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Studies on Mat forming algae in Nyalkal fresh water lake, Nizamabad, Telangana State

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Abstract

Cyanobacteria especially termed blue-green algae typically inhabit damp soils and water. These species represent a large component of the phytoplanktonic biomass in freshwater ponds. In many fields, including medicine, feed, fuel, and pollution combating, cyanobacteria are a crucial resource. An essential ecological factor in freshwater aquaculture, cyanobacterial diversity yields several relevant insights. Blue-green cyanobacteria and sediments make up the majority of Mat forming. Algal mats may be seen in abundance in stromolites. The current research endeavor intends to explore the biodiversity of cyanobacteria. Blue-green algae were examined using a binocular microscope in order to determine their species by their size, shape, and color.

Keywords: Algal diversity; Cyanobacteria; Blue-green Algae; Nyalkal lake.

1. Introduction

Phytoplanktons, aquatic organisms, and prokaryotes are all represented in the freshwater ponds that make up the freshwater ecosystem Demoulin et., al. (2019) [1]. There was a high degree of interdependence among the organisms that lived in freshwater ponds. In freshwater ponds, blue-green algae (cyanobacteria) were common and played an important role in maintaining biological stability and water quality Haraldsson. et., al. (2019) [2]. Many cyanobacteria, especially those belonging to the genera *Anabaena*, *Aphanizomenon*, *Microcystis*, and *Oscillatoria*, developed widespread and long-lasting blooms, mat forming in aquaculture ecosystems. Paerl (1995) [3], Sevrin-Reyssac (1995) [4]. Algae belonging to the Cyanobacteria were abundant in freshwater ponds and played a crucial role in preserving the ecosystem and water quality. Additionally, they may undertake carbon assimilation and N₂ fixation and release several physiologically active chemicals, all of which contribute to increased environmental production. Singh JS (2016) [5]. By performing photosynthesis and releasing oxygen as a byproduct, cyanobacteria serve a crucial role in transforming atmospheric nitrogen into organic forms like nitrate and ammonia that used by other plants for growth and survival. Havens K.E(2008) [6], Murrell M.C (2004) [7]. Blue green algae are found in all types of aquatic bodies. Cyanobacteria found in sedimentary rocks indicate that bacterial life began on Earth during the Precambrian age. The cyanobacteria colonies contain two types of cells, the regular cells with chlorophyll carrying out the photosynthesis, and heterocysts which fix the nitrogen. These heterocysts have thick walls and lack chlorophyll, both of which limits their exposure to oxygen, the presence of which inhibits nitrogen fixation. For the same reason, fixation may also be limited to nighttime when the light-dependent reactions of photosynthesis are shut down, minimizing oxygen production. Bettina E. (2015) [8].

Few cyanobacteria species were used for commercial purposes, according to the available research. Consequently, a comprehensive study of cyanobacteria biodiversity was required to understand the function of cyanobacteria in fresh water ponds; also, the diversity profile of cyanobacteria would disclose the level of pollution and human activities in the environment. Wilson S.D. (2010) [9]. Numerous blue-green algae investigations have identified the following species as

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common in freshwater ponds: *Microcystis sp.*, *Cylindrospermopsis raciborskii*, *Synechococcus sp.*, *Planktothrix agardhii*, *Gloeotrichia sp.*, *Anabaena sp.*, *Lyngbya sp.*, *Nostoc sp.*, *Oscillatoria sp.* Diez B. (2014) [10]. The purpose of this study was to isolate and characterize mat forming several species of cyanobacteria found in freshwater pond of Nyalkal.

2. Material and Methods

2.1. Study Site

Nyalkal lake is located in Nyalkal village. Nyalkal is a Village in Nizamabad Mandal in Nizamabad District of Telangana State, India. It belongs to Telangana region. It is located 4 KM towards South from District headquarters Nizamabad. 4 KM from Nizamabad. This lake is located at Nizamabad district of Telangana state. 180 38'7" N 780 5'11" E latitude and longitude of the lake. Four samplings point will be identified at this water bodies to collect the samples. They are: Sample station-I Mathadi point, Sample station-II Near Katta mysamma temple, Sample station-III Road side Sample, station-IV Beside paddy field.

2.2. Sample Collection

There was a fresh water pond where the water samples were taken from. At a depth of about 30 cm, we used a plankton net to collect samples in 500 ml capacity sterilized bottles. Following collection, samples were examined using a binocular microscope using the wet mount technique. Raju P. Aruna .M. (2023) [11].

2.3. Morphological Diversity Cyanobacteria Species & Identification

Spreading a pure, isolated algae material on glass slides with the use of forceps allowed us to morphologically identify the cyanobacteria present. binocular microscopes were used to examine the glass-covered slide at low (10x) and high (100x) magnifications to determine their sizes, shapes, colors, and other characteristics (Labomed Vision 2000 Microscope). We used T.V. Desikachary's , book to positively identify a wide variety of cyanobacteria species in a pond of fresh water in Nyalkal.

