ISSN: 2287-688X

Annals of
Plant Sciences

Volume 12, Issue 02 (2023) pp. 5732-5736

Research Article

Study of Phytoplankton Composition in Freshwater Bodies in Parts of Western Uttar Pradesh

Shagun P. Maglik, Mohd Ajaz and Narendra P. Singh

Department of Botany, Meerut College, Meerut- 250003 (Uttar Pradesh) INDIA

Abstract

The present study was conducted to assess the Phytoplankton composition in freshwater bodies at four sites from two districts of western Uttar Pradesh. About 21 algal genera of 5 families are found in the selected sites. Phytoplankton identified from the sites mainly composed of the member of Chlorophyceae, Bacilariophyceae and Cyanophyceae family. Maximum number of genera were recorded from Chlorophyceae (47.61%) and members of family Euglenophyceae (4.76%) were found rarely. Palmer Pollution Index values were calculated to know the level of pollution at each site.

Keywords: *Phytoplankton, Palmer index Phytoplankton composition, Freshwater, Plankton Net.*

Introduction

Phytoplankton is microscopic organisms that live in watery environments (salty and fresh). They are polyphyletic group with utmost variation in size, shape, colour, type of metabolism, and life history traits (G. Borics, 2021).Some phytoplankton are Bacteria, some are Protists and most are single-celled plants. Among the common kinds are photosynthesizing bacteria (Cyanobacteria) and single-celled algae that drift in the sunlit top layers of water bodies.

Phytoplankton one of the most important primary producers in aquatic ecosystem and also used to indicate the health of such ecosystem. Due to relatively short life span, there community composition changes quickly in response to the change in physico-chemical characters of water. Like land plants, phytoplankton have chlorophyll to capture sunlight, and convert it to chemical energy through photosynthesis. Phytoplankton are essential primary producers in water bodies and changes in phytoplankton species and number could directly influence water ecosystem structure and function.

Material and Method

Phytoplankton samples were collected by using phytoplankton net of mesh size 60 micron from collection sites in different district of western Uttar Pradesh. Samples were collected from 2 sites in each district in the year 2022 at different time. Selected sites from Meerut district are 1. Makhdoompur 2. Kudikamalpur in Mawana tehsil and from Hapur district are 1. Brijghat 2. Piplheda village .All the samples were collected in the morning between 8 am to 11 am. Samples were collected in sterilized PVC bottles and preserved in 5% formalin solution. Some unpreserved samples were also taken for live phytoplankton identification. These samples were bring to the laboratory of Botany Department Meerut College, Meerut.

Collected sample were centrifuged in electrical centrifuge at 2,500 – 3,000 rpm for 20 – 25 minutes. After sedimentation supernatant siphoned off and sediment portion was preserved in 5% formalin solution. Than phytoplankton identification was done with the help of Microscope (OLYMPUS model – CH20iBIMF).

***Corresponding Author:**
Shagun P. Maglik;

DOI: http://dx.doi.org/10.21746/aps.2023.12.2.2

Fig 1: Makhdoompur (Meerut)

Fig 2: Brijghat (Hapur).

Fig 3: Collection of phytoplankton sample

Fig 4: Collection of phytoplankton sample

Result and Discussion

In laboratory examination results obtained of sample reveals several verities of phytoplankton. After the observation about 21 genera from 5 classes were found. Out of 21 genera, 10 genera were recorded from class Chlorophyceae, 5 genera from Bacilariophyceae, 5 genera from Cyanophyceae and 1 genera from Euglenophyceae. Maximum members of phytoplankton community were found from the class Chlorophyceae (47.61%) and members of Euglenophyceae (4.76%) were found rarely. Distribution and composition of phytoplankton shown in table 1:

Table 1: Phytoplankton community at different sites in two districts

S.No.	Family	Member	Meerut		Hapur	
			Site 1	Site 2	Site 1	Site 2
1.	Chlorophyceae	Chlorella	+	+	+	+
		Spirogyra	+	+	+	+
		Hydrodictyon	+	+	+	+
		Cladophora	+	-	+	-
		Scendesmus	-	+	-	+
		Volvox	+	+	+	+
		Pendorina	+	+	+	-
		Chlamydomonas	+	+	+	+
		Desmidium	-	+	+	-
		Oedogonium	+	+	-	+
2.	Bacilariophyceae	Navicula	+	+	-	+

