



Eco-Physiological Studies On Fox Sagar Lake With Reference To Water Quality

A. Rajani¹, E.M. Sunitha¹, T. Sreelakshmi², P. Vaani¹, O. Sitakumari¹ and K. Shailaja³

1 "Department of Botany, RBVRR Womens College, Hyderabad, Telangana".

2 "Department of Boatny Govt. Degree college, Ranga Reddy, Telangana".

3 "Osmania University College for Women, Koti, Hyderabad, Telangana".

Abstract: The present paper deals with the ecological studies on Fox Sagar lake with reference to pollution. For this purpose both physico-chemical and biological parameters were analysed. Fox Sagar lake is famous for its natural beauty known locally as Kotta Cheruvu. It is located in Jeedimetla near Kompally, Hyderabad. The lake is popular for fishing and a popular spot for picnics. The water samples from the surface were collected from the three sampling stations every month in polythene cans for a period of 2 years from June 2013 to May 2015. All the samples were carried to the laboratory. The samples were analyzed on the same day for different physico-chemical factors following the standard methods. Surface water samples for phytoplankton were collected from the 3 sampling stations. One litre of the sample was kept in sedimentation columns after adding 4% Formaldehyde solution. In Fox Sagar lake four groups of algae were recorded i.e., Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae.

Key Words: Fox Sagar lake, Physico-chemical parameters, Water quality, Algae.

Introduction:

Physico-chemical environment plays a vital role in influencing the quality of water bodies besides topographical, geological and other environmental factors. In lentic waters physical and chemical parameters keep fluctuating by the cycling of water through evaporation and its subsequent return in rain. (Kumar et al., 2005). These changes in addition to the anthropogenic activities affect also the biological environment. The present study focus on physico-chemical and biological assessment of water quality of Fox Sagar lake. The main objective of physico-chemical analysis of water is to determine the nutrient status of the medium which is intimately linked with the occurrence, growth and decay of algae. It is often visited by bird watchers. The local fisherman rear fish in the lake.

Material and Methods:

Fox Sagar Lake, also Jeedimetla Cheruvu or Kotta Cheruvu, is the fifth largest lake, spread over 2 km², in Hyderabad, India. It is located in Jeedimetla near Kompally, Hyderabad. It Coordinates 17.524°N, 78.470°E. It is home to flamingos, yellow-billed storks, ospreys, great cormorants, kingfishers, baya weavers, garganeys, among others. The lake is polluted by emissions from an adjoining industrial estate, killing fish and migratory birds.

The water samples from the surface were collected from the three sampling stations every month in polythene cans for a period of 2 years from June 2013 to May 2015. The samples were analyzed on the same day for different physico-chemical factors following the standard methods. (APHA, 1995). One litre of the sample was kept in sedimentation columns after adding 4% Formaldehyde solution. For the frequency measurements of different species of algae at each station, the drop method (Pearsall et al., 1946).

Results:

Physico-chemical parameters

Average values of Physico-chemical parameters are incorporated in Table-1

Three sampling stations were selected from the Fox Sagar lake. Station I is located at the right side of the lake. Station II is situated at the left side of the lake. This station gets polluted due to anthropogenic activities. Station III is located 200 meter after station II.

In the present investigation pH value ranged from 8.00 to 8.80 at all the stations, carbonates fluctuated between 6.04 - 42.06 mg/L at station-I, 6.02 - 36.06 mg/L at station-II and 6.02 - 36.08 mg/L at station-III. Bicarbonates are varied from 204.02 - 227.34 mg/L at station-I, 204.12 - 232.46 mg/L at station-II and 204.32 - 224.24 mg/L at station-III. Chlorides ranged between 330.24 - 394.10 mg/L at station-I, 342.16 - 398.80 mg/L at station-II and 322.26 - 396.24 mg/L at station-III. In the present investigation the dissolved oxygen fluctuated in between 2.00 - 3.60 mg/L at station-I,

In station-II 2.20 - 3.60 mg/L and 2.60 - 3.40 mg/L at station-III. Oxidizable organic matter ranged from 8.00 - 30.00 mg/L at station-I , 9.00 - 28.00 mg/L at station-II and 14.00 - 22.00 mg/L at station-III.

Biological Oxygen Demand ranged from 60.00 - 140.00 mg/L at station-I , 50.00 - 140.00 mg/L at station-II and 80.00 - 120.00 mg/L at station-III. The total hardness in lake Fox Sagar was ranged between 512.16 - 556.12 mg/L at station-I, 514.22 - 546.21 mg/L at station-II and 514.23 - 547.31 mg/L at station-III. Calcium is observed in between 66.20 - 91.34 mg/L, 68.22 - 95.01 mg/L, 61.26 - 92.64 mg/L at station-I , station-II and station-III. Magnesium ranged between 56.12 - 77.53 mg/L at station-I , 62.22 - 78.12 mg/L station-II and 63.21 - 78.08 mg/L at station-III. Sulphates ranged between 32.00 - 50.00 mg/L at station-I , 30.00 - 46.00 mg/L station-II and 22.00 - 44.00 mg/L at station-III. Phosphates fluctuated in between 2.80 - 4.40 mg/L at station-I, In station-II 2.60 - 3.80 mg/L and 1.60 - 4.20 mg/L at station-III. Nitrates ranged from 5.60 - 8.20 mg/L at station-I , 5.80 - 7.60 mg/L at station-II and 3.00 - 5.20 mg/L at station-III.

