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Algal Diversity in Safilguda Lake, Hyderabad, India

Rohini A*[1] and Manikya Reddy P.[2]

Department of Environmental Science, CVR College of Engineering, Ibrahimpatnam 501 510, Telangana, India

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ABSTRACT

Algal diversity is one of the indicators of the lake trophic status and ecological state. The present study was underken to understand the distribution of phytoplankton diversity and abundance of Safilgudalake, Hyderabad. A monthly sampling was carried out from May 2017 to April 2018 at three different stations of the lake. Four classes of phytoplankton were identified in the lake. Euglenophyceae contributed more percentage of composition followed by Cyanophyceae, Chlorophyceae and Bacillariophyceae. During the study, a total of 105 species of phytoplankton were recorded from different groups. The highest species diversity was seen in Euglenophyceae. The different environmental conditions at three study sites might have caused variation in species composition. Safilguda lake is found to be rich in phytoplankton diversity and phytoplankton density was high during summer period.

Key words: *Phytoplankton, Diversity, Distribution, Abundance and Safilguda lake*

Introduction

Clean, safe and adequate fresh water is requisite for the survival of all the living beings. As human population grows and industrial and agricultural activities expand, water quality is increasingly threatened. Freshwater is the most important natural renewable resource. The freshwater habitats are fragile ecosystems that are susceptible to damage and occupy relatively a small portion of the earth surface as compared to the marine environment. These water bodies are invaluable assets of a nation which are continuously utilized for the various needs of the society such as drinking, irrigation, industrial usage, recreation and so on.

Lakes are the natural or manmade slow moving or standing fresh water bodies. Many of the fresh water lakes have been totally lost due to encroachment while the surviving ones have been shrunk in size and while the waters of several lakes are polluted with the discharge of raw sewage, industrial effluents and agricultural runoff of chemical fertilizers and insecticides (Rohini and Manikya Reddy, 2021).

Algae are widely present in fresh water environments and lakes are the large, fresh water habitats for phytoplankton growth. Phytoplanktons are the microscopic free floating algal communities of water bodies (Jiji Joseph, 2017). Phytoplankton forms the base of the food chain and act as food for zooplankton, fish and other organisms. They constitute the most important biological community of aquatic ecosystem. The productivity of an aquatic system is directly related to the diversity of phytoplankton as the productivity of any water body is determined by the amount of phytoplankton it contains as they are the major primary producers (Amarnath *et al*., 2013). The phytoplanktonic study include distribution, abundance, diversity and composition which is a very useful tool for the assessment of water quality

(*[1]Senior Assistant Professor, [2] Professor)

and productivity of any water body (Pawar *et al.*, 2006). Microscopic analysis of water samples for algal species tells about the diversity and density of phytoplankton (Anyinkeng *et al*., 2016).

Phytoplankton includes several microalgae belonging to Bacillariophyceae-Diatoms, Euglenophyceae-Flagellates, Cyanophyceae-blue green algae and Chlorophyceae-green algae. These are found attached to stones, wood and other surfaces and occur were light, nutrients and other conditions are suitable for their growth. Phytoplankton respond to environmental changes and are used to assess the ecological status of the water bodies as they are the good indicators of water quality and pollution. These can affect the water quality and its aesthetic appeal. Nutrients nitrates and phosphates influence the phytoplankton abundance. These nutrients help in the formation of cell membranes of phytoplankton (Suthers and Rissik, 2009).

The lake selected for the present study is located at Safilguda, Hyderabad (Fig. 1). Water samples were collected in triplicate at monthly intervals during three seasons post-monsoon, pre-monsoon and monsoon from May 2017 to April 2018 from three stations covering the entire lake. The sampling was carried out in the morning between 8.00 AM to 9.00 AM. Station I is the entrance of the lake which is situated at the left side of the lake (Fig. 2), Station II is the middle of the lake (Fig. 3) and Station III is located at the right side of the lake (Fig. 4).

