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Study of Phytoplankton and Zooplankton in Freshwater Kanwar Lake, Begusarai, India

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Abstract: Phytoplankton are small, microscopic plants that live suspended in the open water. Phytoplankton are generally more abundant in lakes than rivers. Microorganisms are present in large quantities everywhere and can survive extreme physical and chemical conditions. Many microorganisms play foundational roles in aquatic ecosystems. They serve as a food and shelter of other aquatic organism especially zooplankton. Phytoplankton acts as a biological indicator of water pollution. The latitude of Kanwar Lake, Begusarai, India is 25.630383, and the longitude is 86.145172. The Plankton sample was collected at once from all three sites of Kanwar Lake in a monthly interval from January 2022 to December, 2022.The plankton sample were collected in sterile plastic bottles with the help of plankton net of mesh size 25 and diameter of pore 60µ. Phytoplankton material was preserved in 4% formalin solution at the site of collection. In the present research investigation, water body show variety of algal genera. Algal genera belong to groups Chlorophyta, Bacillariophyta and Myxophyta. Out of 13 Genera of Phytoplankton 5 belongs to Chlorophyta, 4 belong to Bacillariophyta and 4 belong to Myxophyta. The finding of results showed that all three sites of the lake found to be average and more or less similar. So, it clearly indicated that lake not shown much eutrophic due to a smaller number of pollutants are analysed in this study.

Keywords: Kanwar Lake, Phytoplankton, Zooplanktons,

I. INTRODUCTION

Ecology is a predominantly biological discipline concerned with the distributions of organisms and their interrelationships with each other and their environments. Ecologists also recognize that unless they can name species or, at least, have a close idea of their affinities, the point of their work is very largely lost. At the same time, however, whether they are trying to work out how a system is organized and its functions are allocated, or to distinguish the differences in energy flow through the community structures of old meadow or arable cropland, various types of forest or coral reefs, ecologists will soon resort to additional schemes of classification [1]. Healthy water is one of the most important foundations for the sustainable development of human societies and ecosystems. With rapid economic development and population growth, water quality deterioration has become an important global problem, which may lead to the destruction of biodiversity, eutrophication and serious public health hazards. Spatiotemporal variation and trends in water quality can reflect geographical differences, sources of pollution and types of human activities [2]. The latitude of Kanwar Lake, Begusarai, Bihar, India is 25.630383, and the longitude is 86.145172**.** It is located at India country in the Parks place category with the GPS coordinates of 25° 37' 49.3788" N and 86° 8' 42.6192" E. It is a green area with the territory close to 14 hectares where one can spend a day on a natural setting exploring the locality, walking, picnicking, doing sports, etc. There are two historic temples in the park, which are visited during the holiday season by numerous pilgrims

II. MATERIALS AND METHODS

Study Area:

Kanwar Lake is a small natural park situated in central Bihar, to the north of the city of Begusarai, India. It is a green area with the territory close to 14 hectares where one can spend a day on a natural setting exploring the locality, walking, picnicking, doing sports, etc. There are two historic temples in the park, which are visited during the holiday season by numerous pilgrims.

Collection of Water Sample:

The Plankton sample were collected in once from all three sites of Kanwar Lake, Begusarai, Bihar in monthly interval from January 2022 to December, 2022.The plankton sample were collected in sterile plastic bottles with the help of plankton net of mesh size 25 and diameter of pore 60µ [3]. Phytoplankton material was preserved in 4% formalin solution at the site of collection. The Phytoplanktons were identified by staining with 1% Ligol's Iodine solution and examine under compound microscopes. Quantitative analysis of phytoplankton was done by drop count method. Phytoplankton

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identification was done with the help of standards works [4, 5, 6]. The obtained results were recorded the number of organisms per liter.

III. RESULT AND DISCUSSION

The biological characteristics of lake with respect to phytoplankton mentioned in Table 1 and 2. Phytoplankton or algae are the major inhabitant of fresh water body [7]. In fresh water ecosystem Phytoplanktons are the primary producer which absorbs the radiant energy and convert it into chemical energy. They also play an important role in aquatic food chain. Phytoplanktons communities do not respond only to natural changes into the lake, but may also present variation because of human variation because of human activities affecting the water bodies [8]. In the present study, water bodies show the variety of algal genera. Algal genera belong to groups Chlorophyta, Bascilariophyta and Myxophyta. Out of Thirteen (13) Genera of Phytoplankton Five (5) belongs to Chlorophyta, four (4) belong to Bascilariophyta and four (4) belong to Myxophyta which is mentioned in Table 1. With minor variation in distribution pattern of phytoplankton nearly similar fluctuation throughout the year in all three sites of the lake.

