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Original Research Paper

Biodiversity of Algal Flora in River Chambal at Kota, Rajasthan

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ABSTRACT

Phytoplankton, represented mainly by algae, form a significant part of the food web and, therefore, information on their population is important in wetland management. Phytoplankton are very sensitive to any environmental change since they quickly response to any alteration or changes in the environment. The plankton population observation or biological analysis is reliable tool for biomonitoring to assess the status and quality of aquatic bodies. The present study is aimed to determine the algal diversity and quality of water in Chambal river at Kota, Rajasthan. The algal and water samples were collected at monthly intervals from different areas located in upstream and downstream of the River Chambal. In the present study Palmer's biotic index has been used to assess the quality of water. The algal flora of four sites of river revealed 70 species belonging to four classes.

INTRODUCTION

Algae are a large and diverse group of simple, typically autotrophic organisms, ranging from unicellular to multicellular forms. In aquatic ecosystems phytoplankton play an important role in the ecology of rivers through primary production. Studies on planktonic composition and physicochemical characteristics of water are necessary to acquire basic knowledge on the biodiversity status of a water body. Algal flora varies from season to season and an important feature of freshwater algal flora is its cosmopolitanism. The phytoplanktonic study is a very useful tool for the assessment of water quality in any type of water body and also contributes to understanding of the basic nature of lake (Pawar et al. 2006).

The necessity of using phytoplankton as effective and appropriate method of biomonitoring for evaluation of river water quality has been emphasized (Annalakshmi & Amsath 2012).

In the present study, besides undertaking the algal diversity of Chambal river to obtain the baseline data, Palmer's pollution tolerant index has also been calculated for the assessment of water quality of the river.

MATERIALS AND METHODS

Study area: The city of Kota is located in the south eastern parts of Rajasthan State at 23°45' to 25°53' North latitudes and 75°9' to 77°27' East longitudes. Chambal river is a perennial river flowing 960 km from its origin having a catchment area of approximately 31460 km. Chambal river approaches Kota city near Akelgarh water filter plant and leaves this city near Rangpur/Keshoraipatan. Kota barrage is located about 0.8 km upstream of Kota city and this divides the river into upstream and downstream area. The samples were collected from four sampling stations. Station 1 is located near Akelgarh at entry point of the river in city. As the river flows towards barrage it receives many sewage drains and discharge of city. Station 2 is located near barrage representing upstream region, while stations 3 and 4 are located 1 km and 3 km away from Kota Barrage representing downstream (Fig. 1) (www.mapsofindia.com).

Algal samples were collected monthly using plankton net of bolting silk (No. 25) from the four sampling stations in airtight bottles and polythene bags from September 2011 to August 2012. The collected samples were studied fresh as far as possible and then further preserved in Lugol's solution and 4% formaldehyde solution separately for detailed study.

Identification of algal forms was made with the help of relevant and available literature mainly Desikachary (1959), Randhawa (1959), Prescott (1961,1970), Edmondson (1959) and Anand (1998). Photomicrography was carried out with the help of Metzer microscope with attached photographic camera.

RESULTS AND DISCUSSION

A check list of phytoplankton sampled in the present study is presented in Table 1. The algal taxa consisted of 70 forms belonging to Chlorophyceae, Cyanophyceae, Bacillariophyceae and Euglenophyceae. The Chlorophycean members were dominant representing 50% of the total algal community. This class was represented by 21 genera and 34

Table 1: Biodiversity status of algal flora at Chambal river.

Chlorophyceae	Cyanophyceae	Bacillariophyceae	Euglenophyceae
Actinastrum hantzschi	*Anabaena laxa*	*Anomoneis*	*Euglena sp.*
Ankistrodesnus sp	*Anabaena sp.*	*Cyclotella*	*Phacus*
Characium angustum	*Aphanocapsa sp.*	*Cymbella tumida*	*Trachelomonas sp*
Cladophora sp	*Calothrix sp.*	*Fragilaria sp.*	
Coelastrum microsporum	*Chroococcus turgidis*	*Gomphonema*	
Closterium tumidum	*Chroococcus disperses*	*Melosira sp.*	
C.parvulum	*Gloeocapsa sp.*	*Navicula*	
C.acerosum	*Lyngbya sp*	*Nitzschia palea*	
C.ehrenbergii	*Merismopedia tenuissima*	*Pinnularia*	
Cosmarium sp.	*M. glauca*	*Rhopalodia*	
Crucigenia crucifera	*M. elegans*	*Synedra ulna*	
Hydrodictyon reticulatum	*Microcystis aeruginosa*	*S.gracilis*	
Monoraphidium sp.	*M.lamelliformis*		
Microspora amoena	*M.robusta*		
Mougeotia sp.	*Nostoc sp.*		
Oedogonium sp.	*Oscillatoria proboscida*		
Pediastrum duplex	*O.princeps*		
Pediastrum simplex	*O.tenuis*		
P. boryanum	*Phormidium sp.*		
P.tetras	*Spirulina major*		
Scenedesmus abundans	*S.sublitissima*		
S. dimorphus			
S. quadricauda			
S.acuminatus			
S.armatus			
S.obliques			
S.protuberance			
Spirogyra hyalina			
Staurastrum sp.			
Stigeoclonium tenuae			
Tetraedron tribobulatum			
T. pentraedricum			
Trebauria sp.			
Ulothirx zonata			

Table 3: Palmer's pollution index of algal genera in Chambal river.

