



## Hydrobiological Studies of Foy Sagar Lake, Ajmer

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### Key Words:

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### ABSTRACT

The study of physicochemical characteristics indicates the nature of the Foy Sagar lake water is alkaline, moderately hard and nutrient rich with low value of dissolved oxygen. Most of the nutrients exhibit maximum concentration in summer months. The water quality is deteriorating rapidly due to intense human activities and infusion of pollutants from the surroundings. These include silt, dissolved solids and nutrients like phosphates, nitrates and chlorides etc. Among the zooplankton, rotifers are good indicators of water quality. Rotifers of genus *Brachionus* and *Keratella* are abundant in water of Foy Sagar lake. The species composition and species diversity also point towards the polluted nature of the lake water.

### INTRODUCTION

Physicochemical properties strongly influence the aquatic organisms and many of them serve as good ecological indicators of water quality (Mishra 1999). Hence, physicochemical and biological parameters serve as good index in providing a complete and reliable picture of the conditions prevailing in a water body.

The different zones of a water body are inhabited by different organisms (plants and animals). The organisms occurring in a particular area constitute a community, i.e., the living parts (biotic) of the whole ecosystem. The zooplankton, mostly rotifers and small crustaceans, form a major link in the energy transfer at secondary level in aquatic biotopes. They occupy intermediate position in the aquatic food chains between autotrophs and heterotrophs and also contribute in cycling of organic matter. The distribution and diversity of zooplankton depend mainly on the physicochemical properties of water.

### MATERIALS AND METHODS

Foy Sagar lake is freshwater lake and a recreation centre for the locals of Ajmer. The lake was constructed by Col. Foy in 1878, and is now under the care of Municipal Council of Ajmer.

The samples were analysed chemically with the help of standard methods (APHA 1989, Trivedy & Goel 1986). The density of zooplankton was calculated for per litre and they were identified with the help of standard works (Edmondsom 1959, Tonapi 1980).

### RESULTS AND DISCUSSION

The result of the physicochemical analysis of water are given in Table 1, and zooplankton in Table 2.

**Water temperature:** Temperature has a more profound direct and indirect influence on all life processes than any other factor (Welch 1952). It is important in controlling both quality and quantity of

planktonic flora (Hutchinson 1957). The temperature of the lake water ranged between 17°C and 30.2°C. The highest temperature was recorded during the month of June, and lowest during the month of January.

**pH:** The pH values fluctuated between 7.2 and 8.7 during the entire study period. The maximum values were recorded during summer and minimum during monsoon. Robert et al. (1974) suggested that pH 5.0 to 8.5 is ideal for phytoplankton growth.

**Dissolved oxygen:** The dissolved oxygen content of water indicates the health of the aquatic ecosystem. The dissolved oxygen values ranged from 2.64 mg/L in July to 5.5 mg/L in the month of January. In general, the amount of dissolved oxygen increased with the advancement of season from monsoon to winter. Lowest values were recorded during summer.

**Free carbon dioxide:** The values of free carbon dioxide ranged from 1.5 mg/L to 5.50 mg/L. The minimum amount was recorded during the month of June and maximum during September. The increase of free carbon dioxide during monsoon indicates the influx through rain water in the form of carbonic acid.

**Alkalinity:** Total alkalinity ranged between 90 mg/L and 110 mg/L. The values were higher in summers and lower in monsoon. Higher concentration of bicarbonates during summer months may also be due to the decrease in water level by evaporation. The low values of alkalinity during monsoon may be due to decrease in concentration of bicarbonates due to increase in water level.

**Chloride:** The chloride values fluctuated between 25.60 mg/L and 75.50 mg/L. Slightly higher values were recorded during warmer months. The chloride content was mostly within limit with slightly higher values in summer months due to higher evaporation rate (Sarwar & Rifat 1991). Adoni (1985) has reported that chloride content above 60 mg/L indicates heavy pollution. Water of Foy Sagar lake exhibits moderate pollution, as chloride levels are slightly higher than 60 mg/L.

**Total dissolved solids:** The total dissolved solids ranged between 210.90 mg/L and 900.10 mg/L. The lowest values were recorded during month of September, and highest values during June. The values were higher in Foy Sagar lake particularly in summers, which may be attributed to low water levels caused by evaporation.

**Nitrate:** Nitrate is the highly oxidised form of nitrogen and usually the most abundant form of combined inorganic nitrogen in lakes and streams (Goldman & Horne 1983). In natural waters the most important source of nitrate is biological oxidation of organic matter. In Foy Sagar lake the nitrate levels fluctuated from 0.10 mg/L to 0.39 mg/L.

**Zooplankton:** Zooplankton were identified up to genus level. Their monthly distribution is given in Table 2. The zooplankton population was observed to be composed of mainly Protozoa, Rotifera, Cladocera and Copepoda.

