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Assessment of Phytoplankton Diversity in Midstream of Achankovil river during Monsoon and Post Monsoon Seasons

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Abstract

Algae are organisms with size ranging from microscopic to hundred feet to large seaweeds. The present study focuses on the algal diversity in Pandalam area of Achankovil river, Kerala, India. Pilgrims of Sabarimala uses the water of Achankovil River for various sanitary purposes and there by waste dump in river may cause water pollution and related ecological problems.Water samples were collected during the monsoon and post monsoon seasons in the early morning before increasing the intensity of sunlight. Phytoplanktonic forms were collected using plankton net. The analysis of physico-chemical parameters such as temperature, pH, salinity and productivity show a slight variation in mean value during the two seasons. The study reveals presence of forty one algal genera belongings to four algal classes. The results showed that parameters such as dissolved oxygen, carbon dioxide, total hardness and silicate indicate variations with relation to seasons. The variations and distribution of phytoplankton and changes in physico-chemical parameters in freshwater helps to know the water quality of the river.



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Keywords

Algal Diversity; Aquatic Ecosystem; Biodiversity; River Ecology.

Introduction

Algae belong to the kingdom of Protista and the size varies from the microscopic to macroscopic. Algae are diverse in life forms and are found almost every where on the earth and it play a key role in the balancing of the ecosystem. Algae are the primary producers in aquatic ecosystem and have prime role in the food web. They have an important role in maintaining the equilibrium between living organisms and abiotic factors.¹ Phytoplankton plays a key role in aquatic environment and gives food for higher trophic level.² The algal diversity is determined by the level of richness of species and this decides their functional importance in ecosystem.Presence and

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appearance of a particular algae depends upon the seasons and other environmental variables like the availability of nutrients, sunlight, etc.³ Algal diversity studies are very useful tool for the assessment water quality. Physico-chemical parameters and biotic characteristics of water are interrelated and often driven by the surrounding land uses that determine the quality of water at point sources that enter the freshwater streams.⁴ Physico-chemical parameters and nutrients in water play significant role in the distributional pattern and species composition of aquatic phytoplankton.⁵

Achankovil river is an important river in Kerala, located in the southern tip of the peninsula that originates from the Western Ghats. The Achankovil River enriches the Pathanamthitta district of Kerala state. The river is 128 Kilometers long and having thick flora and fauna on its either banks. It joins with the Pamba River at place Veeyapuram of the Alappuzha district of Kerala. Sabarimala is almost popular pilgrimage centre in India, approximately 45-50 million devotees are visiting during the pilgrimage season. Pandalam is the camp site of this popular pilgrim centre, is situated relatively in the mid part of the Achankovil River. Pilgrims came to Pandalam in large numbers to worship the deity of Valiyakoikkal temple and Pandalam palace. Pilgrims of Sabarimala uses the water of Achankovil River for various sanitary purposes and waste dump in river this causes water pollution and other ecological problems and there by causes the water quality and aquatic life. Water from the Achankovil River was used by public around places near the pandalam. The use of the water unwisely without measuring the physical quality may cause different types of chronic diseases. The present study was undertaken to study the richness of microscopic and macroscopic algal diversity along with the physio-chemical parameters in the mid part of Achankovil River during monsoon and post monsoon seasons (pilgrimage seasons). The phytoplankton diversity and pollution indicator species and results of the physico-chemical parameters of the present study helps to assess of the consumptive uses of the water of Achankovil River.

Materials and Methods

For the present study water samples were collected from the different sites midstream of Achankovil

river, from the collection point such as Pandalam valiyakoikkal temple kadavu, Kaipuzha Sree Krishnan temple kadavu and Mahadeva temple kadavu. Minimum of five sampling stations having a distance of 100 meters were selected from each sites for making the study more reliable. The distance between the sampling sites, such as Pandalam valiyakoikkal temple to kaipuzha Sree Krishna temple was one kilometer and Valiyakoikkal temple to Pandalam Mahadeva temple was two kilometer. The water samples collected during the post monsoon season (June - September) and post monsoon season (November - January). Samples were collected during the early morning before increasing the intensity of sunlight. Phytoplanktonic forms were collected by plankton net Number -20 silk bolting cloth. Water having phytoplankton samples were allowed to settle by adding Lugol's lodine and 4% of formalin for the preservation.Macro algae and attached forms were collected by manually. Microscopic observation was done by Magnus (MX21i Clinical) light compound microscope and algae were identified with the help of Fresh water algal identification key as established by Desikachary, Prescott and Philipose.6,7,8 Water samples collected for the physico-chemical parameter analysis taken in a plastic bottles. Physico-chemical parameters such as temperature, pH, nitrate, dissolved oxygen, amount of CO₂, phosphate, silicate and productivity of water samples were analyzed according to standard procedures of APHA.9 Sediments will also collected using Van Veen Grab for the algal species that live in or on these sediments.

