemical parameters.

INTRODUCTION

The quality of water is of vital concern for mankind in our surrounding. There is a definite permissible limit of different organic and inorganic substance in water which a man can tolerate in the form of domestic water supplies for drinking water. Water quality characteristic of aquatic environments arise from a multitude of physical, chemical and biological interactions. The water bodies, rivers and lakes are continuously subject to a dynamic slate of change with respect to their physiological and biological characteristics. Nagarathna and Hosmani (2003) correlated physico-chemical parameters and phytoplanktons in a polluted Doda lake of Malavalli. Pandey *et al.*, (2003) assessed the physico-chemical characteristics of sub surface water of Makrana, district of Nagour (Rajasthan). Dissolved oxygen, pH and water temperatures serve as variables since the fluctuation of one affects the values of others (Fafioye *et al.*, 2005).

At present Sagar lake is grossly contaminated by the inflow of waste water which shows a high level of nutrients, organic matter, coliform bacteria etc. Due to high and prolific growth of water hyacinth the lake is highly eutrophic. This study, therefore, has been designed to determine the physico chemical parameters of Sagar lake from three selected sites.

MATERIALS AND METHODS

Collection of samples:

Samples were collected once monthly a period of six

months from three sampling sites of Sagar lake (M.P.) from January 2004 to June 2004. These three sampling station were Site-I : Dhobi ghat, Site – II : Temple site and Site-III : Chakra ghat.

Standard procedures were adopted for the determination of physico-chemical parameters such as pH, alkalinity chlorides, nitrate, phosphate, BOD, COD and DO according to Adoni,(1985);APHA,(1985) and NEERI,(1988).

RESULTS AND DISCUSSION

The analysis of the water samples showed that the condition of the Sagar lake is very poor. During the field visit it was observed that the water of the reservoir covered by excessive vegetation. Results of chemical parameters are tabulated in Table 1.

The Sagar lake was alkaline in nature. The pH of water sample ranged from 7.5 to 8.1 at site I, 8.5 to 9.0 at site II, and 8.6 to 9.1 at site III. The pH was found to be low in summer, while high in winter. The high biota production due to high pH values have been supported by high free carbon dioxide values in Omi water body of Ago-lwoye, Nigeria (Fafioye *et al.*, 2005). The water tends to be more alkaline when it contains large quantities of bicarbonates, carbon dioxide and calcium. The average range of water temperature was between 15- 26 °C. The temperature ranged from 15 to 25 °C at site I, 15 to 26 °C at site II, and 15 to 26 °C at site III. The minimum water temperature (15°C) was observed in all the three sites in January and the temperature peak (26 °C) was recorded

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Table 1 : Physico-chemical characteristics of water samples collected from three different sites of Sagar lake (Jan-June 2004).

Month	Sites	pH	Temp (°C)	Parameters (mg/L)							
				Chloride	Alkalinity	Free CO ₂	Phosphate	Nitrate	DO	BOD	COD
January	I	7.5	15	178.3	32.6	Slight pink colour	0.08	18.20	4.06	13.86	49.86
	II	9	15	180.3	38	-do-	0.09	19.10	4.37	13.50	47.16
	III	9	15	179.32	42.6	-do-	0.08	11.53	4.37	13.73	46.43
February	I	7.5	17	176.3	42.6	-do-	0.07	19.46	4.00	17.00	45.26
	II	9	17	175.3	44.0	-do-	0.08	18.36	4.80	14.30	49.33
	III	9	18	179.3	48.6	-do-	0.10	20.2	4.93	17.13	47.20
March	I	7.6	24	186.9	48.6	4.3	0.13	19.76	4.74	15.66	40.06
	II	8.5	23	183.6	62.6	4.0	0.14	20.2	4.88	17.20	47.76
	III	9	23	193.6	70.6	4.6	0.15	19.03	5.13	19.66	25.90
April	I	8.1	24	192.6	61.3	Slight pink	0.17	18.86	5.01	15.56	39.46
	II	8.5	23	181.6	60	-do-	0.18	21.23	5.20	17.53	39.70
	III	9	24	192.99	84	-do-	0.18	21.23	5.20	17.56	39.46
May	I	7.8	24	192.6	91.3	-do-	0.13	19.13	4.97	21.76	20.66
	II	8.1	23	195.3	96.0	-do-	0.14	21.4	5.12	18.86	32.20
	III	8.6	25	200.32	100.00	-do-	0.17	18.73	5.38	23.76	27.76
June	I	7.5	25	195.6	98.6	6.06	0.21	17.3	5.20	22.13	30.00
	II	8.6	26	196.6	101.1	5.73	0.23	21.3	5.42	22.86	21.53
	III	9.1	26	196.6	101.1	6.06	0.26	18.2	5.36	25.00	30.43
CD at 0.05%				278.26	101.17	2.55	0.219	28.22	7.288	27.32	56.17

Site I = Dhobi Ghat, Site II = Temple site, Site III = Chakra Ghat

in June (last month of the experiment). Many workers reported similar findings with regard to temperature of water reservoir Kataria *et al.* (1996), Sohanid *et al.* (2001), Bhadram *et al.* (2004). The alkalinity (mg/L) ranged from 32.6 to 98.6 at site I, 38.0 to 101.1 at site II and 42.6 to 101.1 at site III. It was also recorded that in the entire three sites the amount of alkalinity was less in January and high in July. The alkalinity shifts the pH to the alkaline side of neutrality. Chloride (mg/L) ranged from 176.3 to 195.3 at site I, 175.3 to 196.6 at site II and 179.3 to 200.3 at site III. Free CO₂ (mg/L) was absent in all the months except March and June. Free CO₂ content (4.3) from site I, 4.0 from site II and 4.6 from site III was recorded during March and 6.06 from site I and III, 5.73 from site II was recorded in June. Dissolved oxygen (mg/L) ranged from 4.0 to 5.20 at site I, 4.37 to 5.42 at site II and 4.37 to 5.38 at site III. Appreciable quantity of total dissolved oxygen (mg/L) was present at site II (5.42) and at site III (5.36), which declined at site I (5.20). The

maximum value of dissolved oxygen has been recorded during summer months while the minimum concentration of DO was generally noticed during winter. The aquatic life is held responsible for lowering the value of dissolved oxygen. The BOD (mg/L) ranged from 13.86 to 21.76 at site I, 13.50 to 22.86 at site II and 13.73 to 25.00 at site III. During the period of study the highest value (25.0) of BOD was recorded at site III except in winter months. COD (mg/L) ranged between 20.66 to 49.86 at site I, 21.53 to 49.33 at site II and 25.90 to 47.20 at site III. The high COD (49.86) value was measured from the upper surface of water layer in the month of January while lowest COD (20.66) was noted during the months of May-June. A high value indicates the presence of high concentrations of both biodegradable and non biodegradable pollutants Tiwari, (2004). Nitrate (mg/L) varied from 17.30 to 19.76 at site I, 18.36 to 28.13 at site II and 18.20 to 20.13 at sites III. The higher value concentration of nitrogen (28.13) was recorded at site

III. Phosphate values ranged from 0.07 to 0.21 at site I, 0.08 to 0.23 at site II, and 0.08 to 0.26 at site III. Low concentration of phosphate was found at site I (0.07) during winter while maximum phosphate (0.26 mg/L) at site III during summer.

Water with a significant nitrate concentration usually would be heavily polluted and probably bacteriologically unacceptable. A critical perusal of data obtained in the study clearly revealed that the values of most of the parameters have either exceeded or are nearing the permissive limits pointing to grossly polluted nature of the Sagar lake.

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