The protozoans were represented by species of *Paramoecium* and *Arcella*. *Paramoecium* was observed throughout the study period, whereas *Arcella* was rare in occurrence.

The rotifers were represented by species of *Philodina*, *Brachionus*, *Keratella* and *Asplanchna*. This group showed a peak in summers. *Keratella* dominated the rotifers during summers and winters while *Brachionus* was dominant during monsoon months.

The cladocerans were represented by species of *Moina*, *Daphnia*, *Cypris*, *Simocephalus* and *Ceriodaphnia*. This group has only one peak in summers. Species of *Daphnia* and *Moina* dominated the cladocerans throughout the study period.

Table 1: Physicochemical characteristics of Foy Sagar lake water.

Months	Temp. (°C)	pH	DO (mg/L)	F.CO <sub>2</sub> (mg/L)	Total alk.(mg/L)	Chloride (mg/L)	TDS (mg/L)	Nitrate (mg/L)	ZDe	ZDi
January	17.00	7.88	5.55	4.20	102	44.10	400.00	0.20	19.0	1.1025
February	20.70	7.75	5.26	4.00	90	48.25	500.63	0.10	24.5	1.2010
March	21.50	8.00	4.20	3.65	95	68.88	490.75	0.11	20.5	1.2380
April	25.10	8.00	4.55	4.15	100	62.35	765.93	0.12	35.0	1.1770
May	26.00	8.70	4.95	2.00	108	58.00	820.60	0.30	60.0	1.1810
June	30.20	8.35	2.74	1.50	110	75.50	900.10	0.21	100.0	1.1672
July	28.00	8.20	2.64	2.65	100	25.60	760.10	0.39	65.0	1.1689
August	27.00	7.70	3.09	2.25	98	30.00	320.20	0.35	15.5	1.2000
September	27.20	7.20	3.15	5.50	94	40.80	210.90	0.30	15.0	1.1880
October	26.50	7.50	4.08	5.00	90	40.60	220.10	0.25	15.4	1.1678

Zde = Zooplankton Density (Nos./Litre); ZDi = Zooplankton Diversity

Table 2: Monthly distribution of zooplankton.

Zooplankton	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
<b>Protozoa</b>										
<i>Paramoecium</i> sp.	+	++	++	+	+	+	+	++	++	++
<i>Arcella</i> sp.	-	-	+	+	+	+	+	+	+	+
<b>Rotifera</b>										
<i>Filinia</i> sp.	-	-	-	-	-	-	+	+	+	-
<i>Keratella</i> sp.	+	+	++	+	+++	+++	+	+	+	+
<i>Brachionus</i> sp.	+	+	++	+	+++	+++	+	+	+	-
<i>Asplanchna</i> sp.	+	+	+	+	++	++	+++	+++	+++	++
<i>Philodina</i> sp.	+	+	+	+	+	+	+	+	+	+
<b>Caldocera</b>										
<i>Moina</i> sp.	-	+	+	++	+	+	++	+	+	+
<i>Cypris</i> sp.	-	+	+	+	+	++	+	+	+	+
<i>Simocephalus</i> sp.	-	+	+	+	-	-	+	+	+	-
<i>Ceriodaphnia</i> sp.	-	-	+	+	-	-	-	-	-	-
<i>Daphnia</i> sp.	+	+	+	++	+	++	+	+	+	+
<b>Copepoda</b>										
<i>Diaptomus</i> sp.	+	+	+	+	-	++	+	-	-	-
<i>Eucyclops</i> sp.	+	+	+	++	++	++	+	+	+	+
<i>Cyclops</i> sp.	-	+	+	++	++	++	+	+	+	+
<i>Mesocyclops</i> sp.	+	+	+	++	++	++	+	+	+	-

- Absent; + Rare (< 10); ++ Common (< 50); +++ Abundant (> 50)

The copepods were represented by the species of *Diaptomus*, *Eucyclops*, *Cyclops* and *Mesocyclops*. This group exhibited only one peak in summer. *Eucyclops* dominated the copepods during summers and *Diaptomus* species were dominant during winters.

The zooplankton density ranged between 15 Nos./L for the month of September to 100 Nos./L for the month of June. The zooplankton diversity ranged from 1.10 in January to 1.23 in March. Highest diversity was observed in the month of March, and lowest in January.

The species composition and abundance of each zooplankton group varied from time to time and season and depended on limnological characteristics of the water body. Density, diversity and composition of zooplankton also exhibit monthly variation. In the present study the concentration of

zooplankton was recorded to be minimum in September and maximum in June. On the whole zooplankton exhibited higher density in summer season. Similar summer maxima of zooplankton population was also reported by George (1966), Adoni (1975) and Selot (1977). The entire study indicates that Foy Sager lake is moderately polluted and is in the process of eutrophication.

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