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#### **RESEARCH ARTICLE**

# SEASONAL STATUS OF THE DIVERSITY OF PHYTOPLANKTON IN RIVER GOMATI AT JAUNPUR (U.P.), INDIA.

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#### Abstract

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The river Gomati is popularly known as "Aadi-Ganga". Gomati river is an important tributary of river Ganga and perennial of Awadh plains. The river Gomati originates from MadhoganjTanda village in Pilibhit district (U.P.), run across the major part of U.P. covering nine districts and 940 km stretch area. It passes through the district of Shahjahanpur, Lakhimpurkheri, Hardoi, Sitapur, Lucknow, Barabanki, Sultanpur, Jaunpur and ultimately merges in Ganga river, near SaidpurKaithi in Varanasi. A study was carried out to observe phytoplankton diversity and distribution in three different seasons (monsoon, winter, summer) at different sites during 2010-2011. The phytoplankton (algal) community of river Gomati was represented by four algal group viz. Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Various genera of algae belonging to Chlorophyceae, Cyanophyceae, Euglenophyceae and Bacillariophyceae were recorded from different sites of the river Gomati. Phytoplankton are significant formal natural occupier of all water bodies. Monitoring programmes of phytoplankton are very important. They may provide information on possible new introductions and may serve as early warning system to detect the pollution level. Phytoplankton population showed a positive correlation with pH, DO, alkalinity, Phosphate, nitrate and negative correlation with temperature and chloride. Many of the algal species, of the total reported from the river Gomati like Aulosira, Microcystis, Oscillatoria, Stigonema, Chlamydomonas, Chlorella, Pediastrum, Euglena, Cyelotella, Navicula, Nitzschia etc. were recognized as pollution indicators. The main source of the river were discharged of municipal, domestic and industrial water, human excreta agricultural runoff and burning of corpse. In the present study role of phytoplankton as bioindicator in aquatic health as well as their role in survival of aquatic taxa of animals in river Gomati has been discussed. Proper biological and chemical treatment of domestic sewage and industrial effluents before discharge to river system in suggested

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# Introduction:-

The river ecosystem receives water from their water sheds, marginal run off and domestic sources. These water contain excess of organic matter, nitrogen, phosphorus, suspended particles and toxicants. They also get lot of other wastes in the form of garbage, effluents and sewage which effect the water quality and biotic community of aquatic body. Phytoplankton are ecologically an important group of aquatic ecosystem because they play a key role as a primary producers. Riverine ecosystem have been used extensively for different purposes and exploited recklessly throughout the world. Now a days, however, the riverine ecosystem are in a critical stage of ecological transition as evidenced from thick to very thick stand of macrophytes, indicating advanced stages of eutrophication.

Diversity indicates the degree of complexity of community structure. It is the function of number of species and abundance diversity has often been related to environmental characteristics of water mass and energy within the community. The biodiversity and production functions in riperian riverine ecosystems are reeling under serious threat and need proper evaluation, though some reports are available for different riverine system (Michael and Sharma, 1988, Jha and Chandra, 1997, Lande, 2004, Nath and Ray, 2006).

The present study has been undertaken on the river Gomati which is considered as one of the most important tributaries of the river Ganga in eastern U.P. The present study has been carried out for the assessment of phytoplankton (algal) diversity and the specimens were collected from four sampling stations of the river Gomati at Jaunpur, UP.

Environmental pollution is a serious problem, now a day's belong all ecosystems including aquatic ecosystem. Therefore, the conservation of fresh water environment and its monitoring is highly essential (Nafeesa et al., 2010, Mahapatra and Rangarajan, 1995). Phytoplankton play an important role in the biosystems of organic matter (primary production) in aquatic system, which directly or indirectly serve all the living organism of a water body as food (Anjana and Kanhere, 1998).

Alage and diatoms species distribution shows wide variation due to the differential effect of hydrographical factors on individual species and serve as good indicators of water quality pollution (Nafeesa Begum et. al; 2010, Gouda et al; 1996). Algae of pond ecosystem were studied by Hosmani and Bharat (1980), Bharat and Negi, 1985, Verma and Mohanty, 1995 and several studies on phytoplankton diversity was made in India and abroad on the pond, lakes and reservoirs (Senthi Kumar and Shiva Kumar, 2008, Tas and Gonulol, 2007). In this paper an attempt has been made to study the seasonal changes on diversity of algae and diatoms.

# Materials and methods:-

### Study Area:-

Jaunpur representing south eastern part of U.P. and lies  $82.6^{\circ}E$  longitude and  $25.7^{\circ}N$  latitude embracing an area of nearly 4038 km<sup>2</sup>. Municipal, domestic and industrial sewage from different areas of city and industries are discharged into the river directly or indirectly. Four sampling sites from upstream to downstream were selected near Jaunpur N (25.7°) and E (82.6°) in about 8 km stretch area. For monitoring the river over a period of one year. Four sampling sites were chosen from upstream Gokulghat (S<sub>1</sub>), Jogiyapur (shiv) ghat (S<sub>2</sub>), Miyapurghat (S<sub>3</sub>) and Ram ghat (S<sub>4</sub>) respectively during monsoon (july-october), winter (november-february) and summer (march-june) season. The selection was based on the points where the communities most frequently collected water for drinking.

# Phytoplankton study:-

Plankton samples were collected by using plankton net made up of bolting silled no. 25 (mesh size 0.064mm) from 0-6 meter water column. Specimens were pressured immediately in 5% formaline solution and identified with the help of relevant monographs (Desikachary, 1959, Frittsch, 1935, Prescott, 1980). Algae were counted by usual method. Algali biomass estimated by 'Short term harvested method' (Odum, 1960) in second week of each month.