Algal Genera	Pollution index			
	Upstream		Downstream	
	St.1	St.2	St.3	St. 4
Anacystis	-	-	1	1
Ankistrodesnus	-	2	2	2
Closterium	-	1	1	1
Cyclotella	1	1	-	1
Euglena	-	-	5	-
Gomphonema	1	1	-	-
Melosira	1	1	-	-
Navicula	-	-	3	-
Nitzschia	-	-	3	3
Oscillatoria	-	4	-	4
Phacus	-	2	2	-
Phormidium	-	1	1	-
Scenedesmus	-	-	4	4
Stigeoclonium	-	-	2	-
Synedra	2	2	2	2
	5	15	26	18

species. Throughout the study period many green algae like *Scenedesmus*, *Ankistrodesmus*, *Pediastrum*, *Actinastrum* and *Staurastrum* occurred abundantly and frequently. While Cyanophyceae showed 13 genera and 21 species. Most commonly occurring blue green algae were *Merismopedia*, *Oscillatoria* and *Microcystis* species. In the present study only 12 species of diatoms were recorded. Most abundant diatoms were represented by *Cyclotella*, *Synedra, Nitzschia* and *Fragillaria* in the river. The members of Euglenophyceae were limited in number with only 3 genera. Apart from this the pollution tolerant genera and their pollution index were also calculated as per Palmer's pollution index. These have been represented in Tables 2 and 3 respectively.

The total Palmer's score at Station 3 was greater than 20. A number of genera of pollution tolerant algae with high Palmer's grade points at Station 3 clearly indicates high organic pollution and eutrophication.

The algal pollution index at Stations 2 and 4 was less than 20 indicating probable organic pollution. Lower figure at Sta-

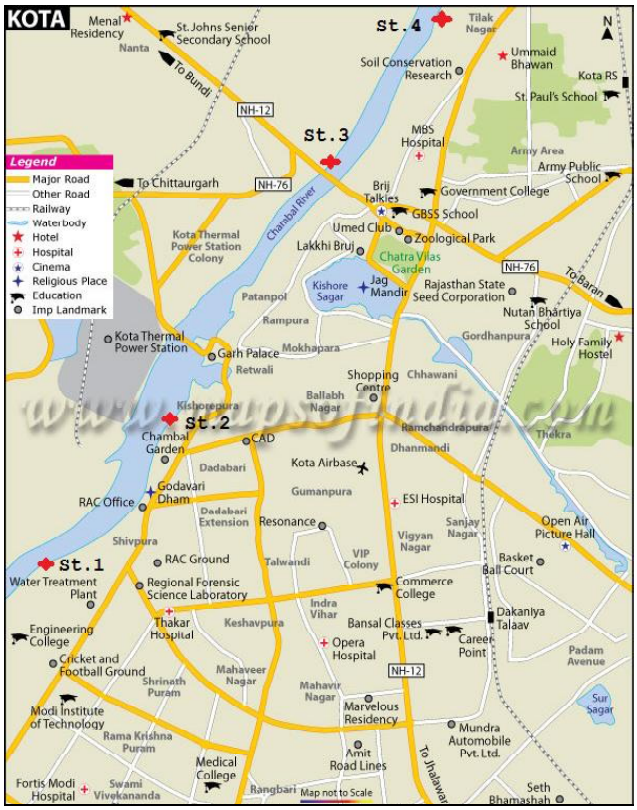

Fig. 1: Study area showing sampling sites.

tion 1 showed the pollution is not high and water is clean. Presence of *Stigeoclonium tenuae* and *Scenedesmus* at Stations 3 and 4 seem to show an indication of pollution of river at downstream.

Thus, if water bodies are to be preserved for their intended use, one should protect their biota and maintain a sustainable and holistic approach to conserve such water systems. Joint efforts are needed by scientists, environmentalists, local inhabitants and youth for the protection of water quality and biodiversity of this precious river system.

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Table 2: Pollution tolerant genera of algae.

Algal Genera	St. 1	St. 2	St. 3	St. 4
Euglena	-	-	+	-
Oscillatoria	-	+	-	+
Scenedesmus	-	-	+	+
Nitzschia	-	-	+	+
Navicula	-	-	+	-
Stigeoclonium	-	-	+	-
Synedra	+	+	+	+
Ankistrodesnus	-	+	+	+
Phacus	-	+	+	-
Phormidium	-	+	+	-
Melosira	+	+	-	-
Gomphonema	+	+	-	-
Cyclotella	+	+	-	+
Closterium	-	+	+	+
Anacystis	-	-	+	+
Spirogyra	-	+	-	-
Anabaena	-	+	+	+
Pediastrum	+	+	+	+
Trachelomonas	-	+	+	-
Fragilaria	-	+	+	-
Ulothirx	+	-	-	-
Lyngbya	+	+	+	+
Spirulina	+	-	+	-
Cymbella	+	+	+	+
Actinastrum	+	+	+	-
Coelastrum	-	+	+	-
Pinnularia	-	+	+	+
Tribonema	-	+	+	-
Crucigenia	+	+	-	+