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Algal Diversity of a Freshwater Lake of Tumkur City, Karnataka, India

G. Venkateshappa[2] and Krishna[1]

[1]Department of Biotechnology, University College of Science, Tumkur University, Tumakuru, Karnataka, India
[2]Department of Studies and Research in Chemistry, University College of Science, Tumkur University, Tumakuru, Karnataka, India

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ABSTRACT

Water is a universal solvent, where almost all the living being's carry out their biochemical reactions. Fresh water usually contains nutrients for all types of microorganisms, one of which, algae found commonly in lakes. Phosphorous and nitrates are the principal nutrient for algae. The study of algal diversity in fresh water is very useful to determine quality of water and nature of aquatic ecosystem. Amanikere lake in Tumakuru city is one of the major lakes to receive residential sewage. Water samples were collected for the study of diversity of algae from June, 2017 to May, 2018. The algal samples were isolated and identified using standard laboratory method of *Clesceri et al.,* (1998). About 38 species of algae were found in randomly selected areas (1 to 6) of water samples of Amanikere lake. Some of the algae found to be in high in Amanikere lake like Cyanophyceae – *Oscillatoria, Nostoc, Anabaena., Chlorophyceae – Spirogyra, Cosmerium* and *Bacillariophyceae – Navicula, Diatoma, Fragellaria.* The study carried out reveals a diversity of algae in the lake.

Key words : *Algae, Diversity, Amanikere, Tumakuru city, Fresh water*

Introduction

Water is an essential part of protoplasm and creates a state for metabolic activities to occur smoothly. In addition, there are thousands of microorganisms which live in water and are transported through it. Water receives microorganisms from air, soil, sewage, organic wastes, dead plants and animal etc. Microbiological studies are of great importance both from the point of monitoring and maintaining a proper aquatic environment as well as optimum utilization of the available and added nutrient for fish production. According to Mane, (2007) the microbiological examination of water has significance in case of pollution studies.

It is generally believed that every water capable of accepting certain minimum amount of pollution without any adverse effect on itself due to natural biological cycles and self purification capacity. Any undesirable change characteristics of water brings about pollution, which is assessed by studying the biological features of aquatic biota.

Study of diversity of any organisms/microorganisms is very much essential in any ecosystem. Algae is one of the eukaryotic microorganisms found commonly in water. Algae uses phosphorus and nitrates as major source of nutrient, these are entering into the water body through by sewage, agricultural runoff, industries, residential area and rain waters. The most expanding field of biology is the biodiversity

study, many researchers worked on many types of diversity and reveals importance of study of biodiversity.

Some of the researchers worked on algal diversity are Zimmerman and Cardinale, (2013) on algal diversity in North America lakes., Srivastava *et al.*, (2014) on algal biodiversity in fresh water reservoir of Durg. Ramesh and Aruna, (2015) on diversity of fresh water algae in Trivenisangamam of Nizamabad district, Telangana state, India. Vijayan *et al.* (2014) on depiction of microalgal diversity in Gundur lake, Tiruchirappali district, Tamil Nadu, South India., Costelloe *et al.* (2005) on algal diversity in lake Eyre Basin., and Skacelova *et al.*, (2013) on biodiversity of freshwater algae and cyanobacteria on deglaciated northern part of James Ross Island, Antarctica. All these researchers paper highlighted the diversity of algae and its effect on freshwater.

In the present study Amanikere lake water from Tumakuru city, Karnataka, India, was selected to know the diversity of algae, because it is located in heart of the city and is exposed to air pollution, high density residential area and small scale industrial area. The study reveals abundance of algal diversity in freshwater lake Amanikere.

Materials and Methods

Study Area

Tumakuru taluk is located between $13^0 06' 30''$ to $13^0 31' 00''$ N and $76^0 59' 00''$ to $77^0 19' 00''$ E. It is located in the south eastern corner of Karnataka state. It has an average elevation of 822 meters or 2696 feet. Fresh water lake Amanikere has storage capacity of 4.68 M cu.m. Sewage water from residential areas is directly passed into the lake through the main drainage. Because of drainage major areas of Amanikere occupied by weeds and large herbs, thus affecting the biological process of living organisms and microorganisms by obstructing penetration of sunlight. Phosphate and nitrates are rich in sewage water which promote the growth of algae, later it leads the eutrophication of lake water.

