



Phytoplankton Diversity in Midstream Region of Meenachil River, Kerala during Premonsoon and Monsoon Season

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

The scenic beauty and rich diversity of Meenachil River in Kerala make it a valuable freshwater resource for the region. This study aimed to explore the phytoplankton diversity in the midstream region of Meenachil River in Kerala during the pre-monsoon and monsoon seasons. Five different taxonomic groups were identified, which included Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae, with a total of 39 species. Chlorophyceae was found to be the most prevalent group with 18 taxa, followed by Bacillariophyceae with 11 taxa, Cyanophyceae with 7 taxa, Euglenophyceae with 2 taxa and Xanthophyceae with 1 taxon. The study revealed that the pre-monsoon season had a higher abundance of phytoplankton with 39

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species, while the monsoon season had only 27 species. This research provides important insights into the phytoplankton diversity of Meenachil River in Kerala and highlights the significance of monitoring changes in phytoplankton abundance throughout the seasons for effective water resource management. The findings of this study will be beneficial for future research on water quality management and monitoring in rivers.

Keywords: *Phytoplankton; Meenachil River; premonsoon; monsoon.*

1. INTRODUCTION

Plankton is a diverse and complex component of ecosystems that encompasses various types. Among these, Phytoplankton are particularly noteworthy due to their ability to serve as bioindicators that quickly respond to changes in environmental conditions [1]. Phytoplankton are not confined to marine environments and can also be found in freshwater systems, such as rivers, where they serve as the foundation of food webs and play a crucial role in the global carbon cycle [2]. They are recognized for their ability to enhance stability and efficiency of resources within freshwater and brackish ecosystems [3]. The diversity of phytoplankton can be significantly influenced by seasonal variations, specific geographic location, and water depth [4].

The Meenachil River is a significant river in the Indian state of Kerala, renowned for its ecological importance and diverse biodiversity. This river stretches for 78 km and has a catchment area of 1272 km². Its origin is in the Western Ghats, and it flows through Poonjar, Teekoy, Erattupetta, Palai, Ettumanoor, and Kottayam before ultimately meeting the Vembanad Lake. The Meenachil River and its tributaries offer habitats for a diverse range of aquatic and terrestrial species, including fish, crustaceans, mollusks, reptiles, amphibians, and birds. Although many studies have explored phytoplankton diversity in India, information about the Meenachil River's phytoplankton diversity is limited, with only one study conducted on its algal diversity [5,6]. This research aims to analyze comprehensively the phytoplankton community in the midstream of the Meenachil River during pre-monsoon and monsoon seasons. The objective of the study is to provide a comprehensive analysis of the phytoplankton diversity in the midstream of the river, which can aid in understanding the area's ecological condition and creating strategies for its preservation and management.

2. MATERIALS AND METHODS

Surface water samples were collected bimonthly from four main sites in the midstream region of the Meenachil river, namely Erattupetta, Pala, Kidagoor, and Pattarmadom between February 2022 to December 2022. The samples were collected early in the morning for analysis. The collection of plankton was done using standard methods outlined in APHA [7]. A plankton net made of bolting silk (No: 25, Mesh size 40 µm) was used to filter 40 L of water. The collected plankton was concentrated to 100 mL and 2 drops of 4% formalin and lugols iodine were added on the spot to preserve them. The samples were then left undisturbed to allow the phytoplankton to settle. The sample was examined thoroughly under an optical microscope for taxonomic analysis. The systematic identification of phytoplankton up to the species level was carried out using standard keys from Desikachary [8], Edmondson [9], Whitford and Schumacher [10], Prescott [11], Palmer [12], and Anand [13].