Phytoplankton

Percentage of phytoplankton is incorporated in Table-2

In Fox Sagar lake four groups of algae were recorded i.e, Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae. Among the four groups of algae Cyanophyceae dominated over the other groups of algae, followed by Chlorophyceae. The diatoms were represents very less in number. In Fox Sagar lake Cyanophyceae exhibited a well marked periodicity. They were present throughout the period of investigation reaching summer peaks. Chlorophyceae occupied the second position in the lake. Chlorophycean members continued to be present in the same respect at all the stations throughout the period of investigation. Euglenophyceae formed comparatively lower fraction of the phytoplankton in the waters of the present investigation. In the present study the diatoms were recorded very less number (Fig.1)

Discussion:

In the present study the high values of carbonates may be due to dissolution of calcium carbonate in bottom layer of lake. The chloride values are very high indicating high salinity and heavy sewage pollution. In the Fox Sagar lake chlorides were high at all the stations. Average values are 364.95 mg/L, 375.99 mg/L, 365.72 mg/L in station-I, Station-II and station III, the chloride content was high due to discharge of domestic sewage. The similar observation was made by Rajeev Sharma and Ajay capoor, (2010). A high pollution load

may also decrease the DO values to a considerable level (Sharma and Sarang, 2004). On an average basis, the demand for oxygen is proportional to the amount of organic waste to be degraded by aerobically (Ananthaiah ,2010). The major sources of sulphur in natural waters are rocks, fertilizers and waste discharges from industries. Phosphates increased in lake water after heavy showers , this was observed by Satyamohan and Zafar (1986). In monsoon the values were maximum and significantly increased after each spell of rain. Mahananda, (2010) reported that high content of nitrates in the monsoon is due to the increased soil particles washed into these waters from the catchment area.

Cyanophyceae was the dominant group observed Higher concentration of chlorides, magnesium, phosphates , total suspended solids contributed to the higher number of Cyanophycean members. Cyanophycean forms exhibited qualitative and quantitative abundance forming blooms almost throughout the period of investigation (Sarojini, 1996). Blooms of *Oscillatoria* species were very common in lake Fox Sagar. Bloom of *Microcystis* and *Arthrospira* species were present throughout the investigation period. Chlorophyceae occupied the second position in the lake. Chlorophycean members continued to be present in the same respect at all the stations throughout the period of investigation. High concentration of bicarbonates i.e 375.99 mg/L in Fox Sagar favoured the growth of Chlorophycean members. This trend was also observed by Seenayya (1971).

Conclusion

Finally on the basis of physico-chemical and biological parameters the Fox Sgar Lake water was alkaline. Bicarbonates and chlorides were recorded in high concentrations. Organic matter, Sulphates, phosphates, Nitrates were recorded in high concentration. Among the algae Cyanophyceae constituted the major group of phytoplankton, followed by Chlorophyceae.

In the lake *Oscillatoria animalis*, *Microcystis aeruginosa*, *Arthrospira plateusis* constituted the thick growth and bloom for matrices. This clearly indicates the lake is eutrophic. On the basis of physico-chemical and biological parameters the lake water is highly polluted and not suitable for drinking.

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Table-1
AVERAGE VALUES OF PHYSICO-CHEMICAL PARAMETERS

All the values are expressed in mg/L except pH and Temperature ($^{\circ}\text{C}$)

S.NO	Physico-chemical parameters	Station-I	Station-II	Station-III
1	PH	8.25	8.20	8.18
2	CO_3^{2-}	17.30	14.13	12.62
3	HCO_3^-	213.14	217.63	216.68
4	Cl^-	364.95	375.99	365.72
6	DO	2.90	3.10	2.92
7	BOD	94.00	82.00	96.00
8	OM	17.00	16.00	18.05
9	TH	529.27	530.08	530.94
10	Ca^{2+}	79.15	82.46	82.13
11	Mg^{2+}	67.14	70.78	71.21
12	SO_4^{2-}	43.00	38.00	33.00
13	PO_4^{3-}	3.60	3.10	3.50
14	NO_3^-	6.80	6.20	4.20

Table-2
PERCENTAGE OF PHYTOPLANKTON

Groups	Station-I	Station-II	Station-III
Cyanophyceae	79.69	82.07	78.95
Chlorophyceae	11	9.37	11.38
Euglenophyceae	5.72	5.41	6.4
Bacillariophyceae	3.57	3.13	3.27

Figure:1
Distribution of Phytoplankton