		Synendra	+	-	+	+
		Fragilaria	-	-	+	-
		Tabellaria	+	-	-	+
		Pinnularia	+	+	+	-
3.	Cyanophyceae	Nostoc	+	+	+	-
		Anabena	+	+	+	+
		Spirulina	+	+	+	+
		Oscillatoria	-	+	-	+
		Microcystis	-	+	+	-
4.	Euglenophyceae	Euglena	-	-	+	-

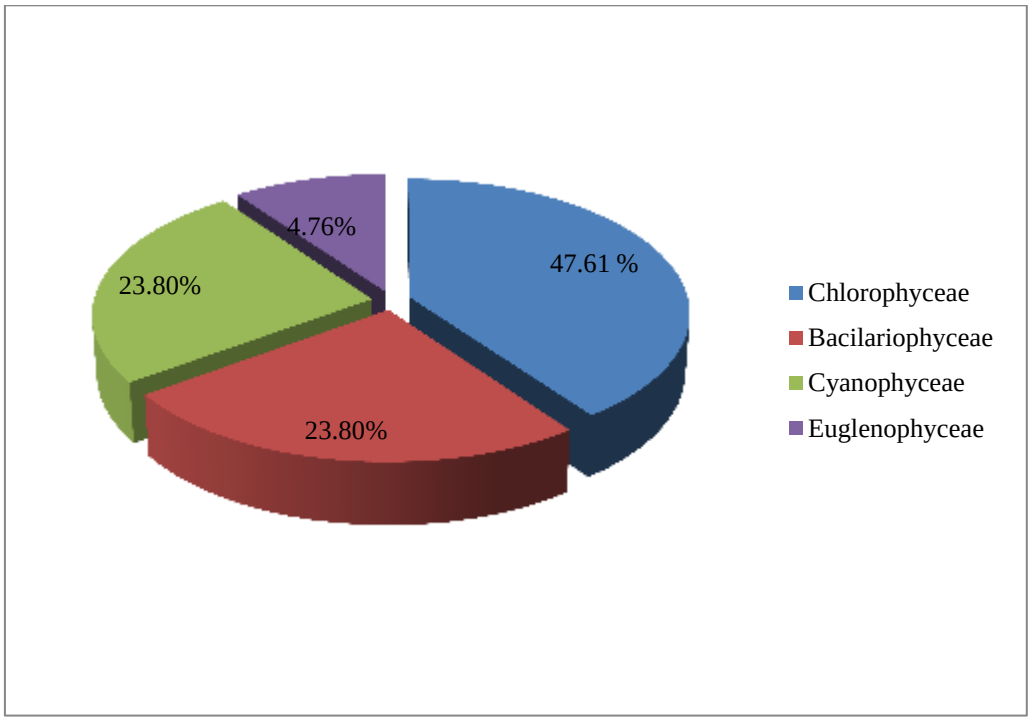

Fig 5: Graphical presentation of percentage distribution of Phytoplanktons

Palmer Pollution Index

First attempt to identify and prepare the list of most tolerant species and genera of algae to pollution had been done by Palmer (Palmer C.M., 1969). It is a rapid, reliable and relatively inexpensive way to record water pollution. Palmer assigned a pollution index factor of 1 - 5 to the 20 types of Algae that are most tolerant to organic pollution.

Palmer index numerical values indicate:

- 0-10 = no evidence of pollution
- 10-15 = moderate pollution
- 15-20 = probable high pollution
- >20 = high organic pollution

Only 8 genera were appeared in the studied sites out of 20 genera included in Palmer Index.

