Original Research Article

Study of Phytoplankton Abundance and Species Diversity in Shahjangi Pond of Bhaghalpur District, Bihar (India)

Abstract

In the present study, species diversity and phytoplankton abundance were examined in Shahjangi Pond in the Bhagalpur region of Bihar.The present study was carried out fromApril 2021 to March 2022.Phytoplankton is considered a type of microscopic plankton capable of a photosynthesis process that is found as an essential element of the aquatic ecosystem.Phytoplankton can range in size and shape and they are photosynthesizing autotrophic organism The primary goal of this study is to learn more about the variety of phytoplankton in this pond.A blotting silk net was used to capture the sample. The planktons were collected in wide, thick bottles with a 200ml capacity.The vial containing the filtrate was then brought to the lab. In the laboratory 5ml of 4%, formalin solution was added collected filtrate. Under a compound microscope, sample analysis was carried out at 10x and 40x magnification.

Keywords: *Chlorophyceae, Myxophyceae, Phytoplankton, Pond, Species*

Introduction

Phytoplanktonarea very important character of an aquatic ecosystem and plays a crucial role in the energy transfer among the aquatic food chains or food webs.Freshwater phytoplankton plays a vital role in aquatic ecosystem like ponds, lakes and reservoirs (Sant Manickam et al., 2014).Phytoplankton is the chief primaryproducer in almost all aquatic systems and is an imperativefood source for other organisms (Sukumaran et al, 2008). Zooplankton feeds on phytoplankton. They are accountable for eating millions of little algae and other phytoplankton.Phytoplankton not only serves as nutrition or food or diet forthe

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aquatic animal but also playsa significant role inkeeping the biological equilibrium and quality ofwater (Pandey et al.,1998).

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Material& Method

Sample Collection

For collection of water sample,3 stations werecastin the pond. Water samples for the Phytoplankton study were collected from three different stations. Monthly collections were performed between 8:00AM to9:00AM at the three stations when weather conditions allowed sampling from the Pond. There was surface sampling at stations 1, 2 and 3. At the station, samples were collected at mid-depth (9 m) and the bottom depth (19 m). All the collected samples were transported to the laboratory.Plankton samplingwas carried out by using the plankton net ofmesh size 55µm by hauling horizontally for five meters according to the method.

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Filtered watersamples were stored in the sample bottle andthen preserved with Lugol's iodine solution of10%. Identification of the phytoplankton specieswas according to Botes(2003) Emi and Andy (2007).

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H' - Shannon-Wiener diversity index

S - Species richness (number of species), pi –

$$H = -\sum_{i=1}^{k} p_i \log p_i$$

Result& Discussion

Four families (Bacillariophyceae, Chlorophyceae, Chrysophyceae, and Myxophyceae) and 18 phytoplankton species were found after the six-month survey.Flagilaria recorded the highest with apercentage abundance of 28.49% followed byAnkistrodesmus with 22.08%, Aphanocapsa with21.27% while Eudorina with 0.24% is the leastabundant (Table 1).Tables 2 and 3 of the study revealed theShannon-Wiener Diversity Index (H') and theSpatial Variation in the Diversity indices of thestudy.

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Species	***Total Abundance***	***% Abundance***
Flagilaria	113217	28.49
Tabellaria sp.	13535	3.40
Naviculales	4121	1.03
Nituschia	2452	0.61
yclotella	13349	3.36
Ankistrodesmus	87791	22.08
Chlorella	19723	4.96
Ulothrix	4523	1.13
Enteromorpha	1009	0.25
Closterium	5145	1.29
Eudorina	1030	0.24
Oocystis	11458	2.88
Zugrema	1523	0.38
Microspora	5121	1.28
Aphanocapsa	84521	21.27
Anabaena	12456	3.13
Oscillatoria	1321	0.33
Aphanizomenon	8452	2.12
Mallomonas	6521	1.64
Total	**= 397268**	

Table 1. Species composition and abundance of phytoplankton in Shahjangi Pond (Bhagalpur)

	Site		
	A	***B***	***C***
Shannon-Wiener Diversity Index (H')	***3.12***	***2.57***	***3.09***
Evenness Index (E)	***0.75***	***0.73***	***0.76***
Simpson's Density Index (D)	***0.16***	***0.19***	***0.20***

Table 2. Spatial variation in diversity indices of phytoplankton population across the study sites

