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Seasonal Variations in the Physico-Chemical properties of Siliserh Lake, Alwar

Khinchi Aruna[1]*, Bhatnagar Ravi[1], Dagar Navin[2] and Yadav R. N.[2]

[1]Department of Life Science, Sunrise University, Alwar
[2]Department of Chemistry, Govt. R. R. College, Alwar

ABSTRACT

Present study is undertaken to access the water quality of Silisher Lake by observing different physico-chemical parameters during four seasions. These are TH,COD BOD, pH, TH Ca&Mg, TDS, Chloride, Fluoride, and biological analysis and examine the water quality of siliserh lake which is deteriorating rapidly due to intense human activities and influx of agricultural pollutants.

KEYWORDS: Physico-chemical,Waterquality,Pollutants, Silisher Lake

* **Corresponding Author –**

Aruna Khinchi

Department of Life Science, Sunrise University, Alwar
E-mail: drnavin.dagar@gmail.com

INTRODUCTION

Siliserh Lake is a water body which once considered as divine source of water for drinking and irrigation purpose is now increasingly being abused and severely polluted. Disposal of domestic waste in lake is causing undesirable change in physico-chemical and biological characteristics of the water. Water is essential commodity for human being which is required by them in its pure form. The physical properties of water, in any aquatic ecosystem, are largely dependent on the meteorological conditions of the area and chemical properties of the water[1].

Anthropogenic nutrient enrichments cause serious alteration in aquatic ecosystems according to Ansari[1]. Chemical characteristic of water not only alter the physical properties of the medium but also exert significant effect on the distribution and metabolic activities of organisms, which in turn change the chemical qualities of water in due course of time.

Agarwal P K[2]et al studiedthe water quality of Udaipur lakes by observing different physico-chemical and microbiological parameters during the year 2004-05. High water temperature, BOD, pH, total hardness, electrical conductance, TDS, phosphates, nitrates and dissolved organic matter and low depth of visibility and dissolved oxygen showed heavy load of organic matter in lakePichhola, Fatehsagar, Swaroopsagar, and Udaisagar. The microbiological studies include, MPN 548 to 2400/100ml, total coliform colonies $27.5x10^3$ to $84.17x10^3$/ml and faecal coliform ranged between 109 to m2400/100ml. for lakePichhola, Fatehsagar, Swaroopsagar and Udaisagar.

Harish and Madhur Mohan Ranga[3] estimated Primary Productivity of Ana Sagar Lake, Ajmer (Rajasthan), from sep. 2007 to Aug 2008. They analysed GPP value range between 1.93 to 6.24gC/m2/day, NPP ranged between 0.72 and 4.99 gC/m2/day and community respiration ranged, water temperature variation, pH, dissolved oxygen, Biological oxygen demand and alkalinity variation, concentration of nutrients like chloride (18.5 to 32.4 mg/l), nitrate (12.9 to 26.4 mg/l) and phosphate (1.2 to 3.2 mg/l) varried independent and they found primary productivity and physico-chemical values of the lake were found high, mainly due to sewage discharged, industrial effluents and agricultural runoff by surrounding city population. High values of productivity and nutrients also exposed its eutrophic condition.

MATERIAL AND METHODS

Study area:

Siliserh Lake is a beautiful fresh water lake, Spread in 7 sq.Kms area.Siliserh Lake is located just 165 Kms from Dhaula Kuan, Delhi and 110 Kms from Jaipur. Siliserh Lake is situatedin the north eastern part of Rajasthan. Lake was built by maharaja Vinay Singh in the year 1845. The Lake and reservoir of Siliserh was created by Maharaja for the people of Alwar because water can be channeled to Alwar city. A beautiful Lake palace was also built by Maharaja for his beloved wife Shila. Itwas used as Lake palace and hutinglodge. The Silisher Lake is a large man made water body that forms a significant environmental feature and lies to south west of historical city Alwar. The lake is approximately 130 ha in its full spread and has a catchment falls in a dense rural area of 15.5 sq. KM. for analysis of water quality.

5 sampling sites have been selected, 2 sites towards the dam and 2 on opposite west side of the lake and one site selected as light house. Samplings at different sites were made at monthly intervals from July, 2012 to June 2013. Samples were collected in clean and dry containers and various physico-chemical features were estimated as per standard methods of APHA[4].

The present study was planned by selecting five locations located in different area of lake collected as per standard procedure. The literature survey showed that no studies were made in these localities so far. Hence the present study was undertaken by authors.

Collection and analysis of water samples[5-7]

The lake water samples were collected in pre cleaned one- liter plastic bottles from different sites. The lake water samples which collected from different sources, analyzed as per standard procedures to know the physico- chemical status of lake water. The analyzed data were compared with the water standards. Results of lake water samples of different sites are summarized in the Table 1&2.