Fig. 1. A View of Safilguda Lake

Phytoplankton samples after collection were preserved in 4% formaldehyde solution. For phytoplankton identification, slides of each sample were prepared in triplicate. A drop of sample was placed on a sterilized slide covered with a slip and observed under the microscope. Phytoplankton species were identified and counted by the use of a binocular light microscope. Micro photograph of each specimen was taken using American optical binocular research microscope fitted with Cat com digital image camera. Phytoplankton were identified through morphology and description upto species level using standard books, manuals, earlier research works and different monographs (Desikachary, 1959, Prescott, 1968, Anand, 1989 and Adhikary, 2010).

Fig. 2. Station I

Fig. 3. Station II

Fig. 4 Station III

Results and Discussion

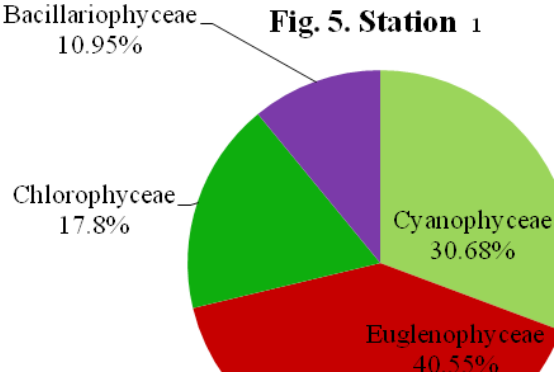
The species diversity and abundance of microalgae in three stations were analyzed covering three seasons during the period 2017-2018. The study has recorded four classes of Phytoplankton in Safilguda lake which are Euglenophyceae, Cyanophyceae, Chlorophyceae and Bacillariophyceae. In the lake, 105 species of phytoplankton were identified. The class Euglenophyceae (Euglenoids) had highest percentage distribution at all the three stations followed by Cyanophyceae (Blue-greens), Chlorophyceae (Chlorococcales) and Bacillariophyceae (Diatoms). Similar to the present investigation, many researchers reported four algal groups in their studies (Amin, 2013; Rohini and Manikya Reddy, 2023; Seeta and Manikya Reddy 2018, Srinivas and Manikya Reddy, 2017). Phytoplankton diversity was found in the order of Euglenophyceae> Cyanophyceae> Chlorophyceae>Bacillariophyceae.

Percentage wise contribution of phytoplankton groups at three different stations is represented in the form of pie-diagrams (Fig. 5, 6, 7). The total number of phytoplankton from different algal groups recorded at three monitoring stations is shown in Table 1.

Table 1. Total number of Phytoplankton

Algal Groups	Station-I	Station-II	Station-III
Euglenophyceae	3370	3144	3220
Cyanophyceae	2550	2360	2620
Chlorophyceae	1480	1425	1580
Bacillariophyceae	910	790	930
Total	8310	7719	8350

Several other researchers also found dominance of Euglenophyceae in the lakes (Muralidhara and Yogananda 2018, Padmapriya *et al.*, 2022). Euglenophycean members contributed maximum diversity in Safilguda lake and were the most dominant class. Euglenoids are one of the best known groups of unicellular flagellates commonly found especially when water is rich in organic materials (Muralidhara and Yogananda, 2015). They occur in freshwater as indicator organisms to be used for assessing water quality. Hence, euglenoids occur in greater number in polluted water bodies. This class was represented by *Euglena, Phacus, Trachelomonas and Lepocinclis.* Euglenophycean diversity was highest during the months of summer season were temperature was high. Thus, density and diversity of euglenoid flagellates is positively correlated with water temperature. *Euglena* and *Phacus* were present at all the stations and were recorded in good numbers (Rohini and Manikya Reddy, 2023).