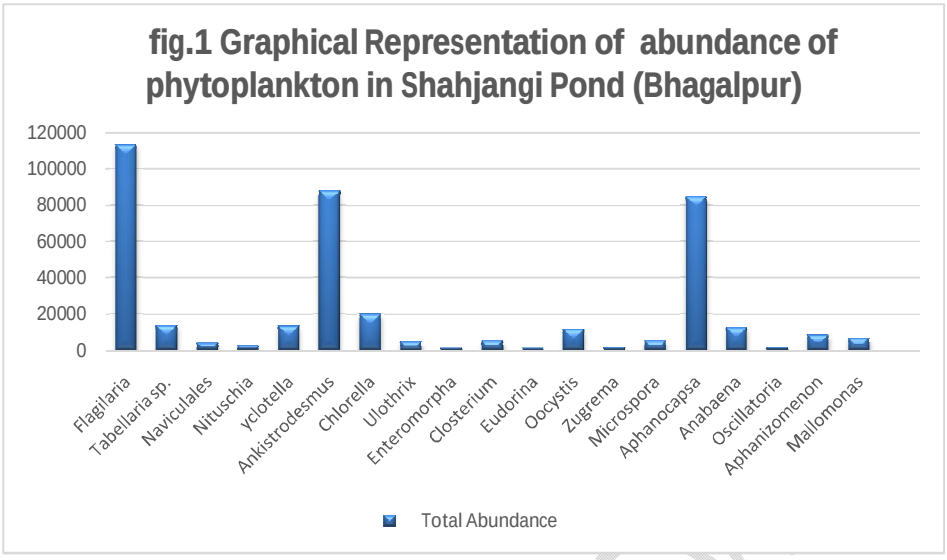

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Table 3. Spatial variation in diversity indices of phytoplankton population across the study sites

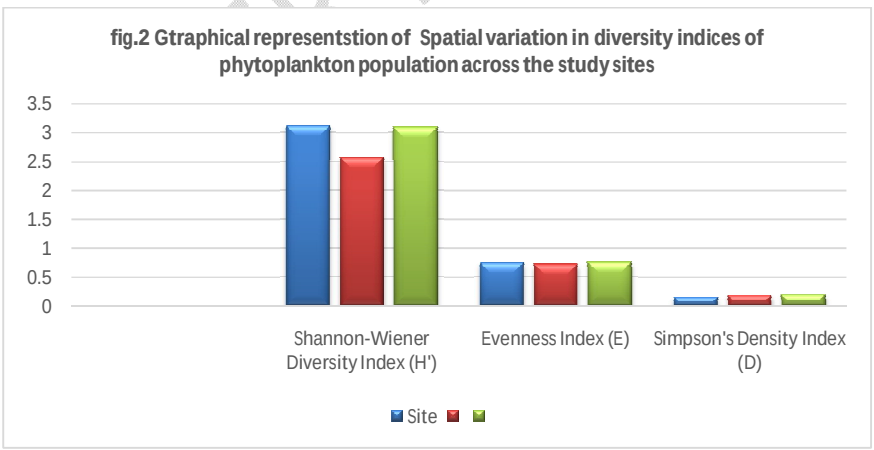

Table 1 and 2 of the study revealed theShannon-Wiener Diversity Index (H') and theSpatial Variation in the Diversity indices of thestudy. The Shannon-Wiener Diversity Index (H')ranged between 2.57 – 3.12 across the threestudy sites. Pielou Evenness Index (E) rangedbetween 0.73 - 0.76; Simpson's Diversity Index(D) ranged between 0.16 - 0.20. The study supports Azma's results that a Simpson Index value of 0.83 to 0.93 suggests that the communities are mature and stable since the dominance is shared by a sizable number of individuals.According to Azma and Frutoset al.,pointed out that if the Pielou Indexvalues are less than 0.5, it could be an indicatorof the presence of ecological stress.

It is generally accepted that the dynamics of water circulation, nutrient concentrations, rainfall patterns, location, and the physical environment—which varies primarily in accordance with the dry and wet seasons in tropical waters—are the primary factors driving seasonal variation of phytoplankton community structure (Fonge et al., 2012& Jeje et al., 1986). During the six-month research period, more Ankistrodesmus (22.08%) and Flagilaria (28.49%) cases were noted.Nineteen (19) phytoplankton species in total were discovered during the study period. In general, the three sites' plankton species compositions were comparable. This is comparable to the findings of Mohammed et al.,2009 &Anago etal., 2013, who reported phytoplankton andzooplankton abundance in a study ofphytoplankton diversity from Koil Coastal watersin India and Awba Reservoir Ibadan Nigeriarespectively.Furthermore, a study conducted byFonge et al.,on Phytoplankton diversity andabundance in the Ndop wetland plain, Cameroonshowed a high diversity of phytoplankton in studyareas.Anthropogenic activities at Station A may be to blame for the high quantity of phytoplankton there. The results support those of Fonge et al.,who noted that the ongoing input of nutrients, particularly through the usage of nitrate and phosphate fertilizers adjacent to the station, may also be responsible for the high abundance of phytoplankton species. All sites showed an increase in species richness, variety, and evenness.This might be explained by more microhabitats emerging as a result of increasing living space.

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Conclusion

In conclusion, it can be said that the phytoplanktonic communities of Shajangi pond are mature and stable with great diversity. The study has been made throughout the year so season and geography both have an impact on

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phytoplankton diversity and abundance, but despite this, the diversity of phytoplankton has remained stable.

Additional research should be done to assess the physicochemical and phytoplankton abundance and composition in various water bodies throughout the year.

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