Studies on Algal Flora in Fox Sagar Lake, Jeedimetla, Hyderabad

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Abstract: In the present study to study the periodicity and seasonal distribution of phytoplankton and to identify the planktonic algae, which serve as indicators of pollution. 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. In Fox Sagarlake 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.

Keywords: Fox Sagar Lake, Algal flora and Cyanophyceae.

Introduction:

The aquatic ecosystem holds complex biological environment. The biotic diversity is highly influenced by any alteration in the water quality. The response of the organism to the fluctuations in the aquatic environment is characteristic of each specific species (Deeksha Dave, 2011).

Phytoplankton being dominant photoautotrophic organisms in the aquatic environment plays a significant role as a tool in assessing the quality of the water. This is because of the high degree of sensitivity these organisms, exhibit to the altering environment (Kumar and Rai, 2005). The degree of the contamination with the other substances corresponds to definite micro flora and micro fauna. Thus there is a possibility to establish the severity and type of pollution by the presence of indicator organisms in a given habitat. The distribution and periodicity of the phytoplankton is governed by the seasonal change. In general biological parameter involves the study of biotic diversity, and its productivity of flora and fauna in relation to the physico-chemical environment prevailing in a specific habitat (Mishra, et al., 2007).

The production of algae in an aquatic habitat tends to vary with the variation in physical factors such as temperature, light etc. Low temperature and reduced light inhibits biological productivity where as in late summer where the temperature is generally high, eutrophic water is characterized by blooms of Cyanophyceae (Mahananda, et al., 2005). Thus water quality is directly influenced by thermal stratification and in turn influence productivity. In the present study to study the periodicity and seasonal distribution of phytoplankton and to identify the planktonic algae, which serve as indicators of pollution.

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. The lake is popular for fishing and a popular spot for picnics.

Three sampling stations were selected from the Fox Sagar Lake and are characterized as follows. 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 and Station III is located 200 meter after station II.

Phytoplankton Enumeration

Surface water samples for phytoplankton were collected from the 3 sampling stations for a period of 2 years from June 2013 to May 2015. One litre of the sample was kept in sedimentation columns after adding 4% Formaldehyde solution. The samples were kept in dark undisturbed for about fifteen days for complete settling of the organisms. Finally the sample was concentrated to 100 ml.

For the frequency measurements of different species of algae at each station, the drop method Pearsall, et al., (1946) and as described by Venkateswarlu (1969) was adopted and finally the organisms present in 120 high power fields of the microscope (15*45, 30537) and a number of individual species were noted. The microscope was standardized to find out the area of the field. The number of organisms per ml was further calculated depending upon the concentration of the sample.

Results and Discussion:

The biological parameters include the estimation of phytoplankton community structure and their distribution in various seasons. The taxa recorded in the lakes have been classified under four classes Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae.

Cyanophyceae constituted 79.69% at station-I, 82.07% at station-II and 78.95% at station-III. Chlorophyceae constituted 11.00% at station-I, 9.37% at station-II and 11.38% at station-III. Euglenophyceae constituted 5.72% at station-I, 5.41% at station-II and 6.40% at station-III and Bacillariophyceae constituted 3.57% at station-I, 3.13% at station-II and 3.27% at station-III (Table: 1).

In Fox Sagar lake Cyanophyceae exhibited a well marked periodicity in the lake. They were present throughout the period of investigation reaching summer peaks. The physico-chemical parameters like pH, temperature, dissolved oxygen, nitrates, phosphates and rainfall play an important role in periodicity of Cyanophyceae.

Cyanophyceae forms exhibited qualitative and quantitative abundance forming blooms almost throughout the period of investigation. Blooms of *Oscillatoria* species were very common in lake Fox Sagar. Bloom of *Microcystis* and *Arthrospira* species were present throughout the year thus showing vast degres of tolerence to widely varying environmental conditions prevailing in different seasons of the year. The presence of these blooms indicates eutrophic nature of the lake (Murugesan and Sivasubramanian, 2008). It was observed that the cyanophycean fluctuated with the rainfall and temperature. Cyanophycean members constituted 80% of the total algae when the water temperature fluctuated between 24 - 26^{0}C. The species *Oscillatoria* and *Microcystis* were dominant in the lake.

