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Research Article

PRELIMINARY STUDY OF PHYTOPLANKTON DIVERSITY IN RIVER NARAMADA VALLEY OF JABALPUR REGION (M.P.)

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ABSTRACT

The river Narmada velly is one of the major hot spot for aquabiodiversity in India. The presented study is conducted on the variable account of Phytoplankton. A total 30 algal taxa belonging to 16 genera have been collected and identified. Chlorophyceae was the most diverse class having 12 taxa followed by *Bacillariophyceae* with 7 taxas. The algal communities correlated with water pollution. The algal community correlated with water pollution. The total biodiversity shows a drastic decrement caused by globalization and human interference in the nature. Present studies examined the potential for algal bio-monitoring across a gradient of agriculturally impacted streams.

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INTRODUCTION

The Narmada River is also called Maikalsutha or Rewa in central India and fifth largest river in the Indian subcontinent. The Narmada River, bounded between Vindhya and Satpuda ranges, extends over an area of 98,796 km² and lies between east longitudes 72° 32' to 81° 45' and north latitudes 21° 20' to 23° 45' lying on the northern extremity of the Deccan Plateau. The basin covers large areas in the states of Madhya Pradesh (86%), Gujarat (14%) and a comparatively smaller area (2%) in Maharashtra. There are 41 tributaries, out of which 22 are from the Satpuda range and the rest on the right bank are from the Vindhya Range (Tali *et al*., 2012). Intense farming has led to severe disturbance of watersheds throughout the world, resulting in fundamental changes in the structure and functioning of stream ecosystems. Modern intensive agriculture is responsible for chemical and physical alterations such as increased contaminant and nutrient runoff, an increase in suspended solids due to erosion, and changes in discharge and channel morphology. The traditional physico-chemical measurements used in water quality monitoring programs such as total phosphorus and suspended sediment load are an important guide to environmental change. However, they are only representative of short-term conditions found at the instant of sampling and do not provide information about the effects of these changes on biological communities. The need for a better comprehension of interactions between environmental quality and ecosystem integrity has increased the interest in nding biological indicators that provide a more accurate guide to changes in ecological conditions. From the earliest years of the last century, periphytic (benthic) algae have been identi ed as a valuable option for the biomonitoring of stream and river ecosystems (Kolkwitz and Marsson, 1908 cited by Hill *et al*., 1999). More recently, this approach has been applied with success to evaluate a variety of water quality problems (Rott *et al*., 1998; Hill *et al*., 1999; Winter and Duthie, 2000a; Potapova *et al*., 2005). Periphytic communities provide an integrated measurement of waterquality as experienced by the aquatic biota and have many biological attributes that make them ideal organisms for biological monitoring. Algae lie at the base of aquatic food webs and therefore occupy a pivotal position at the interface between biological communities and their physico-chemical environment. Furthermore, benthic algae have short life cycles and can therefore be expected to respond quickly to changes in the environment (McCormick and Stevenson, 1998). However, few studies to date have examined the potential for algal bio-monitoring across a gradient of agriculturally impacted streams. Algae are involved in water pollution in a number of important ways. Due to the enrichment of inorganic phosphorous and nitrogen is responsible for the growth of algae in water bodies. Research in the freshwater ecology of algae

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related to water pollution is sparse, and it is necessary of detailed study for searching indicator species. The uses of algal communities correlating water pollution (Sonneman *et al.*, 2001). Algae are one of the most rapid bioindicator of water quality changes due to their short life spans, quick response to pollutants and easy to determine their numbers (Plafkin *et al.*, 1989).

MATERIALS AND METHODS

Study Area

The present study is based on study the Phytoplankton population. The present study was carried out during year June 2015 to December 2015. The whole Narmada valley of Jabalpur region was selected as study site for the collection of sample.

Sample collection

The points of study at the river where water samples were collected are referred as stations. The hydro biological study of the river Narmada at the stretch selected has been done for round the year, by taking the samples monthly with a view to assess the nature and degree of pollution. The sampling was done usually in morning hours between 8 a.m. to 11 a.m. and samples were collected from just below the water surface. At each of the station, three types of water samples, first from 200 m upstream, second from the confluence and third from 200m downstream were collected, for all biological analysis.

Biological analysis

Each of the 1 Litre samples collected was centrifuged to concentrate the plankton organisms. Every one of these samples was made up to 100 ml after removing the surface water in the centrifuge tube. General Phytoplankton was studied for quantitative and qualitative details. The identification of phytoplankton species was done with the help of literature of Fritsch (1959), Desikachary (1959) and APHA (1998).

RESULTS AND DISCUSSION

A total 30 algal taxa belonging to 16 genera have been collected and identified from different session. The number of various member of class *Chlorophyceae* with 12 taxa (40%), *Euglinophyceae* with 3 taxa (10 %), *Bacillariophyceae* with 7 taxa (23%), *Trebouxiophyceae* with 1 taxa (3%), *Ulvophyceae* with 1 taxa (4%), *Zygematophyceae* with 1 taxa (3%) and *Cyanophyceae* with 5 taxa (17%) are as shown in Table 1, Fig. 1. and Fig. 2.