RESULT AND DISCUSSION[9-12]

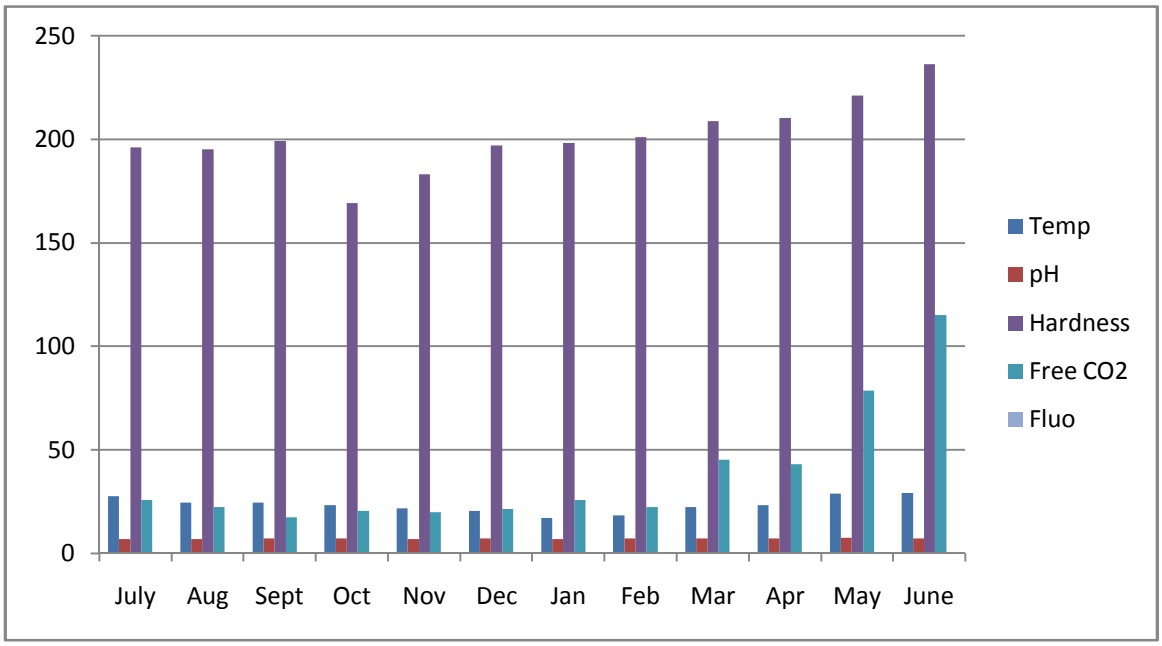
Table1: Observations taken from July, 2012 to Dec, 2012.

Parameters	July	August	Sept	October	Nov	Dec
Temp ˚C	27.5	24.4	24.4	23.2	21.6	20.4
pH	6.8	6.9	7.2	7.0	6.9	7.1
Alkalinity (mg/L)	368.5	445.0	785	755	486	555
Hardness (ppm)	196	195	199	169	183	197
Free CO2 (mg/L)	25.6	22.2	17.2	20.5	19.8	21.4
Chloride (mg/L)	511.2	549.87	465.4	547.05	591.43	360.2
Fluoride	0.012	0.0011	0.010	0.008	0.007	0.008
TDS (mg/L)	711	802	755	685	692	732
Dissolved O2 (mg/L)	8.8	10.2	11.5	9.6	10.5	11.1
BOD (mg/L)	13.8	13.9	12.2	14.2	12.2	13.3
COD (mg/L)	96.7	99.1	93.5	88.9	97.0	98.5

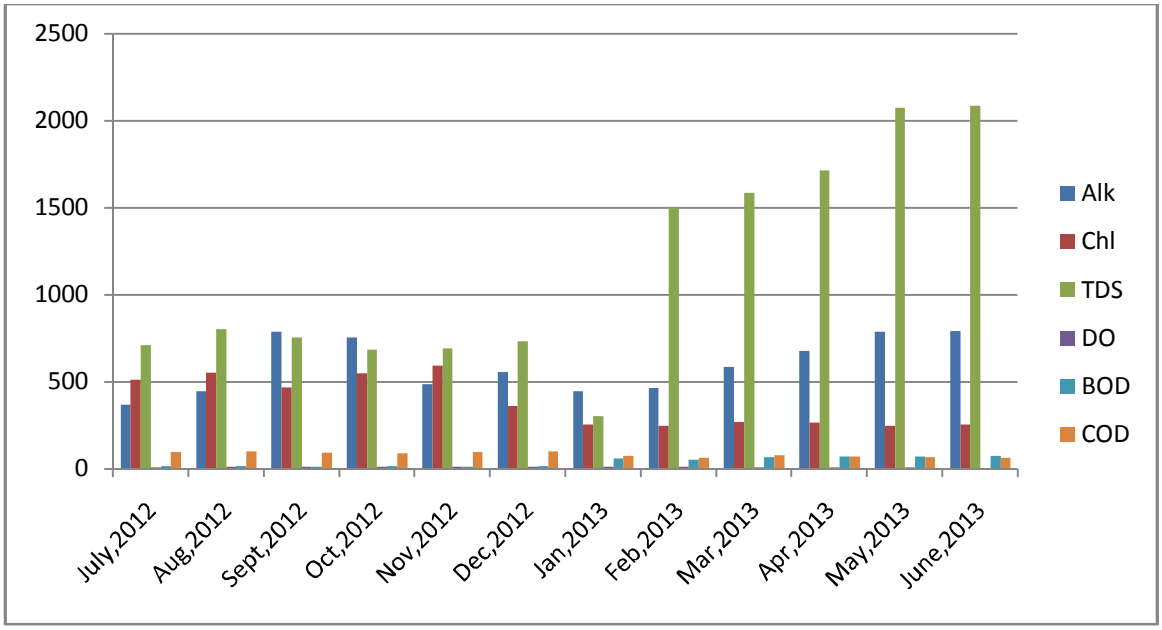
Table2: The observations taken from January 2013 to June, 2013.