Collection of samples

The present study was undertaken during the months of July 2017 to May 2018. Water samples were collected during the morning hours in randomly selected area (Area 1 to Area 6). Previously a cleaned plastic bottle was taken and about quarter of it was filled with 70% of alcohol. At the time of sample collection, the bottle was rinsed with alcohol and once again thoroughly rinsed with water of collection site. Then the bottle was introduced into water source to collect algal sample, after the collection the cap was closed and sample bottle was brought to Biotechnology laboratory, University college of Science, Tumakuru, and stored in refrigerator. Later the analysis was undertaken within 24hours of collection. (Methodology: Clesceri *et al.*, 1998 and Trivedy and Goel, 1986)

Collection and Identification of algae

Samples have been collected between 10am to 1pm, during clear sunlight. Following methods of Clesceri *et al.*, (1998) the water samples were identified for the microscopic algae. Photocopies of the individual species were obtained in Sony digital camera. The algal species were identified according to Prescott, (2002).

Liquid preservation of Algae

10ml of concentrate sediment of algae was preserved in 1ml of 4% formalin (is commonly used for short term storage of algae) (Hurst *et al.*, 1997).

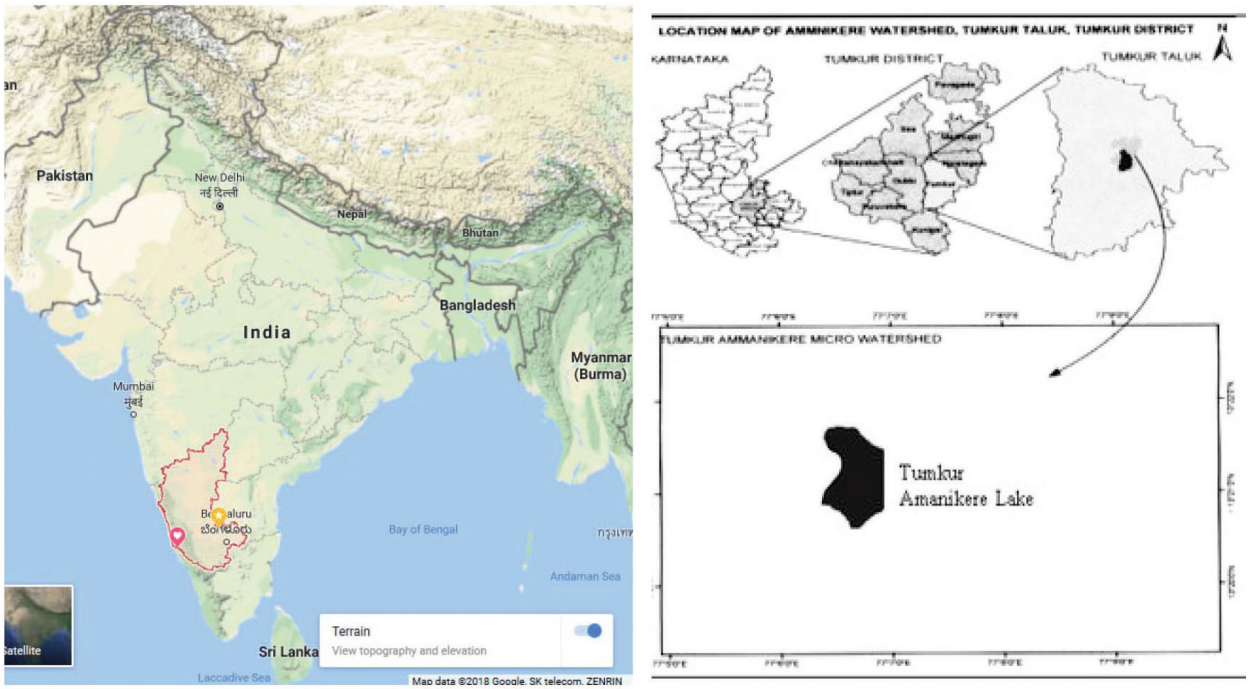
Results

Amanikere freshwater lake recorded about 38 species of algae. Some of the algae found to be high in Amanikere lake like Cyanophyceae – *Oscillatoria, Nostoc, Anabaena., Chlorophyceae – Spirogyra, Cosmerium and Bacillariophyceae – Navicula, Diatoma, Fragellaria.* The study carried out reveals a diversity of algae in lake (Table 1). All the species identified are photographed and recorded.

Discussions

According to Adeyemo *et al.*, (2008) the high levels of nitrogenous compounds in waste water can be effectively removed only by algae. Skacelova *et al.*, 2013 recorded rich diversity of Cyanobacteria and then Chlorophyta, Bacillariophyceae and Eustigmatophyceae in northern part of James Ross Island, Antarctica.