Active multiplication of Cyanophyceae coincided with higher concentration of dissolved oxygen. This is due to the tendency of Cyanophyceae members to produce oxygen as recorded by Hosmani, (2002).

The Cyanophyceae has been observed to be the most significant group in the lake with 80%. The Cyanophyceae population has been represented primarily by the species of *Oscillatorialimosa, Merismopedia punctata, Microcystis aeruginosa*, *Chroococcus minutus and Arthrospira platensis* (Table: 2).

In the present investigation the Chlorophycean members were represented in more numbers during early summer season. Among the Chlorophyceae Chlorococcales dominated the lake. The periodicity and diversity of Chlorococcales and the role of physico-chemical parameters of the lakes in regulating them was studied from time to time.

Chlorophyceae is observed as a stable community in the lake. They existed throughout the period of study. Chlorophyceae occupied the second position in the lake (11%). The abundance of this class is mainly due to the presence of *Chlorella vulgaries, Coelastrum microporum, Scenedesmu sacutiformis*, *Eudorina elegans, Chlamydomonas angulosa and Pandorina morum.*

In the present investigation it was observed that high temperature (25^{0}C - 26^{0}C) and greater amounts of organic matter were favourable for the members of Euglenophyceae to multiply.

Euglenophyceae were represented by *Euglena polymorpha, Euglena acus, Euglena oxyuris, Phacus acuminatus, Phacus curvicauda* and *Phacus longicauda.* The presence of these species indicates organic pollution.

One of the most abundant and diversified groups of algae are diatoms. In the present study the diatoms were recorded very less number. Some diatoms existed throughout the period of investigation while many occurred rarely and were not in abundance, due to high concentration of organic matter (Sandhya, 2011). This constitutes *Cyclotella meneghiniana, Navicula rhynchocephala and Nitzschia palea* which are marked as species showing wide range of tolerance to pollution.

In general the Cyanophyceae constituted the high peaks during summer and diatoms in winter (Fig: 1 – 3). Chlorophyceaee dominant in early summer. Temperature, organic matter, phosphates and nitrates are influenced the growth of Cyanophyceae. Whereas the Chlorophyceae was influenced by temperature and oxygen. Silicates and oxygen are responsible for the growth of diatoms (Veerandra et al., 2006). The Euglenophyceae influenced by temperature, organic matter and nitrates.

Conclusions:

In Fox Sagarlake 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. The phytoplanktonic diversity and the dominance of blue greens is an indication to organic pollution. Organic pollution in the present study is evident from the luxurient growth of *Microcystis aeruginosa, Oscillatoria limosa and Merismopedia punctata* and blooms of *Cyclotella meneghiniana, Navicula rhynchocephala and Nitzschia palea*. This is an indication of sewage pollution.

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Table - 1
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

Table - 2

Common and dominant species of Phytoplankton

| Groups	Species
Cyanophyceae	*Oscillatoria limosa, Oscillatoria curviceps, Oscillatoria animalis, Oscillatoria chalybea, Oscillatoria ornata, Merismopedia punctata, Microcystis aeruginosa, Arthrospira platensis* and *Chroococcus minutus*
Chlorophyceae	*Eudorina elegans, Chlamydomonas angulosa, Pandorina morum, Chlorella vulgaries, Coelastrum microporum, Scenedesmus acutiformis, Scenedesmus armatus, Scenedesmus quadricauda, Ankistrodesmus falcatus* and *Actinastrum hantzschii.*
Euglenophyceae	*Euglena polymorpha, Euglena acus, Euglena proxima, Euglena oxyuris, Phacus acuminatus, Phacus curvicauda* and *Phacus longicauda*
Bacillariophyceae	*Nitzschia palea, Navicula pupula, Navicula mutica, Navicula rhynchocephala, Gomphonema parvulum* and *Cyclotella meneghiniana.*

