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**INTERNATIONAL JOURNAL OF ADVANCED RESEARCH** 

#### **RESEARCH ARTICLE**

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

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#### **Manuscript Info**

Manuscript History:

#### Abstract

Received: 14 December 2015 Final Accepted: 26 January 2016 Published Online: February 2016

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Key words: Phytoplankton, Density, River Gomati, Pollution.

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..... The river Gomati is popularly known as 'Aadi-Ganga'. Gomati river is an important tributary of river Ganga and perennial river of Awadh plains. The river Gomati originates from Madhoganj Tanda 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, Lakhimpur kheri, Hardoi, Sitapur, Lucknow, Barabanki, Sultanpur, Jaunpur and ultimately merges in Ganga river, near Saidpur Kaithi in Varanasi. Biodiversity of river Gomati is heavily affected by pollution. Phytoplankton are important biological parameters to access the pollution level. Phytoplankton play an important role in biosynthesis of organic material and influence the river ecosystem, aquatic food chain and water characteristic. The biological productivity as ecological indicator to identify the ecological quality of river Gomati. The phytoplankton density fluctuated maximum in between the range of 159-546 Ind/l during summer season and minimum 93-113Ind/l during monsoon season. During study period the total of phytoplankton (35 sp.) were noticed during different seasons. Present study concluded that seasonal differences of phytoplankton density will help in further planning of water management and their use for beneficial purpose like agricultural, drinking for mankind.

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#### Introduction:-

Phytoplankton are the minute organism and are effective tools in environment bio-monitoring of aquatic ecosystem. Unplanned urbanization, rapid industrialization, indiscriminate use of artificial chemical in agriculture causing aquatic pollution, which deteriorating quality and depletion of aquatic biota (Yeole and Patil, 2005). Seasonal variation in phytoplankton density are result of a complex interplay of physical, chemical and biological process, which indicate the diversity in ecological niches (Bansal et al., 1989). Phytoplankton diversity is controlled by seasonal changes as well as by the rate at which plant nutrients are supplied. Nitrogen, Phosphorus and Silica are three main nutrients needed for the phytoplankton to grow at different times and in different ratio (Pilkaityte, 2003). Phytoplankton are essential link in food chain of all aquatic organisms include blue-green algae, green algae, diatoms (Mishra et al., 2001). Planktons in the water body reflects existed ecological characteristics and so therefore, planktons and organism may be used as indicators of water quality (Saha et al., 2000), Angadi et al., 2005). A considerable research work has been done in fresh water bodies in relation to phytoplankton (Nautiyal, 1986, Bhatt et al., 1999, Calijuri et al., 2002).

Therefore biological assessment is a significant alternative for assessing the ecological quality of aquatic ecosystem which influence the biological communities of rivers (Stevenson and Pan, 1999, Misra, 2000, Das and Panda, 2010).

Species diversity indicates when correlated influence of pollution on aquatic communities. The present study was conducted to examine the interaction of phytoplankton density of river Gomati that may be influenced by the season.

# Materials and methods:-

## Study Area:-

Jaunpur is representing south eastern part of U.P. and lie  $82.6^{\circ}$  E longitude and  $25.7^{\circ}$  N latitude embracing an area of nearly 4038 km<sup>2</sup>. Municipal and industrial sewage from different areas of city and industries are discharged into Gomati river directly or indirectly. Four sampling sites from upstream and 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 Gokul ghat (S<sub>1</sub>), Jogiyapur (Shiv) ghat (S<sub>2</sub>), Miyapur ghat (S<sub>3</sub>) and Ramghat (S<sub>4</sub>) respectively during monsoon (July - October), winter (November - February) and summer (March - June) season. All the sampling sites further divided as 1, 2, 3 for northern bank, midstream and southern bank respectively. The selection was based on the points where the communities most frequently collected water for drinking.

