

Effect of Physico-chemical Parameters conditions on the phytoplankton community in Shiva Sagar Lake, Vikarabad, Telangana

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ABSTRACT

Shiva Sagar Lake 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 conditions on the phytoplankton community in Shiva Sagar Lake. The present study on Shiva Sagar Lake, Vikarabad, Telangana was undertaken from March 2014 to February 2015 to study abundance of phytoplankton and their relation with physico-chemical conditions of water. The various physico-chemical parameters like temperature, pH, carbonates, bicarbonates, chlorides, total hardness, calcium, magnesium, dissolved oxygen, nitrates, nitrites, phosphates and sulphates were analysed. A total of 54 phytoplanktons belonging to Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae were identified. A clear dominance of Bacillariophyceae over Chlorophyceae, Cyanophyceae and Euglenophyceae was observed throughout the study period.

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

I. INTRODUCTION

Lakes, rivers and reservoirs are the important water resources and used for several purposes. Lakes form a significant component of inland aquatic resources of India, especially because of their potential for fishery (Banakar et al., 2010). These lakes also have high conservation values. Despite the ecosystem services they provide their patrimonial value, their biological diversity has been seldom investigated. The water quality of all fresh water environments is assessed by the physico- chemical and biological parameters. A lake's structure has a significant impact on its biological, chemical, and physical features. Lakes can be classified on the basis of a variety of features including their formation and their chemical or biological condition as oligotrophic and eutrophic

(Chaterjee et al., 1988). Oligotrophic lakes are characterized by relatively low productivity and are dominated by cold-water bottom fishes such as lake trout. Phytoplankton is the chief primary producer of the aquatic environment which fixes solar energy by process of photosynthesis, assimilating carbon dioxide and water to produce carbohydrates (Banatwala et al., 2004).

Phytoplankton is the primary producer community and consists mainly of algae such as diatoms, dinoflagellates and a variety of forms from other divisions of the plant kingdom. Phytoplankton constitutes the very basis of nutritional cycles of an aquatic ecosystem. Phytoplanktonic species have different physiological requirements and thus show diverse responses to physical and chemical parameters

such as light, temperature and nutrient regime (Dakshini et al., 1984). Their sensitivity and variations in species composition are often a reflection of significant alteration in ambient condition within an ecosystem.

II. METHODS AND MATERIAL

The surface water samples were collected from the selected water body at an interval of one month from March 2014 to February 2015. The samples were analyzed on the same day for different physico-chemical factors following the standard methods. The following factors has been analysed: Temperature, pH, carbonates, bicarbonates, chlorides, total hardness, calcium, magnesium, dissolved oxygen, nitrates, nitrites, phosphates and sulphates were analyzed following the APHA (1998). One litre of sample was collected separately and sedimentation was made in acid Lugol's solution. The supernatant was discarded. The phytoplankton sediment was concentrated to 30ml by centrifugation.

III. RESULTS AND DISCUSSION

The average values of physico-chemical parameters are reported in the tables 1.

The average value is 8.20 mg/l at all the stations. The average values of carbonates are 12.08 mg/l, 36.08 mg/l and 32.08 mg/l in station-I, station-II and station-III respectively. The average values of chlorides were 142.35 mg/l at station-I, 16.87 mg/l at station-II and 18.05 mg/l at station-III. The average values of total hardness were 226.22 mg/l at station-I, 224.22 mg/l at station-II and 244.22 mg/l at station-III. The average values of sulphates were 26.0 mg/l at station-I, 26.0 mg/l at station-II and 28.0 mg/l at station-III.

The water temperature plays an important role in the solubility of salts and gases. It is one of the most

significant parameters which control inborn physical qualities of water. In this study, the water temperature fluctuated between 15.0°C and 25.7°C. pH is an important quality parameter which influences the survival and nourishment of biological life (Sharma et al., 2010). The pH is also a factor which influences the biological activity of the water micro flora. The principal component regulating ion pH in natural waters is the carbonate, which comprises CO₂, H₂CO₃ and HCO₃⁻.