Table 2: Palmer Pollution Index of selected sites in two districts

Palmer genus	Palmer index	Meerut		Hapur	
		Site 1	Site 2	Site 1	Site 2
Ankistrodesmus	2	-	-	-	-
Chlamydomonas	4	4	4	4	4
Chlorella	3	3	3	3	3
Closterium	1	-	-	-	-
Cyclotella	1	-	-	-	-
Euglena	5	-	-	5	-

Gomphonema	1	-	-	-	-
Lepocinclis	1	-	-	-	-
Melosira	1	-	-	-	-
Micractinium	1	-	-	-	-
Navicula	3	3	3	-	3
Nitzschia	3	-	-	-	-
Oscillatoria	5	-	5	-	5
Pandorina	1	1	1	1	-
Phacus	2	-	-	-	-
Phormidium	1	-	-	-	-
Scendesmus	4	-	4	-	4
Stigeoclonium	2	-	-	-	-
Synendra	2	2	-	2	2
Anacystis	1	-	-	-	-
Pi value	44	13	20	15	21

In the present study, according to Palmer Pollution Index, site 2 (Piplheda) in district Hapur has maximum pollution index value of 21 while at site 1 (Makhdoompur) in district Meerut has lowest pollution index value of 13.

Similar observations were also done in freshwater bodies in different regions by many researcher such as Nafasat, *et al*., (2009), Negi, *et al*., (2012), Seema Trivedi, (2015), Neelam, *et al*., (2016), Veer Pratap Singh, *et al*., (2016).

Acknowledgement

Authors are grateful to University Grants Commission, New Delhi for providing financial support for the work and thanks to Department of Botany, Meerut College, Meerut (Uttar Pradesh) for the facilities to conduct the research.

References

1. APHA. "Standard Methods for the Examination of Water and Waste water 17rd Ed." *American Public Health Association, Washington D. C* (1989).
2. Gabor, B., Andras, A., Nico, S. and Robert, P. "Freshwater Phytoplankton Diversity: Model, Drivers and Implications for Ecosystem Properties." *Hydrobiologia* 848 (2021): 53 – 75
3. Kumar, J., Absar, A., Dharm, N.J., Pranab, G., Simanku, B. and Basanta ,K.D. "Impact of barrages on assemblage pattern of phytoplankton in tropical river Ganga, India." *Environ Monit Assess*, (2022): 194-804.
4. Moncheva, S. and Bill, P. "Manual for phytoplankton sampling and analysis in Black Sea." (2010).
5. Winder, M. and Ulrich, S. "Phytoplankton Response to a Changing Climate." *Hydrobiologia* 698 (2012): 5-16.
6. Ali, S.N., M. Akhtar. and Pandey, A.K. "Studies on phytoplankton diversity in river Gomti at Jaunpur (U.P.)." *Asian Journal of Environmental Science* 4.1 (2009): 78-80.
7. Negi, R.K, *et al*. (2012) "Seasonal Variation and species composition of phytoplankton in Ganga river and its tributary at Garhwal region, Uttarakhand, India." *International journal of Zoology and Research* 2.2 (2012): 19-30.
8. Palmer, C.M. "A composite rating of algae tolerating organic pollution." *J. Phycology* (1969): 78-82.
9. Prescott, G.W. "How to know the freshwater algae." 3rd ed. *Dubuque USA: Brown* (1978).
10. Prescott, G.W. "The algae: A Review." *Nelson and Sons Led. New York* (1969): 416.
11. Salem, Z, *et al*. "Spatio-temporal evaluation of the surface water quality in the middle Nile Delta using Palmer's algal pollution index." *Egyptian Journal of Basic and Applied Sciences* 4 (2017): 219-226.
12. Shukla, N, *et al*. "A study on Phytoplankton diversity in river Ganga at Allahabad,

Uttar Pradesh (India)." *Green Chemistry & Technology Letters* 11 (2015): 92-95.
13. Singh V.P, *et al*. "Seasonal status of the diversity of Phytoplankton in river Gomti at Jaunpur (U.P.), India." *International Journal of Advance Research* 4.3 (2016): 1900-1905
14. Trivedi, S. and A. Karode. "Diversity of phytoplankton in Kshipra river – Triveni station, Ujjain (M.P.)." *International Journal of Research Granthalayah* (2015).

Source of support: Nil;
Conflict of interest: The authors declare no conflict of interests.

Cite this article as:
Maglik, S.P., Mohd, A. and Narendra, P.S. "Study of Phytoplankton Composition in Freshwater Bodies in Parts of Western Uttar Pradesh." *Annals of Plant Sciences.*12.02 (2023): pp. 5731-5736.