Chlorophyta members found to be most dominant group of Phytoplankton with respect to diversity and density. Among total phytoplankton population Chlorophyta contribute 43.38% (Table 3) population density of Chlorophyta found maximum 131 unit/l in the month of January at site- 3. Whereas minimum 23 unit/l during the month of August at site - 2. Among the Chlorophyta, Closterium, Oedogonium and Hydrodyctyon Species shown their abundance throughout the research. Bascilariophyta was contributed 35.6 % of total phytoplankton population and acquired 2nd position which was shown in Table 3.

The highest population of Bascilariophyta (108 unit/l) was found at site 3 and lowest population was found at site- 2 (29 unit/l). Among these members Diatoms and Melosira were found to be most abundance in site -1 and 3 during the period of study. Abundance of Diatoms was found from January to May as there is a significant amount of silica [9]. Diatoms population also maximum in October in Site 1 and 3, it is due to heat and bright sunlight. As the summer advanced and temperature increased the diatoms become dominant [10].

In Kanwar Lake zooplanktons population also found and these are members of Protozoan, Rotifera and Cladocera [11]. Among the protozoa, the member of the Mastigophora, Rhizopoda and Ciliata mostly present in the small patches among the senescent and rotting vegetation while Rhizopoda are present in open water. Some species of protozoan are Euglena, Diflugia, Paramoecium and Vorticella mostly found in post winter seasons. The four species of rotifera are found during the investigation period from the lake of which Brachyonus sp. was dominated. Among rotifers the species are of Filinea, Brachyonus and Keratella are prominently founds. Among the zooplanktons, Cladocera are found during summer months. They are mostly occurring from January to pre-monsoon period. Daiphanosoma and Ceriodaphnia sp. Found throughout the investigation period [12]. But the population decreased during the month of July to September. The members of Cladocera are Diaphdnasoma sp., Ceriodephnia sp., Ceriodaphnia sp. Chydorus and Moina spp. mostly found during the study period.

Table 1 - Total Species Composition various algal groups at Kanwar Lake

Chlorophyta	Bascilariophyta	Myxophyta
Ulotrix	Diatoms	Anabaena
Oedogonium	Fragilaria	Microcystis
Closterium	Melosira	Nostoc
Hydrodyctyon	Navicula	Oscillatoria
Zygnema		

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Table 2 - Phytoplankton Distribution Jan, 2022 to December, 2022

Phytoplankton (Class)	Sites	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept.	Oct	Nov	Dec	Mean
Chlorophyta	S-1	113	121	91	78	74	66	41	28	61	81	112	118	82.0
	S-2	109	116	87	76	70	54	38	23	39	70	76	89	70.58
	S-3	131	128	103	83	81	73	50	39	54	91	123	121	89.75
Bascilariophyta	S-1	65	71	63	77	96	60	38	32	45	93	83	77	66.66
	S-2	59	66	60	70	80	51	32	29	41	58	79	72	58.08
	S-3	74	87	79	67	108	64	53	49	55	96	81	88	75.08
Myxophyta	S-1	53	65	59	46	38	30	26	23	28	49	55	65	44.75
	S-2	56	51	60	64	59	73	31	29	26	57	62	54	51.83

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Table 3
Density percentage (%) of Phytoplankton at all three sites of Kanwar Lake

Class	Site -1	Site -2	Site -3
Chlorophyta	42.2	38.41	43.38
Bascilariophyta	32.33	32.39	35.60
Myxophyta	24.87	29.18	20.51

IV. CONCLUSION

From the present investigations, it may be inferred that Phytoplankton and zooplankton distribution in freshwater of Kanwar Lake, Begusarai, India. The lake had a diversified algal flora in which Chlorophyta members were dominant in all three sites than Bascilariophyta and Myxophyta. The algal study very essential for evaluation of the good or bad condition of the fresh water ecosystem. The finding of the all three sites of the lake, found to be average and more or less similar. So, it clearly indicated that lake not shown much eutrophic due to a smaller number of pollutants are analysed in this study.

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