According to Costelloe *et al.*, (2005) algal diversity is highest during or soon after flood events, they suggest that the combination of germination of algae from channel and flood plain sediments and the



Google Map and C.R. Ramakrishnaiah *et al.,* 2010 (Courtesy)

Fig. 1. Map of India, Karnataka State showing Tumakuru District and Amanikere Lake in Tumakuru city.

transport of algae from aquatic refuges during flood events resulted in the increased diversity. They discovered total of 118 genera, containing 237 taxa, in seven phyla. In the present study, in Tumakuru city, rain fall is less and flood chances are negative, but recorded high density of algae (Table 1).

The lake water sample from Amanikere showed the growth and abundance of phytoplanktons. According to Kumar *et al.* (2002) to some extent the composition of phytoplanktons it self indicate about the quality of water. Phytoplankton species like *Navicula, Syndra, Melosira and Cymbella, Oscillatoria, Anabaena, Spirogyra* etc was significantly present in the status specifically during the period when the sewage load was higher. But they also have ability to utilize the available nutrients, thus purify the water up to certain extent.

Algal diversity in six sites of Gundur lake located in the southern part of Trichirappalli, Tamil Nadu recorded 81 species of algae which includes 35 species belongs to Chlorophyta, 9 species belongs to Bacillariophyta and 37 species of Cyanophyta. Some of the predominant algae in the lake were *Cosmarium Pediastrum*, *Rhophalodia*, *Microcystis*, *Chroococcus*, *Oscillatoria*, *Scytonema* and *Gloeotrichia*. (Vijayan *et al.,* 2014)

Algal diversity work of Ramesh and Aruna, (2015) recorded Chlorophyceae, Cyanophyceae, Charophyceae and Bacillariophyceae and from their work it revealed that Chlorophycean members were dominant followed by Cyanophycean and Bacillariophycean members in Rivers of Godavari, Maneera and Haridra in Kandakurthi village, Nizamabad district. Whereas in Amanikere lake found Chlorophyceae as a dominant alga. This because of variation in temperature and type of pollution in the water.

Srivastava *et al.,* (2014) also recorded almost same type of algae like Chlorophyceae and Cyanophyceae in Shivnath river at a stop dam construction near Durg city, Chhattisgarh state. According to them variation in temperature and light intensity show variation in algal diversity. But in Amanikere lake variation in diversity of algae is almost negative, from June, 2017 to May, 2018, it may be because of low rain fall in Tumakuru city.

Conclusion

Algal diversity in Amanikere lake revealed by observing under microscopic field with 38 species of

Table 1. Algae identified from water samples of Amanikere Lake from June 2017 to May 2018

Samples	Cyanophyceae	Chlorophyceae	Bacillariophyceae
Area 1	-	-	*Navicula* sp
Area 1	*Oscillatoria tennis*	*Spirogyra crassa*	*Navicula sp*
		Scendesmus sp	*Cymbella sp*
Area 2	-	*Spirogyra condensata*	-
Area 3	*Oscillatoria lecustris*	*Oedogonium sp*	*Ocephora sp*
	Nostoc microscopicum	*Ulothrix sp*	*Navicula lenzi*
	Anabaena spiroides	*Cosmerium depressum*	*Navicula pygmaea*
		Cladophora glomeata	*Bacillaria sp*
		Spirogyra crassa	*Cymbella sp*
Area 4	*Gleocapsa sp*	*Cosmerium sp*	*Fragellaria sp*
	Nostoc sp	*Chroococcus limneticus*	*Navicula sp*
		Ceratium hirundinella	
		Ulothrix sp	
		Spirogyra condensata	
Area 5	*Anabaena viguieri*	*Calonies bacillum*	*Navicula multicopsis*
		Cosmerium cucurbitinum	*Navicula pymaca*
		Spirogyra fluviatilis	*Meridian sp*
Area 6	*Oscillatoria sancta*	*Oedogonium sp*	*Fragillaria ulna*
	Nostoc microscopicum	*Zygnema pectinum*	*Cymbella sp*
		Pediastrum biradiatum	*Diatoma sp*
		Spirogyra subsalsa	*Bacillaria sp*
		Staurastru sebaldi	*Diachros simplex*
		Scenedesmus arcuapus	

algae. Among three algal genera like *Cyanophyceae*, *Chlorophyceae* and *Bacillariophyceae*, the *Cyanophyceae* and *Bacillariophyceae* are observed to be in high density. This may lead to the algal bloom and changes in the physicochemical characteristics of freshwater. So proper water management must be taken to save the freshwater.

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