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Phytoplankton diversity in Alwara lake of district Kaushambi (U.P.)

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Abstract

Alwara lake is a perennial wetland (water logged area), located in Kaushambi district of Uttar Pradesh. This lake has vast range of flora and fauna, diversity of which is influenced by several physico-chemical characteristics. The Alwara lake has a dynamic landscape, created by annual flooding from adjacent Yamuna river. Both phytoplanktons as well as zooplanktons are found abundantly in this water ecosystem but phytoplanktons are major producers that fix the energy and transfer to the land. Present investigation is an attempt to find out the diversity in phytoplankton genera. Phytoplankton diversity is an important criterion for evaluating the suitability of water for irrigation and drinking purposes. Present study will not only help to attract the biologists for further study but also provide a message to frame appropriate strategy for the development of this almost ignored Wetland.

Keywords: Wetland, Phytoplankton, Chlorophyceae, Diversity, Alwara lake.

1. Introduction

The lake under investigation is surrounded by agricultural fields and connected to the river Yamuna. In this lake, the water level falls during summer but rises during rainy season. The lake has derived its name from village Alwara. Locally it is called Alwara taal.

The Alwara lake is a naturally formed lake and covers about several hundred hectares area. The surrounding areas are Paur Kashi Rampur in east, Tikara in the north, Shahpur in the south and the river Yamuna in the west. This perennial wetland is characterized also by the existence of some endangered plant species such as lotus and some vulnerable animal species such as sarus crane ^[1]. The sarus cranes are at the verge of extinction due to widespread reductions in the extent and quality of their wetland habitats, exploitation and the effects of pollutants, unplanned farming, irrigation and non-adoption of wild life rules and regulations as well.

In a water ecosystem, phytoplanktons are free floating unicellular, microscopic and colonial autotrophic organisms. The movement of phytoplanktons is more or less influenced by water currents ^[2]. They play a key role in maintaining equilibrium between abiotic and biotic components of aquatic ecosystem ^[3]. These phytoplanktons directly provide fabricating material for constructing the nests by the birds inhabiting there and indirectly provide food for them. ^[4] studied the phytoplankton diversity of lentic water bodies. ^[5] studied the monthlies variations in phytoplankton density and ^[6] performed the limnological studies in this Alwara lake.

Phytoplankton composition and diversity of Alwara lake were studied for a period of 12 months from January to December 2014. Present investigation is therefore an attempt to find out the diversity in phytoplankton genera.

1.1 Study Area

The Alwara lake (Fig.) is located in Kaushambi district of Uttar Pradesh. The lake is nearly 75 km away from Allahabad, 25 km from Manjhanpur (headquarter of district Kaushambi) and 290 km from Lucknow by road. Its nearest railway station is Bharwari at a distance of 35 km and nearest airport Bamrauli (Allahabad) is at a distance of 70 km. It is situated between the latitude 25°24'05.84"S–25°25'10.63"N and longitude 81°11' 39.49"E-81°12'57.95"W with altitude MSL – 81.08 meter.

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Fig A: view of Alwara lake in Kaushambi district (U.P.)

2. Material and Methods

Water samples were collected weekly *i.e.* four times in a month from selected areas throughout year 2014. The collection time was morning hours from 7.00 to 9.00 am. The lake water was collected in a flask and brought to laboratory for further examination. Physico-chemical analysis was carried out in accordance with Standard Methods for Examination of Water and Waste Water described by American Public Health Association [7]. The samples to detect dissolved oxygen (DO) and biological oxygen demand (BOD) were fixed at collection sites. The temperature was measured with the glass-mercury centigrade thermometer at the collection site. Transparency was measured with the Secchi disc at the site. Local villagers also assisted in the collection of materials.

The assessment of phytoplankton population was done by preparing 10 ml concentration in 4% formalin after filtering 100 liter of sample water through number 20 bolting net. Microscopic counting was done by Sedgwick Rafter Cell slide by using of binocular stage microscope.

Identification of phytoplankton was done according to [8-10]. In present investigation, authors studied four different groups of phytoplanktons *namely* Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae.

3. Results and Discussion

Total four groups of phytoplanktons *namely* Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae were worked out. [11] studied the seasonal variation of these four types of phytoplankton in Jhalamand pond, Jodhpur. Total 43 genera recorded, out of which 12 in Bacillariophyceae, 16 in Chlorophyceae, 13 in Cyanophyceae and 2 in Euglenophyceae, as represented in table.

The table represented explains that Chlorophyceae was dominant in density and diversity among all the observed phytoplanktons. The dominancy of Chlorophyceae in the similar physiographic region has also been reported by various workers [12-14]. Relative approximate abundance of phytoplankton in Alwara lake is also investigated. It showed maximum of Chlorophyceae (41%), followed by Bacillariophyceae (37%), Cyanophyceae (19%) and lastly Euglenophyceae (3%).

The phytoplankton density and diversity depend more to physical factors than chemical factors of water which influence their seasonality and distribution pattern in the water body in this physiographical environment. That is why certain phytoplanktons and their density are regulated by seasonal fluctuations of water temperature and apparently disappear in severe condition due to the fact that certain species either become too scarce or occur as spore, resting eggs, etc. which are not easily detectable. [15-17] also reported that phytoplankton biodiversity is influenced by physico-chemical factors.

4. Conclusion

During the period of 12 months of investigation, 43 genera of phytoplanktons representing four taxonomic groups *viz.* Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euglenophyceae were recorded. Relative approximate abundance of these four groups in further study showed maximum of Chlorophyceae, followed by Bacillariophyceae then Cyanophyceae and lastly Euglenophyceae. The dominancy of chlorophyceae members is due to the fact that they can adapt to any type of water environment due to their photosynthetic pigments.

Table: Phytoplankton genera observed in Alwara lake of Kaushambi, (U.P.) during 2014.

	Bacillariophyceae	Chlorophyceae	Cyanophyceae	Euglenophyceae
1.	<i>Amorpha</i>	<i>Ankistrodesmus</i>	<i>Aphanocapsa</i>	<i>Euglena</i>
2.	<i>Cymbella</i>	<i>Coelastrum</i>	<i>Anacystis</i>	<i>Phacus</i>
3.	<i>Diatoma</i>	<i>Cosmarium</i>	<i>Coelosphaerium</i>	
4.	<i>Eymbella</i>	<i>Closteridium</i>	<i>Anabaena</i>	
5.	<i>Fragillaria</i>	<i>Chara</i>	<i>Gloeocapsa</i>	
6.	<i>Gomphonema</i>	<i>Eudorina</i>	<i>Phormidium</i>	
7.	<i>Melosira</i>	<i>Genicularia</i>	<i>Microcystis</i>	
8.	<i>Navicula</i>	<i>Mougeotia</i>	<i>Merismopedia</i>	
9.	<i>Nitzschia</i>	<i>Netrium</i>	<i>Nostoc</i>	
10.	<i>Pleurosigma</i>	<i>Pediastrum</i>	<i>Oscillatoria</i>	
11.	<i>Synedra</i>	<i>Pandorina</i>	<i>Spirula</i>	
12.	<i>Terpsinoc</i>	<i>Scenedesmus</i>	<i>Scytonema</i>	
13.		<i>Staurastrum</i>	<i>Rivularia</i>	
14.		<i>Spirogyra</i>		
15.		<i>Volvox</i>		
16.		<i>Zygnema</i>		

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