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THE IMPACT OF POLLUTION ON BIODIVERSITY OF PHYTOPLANKTON IN KALPATHY RIVER, PALAKKAD, KERALA

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ABSTRACT

The environmental quality is greatly focused on water because of its importance in maintaining the human health and stability of the ecosystem. Many parts of the world are facing water scarcity problem due to limitation of water resources coincided with increasing population. Rivers are vital freshwater systems that are critical for the sustenance of life. In the present study, river water samples were collected in the period between February – July 2009 from three different stations of Kalpathy River. The present study on Phytoplankton analysis revealed the dominance of chlorophyceae followed by cyanophyceae and bacillariophyceae.

Keywords: Pollution, Kalpathy River, Phytoplanktons.

INTRODUCTION

Water is one of the important natural resources useful for developmental purposes in both urban and rural areas. Despite this, most of the rural communities in the developing countries are in the lack of access to portable water supply. They rely commonly on rivers, streams, wells and ponds for daily water needs [1]. However, World Health Organization [2] maintained that water from most of these sources was contaminated, yet they are used directly by the inhabitants. Agricultural wastes such as pesticides, fungicides and fertilizers, human and animal feces, seepage from pit latrines and septic tanks, refuse dump and industrial, domestic and municipal wastes released into water bodies are often responsible for surface water contamination. Bremen et al. (2001) observed that most surface water resources accessible to household in rural areas are subjected to chemical and biological contaminations which may come from animals, septic tanks and storms water run off. Contaminated water is associated with health risks. It leads to the spread of diseases such as dysentery, cholera, typhoid and diarrhoea and so on. The diseases associated with most surface water supplies include Campbacteriosis, Shigellosis, Salmollosis, Cholera and a varieties of other bacteria as well as fungi, viral, and parasitic infection [3].

The pollution of surface water by discharges from human activities is one of the major environmental problems faced worldwide [4-5]. Effluent discharge in small proportions fertilizes the river water and increase the rate of productivity, but over fertilization adds pressures on the aquatic environment resulting in eutrophication. This leads to excessive growth of algae which becomes detrimental to the systematic productivity. The phytoplanktons are the primary producers of organic matter in aquatic environment and constitute the first trophic level pelagic food web and through the process of photosynthesis provide food and oxygen to other organism. Some notable works on this aspect have been done by Prasad (1962),Khare (1997) and Dixit *et al.* (2007) [5-6].

Pollution may selectively stimulate the growth of a few types of phytoplankton and that in turn reduces the water quality and affects its use. The selective types of algae that exist in polluted water are being used as indicators of pollution. Since algae constitute part of a chain of aquatic life in the water, whatever alters the number and types of algae affects all of the other organisms, including fish. Further, phytoplankton respond quickly to environmental changes, and hence their standing crop and species composition are more likely to indicate the quality of the water mass in which they are found [7].

Therefore, water quality affects the abundance, species composition, stability, productivity and physiological condition of indigenous population of aquatic organisms. As a result the nature and health of the aquatic communities is an expression of the quality of the water.

MATERIALS AND METHODS

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AREA OF STUDY

Kerala is a land blessed with diverse, luxuriant habitat types, widely varying topography, high rainfall and large number of water bodies. Kerala receives generally the annual rainfall of 3000 mm. Rivers are the veins of land with cultural, economic as well as ecological significance which regulate the surface flow of water.

The river Kalpathy starts from a place called Chenthamarakulam in the hills, north of Walayar. This River is also known as Korayar. Kalpathy river is formed by four streams: Korayar, Varattar, Walayar and Malampuzha. Kalpathy is one of the well known gramams (villages) of Palakkad which is situated on the banks of the Kalpathy river. The place is famous for its agraharams (old Brahmin settlement), ratholsavam (temple car festival) and carnatic music. Another view regarding Kalpathy being linked to Kasi is that the main diety is lord Shiva and the temple on the banks of the River as Kasi, is on the banks of Ganges. The River water is used for domestic, small scale industries and agricultural purposes.

The Kalpathy river receives industrial, domestic and heavy loads of agricultural runoff. Besides these it is polluted by loads of domestic sewage with high sewage and considerable amount of effluents from small scale industries. The river also receives large amount of pollutary waste and hospital waste etc. The present work is one such effort of a preliminary nature. It is also aimed at getting some data about the extend of River pollution. It is hoped that the information thus collected will create awareness in the minds of people and society by preventing pollution of their previous water resources and this awareness will lead to minimize and check this hazard [4].

