Seasonal Variation in Phytoplankton Diversity in River Sai at Unnao District of U.P.

RANJIT SINGH[1], ARYA SUNITA[2]
[1] *Department of Botany, D.S.N. (PG) College Unnao (U.P.)*
[2] *Department of Zoology, D.G. (PG) College Kanpur (U.P.)*

Abstract- ***River Sai is a lotic waterbody and tributary of river Gomati. The seasonal variation of phytoplankton diversity were studied for a period of one year. The seasonal variation of phytoplankton density and diversity were studied for a period of one year. In the present study total 20 genera of phytoplankton was observed between the study period. Out of 22 genera, 9 genera belonging to Chlorophyceae, 6 to Bascillariophyceae, 3 to Cyanophyceae and 2 Euglenophyceae. The annual density shows that Chlorophyceae dominates and constituted 52.06% of the total phytoplankton population was followed by Bascillariophyceae (27.25%), Cyanophyceae (16.11%) and Euglenophyceae (4.57%). However, the overall phytoplankton was found maximum in summer, medium in winter and lowest in monsoon season.***

Indexed Terms- ***Phytoplankton, diversity, density, Sai River,***

I. INTRODUCTION

Biodiversity is the 'foundation of human life' on earth because each organism plays an important role and helps in producing more productive and stable ecosystem which has the ability to survive in stress conditions (Prakash, 2019, 2021). Environmental conditions play a key role in defining the function and distribution of organisms, in combination with other factors. Environmental changes have had enormous impacts on biodiversity patterns in the past and will remain one of the major drivers of biodiversity patterns in the future (Prakash and Verma, 2019 & 2022). The biodiversity helps to maintain the ecological balance; however, climate or environmental change adversely affect the biological diversity (Ashok, 2017 & 2018; Verma, 2021).

Phytoplanktons are the basic component of aquatic ecosystems and hence change in phytoplankton population has a direct link with the changes of water quality of any water body (Ranjan and Prakash, 2020; Bhagde *et al*., 2020). Phytoplankton serves as a food for development and growth of zooplankton. Some of phytoplankton species gives a reliable information about pollution status of aquatic bodies. So, these are called good indicator of water quality because they are strongly affected by environmental conditions and respond quickly. It is more or less related with limnological studies (Verma, 2019; Prakash and Verma, 2020).

Though numerous works on phytoplankton diversity are being reported from different parts of India but there is scarcity of report from freshwater lentic water body of eastern Uttar Pradesh except some work (Prakash *et al.* 2015; Prakash, 2001; Sinha *et al*., 2002; Sugumaran *et al*., 2020). However, Singh and Kushwaha (2022) studied the water quality of this river. So, the present study was an attempt for studying phytoplankton dynamics of river Sai at Unnao district of U.P.

II. MATERIAL AND METHODS

Phytoplankton samples were collected monthly with plankton net of bolting no. 25 with a mesh size 25µ attached with a collection tube at the base of net throughout the study period i.e., from July,2021 to June, 2022, between 10.00 to 11.00 am. 50 liter of surface water was sieved through the plankton net and sample was collected inside the collection tube. The sample was transferred to plastic bottle and preserved in 70% alcohol. Phytoplankton productivity was measured by using Sedge Wick Rafter Plankton counting cell and quantities are expressed as unit per liter of the river water. The diversity of phytoplankton was studied under light microscope with

magnification 10X initially and followed by 40X. The specimens were identified following standard literature (Alfred *et al*., 1973; Needham and Needham, 1962; Wetzel *et al*., 1991).

III. RESULT AND DISCUSSION

In the present study, density and diversity of phytoplankton are analyzed on seasonal basis and presented in table 1 & 2. In the present study total 20 genera of phytoplankton was observed between the study periods. Out of 20 genera, 9 genera belonging to Chlorophyceae, 6 to Bascillariophyceae, 3 to Cyanophyceae and 2 Euglenophyceae (table1). The present study showed that there were great fluctuation in diversity and density of phytoplankton in the present river during all the three seasons.

Table 2. Seasonal alteration in Phytoplankton Diversity of River Sai

Phytoplanktons	Summer	Rainy	Winter
Chlorophyceae			
Closterium sp.	+	+	+
Chlorella sp.	-	+	-
Cledophora sp.	+	+	+
Desmidium sp.	+	+	+
Microspora sp.	+	+	-
Nitella sp	-	-	+
Pediastrum sp.	+	+	+
Scenedesmus sp.	-	+	+
Sirogyra sp.	+	-	+
Bacillariophyceae			
Amphora sp.	+	+	+
*Cymbella*sp.	+	+	+
*Diatoma*sp.	-	-	+
*Fragilaria*sp.	+	-	+
*Naviculas*p.	+	+	+
*Nitzchia*sp.	-	+	+
Cyanophyceae			
*Micocystic*sp.	+	+	+
*Scytonems*sp.	+	+	-
*Oscillatoria*sp.	+	-	+
Euglenophyceae			
Euglena sp.	+	-	+
*Phacus*sp.	+	-	+

The annual density shows that Chlorophyceae dominates and constituted 52.06% of the total phytoplankton population was followed by Bascillariophyceae (27.25%), Cyanophyceae (16.11%) and Euglenophyceae (4.57%) (Table2).

In the present study the maximum density of phytoplankton was recorded in Summer season (1416 units/lit.) and minimum in winter season (1011 units/ lit.). The population density of Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae ranges from 311-709 units/ lit., 139-433 units/ lit., 87-213 units/ lit and 29-61 units / lit., respectively

Table 2: Seasonal variations in Total Phytoplankton Counts (units/lit.) of River Sai

Group	Summer	Rainy	Winter	Total	%age
Chlorophyceae	709	311	554	1574	52.06%
Bacillariophyceae	433	139	252	824	27.25%
Cyanophyceae	213	87	157	487	16.11%
Euglenophyceae	61	29	48	138	4.57%
Total	1416	566	1011	3023	-

In the present study, a total of 9 genera of Chlorophyceae recorded and they exhibited highest density in summer season followed by winter and rainy seasons. Similar finding were found in various fresh water bodies in U.P. (Prakash and Ansari, 2000; Prakash, 2001; Sinha *et al*., 2002). In the present investigation, a total of 6 genera of Bacillariophyceae recorded and they exhibited highest density in summer season followed by winter and rainy seasons. Similar finding were found in various fresh water bodies in U.P. (Prakash and Ansari, 2000; Prakash, 2001; Sinha *et al*., 2002). In the present study, a total of 3 genera of Cyanophyceae recorded and they exhibited highest density in summer season followed by winter and rainy seasons. Similar finding were found in various fresh water bodies in U.P. (Prakash and Ansari, 2000; Prakash, 2001; Sinha *et al*., 2002). In the present study, only2 genera of Euglenophyceae were recorded and they exhibited highest density in summer season

followed by winter and rainy seasons. Similar finding were found in various fresh water bodies in U.P. (Prakash and Ansari, 2000; Prakash, 2001; Sinha *et al*., 2002).

CONCLUSION

The present study revealed that River Sai is a good productive in terms of density of different phytoplankton communities. Total 20 genera of phytoplankton were identified. Out of 20, 9 belong to Chlorophyceae, 6 to Bascillariophyceae, 3 to Cyanophyceae and 2 Euglenophyceae. Chlorophyceae was dominated over rest of the phytoplankton population. However, the overall phytoplankton was found maximum in summer, medium in winter and lowest in monsoon season. Presence of *Microcystis* specie is the indicator water pollution. Therefore, measures must be taken to minimize the water pollution by regulating human activities in watershed areas.

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