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Research Paper

An Assessment of Phytoplankton Diversity of Tighra Reservoir, Gwalior (Madhya Pradesh)

Zoology

KEYWORDS : Phytoplanktons, Tighra reservoir, Fresh water habitat, Seasonal variations

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ABSTRACT

Phytoplanktons which are present in a variety of aquatic habitats were studied with respect to their species diversity and seasonal distribution. Studies on phytoplankton of Tighra reservoir, Gwalior (M.P.) were undertaken for one complete year (November 2010 to October 2011). Among the total 26 genera recorded during the study, 9 were from Bacillariophyceae, 9 from Chlorophyceae, 6 from Myxophyceae and 2 from Euglenophyceae. Bacillariophyceae was the most dominant group followed by Myxophyceae, Chlorophyceae, and Euglenophyceae. Seasonal variations were observed in the distribution of phytoplankton. Seasonally, the number was highest during summer.

INTRODUCTION

In aquatic ecosystems, phytoplanktons are the important component which consists of primary producers with photosynthetic activity that constitute the first step in the carbon cycle of water body. These organisms are the important biotic component of an aquatic ecosystem and provide the main food of fishes directly or indirectly and can be used as indicator of the trophic phase of the water body. The wide distribution of phytoplanktons and their frequent abundance account for the great importance of the phytoplanktons in the food web of aquatic ecosystems. There is a large variation in the composition of planktons in different regions and at different depths and also at different seasons. In water body phytoplanktons are represented by algae population. Often one or small groups of species may be dominate, depending upon the nutritional status of the water body.

The most common phytoplankton groups found in fresh water bodies are - Bacillariophyceae, Chlorophyceae, Myxophyceae and Euglenophyceae.

Many workers have studied phytoplanktons of water bodies. Davis (1955) studied the planktons and plankton production. Sharma and Bhatnagar (1977) recorded seasonal variations in planktons in Bhopal Lake. Goel and Autade (1995) recorded 61 species of phytoplanktons and 19 zooplankton species in Panchganga River at Kolhapur. Joshi et al. (1996) studied planktonic population of Ganga canal in relation to certain physico-chemical factors. Jeelaniet al. (2005) studied distribution and ecology of phytoplanktons in Dal lake,Kashmir.Phytoplankton population in Dal Lake consisted of six major groups namely Bacillariophyceae, Chlorophyceae, Cyanophyceae, Dinophyceae, Euglenophyceae and Chrysophyceae.Adesalu and Nwankwo (2005) identified three classes of phytoplanktons – Bacillariophyceae, Cyanophyceae and Xanthophyceae in Olero Creek and Benin river, Nigeria.. Bhat and Pandit (2005) studied the phytoplanktons of Anchar River, Kashmir. They recorded 143 species of algae. Sakhare (2006) identified 14 species of chlorophyceae, 9 species of bacillariophyceae and 7 species of myxophyceae from Jawalgaon reservoir.

Achionye-Nzeh and Isimaikaiye (2010) recorded the fauna and flora of a reservoir in Nigeria. Basavarajappaet. al.(2010) discussed the phytoplankton diversity in Hadhinam lake, Mysore.

VidyaGurkar and Mahesh (2011) studied the phytoplankton diversity in Varuna Lake of Mysore. Harish Kumara and Srikantaswamy (2011) worked on the seasonal variations of planktons of Tungabhadra reservoir. Recently, Singh and Laura (2012) made an assessment of physico-chemical properties and phytoplankton density of Tilyar Lake, Rohtak (Haryana).

Gwalior, an ancient city known for the great musician Tansen, is situated in the north region of Madhya Pradesh, India. The city is gifted with a number of historical places and tourist places. The Tighra reservoir, the life line of Gwalior, was primarily constructed to fulfill the water supply of the city. Besides supplying drinking water,the reservoir is also used to culture fishes by the fisheries department and for irrigation purpose.

The reservoir is situated about 20 km west of Gwalior city, near Tighra village which is in close proximity of SADA Magnet city. It lies on 26°13` N latitude and 78o 30' E longitude at an altitude of 218. 58 m . The reservoir is surrounded by hills from three sides . The hills on the north and western side are 300 m high and those on southern and south east side are about 225m high. At the south western side river Sank joins the reservoir through a gorge. About a dozen of small nallahas drain in the reservoir from the hill slopes. In the north east of the reservoir there is a concrete masonry wall. The reservoir is being known as Tighra reservoir, after the name of the village Tighra, near which it is situated.