The River samples were collected from three places, i.e., Station I(Near Kalpathy temple), Station II(Power engine road) and Station III (Kavilpad).

Water samples were collected for a period of six months (Feb. 2009 to July, 2009). The collections were made once in a month at the same time (7:30 am - 8:30 am) and same spots throughout the period of study. The samples were collected in a clean polythene container. Collected samples were brought to the laboratory for further analysis.

The collection of plankton was made by filtering 50-60 litres of water through planktonic net with a pore size of about 60 µm. Samples in the laboratory were immediately preserved in Lugol's solution (0.3ml Lugol's solution to 100 ml sample) and stored in dark. However, for long term storage a parallel set was kept. In that 0.7ml Lugol's solution per 100ml sample and buffered formaldehyde to a minimum of 2.5% final concentration after 1 hour was added. The samples were observed under 10X and 45X magnifications. Then the samples were identified with the help of manuals.

RESULTS AND DISCUSSION

Variations in ecological conditions are reflected in both distribution and in periodicity, which are noticeable in planktons [8-9]. The phytoplankton diversity observed at different sampling stations is given in Table-1

Phytoplanktons are represented as chlorophyceae (Green algae); Bacillariophyceae (diatoms) and Cyanophyceae (blue green algae). Among the algal species chlorophyceae were found to be common. In chlorophyceae certain species like *Ankistrodesmus falcatus*, *Chara* sp. *Chlamydomonas globosa*, *Cladophora glomerata*, *Closterium acerosum*, *Oedogonium* sp., *Spirogyra varians and Volvox* sp. were common and *Ankistrodesmus falcatus* was dominant. In Cyanophycea, *Nostoc pruniforme* and *Scytonema* sp. were noted to be present. In Bacillariophyceae, *Nitzchia* sp. was present. Higher number of algal species recorded in the site of effluent water indicates that it is most conductive for the luxuriant growth of many phytoplanktons which in turn forms nuisance blooms of blue green algae (Tripathi and Pandey, 1990). Same results were observed by Goldyn and Poznan (1989) in Radania river.

Table 1. Phytoplankton population of the Kalpathy River during February 2009 – July 2009

Name of the species	February			March			April			May			June			July		
	S I	S II	S III	S I	S II	S III	S I	S II	S III	S I	S II	S III	S I	S II	S III	S I	S II	S III
CHLOROPHYCEAE																		
Ankistrodesmus falcatus	4	1	1	2	-	-	3	-	-	2	1	1	4	3	1	2	1	1
Chara sp.	1	-	-	1	-	-	1	-	-	1	-	-	1	1	-	-	1	-1
Chlamydomonas globosa	2	1	1	1	1	1	2	1	1	2	1	1	1	1	1	1	1	-
Cladophora glomerata	3	2	1	2	1	1	1	1	1	1	1	1	2	1	1	-	2	-
Closterium acerosum	1	-	-	1	-	-	1	-	-	1	-	-	1	-	-	1	-	1
Oedogonium sp.	3	1	1	2	-	-	3	2	1	2	1	-	1	-	1	1	1	1
Spirogyra varians	3	1	1	2	-	-	2	1	2	1	2	-	1	1	1	1	1	1
Volvox sp.	2	1	1	2	-	-	1	-	1	2	1	-	1	1	1	1	1	1
CYANOPHYCEAE																		
Nostoc pruniforme	3	2	1	3	1	1	1	-	1	1	1	1	3	2	1	3	2	1
Scytonema sp.	2	1	1	2	1	1	2	-	-	3	2	1	2	3	1	2	2	1
BACILLARIOPHYCEAE																		
Nitzchia sp	1	-	-	-	-	1	1	-	-	1	1	-	-	1	1	1	1	1

CONCLUSION

During the ecological study of the river Kalpathy, it was noticed that the biological equilibrium is disturbed by the domestic sewage and industrial effluent. Therefore, to maintain the ecosystem stability and hence the productivity, proper treatment of the sewage water and effluent is advocated before discharging into the river Kalpathy. However, still more stations must be studied to generate large amount of data to know the effect of water pollution on physicochemical and biological characters so as to understand ecosystem structure and function in Kalpathy river.

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