3. Results and Discussion

3.1. Cyanobacteria Isolation and Species Identification in Nyalkal lake:

The diversity of cyanobacteria populations in Nyalkal fresh water ponds has been mapped out. According to the findings, 17 different cyanobacterial species representing 7 different families. Each species is unique and important in its own right; its size, form, and coloration are just some of the characteristics that allow them to be placed in their own distinct taxonomic families. Cyanobacterial species from the families *Oscillatoriaceae* and *Microcystaceae* were found in very high number Similar findings reported. Muthu Kumar. C.(2007a) [12], K. Rajyalaxmi, M. Aruna (2018) [13]. Family *Oscillatoriaceae* was the most abundant, followed by *Nostocaceae*, *Microcystaceae*, *Scenedesmaceae*, and *Desmidiaceae*. (Table No-1). Fig No-1 indicating some algal micrographs from Nyalkal lake.

The capacity of cyanobacteria to thrive in turbid water and with dim lighting has allowed them to retain their dominance. Prasad (2019) [14]. They may develop enormously during the wet season when nitrogenous fertilizers were plentiful Muthu Kumar et., al. (2007b) [15]. Minimal eutrophication and human activity were represented in this research by groups including *Naviculaceae*, *Microcystaceae*, *Scenedesmaceae*, and *Fragilariaceae*. Umar ani V,(2017) [16].The current study analyzed the diversity of cyanobacteria in fresh water pond of Nyalkal lake in great detail; however, further research at the biochemical, and molecular level may be useful in order to fully grasp the significance of this diversity to the fresh water ecosystem.

Table 1 Indicating Cyanophyceae class algal members

Class	Name of the family	Micro algae
Cyanophyceae	<i>Rivulariaceae</i>	<i>Calothrix sp</i>
	<i>Chroococcaceae</i>	<i>Chroococcus turgidus</i>
	<i>Merismopediaceae</i>	<i>Merismopedia glauca</i>
		<i>M. punctata Meyen</i>
	<i>Spirulinaceae</i>	<i>Spirulina subsalsa</i>
	<i>Microcystaceae</i>	<i>Microcystis aeruginosa</i>
		<i>M. marginata</i>
		<i>M. flos-aquae</i>
		<i>M. robusta</i>
	<i>Nostocaceae</i>	<i>Nostoc linckia</i>
		<i>N. calcicola</i>
		<i>N. stagnale</i>
		<i>Anabaena. Sphaerica</i>
		<i>A.iyengarii</i>
		<i>A.arnoldii (aptekarij)</i>
		<i>Lyngbya majuscula</i>
	<i>Oscillatoriaceae</i>	<i>Oscillatoria princeps</i>
		<i>O. majuscula</i>
		<i>O. nigra</i>
		<i>O. curviceps</i>

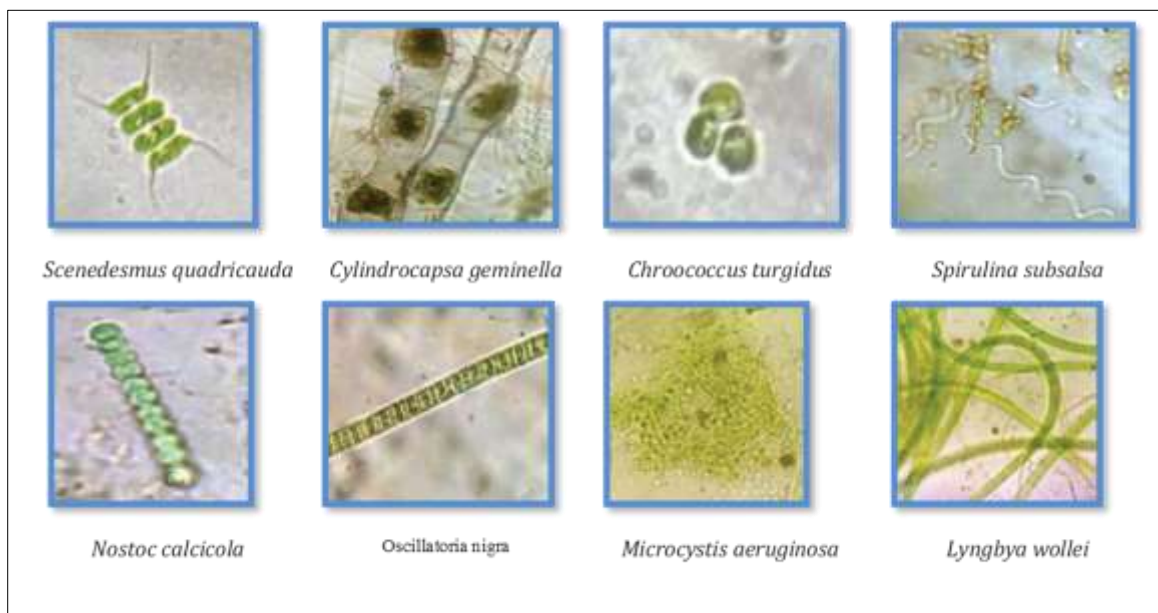


Figure 1 Some of the algal micrographs in Nyalkal lake



Figure 2 Nyalkal Lake Satellite View and Microscopic Observation

4. Conclusion

Many scientists have looked at the diversity of cyanobacteria in fresh water ponds, but no such studies have been conducted in the fresh water of Nyalkal lake. This analysis also brought attention to the rich variety of cyanobacteria. As a result, this work might serve as an effective foundational study for future research into the variety of fresh water cyanobacteria in Nyalkal lake.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare no conflict of interest.

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