Chlorides are important inorganic anions which contain varying concentrations in natural waters. Chlorides are trouble some in irrigation water and also harmful to aquatic life (Mahananda et al., 2005). High concentration of chloride is considered to be the indicators of pollution due to organic wastes of animal or industrial origin (Sumitra et al., 2007).

Dissolved oxygen showed a direct correlation with bicarbonates, chlorides . Calcium , carbonates and magnesium showed the direct correlation with pH. BOD and Nitrites exhibit positive correlation with carbonates and bicarbonates. Chlorides negatively correlated with magnesium.

One of the most abundant and diversified groups of algae are diatoms. In the present study the diatoms were recorded very high number. The species of *Cyclotella*, *Melosira*, *Nitzschia*, *Navicula* and *Gomphonema* were present. Kumar and Singh (2000) and Radhika et al., (2004) reported that they were represented in large numbers during summer and winter seasons.

Chlorophyceae occupied the second position in the lake. Calcium exhibited a direct relation with the Chlorophyceae. Chlorophyceae was dominant in summer months in the lake. Preeti Gupta et al., (2011) have the opinion that sewage contamination favors the growth of Chlorophyceae. High temperatures, a high value of COD also favors the growth of green algae.

In temperate regions higher atmospheric or water temperature along with bright sunshine are considered as favourable factors for the development of Chlorococcales. Chlorococcales are represented by the species of *Chlorella vulgaris*, *Coelastrum*, *Scenedesmus* and *Ankistrodesmus*.

Cyanophycean members showed less periodicity in the lake and formed very less dominant group of the algal members. Organic matter showed positive influence on growth of Cyanophyceans in the present investigation. Padma and Periakali (1999) also stated that the Blue-green algae development depends on the ability of lakes to maintain low concentrations of dissolved oxygen for a long period. In the present investigation bicarbonates appear to be more influence on Cyanophyceae blooms. The species of *Oscillatoria* and *Arthrospira* were present.

Among the four groups of algae Euglenophyceae very less dominated over the other groups of algae. The species of *Euglena*, *Phacus*, *Trachelomonas* were present in the lake. According to Dhere and Gaikwad (2006) lower pH is responsible for Euglenoid growth. In the present investigation it was observed that high temperature (25°C - 26°C) and less amount of organic matter were very less favorable for the members of Euglenophyceae to multiply. Oxidizable organic matter fluctuated more or less directly with Euglenophyceae.

IV. CONCLUSION

Physico-chemical and biological characteristics of water and algal samples collected in the Shiva Sagar Lake, Vikarabad. It is shown that the levels of measured parameters in both water and algal samples. Organic matter, COD, phosphates and nitrates were recorded in low concentration. The pH and carbonates are inversely proportional to bicarbonates. Chlorides showed an inverse correlation with carbonates. Dissolved oxygen shows an inverse

correlation with organic matter and biological oxygen demand. Four groups of algae were recorded in the lake i.e., Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae. Among the four groups of algae Bacillariophyceae constituted the dominant group. Cyanophyceae and Euglenophyceae recorded in very low numbers. On the basis of both physico-chemical and biological characteristics the lake is oligotrophic.

V. REFERENCES

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Table 1. Average Values of Physico-Chemical Parameters

Physico-chemical parameters	Station-I mg/l	Station-II mg/l	Station-III mg/l
Temp	24.0°C	25.0°C	25.0°C
pH	8.2	8.2	8.2
CO ₃ ²⁻	12.08	36.08	32.08
HCO ₃ ⁻	168.54	118.45	158.54
Cl ⁻	142.35	122.65	142.35
DO	5.2	5.2	6.0
OM	20	11	20
TH	226.22	224.22	244.22
Ca ²⁺	42.36	62.34	52.34
Mg ²⁺	30.66	30.93	50.93
TDS	240	240	440
TSS	250	350	250
SO ₄ ²⁻	26	26	28
PO ₄ ³⁻	0.3	0.3	0.4
NO ₂ ⁻	0.4	0.4	0.4
NO ₃ ⁻	4.4	4.4	3.4