Figure - 1

Distribution of algae
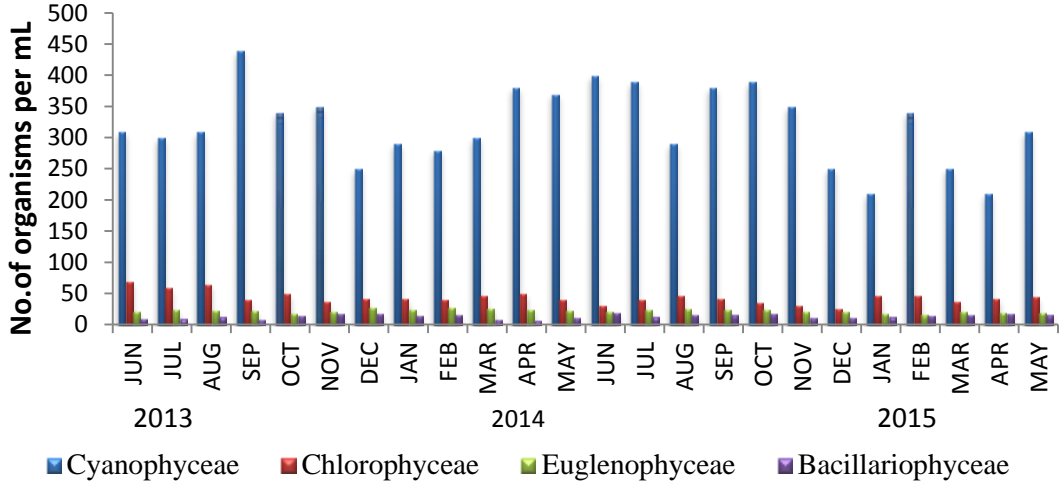
Station - I

Figure - 2

Distribution of algae
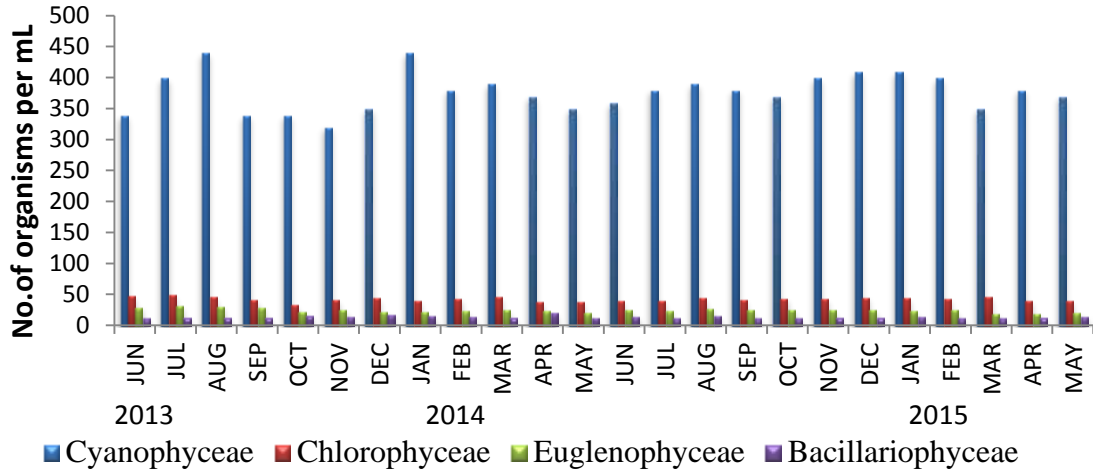
Station - II

Figure - 3

Distribution of algae

Station - III