Parameters	January	February	March	April	May	June
Temp ˚C	17.0	18.2	22.4	23.2	28.8	28.9
pH	6.8	7.0	7.2	7.1	7.3	7.2
Alkalinity (mg/L)	444.2	462.3	585.5	676	787	789
Hardness (ppm)	198	201	208.5	210	221	236
Free CO2 (mg/L)	25.6	22.2	45.2	42.8	78.6	115
Chloride (mg/L)	255	245	268	266	248	252
Fluoride (Mg/L)	0.005	0.004	0.012	0.010	0.008	0.008
TDS (mg/L)	301.1	1501	1586	1713	2075	2083
Dissolved O2 (mg/L)	9.83	9.83	7.5	7.7	5.98	5.2
BOD (mg/L)	57.43	50.72	66.52	69.6	70.45	74.55
COD (mg/L)	75	61.2	77.6	69.5	66	62.3

Note: The values are average of samples collected from 5 sites of the lake monthly. The average rainfall during the year 2012-13was 1086.69 mm.



Graph: (i) Graphical presentation of monthly data with Physico-chemical parameters.



Graph: (ii)

Fig: (i) and (ii) Graphical presentation of monthly data with Physico-chemical parameters.

Temperature: The temperature fluctuated between 17.0 (in January) to 28.9 ˚C in June 2013 (Table2). Higher temperature 28.9 ˚C in June, 2013 was probably due to increase load of suspended solids, lake soil particles and decomposed organic matter in the lake water because suspended solids absorb more heat.

pH- The pH exhibit acidic and alkaline in nature and ranged between 6.8 to 7.3˚C. Minimum pH was found in July, 2012 and January, 2013, and maximum in May, 2013. Acidic nature of lake water in monsoon and winter could be attributed to reduce photosynthetic activity.

Alkalinity –The total alkalinity fluctuated between 789 to 368.5 mg/litre with the highest value in the month of June 2013. The alkalinity in water is caused by carbonate bicarbonate and hydroxyl ions. Because alkalinity value correlate positively with the pattern of rainfall and this implies that surface runoff from the Silisher Lake contains substances which contribute to alkalinity.

Hardness- The mean value of hardness has been found to vary between 169 (Oct.,2012) to 236 ppm (June, 2013). The higher hardness may be ascribed to accumulation of dissolved materials due to increasing pollution from surrounding agricultural fields and tourist wastage of eatables.

Free Carbon dioxide- During the study period of investigation, the mean value of free Carbon dioxide varied between 17.2 (Sept., 2012) to 115 mg/litre (June, 2013). Carbon dioxide exhibited an inverse relation with dissolved oxygen. A gradual rise in dissolve oxygen and fall of free carbon dioxide level had probably disrupted the equilibrium between these two gases.

Chloride- The mean value of chloride content in the lake is 379.93 mg/litre. The peak chloride values during the early mansoon tend to increase sharply till the post monsoon approaches. The peak chloride value can be attributed to the surface run off, rich in animal origin and organic waste.

Fluoride-The mean value of fluoride content in the lake is 0.00775 Mg/L. The peak fluoride values during summer season can be attributed to the surface run off, rich in animal origin and organic waste. Even though this level is not harmful to the aquatic life, and not more than normal level of fluoride standard determined by WHO.

Total Dissolved Solids- The total dissolved solids fluctuated between 685 (October, 2012) to 2083 mg/litre (in June, 2013) which show hard water character. Further total hardness exhibits a change with low value in monsoon season and high range in between winter season.

Chemical oxygen demand- The COD values ranged from 51.2 to 99.1 Mg/litre. Its higher value during winter may be due to higher organic load.

Dissolved oxygen- The dissolved oxygen content of water indicates health of an ecosystem. The value of DO range from 5.2 to 11.5 Mg/litre. The low value during the monsoon may be due to high load of suspended particles, soil particles; decomposed organic matter which reach the water and reduce the penetration of light that in turn lowers photosynthesis. In winter O2 holding capacity of water increases therefore rise in O2 content seen in the winters. The conclusion from the present study may be drawn that the Silisher Lake is going to be contaminated day by day with human activities and ultimately eutrophication lead to affect plankton, fish and other aquatic life.

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