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



#### Phytoplankton Study:-

For phytoplankton estimation the method followed by Sheshodia (1988) was adopted. The phytoplankton sample were collected by filtering about 25 litre of water through plankton net of bolting silk no. 25. The samples were taken into Sedywick Rafter cell. Then placed the cell under microscope and counted all the phytoplankton present in the cell by moving it horizontally and vertically. Counting of phytoplankton was done by applying the following formula.

$$N = n \times \frac{v}{V}$$

Where :

N = Total number of organism/litre of water filtered.

n = Total number of organism counted in 1 ml of plankton sample.

v = Volume of concentrated plankton sample (ml).

V = Volume of total water filtered.

### **Results and discussion:-**

Rivers are the important source of natural water and provide life support ecosystem for existed aquatic life. Generally, phytoplankton are heterogeneous minute organisms occurred in aquatic ecosystem and float on the wave action movement of water. In the present study, the fluctuation of diversity of phytoplankton at different sites and in different seasons in Gomati river indicated relation of particular variable for the growth of existing phytoplankton in aquatic system. Seasonal density of phytoplankton are given in Table 1. The river comprises the maximum density of phytoplankton (546 Ind/l) during summer season, when turbidity, velocity and volume of water in the river were low and minimum density of phytoplankton (93 Ind/l) during monsoon season, when turbidity, velocity and volume of water in the river were high. Sharma et al. (2007) monitor phytoplankton diversity in the hill stream chandrabhaga in Garhwal Himalayan and Misra and Ram (2007) also monitor comprehensive study of phytoplankton community in polluted ponds of Jaunpur city.

At Gokul ghat  $(S_1)$  phytoplankton concentration was recorded as 497-546 Ind/l in summer season, 273-342 Ind/l in winter season and 104-113 Ind/l in monsoon season. Bhowmick and Singh (1985) observed maximum density of phytoplankton during summer and minimum in monsoon season. The low phytoplankton concentration 88-95 Ind/l was recorded at Jogiyapur ghat  $(S_2)$  during winter season. The minimum range of phytoplankton was mainly due to anthropogenic like bathing, washing and sewage at Jogiyapur (Shiv) ghat  $(S_2)$ . The maximum density of phytoplankton were seen at towards upstream at Gokul ghat  $(S_1)$ , it drastically goes down in city area between Jogiyapur ghat and Miyapur ghat, then it regains somewhat to downstream at opposite site of Ram ghat  $(S_4)$ . Decreased in biomass of phytoplankton in the Jogiyapur and Miyapur ghat because of the slotter house sewage near Turtipur and chemical discharge directly into the sewage by goldsmith which meets in the river near Jogiyapur and Miyapur ghat.

Table-1. Variation in phytoplankton density at different sampling sites (1-3) in river Gomati at Jaunpur during 2010-2011.

Sites	Planktons	Monsoon Season			Winter Season			Summer Season		
		1	2	3	1	2	3	1	2	3
1. Gokul ghat	Phytoplankton	113	104	109	328	273	342	497	332	546
2. Jogiyapur (Shiv) ghat	Phytoplankton	106	103	97	95	116	88	208	273	159
3. Miyapur ghat	Phytoplankton	107	97	102	143	178	113	248	288	178
4. Ram ghat	Phytoplankton	93	101	108	171	201	249	258	293	362

The present study indicates that highest phytoplankton population in summer season (546 Ind/l) due to favorable condition of growth and velocity of water low in summer season. It has been monitored during the study time the water current above the moderate speed is usually directly inhibitory to phytoplankton development. The fluctuation in occurrence of phytoplankton and abundance can be a major indicator of the environmental status of any water body like phytoplankton. Almost many scientists reported this type of finding in various habitats. The present study

revealed that population density of different biotic community including phytoplankton in river Gomati were affected with the variations of abiotic factors either directly or indirectly.

#### Acknowledgement:-

The authors are grateful to Principal, T.D.P.G. College, Jaunpur (V.B.S. Purvanchal University, Jaunpur) and Principal, Udai Pratap (Autonomous) College, Varanasi for encouragement and facilities provided during investigation.

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