Observations and Discussion

Present research work intended to explores the algal diversity of Achankovil River during monsoon and post monsoon seasons. The observations of the research investigation revealed the presence of forty one algal genera belongs to the Classes of Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae. The members of Class Chlorophyceae was dominated with sixteen followed by Bacillariophyceae with fifteen. The genera belong to Cyanophyceae was represented by seven and Euglenophyceae with three numbers only (Table:1). The results of physico-chemical parameters were given in Table-2.

Algal Class	Algal genera and species	Monsoon season	Post Monsoon season
Chlorophyceae	Cosmarium candianum	_	+
	Cosmarium manipurense	+	+
	Scenedesmus quadricauda	-	+
	Chlorella	+	+
	Chlorococcum	+	+
	Closterium acutum	+	+
	Euastrum	+	-
	Nephrocytium	+	-
	Mougeotia	-	+
	Closteriopsis	-	+
	Gonatozygon	-	+
	Selenastrum	-	+
	Odogonium	+	+
	Pediastrum boryanum	+	+
	Pediastrum tetras	-	+
	Ankistrodesmus convolutus	+	-
Bacillariophyceae	Cocconeis	+	+
	Cymbella	+	+
	Gomphonema	+	+
	Gyrosigma	+	+
	Navicula pupula	+	-
	Navicula hasta	+	+
	Navicula mutica	+	+
	Nitzschia	+	+
	Pinnularia gibba	+	+
	Pleurosgma	+	-
	Surirellar obusta	+	+
	Syndra ulna	+	+
	Tabellaria flocculosa	+	-
	Fragilaria	-	+
	Melosira	+	+
Cyanophyceae	Oscillatoria ornate	+	+
	Oscillatoria agardhii	-	+
	Oscillatoria annae	+	+
	Lyngbya majuscule	-	+
	Lyngbya arboricola	-	+
	Anabaena	-	+
	Gloeocapsa	+	+
Euglenophyceae	Euglena	-	+
	Phacus	+	+
	Trachelomonas	-	+

Table 1: Algal diversity in the midstream of Achankovil river

Parameters	Monsoon season	Post-monsoon season	
Temperature(0c)	27	29	
рН	6.8	7.3	
Dissolved oxygen(mg/L)	4.8	3.6	
CO2(mg/L)	4	6	
Salinity(mg/L)	0.055	0.068	
Total hardness(mg/L)	18	22	
Nitrate(mg/L)	0.015	0.083	
Phosphate(mg/L)	0.027	0.068	
Silicate(mg/L)	0.025	0.167	
Productivity(mg/C/l/hr)	0.375	0.45	

 Table 2: Showing the values of physico-chemical parameters

Presence of pollution indicator species increased in monsoon season to post monsoon season of the river. Presence of *Euglena* indicated the abundance of decaying organic materials for algal growth.¹⁰ Presence of pollution tolerant algae like *Melosira,Oscillatoria, Pediastrum and Scenedesmus* are considered as indicative of enriched water, thus providing evidence of pollution of water.¹¹ *Pinnularia gibba, Cymbella, Nitzschia* and *Navicula* are indicators of organic as well as anthropogenic pollution.¹²

In the present study the dissolved oxygen ranged from 3.6 to 4.8mg/I. as DO levels in water drop below 5mg/I many life forms are put under pressure. pH ranged from 6.8 to 7.3 it indicate water was slight alkalinity. pH ranged from 5 to 8 which was best for plankton growth.¹³ Physico-chemical parameters had direct relationship on phytoplankton diversity. DO, pH and dissolved nutrients are important for phytoplankton multiplication.¹⁴

Conclusions

The present investigation on algal diversity of midstream areas of Achankovil River showed four groups of algae. Among the four groups Chlorophyceae were dominant over all other groups. Euglenophyceae were present in least number i.e., only three species.Water samples collected from the three different sites of Achankovil River during the monsoon and post monsoon seasons. Phytoplankton samples collects by using plankton net and preserved in collection bottles. Water samples for physico-chemical parameter analysis collected separately in plastic bottles and analyzed according to the standard procedure. Presence of pollution indicator phytoplankton increased in monsoon season to post monsoon season, that is pollution increased during the pilgrimage seasons and physico-chemical parameters results support this conclusion.Thus this study concludes that the water of Achankovil River is polluted due to contaminations especially during the study seasons.

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Conflict of Interest

The authors do not have any conflict of interest.

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