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ORIGINAL ARTICLE

Pollution Causing Algae Of River Kali At Mainpuri

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Abstract:

In view of increasing pollution and subsequent algal growth in waters of River a detailed study of algal flora of river Kali at Mainpuri has been conducted during present investigation. Physicochemical characteristics of water samples from river Kali at Mainpuri have revealed varying levels of pollution. Quantitative and qualitative estimates have been made on monthly basis and as many as 44 significant algal species have been identified which can tolerate high degree of pollution. Their role as possible indicators of pollution has been discussed. Principal groups of algae constitute Cyanobacteria, Chlorophyceae and Chrysophyceae. The most significant finding being that apart from 3 species of Euglena and 5 species of Scenedesmus which perhaps are the best adapted species of polluted waters, the members of Cyanobacteria like Oscillatoria, Merismopedia, Chroococcus and Spirulina etc. are the major pollution indicating species. The other dominant group is the diatoms with the genera like Nitzschia, Navicula, Synendra, Gomphonema and Fragilaria etc. Species of Microcystis, Nostoc, Anabaena, Cladophora, Spirogyra, Closterium, Pediastrum, Hydrodictyon are abundantly found during present investigation.

KEYWORDS:

Pollution, River, Water, Ecological.

INTRODUCTION

Algae are an ecologically imperative group of organisms in most aquatic ecosystems but often ignored as indicators of disturbance and conditions of aquatic ecosystem. Because of their nutritional needs and their position at the base of food chain, algal indicators provides relatively unique information concerning ecosystem conditions in comparison to commonly used animals and bacterial indicators. Algae, in general, and phytoplankton as specific group, respond rapidly and predictably to a wide range of pollutants and thus provide potentially early signal of the deteriorating condition of waters and possible causes. Algal assemblage provides one of the few benchmarks or establishing the required water quality conditions and for characterizing the minimally impacted biological conditions of many disturbing ecosystems.

Algae represent a prominent and important group in their continuously changing population on a stream. The variation in algal population of different sampling sites or under different ecological conditions or different pollutional constituents of these one indices applied to any desired location in stream to determine the presence or absence of domestic, industrial wastes or other putrescrible wastes or to measure the degree of recovery form pollution with these wastes. The river receives domestic and industrial wastes and water shows high degree of pollution. There are few reports on algal pollution (Fogg, 1960; Reimer, 1965; Vankateswarlu, 1969; Palmer, 1969, 1983; Hosmani and Bharti 1980; Prasad and Singh, 1980; Kant,

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1983; Whitton, 1975; Shubert, 1984; Joy and Joseph, 1995; Sudhkar et. al. 1994; Saha et.al. 2000; Dwivedi and Pandey 2002; Mahadev and Hosmani, 2005 Pramila et. al. 2008; Rishi and Awasthi, 2012). The present investigation has been based on the data generated from June 2010 to May 2011 of river Kali and numbers of algal species have been identified at Mainpuri which are useful indicator of pollution in river.

MATERIALS AND METHODS

Surveys of different sites of River Kali at Mainpuri were made and three sampling stations (Station I, Station II and Station III) were carefully chosen on the basis of their significance in pollution input and capability of the river or assimilation and self purification. Sampling station I was situated where river entered into the city, sampling station II middle of river in the city and Sampling Station III at the exit point of river from the city. The water and algal samples were collected from different sampling stations in each month since June 2010 to May 2011 to analyze the presence of algal species. The collected samples were brought to the laboratory and simultaneously preserved in 5% formalin. The samples were examined through microscope and Camera Lucida diagrams also prepared for the measurement. On the basis of structure and measurement algae were identified using standard text i.e. Desikachary 1959; Chapman 1962; Bold and Wynne 1978 and Prescott 1962 and numbers of algal species have been identified.

RESULTS AND DISCUSSION

Algae are one of the mainly rapid detectors of water pollution. This is because of their quick response to toxic and other substances. They are primary producers in aquatic ecosystems. Algae are especially significant because those algae which accumulate toxic materials may intoxicate the entire food chain. Pollution stress reduces the number of algal species with a concurrent increase in the number of their individuals. In this manner the complex organization of community gets actually simplified pollution pressure (Patrick, 1949). A large number of algae have been collected from various sampling stations of river Kali at Mainpuri during June 2010 to May 2011 and about 19 genera spread over 44 species have been identified as indicator of water quality. Beside these major pollution indicating algae many other algae such as Cladophora, Spirogyra, Ulothrix, Pediastrum and Hydrodictyon have been abundantly observed in Kali water at Mainpuri during present investigation.