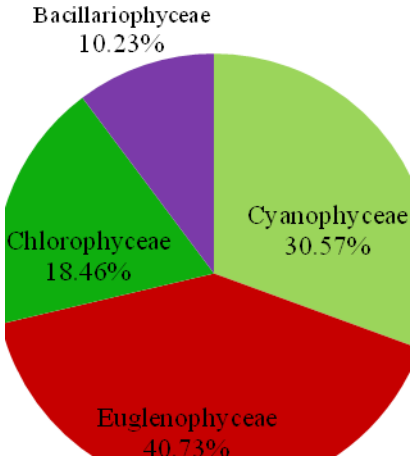


Fig. 6. Station 2

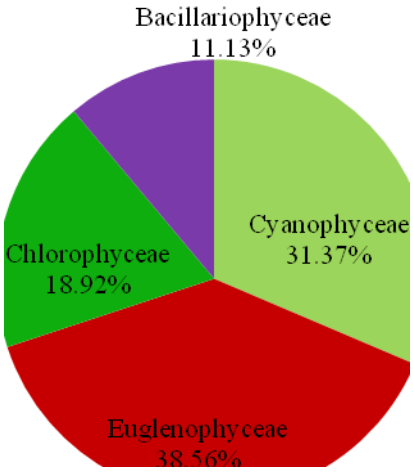


Fig. 7. Station 3

Cyanophyceae dominated over Chlorophyceae and Bacillariophyceae and is the second dominant class of phytoplankton in the present investigation. Blue-greens are found in most diverse habitats. Among the blue-green algae, *Arthrospira, Oscillatoria, Merismopedia, Chroococcus and Microsystis* were reported in the present study. *Arthrospira* and *Oscillatoria* were observed in good numbers and were recorded at all the stations. Bloom of blue-green algae in aquatic ecosystem is a sign of eutrophication caused by addition of sewage. This bloom imparts a characteristic blue colour to the aquatic habitat. The eutrophic environment is due to high concentrations of the nutrients especially nitrates and phosphates (Mohammad Nasser, 2013). Thus, cyanophycean members exhibit heavy growth in eutrophic water bodies. Many workers observed maximum number of blue-greens during summer and minimum in winter (Santosh *et al.,* 2007; Khanna and Indu, 2009; Neelam *et al.,* 2009). Similar results are reported in the present study.

The class Chlorophyceae has diverse forms of algae and are distributed widely. Chlorophyceae is represented by Chlorococcales and Desmids. In the present work, Chlorococcales were dominant and desmids were completely absent. Desmids are the sensitive organisms and their absence in the lake indicates the polluted condition of the lake. The species of *Scenedesmus, Coelastrum, Chlorococcum, Pandorina, Eudorina* and *Pyrobotrys* represent chlorococcales in the present investigation. Many types of *Scenedesmus* species were identified in the lake. Seasonally, maximum density of chlorococcales were recorded during summer as high temperature and bright sunlight favoured their growth and abundance (Tapan Sarkar, 2023).

Table 2. List of Phytoplankton identified from Safilguda lake (May 2017-April 2018)

Euglenophyceae	Cyanophyceae
Euglena	*Arthrospira*
Phacus	*Oscillatoria*
Trachelomonas	*Merismopedia*
Lepocinclis	*Chroococcus*
Chlorophyceae	*Microcystis*
Scenedesmus	
Coelastrum	Bacillariophyceae
Chlorococcum	*Cyclotella*
Pandorina	*Nitzschia*
Eudorina	*Navicula*
Pyrobotrys	*Gomphonema*
	Synedra

The group Bacillariophyceae represents diatoms. Among the planktonic community, diatoms form the bulk of the planktonic population in the fresh waters. Diatoms are known for the silica based cell wall. Safilguda lake has lesser portion of diatoms when compared to other algal groups. The species of *Cyclotella, Nitzschia, Navicula, Gomphonema* and *Synedra* were found in the lake. Highest number of diatoms were recorded in winter in the present work which is in accordance with Navatha and Manikya Reddy (Navatha and Manikya Reddy, 2016).

Conclusion

The present study provides an insight into the distribution, diversity, abundance and ecology of phytoplankton in Safilguda lake, Hyderabad. The lake had a diversified group of phytoplankton dominated by Euglenophycean members followed by Cyanophyceae, Chlorophyceae and Bacillariophyceae. A total of 105 species of phytoplankton were identified in the lake from different algal classes. The organisms *Euglena, Phacus, Arthrospira*, *Pandorina*, *Cyclotella* and *Nitzschia* react to the environmental conditions and hence, are the indicators of water quality and pollution. From the study, it is evident that Safilguda lake support a rich diversity of algal flora and is an Eutrophic lake.

Conflict of Interest- None

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