3. RESULTS AND DISCUSSION

The Meenachil River in Kerala is home to a diverse array of phytoplankton species that serve as indicators of water quality and ecosystem health. A total of 39 phytoplankton species from five taxonomic divisions were identified in this study including Chlorophyceae, Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae (Table 1). Chlorophyceae was the most prevalent group, comprising 18 taxa, followed by Bacillariophyceae with 11 taxa, Cyanophyceae with 7 taxa, Euglenophyceae with 2 taxa, and Xanthophyceae with 1 taxon. The abundance of phytoplankton varied by season, with higher diversity found during the pre-monsoon period than the monsoon season, consistent with previous studies [14,5,6,15-18].

Table 1. Abundance and composition of Phytoplankton in the midstream of Meenachil River, Kerala

Phytoplankton class	Phytoplankton genera and species	Pre-monsoon	Monsoon
Chlorophyceae	Coelastrum microporum	++	+
	Ankistrodesmus falcatus	+	+
	Closterium sp.	++	-
	Chlamydomonas globosa	+	
	Chlorella ellipsoidea	+++	+
	Chlorella vulgaris	+++	+
	Pediastrum duplex	++	+
	Scenedesmus quadricauda	++	+
	Pediastrum boryanum	++	+
Bacillariophyceae	Mougeotia sp.	+	+
	Cosmarium species	+	-
	Staurostrum sps.	+	+
	Tetraedron trigonum	+++	+
	Volvox sp.	+++	+
	Arthrodesmus sp.	+	-
	Chlorococcum humicola	++	+
	Tetraspora lubrica	+++	+
	Spirogyra sp.	++	+
	Melosira granulata	++	+
	Navicula sp	++	+
	Amphora ovalis	++	-
	Pinnularia gibba	++	-
	Pinnularia viridis	+++	-
	Nitzschia vitrea	++	+
	Gyrosigma acuminatum	+++	+
	Fragilaria ratonensis	++	-
	Synedra ulna	+	-
	Cymbella naviculiformis	+++	+
	Cyclotella stelligera	+++	-
Cyanophyceae	Aphanocapsa itoralis	+	-
	Synechococcus aeruginosus	+	+
	Oscillatoria subbrevis	++	+
	Gloeocapsa magma	+++	+
	Anabaena spiroides	+	+
	Nostoc pruniforme	+++	-
	Lyngbya sp.	++	+
Euglenophyceae	Euglena viridis	++	+
	Phacus acuminatus	+	+
Xanthophyceae	Tribonema sp.	++	+

+++ : abundant; ++ : fairly present; + : rare

In the pre-monsoon season, a total of 39 species were identified, with Chlorophyceae being the most abundant group (18 species), followed by Bacillariophyceae (11 species), Cyanophyceae (7 species), Euglenophyceae (2 species), and Xanthophyceae (1 species). In contrast, during the monsoon season, 27 species were observed, with Chlorophyceae (14 species) being the dominant group, followed by Bacillariophyceae and Cyanophyceae (each with 5 species), Euglenophyceae (2 species), and

Xanthophyceae (1 species). The higher diversity of phytoplankton during the pre-monsoon season can be attributed to factors such as increased levels of salinity, temperature, nutrient content, pH, and light intensity, as observed in previous studies [19-22]. However, it should be noted that this study on Phytoplankton diversity in Meenachil river is only preliminary in nature and further factors need to be considered in future studies. Additionally, a correlation study is necessary to clarify the relationship between

these factors and the observed increase in phytoplankton diversity of this river [23].

4. CONCLUSION

In conclusion, the diversity of Phytoplankton varies naturally and is influenced by seasonal and water conditions. The study conducted in the midstream of Meenachil River, Kerala, during the pre-monsoon and monsoon season identified 39 species of phytoplankton from five taxonomic divisions, with Chlorophyceae being the dominant group followed by Bacillariophyceae, Cyanophyceae, Euglenophyceae, and Xanthophyceae. The pre-monsoon season exhibited higher phytoplankton abundance than the monsoon season. This research provides valuable insights into the Phytoplankton diversity of Midstream Region of Meenachil River, Kerala, and emphasizes the need to monitor seasonal changes in phytoplankton abundance for better water resource management.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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