All sampling stations showed the dominance of Cyanobacteria and Diatoms over to Chlorophyceae. The species of Oscillatoria, Euglena, Scenedesmus, Chlorella, Navicula, Nitzschia, Stigeoclonium, Cyclotella, Gomphonema, Melosira etc. algae are most adapted to the polluted waters and can be effectively utilized as indicators of various labels of organic pollution (Hosmani and Bharti, 1980, 82; Gunale and Balakrishnan, 1981). Oscillatoria, Euglena and Chlorella are typical inhabitant to most polluted waters (Ratnasabapathy, 1975). According to Patrick (1965) the species of Euglena and Oscillatoria most tolerant to highly polluted water and significant indicator of eutrophication. In present study same genera with high grade points of Palmer's scale such as Euglena viridis, E. gracilis, E. acus, Oscillatoria princeps. O. formosa, O. limosa, O. pseudogeminata were observed. It has already been known that Species of Stigeoclonium tolerant to polluted water and also tolerant to heavy metals (Mclean, 1974).

The algal flora of polluted sites of Kali at Mainpuri showed the dominance of Cyanobacteria and Diatoms such as Anabaena, Chroococcus, Merismopedia, Microcystis, Oscillatoria, Nostoc, Spirulina, Cyclotella, Cymbella, Gomphonema, Fragilaria, Melosira, Navicula, Nitzschia and Synedra.

By the application of Palmer's (1969) Algal Genus Index for Pollution, it has been observed that as many as 11 genera in the present study observed with their Pollution Index Score were 30. The most significant finding of present investigation that the presence of 11 genera which are highly tolerate to pollution, observed from all sampling stations of river Kali at Mainpuri.

Thus, it can be concluded from the above results that there are a large number of pollution indicating algae (19 genera and 44 species) observed which can tolerate various degrees of organic pollution. Therefore, they can be significantly applied as indicators of organic pollution and can be used for the bio-monitoring and control of organic pollution in river Kali.

Table 1: Observed algal genera and their pollution index of river Kali at Mainpuri

S. no.	Genus	Pollution Index
1.	*Chlorella*	3
2.	*Stigeoclonium*	2
3.	*Scenedesmus*	4
4.	*Euglena*	5
5.	*Anabaena*	0
6.	*Chroococcus*	0
7.	*Merismopedia*	0
8.	*Microcystis*	0
9.	*Oscillatoria*	5
10.	*Nostoc*	0
11.	*Spirulina*	0
12.	*Cyclotella*	1
13.	*Cymbella*	0
14.	*Gomphonema*	1
15.	*Fragilaria*	0
16.	*Melosira*	1
17.	*Navicula*	3
18.	*Nitzschia*	3
19.	*Synedra*	2
	Total	**30**

Table 2: Occurrence of algal species in different sampling station of river Kali at Mainpuri.

S. No.	Algal Species	Sampling Station I	Sampling Station II	Sampling Station III
1.	*Chlorella vulgaris*	P	P	P
2.	*C. pyrenoidosa*	P	A	A
3.	*Stigeoclonium tenue*	A	P	P
4.	*Scenedesmus abundans*	P	P	P
5.	*S. arcuatus*	P	P	P
6.	*S. acuminatus*	A	P	P
7.	*S. bijuga*	A	P	A
8.	*S. qudricauda*	P	P	P
9.	*Euglena acus*	A	A	P
10.	*E. gracilis*	A	P	P
11.	*E. viridis*	P	A	A
12.	*Anabaena planktonica*	A	A	P
13.	*A. fertilissima*	P	A	A
14.	*Chroococcus tenax*	A	A	P
15.	*C. major*	A	P	A

16.	*Merismopedia punctata*	A	P	P
17.	*M. glauca*	P	A	A
18.	*Microcystis aeruginosa*	P	P	P
19.	*M. flos-aquae*	P	P	P
20.	*Oscillatoria princeps*	P	P	P
21.	*O. formosa*	A	A	P
22.	*O. limosa*	P	A	A
23.	*O. pseudogeminata*	A	P	P
24.	*Nostoc linckia*	P	P	P
25.	*N. muscorum*	A	P	P
26.	*Spirulina major*	P	P	P
27.	*S. laxissima*	P	A	A
28.	*Cyclotella meneghiniana*	P	A	P
29.	*C. glomerata*	A	P	P
30.	*Cymbella cynbiformis*	P	P	P
31.	*C. obtusa*	P	A	P
32.	*Gomphonema constrictum*	A	A	P
33.	*G. gracile*	P	P	A
34.	*Fragilaria construens*	P	P	P
35.	*F. crotonensis*	P	A	A
36.	*Melosira distans*	A	P	P
37.	*M. varians*	P	A	A
38.	*Navicula ambigua*	P	P	P
39.	*N. exigua*	P	P	P
40.	*N. dicephala*	P	A	P
41.	*Nitzschia linearis*	P	P	P
42.	*N. palea*	P	A	P
43.	*Synedra acus*	P	P	P
44.	*S. ulna*	P	P	P

Abbreviation: A= Absent; P= Present

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