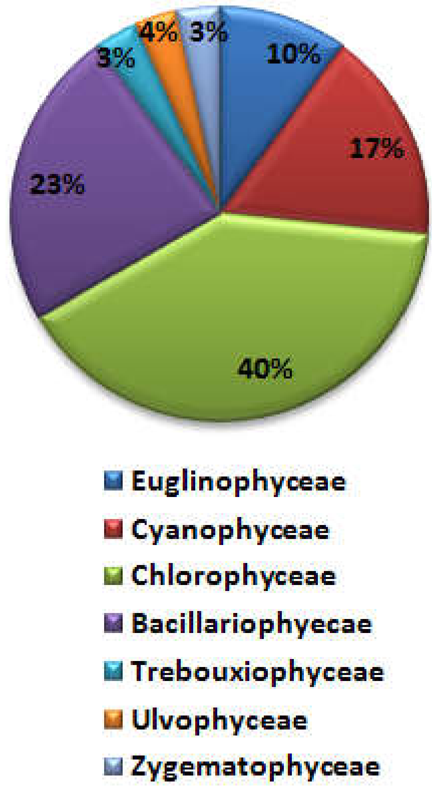

Fig. 2. Algal compositon in river Narmada, Jabalpur

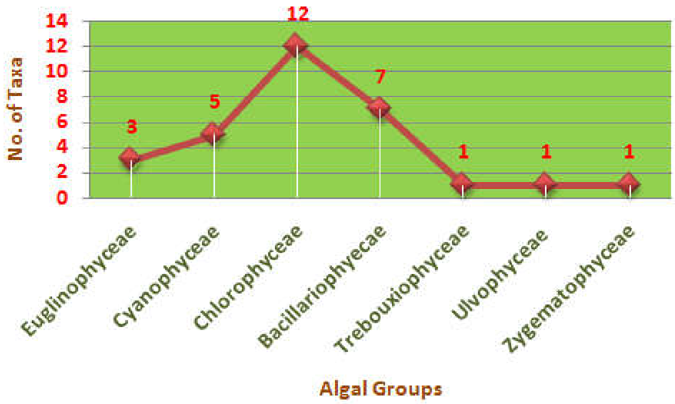

Fig. 2. Alage taxa in River Narmada

The present investigation had been discussed to the Phytoplankton frequency of the aquatic environment. Most of the algae were planktonic, free floating and few are epizootic. The availability of phytoplankton in the reverie ecosystem depends upon its physiographic.

Table 1. Composition of Phytoplankton

No.	Algal groups	Composition of phytoplankton during study period	
		GENERA	TAXA
1.	*Euglinophyceae*	2	3
2.	*Cyanophyceae*	4	5
3.	*Chlorophyceae*	5	12
4.	*Bacillariophycae*	2	7
5.	*Trebouxiophyceae*	1	1
6.	*Ulvophyceae*	1	1
7.	*Zygematophyceae*	1	1
	Total	16	30

Reduced numbers of phytoplankton had been reported from acidic water and it was supported by Lewitus *et al*., (1998). The maximum phytoplankton population found form post monsoon, it may be due to the favourable condition of the water Sharma *et al*. (2005). In monsoon season the population was low, probability due to increased rainfall, increase turbidity runoff and dilution effect of flood. Species of *Chlorophyceae* were maximum in early summer while the species of *Cyanophyceae* were highest in late summer. However *Euglenophycae* are rarely found in fast flowing water but few species were observed in early winters. Similarly, members of *Bacillariophyceae* were dominated during late winter (Mathur, 1990). Thus, the algal spectrum of river Narmada showing the oligotrophic nature at certain sites and due to dominance of filamentous green algae, the river Narmada can be classified under "Zygnema type of river" (Blum, 1956). At polluted water, a large number of algae tolerating organic pollution were reported, mostly belonging to Chlorococcales, Euglinoids, Desmids and few members of Cyanophyceae (Kapoor, *et al*., 1992; and Bowling, 1994).

Conclusion

Biological monitoring using algae is a useful alternative tool for assessing the water quality of any aquatic ecosystem, as it can help in evaluation of environmental changes in the water bodies. The most convincing reason for including algal indicators in environmental monitoring programs is that changes in both algal production and taxonomic composition can greatly affect food web interactions and ecosystem dynamics and also biomonitoring using algae is less expensive, more informative and convincing. The algal communities correlated with water pollution. The total biodiversity shows a drastic decrement caused by globalization and human interference in the nature. Biomonitoring results can be used to identify the water body ecology problems and establish priorities for pollution control efforts. Among taxonomic analysis of algal assemblage, Community study are capable of measuring ecosystem changes in response to broad range of impact scenario, but require a suitable reference condition to be set up.

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