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Fresh Water Algal Biodiversity in Aruvikkara Reservoir

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Abstract

The present study was carried out to explore the Physico-chemical properties of water and seasonal algal diversity of Aruvikkara reservoir.The study revealed the presence of 17 different species of algae. During the study period members of Chlorophyceae dominated the algal community, followed by members of Cyanophyceae, Bacillariophyceae and Euglenophyceae. Thallus diversity was noticed during the study.

Keywords: Physico-chemical properties, Algal diversity, Chlorophyceae, Cyanophyceae and Euglenophyceae.

Introduction

Water plays a pivotal role for the survival of mankind. Of the 71% of water covering the Earth's surface, only 3% is fresh water, 97% constitute marine water. Freshwater ecosystems represent a major group of habitats around the world. Reservoirs are water locked ecosystems that are bodies of stagnant water with plenty of submerged, floating or rooted plants along with phytoplankton. All freshwater bodies are dynamic systems, not only are their organisms affected by the physico-chemical conditions, but also the plant and animals interact and may influence both the habitat and one another. They have a major influence on the physical and chemical conditions, while intra and interspecific relationships among plants and animals may be of critical importance to both water quality and the structure of communities. Freshwater bodies are one of our most vital natural resources. Algae are vital for almost all the fresh water ecosystems as they play an important role through primary productions in the food chain; they are also a useful tool for the assessment of water quality.

Biodiversity is the wide spectrum of living organisms including plants, animals and microbes inhabiting the terrestrial, aquatic and other habitats. Biodiversity provides the basis of life on earth. Biodiversity is the level of variation in life forms within a specified ecosystem. Aquatic biodiversity can be defined as the variety of life and the ecosystems that make up the freshwater, tidal, and marine regions of the world and their interactions. Freshwater aquatic biodiversity encompasses freshwater ecosystems, including lakes, ponds, reservoirs, rivers and streams, groundwater, and wetlands. The algal biodiversity is determined by the level of richness of species and their specific ecosystem. It shows tremendous diversity and uniqueness with respect to geographical, topographical and climatic conditions. Algae are ecologically important as well as they are known to produce more oxygen than all plants in the world put together. Though the knowledge of algal forms in rivers in India is limited but recently phytoplankton of fresh water rivers have been studied in detail (Mishra et al., 2002, Jafri and Gunale 2006). The assessment of water quality using phytoplankton diversity and their association as biological indicators has been carried out by several workers (Chaturvedi et al., 1999). Seasonal variation of algal forms in lakes and rivers is presented by many researchers (Kaur et al., 2001, Tiwari and Chauhan 2006). Algal biodiversity of water bodies have been studied by several workers in India. Algal members are rich in different phycochemicals.

Distribution of algae and their variation at different zones of a water body is influenced by physico- chemical parameters of water. The algal growth in a habitat influences the ecosystem and responds rapidly to changes in the aquatic environment particularly in relation to nutrients. As per Goswami (2012) the first step towards the conservation of an aquatic system should be on the identification and assessment of biodiversity composition of a lake. Aruvikkara located in Kerala, India with co-ordinates 8.5677800°N 77.018890°E is a village in Thiruvananthapuram district in the state of Kerala, India. It is on the banks of the Karamana river, 15km from Thiruvananthapuram, the capital city of Kerala, South India. Aruvikkara dam is one of the main sources of water for distribution in Trivandrum city. The present investigation was carried out as an attempt to assess the diversity status of phytoplankton along with the physico-chemical parameters of Aruvikkara dam.

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Materials and Methods

Water and Algal samples from three different sites in the Aruvikkara dam were collected during the period October 2008 to September 2009. Samples were analysed for physico-chemical parameters like water temperature which was tested using Celsius thermometer at the sampling sites at the surface and bottom of the water. pH was measured using pH meter in the field itself, while samples for dissolved oxygen were fixed on the spot by Winkler's reagent and further estimated in the laboratory. Biological oxygen demand was also calculated by incubating the water samples in BOD incubator for three days and determining DO again the difference between the two values gave the Biological oxygen demand of the samples. The samples were carefully collected, cleaned in clean water to remove all the extraneous matter and were observed fresh by preparing wet mounts within 48hrs. Then the samples were further preserved in Lugol's solution and 4% formaldehyde solution separately for detailed study. Chlorophycean algae were stained with iodine and mounted in lycerine. The collected algal forms were observed under microscope, and identified them by referring to the standard literature on algae (Desikacharya, 1959; Fritch 1935, Prescott, 1951; Smith, 1920).

Results & Discussion

In the present study Physico-Chemical properties of water were studied. During post monsoon highest temperature and pH were noticed (Table-1). A total of 17 fresh water algal genera belonging Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae have been collected from the study area. Members of Chlorophyceae were found to be dominating of the total algal community.

Water showed slight to highly alkaline pH, which showed increased photosynthetic activity. PH was reported slightly higher during post mosoon seasons, which may be attributed to the increased photosynthetic activity in the aquatic body which demand more CO2 than furnished by respiration and decomposition. The amount of oxygen in an aquatic ecosystem is dependent on temperature, photosynthetic activity, respiration and organic loading. The higher values in premonsoon seasons may be due to higher solubility of oxygen at relatively lower temperature and relatively high DO in monsoon may be attributed to circulation and mixing of water due to surface runoff.

Conclusion

Present study shows seasonal diversity richness in monsoon followed by pre monsoon and post monsoon winter due to variation in temperature and light intensity. Variation of cellular organisation from prokaryotes to eukaryotes at cellular level in Cyanophyta and others classes was noticed. There is great organisation diversity from unicellular, colonial to coenobial form unbranched to branched thallus.

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Table 1. Physico-Chemical properties of water

Parameter	Pre- Monson	Monson	Post Monson
Temperature(^{0}C)	27^0 C	26^0 C	30^0 C
pH	6.9	7.2	8.1
Dissolved Oxygen (ppm)	6.9	6.7	5.9
Biological Oxygen Demand	3	4	5.9

Table 2. Algal Diversity

Plankton Species	Station1			Station2			Station3		
	Pre-Monsoon	Monsoon	Post-Monsoon	Pre-Monsoon	Monsoon	Post-Monsoon	Pre-Monsoon	Monsoon	Post-Monsoon
Cyanophyceae									
Anabaena verrucosa	+	+	-	+	+	-	+	+	-
Nostoc commune	+	-	+	+		+	+	-	+
Oscillatoria ahardhii	+	+	-	+	+	-	+	+	-
Rivularia sp.	+	+	-	+	+	-	+	+	-
Microcystis sp.	+	-	+	+	-	+	+	-	+
Chlorophyceae									
Cladophora sp.	+	+	-	+	+	-	+	+	_
Oedogonium sp.	+	+	+	+	+	+	+	+	+
Pandorina sp.	+	+	-	+	+	-	+	+	-
Paediastrum sp.	+	+	+	+	+	+	+	+	+
Spirogyra sp.	+	+	-	+	+	-	+	+	+
Scenedesmus acuminatus	+	+	-	+	+	-	+	+	+
Ulothrix sp.	+	+	-	+	+	-	+	+	+
Zygnema sp.	+	+	-	+	+	-	+	+	+
Euglenophyceae									
Euglena sp.	+	+	-	+	+	-	+	+	-
Phacus sp.	+	+	-	+	+	+	+	+	+
Bacillariophyceae									
Diatom sp.	+	+	-	+	+	-	+	+	+
Fragilaria sp.	+	+	-	+	+	-	+	+	+

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