# **Results and discussion:-**

The phytoplankton (algal) community of the river Gomati at four sampling sites in different season were represented by four group of algae. A total number of 35 genera of algae, Cyanophyceae (11 genera), Chlorophyceae (12 genera), Euglenophyceae (1 genera) and bacillariophyceae (11 genera) were recorded in monsoon (july-october) during the period of 2010-2011. Out of total 35 genera, 7 genera were common to all the four sites while rest were present only at specific sites during summer season. Out of total 20 genera, no genera were common to all the four sites during monsoon season. Out of total 31 genera, 5 genera were common to all the four sites during winter season. Usually at all sites the diversity of phytoplankton were gradually increased from winter to summer season and reached to maximum in summer season while the minimum diversity of phytoplankton were found in monsoon season. The maximum diversity of phytoplankton were seen at Gokulghat (S<sub>1</sub>) during all season and minimum diversity of phytoplankton were seen at Jogiyapur (shiv) ghat (S<sub>2</sub>) during all season. The diversity and distribution of phytoplankton are given in Table - 1.



Fig 1: Selected Sampling sites of river Gomati with Gokulghat  $(S_1)$ , Jogiyapur (Shiv) ghat  $(S_2)$ , Miyapurghat  $(S_3)$  and Ramghat  $(S_4)$ .

Phytoplankton	Monsoon Season				Winter Season				Summer Season			
	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>1</sub>	$S_2$	S <sub>3</sub>	S <sub>4</sub>
(A) Chlorophyceae												
Chlaymydomonas	-	-	-	-	+	-	-	+	+	-	-	+
Chlorella	+	+	-	-	+	+	+	+	+	+	+	+
Cladophora	-	-	-	-	+	-	-	+	+	-	+	-
Cosmarium	-	-	-	-	+	-	-	+	+	-	-	+
Hydrodictyon	-	-	+	+	+	+	+	-	+	-	+	+
Oedogonium	-	-	-	+	+	-	-	+	+	-	-	+
Pediastrum	+	+	-	-	+	+	+	-	+	+	+	+
Scendesmus	-	-	-	-	+	-	-	+	+	-	-	+
Spirogyra	+	-	-	-	+	+	-	-	+	-	+	+
Ulothirix	-	-	-	-	-	-	-	+	+	+	-	+
Volvox	-	-	-	-	-	-	-	-	+	-	-	-
Zygnema	-	-	-	+	+	+	-	+	+	+	-	+
			<b>(B)</b>	Cyanop	hyceae	9						
Anabaena	+	-	-	-	+	+	+	-	+	-	+	+
Aulosira	-	+	+	-	+	+	+	+	+	+	+	+
Chroococcus	-	-	-	-	+	-	+	-	+	-	+	-
Cylinderospermum	+	-	-	+	+	+	+	+	+	-	+	+
Lyngbya	-	-	+	-	-	-	+	+	+	-	+	+
Microcystis	+	+	-	+	+	+	+	-	+	+	+	+
Nostoc	+	+	-	+	+	+	+	+	+	+	+	+
Oscillatoria	+	-	+	-	+	+	-	+	+	+	+	-
Phormidium	-	-	-	-	-	-	+	+	-	-	+	+
Plactonema	-	+	+	-	+	+	-	+	+	+	+	-
Rivularia	+	+	-	+	+	+	+	-	+	+	+	+
			(C) E	ugleno	phycea	e						
Euglena	+	+	-	+	+	+	+	+	+	+	+	+
			(D) Ba	cillario	ophyce	ae						
Achnanthes	+	-	+	-	+	+	+	-	+	+	+	-
Bacellaria	-	-	+	-	-	-	-	+	+	-	-	+
Cocconeis	-	-	+	+	+	+	-	-	+	+	-	-
Cyelotella	+	-	+	+	+	-	+	+	+	-	+	+
Cymbella	-	-	-	-	-	-	-	-	+	-	-	-
Diatoma	-	-	-	-	-	-	+	-	-	+	-	+
Gyrosigma	-	-	-	-	-	-	+	-	-	+	-	+
Navicula	-	-	-	-	-	-	-	-		+	-	-
Nitzschia	-	-	-	-	-	-	-	-	-	-	-	+
Pinularia	-	-	-	-	+	-	-	+	+	-	-	+
Synedra	-	-	-	-	-	-	+	-	-	-	+	+
Total Number of Genera (35)	12	8	9	10	24	16	18	19	29	16	20	26

Table 1: Diversity and distribution of phytoplankton at different sites during monsoon, winter and summer	r season in
river Gomati at Jaunpur (2010-2011).	

**Note :**(+ ) Present, (- ) Absent

Algal population showed a positive correlation with pH, DO, alkalinity, phophate and nitrate. A negative correlation was observed with temperature and chloride. Table florestic composition of water bodies showed different levels of pollution of algal composition as the indicator of the level of population (Hutchinshon, 1967). The natural enrichment of the river is usually not sufficient to produce polluting conditions but the pressure of the human activities can influence the river water quality to a great extent. River Gomati seems to be victim of increasing anthropogenic pressure at Jaunpur because of which water has become quite unsuitable for various purposes. Out of 35 genera, 7 genera of different group were found common at all the sites including high pollution tolerant species. Pressure of more cyanobacterial populations at  $S_2$  and  $S_3$ , suggested for high pollution load due to nutrient rich

condition. Franklin (1972) suggested that cyanobacteria are general indicators of entrophy of water. Green algae (Chlorophyceae) were also to be the indicator of highly polluted water (Rama Rao et al., 1978). Presence of diatoms (Bacillariophyceae) and euglenoids at sites with increased number at  $S_2$  and  $S_3$  is suggesting for nutrient each condition and low pH and DO as reported earlier for other riverine ecosystem (Rai and Kumar, 1976).

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