MATERIALS AND METHODS

Studies on phytoplankton were carried out for one complete year from November 2010 to October 2011 to study the seasonal variations in the phytoplankton diversity. Both qualitative and quantitative studies were under taken. Samples were collected, once in a month, in the morning hours between 9.00 A.M. and 11.00 A.M. Samples were collected by filtering 50 litre surface water through a plankton net made up of bolting silk cloth no. 20. Extreme care was taken in order to keep water undisturbed at the time of sampling. The collected samples were preserved in lugol's solution. The preserved samples were brought to the laboratory for qualitative and quantitative analysis. Phytoplanktons were identified by using the standard methods suggested by Smith (1950) ,Phillipose (1970) and Adoni(1985). Quantitative studies were made by using Sedgwick rafter cell. Sample was properly agitated to distribute the organisms evenly. By using a pipette, one ml of sample was transferred onto the cell. The cover slip was placed properly avoiding any air bubble. The planktons were allowed to settle for some time and counting was made under microscope. All the planktons, present in the cell were counted by moving the cell vertically and horizontally, covering the whole area.

RESULTS AND DISCUSSION

Results are given in table 1-3. In Tighra reservoir all four groups of phytoplanktons, Bacillariophyceae, Chlorophyceae, Myxophyceae and Euglenophyceae were recorded. Among the total 26 genera of phytoplanktons, observed in Tighra reservoir, 9 were from bacillariophyceae, 9 from chlorophyceae,6 from myxophyceae and 2 from euglenophyceae.

Bacillariophyceae was the most dominant group, representing 39.81 % of the total phytoplanktons, followed by myxophyceae (29.21%), chlorophyceae (20.68 %) and euglenophyceae (10.28 %) (Fig.1). Bacillariophyceae were represented by 9 genera, Cyclotellaoperculata, Synedrasp., Naviculasp., Melosirasp., Diatoms sp.,Fragilariasp., Cymbellasp., Tabellariasp.andPinnulariaviridis. The number of bacillariophyceae were found to be highest during April 2011 (1052 cells/lit) at Station 2. The minimum

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number (252 cells/lit) was recorded during October 2010. The number of cells recorded was more during summer months (Fig.2).Jeelaniet al. (2005) found bacillariophyceae as the most dominant group out of the six major groups of phytoplanktons, recorded from Dal Lake, Kashmir. They also observed seasonal variations in the distribution of phytoplanktons with bacillariophyceae peak during autumn and chlorophyceae, cyanophyceae, euglenophyceae, chrysophyceae showed peak in summer.

9 genera of chlorophyceae, identified from Tighra reservoir were –Pandorinamorum, Scenedesmussp., Pediastrum duplex, Ankistrodesmussp., Chlorella vulgaris, Closteriumsp., Spirogyra sp., Oedogoniumsp. and Ulothrixsp. Highest number of chlorophyceae were recorded during January 2011 (453 cells/lit) at Station 3, followed by 415 cells/lit during April 2011 at the same station. Minimum number of chlorophyceae was recorded during October 2011 (155 cells/lit) at Station 4. Seasonally the numbers were more during summer, followed by monsoon and lowest during winter(Fig.3).Pandeyet al. (1995) recorded four algal groups: chlorophyceae, bacillariophyceae, myxophyceae and euglenophyceae in river Saura with chlorophyceae being the most dominant group. Tiwari and Chauhan (2006) observed chlorophyceae being the most dominant during winter, followed by bacillariophyceae in Kitham Lake, Agra. During summer cyanophyceae and euglenophyceae were the most dominant groups.

Out of total 26 genera of phytoplanktons 6 belonged to myxophyceae. They were Microcystissp., Merismopedia sp. ,Oscillatoriachlorina, Spirulinasp., Anabaena sp. andNostocsp. Minimum number of cells (255 cells/lit) were recorded during November 2010 at Station 4 while number was highest (580 cells/lit) during April 2011at Station 1. Microcystissp., Merismopediasp. andSpirulinasp. were found in maximum number among all the Myxophyceae.Harsha and Malammanavar (2004) recorded maximum density of cyanophyceae in their studies on Gopalaswamy pond at Chitradurga, Karnataka. They observed considerable fluctuations in phytoplankton density in relation to environmental variables.

Only 2 genera of euglenophyceae, Phacussp. and Euglena sp. were identified. They represented 10.28% of the total phytoplanktons. The number was maximum during April 2011 (265 cells/lit) and it was minimum during August 2011 (80 cells/lit). The number was lower during winter months in comparison to summer months. The highest number (312 cells/lit) was recorded at Station 1 during April 2011 and lowest number (65 cells/lit) was recorded at Station 3 during September 2011 and Station 4 during August 2011 and October 2011.

Seasonally, bacillariophyceae andmyxophyceae were found to be maximum during summer and minimum during winter(Fig. 2 and 3). In case of chlorophyceae and euglenophyceaemaximum numbers were observed during summer and lowest number in rainy season (Fig.4 and 5). This variation in phytoplanktons number may be due to high temperature. In their study, Kumar and Bohra (2005) found maximum number of phytoplanktons during summer and minimum number in rainy season in the Munshi pond, Jharkhand.

Several researchers have proposed temperature as a vital factor responsible for the growth of algae (Ramkrishnaiah and Sarkar, 1982; Verma andDattaMunshi, 1987; Kaushiket al., 1991; Bohra and Kumar, 1999). Wisharad and Mehrotra (1988) reported that proliferation of phytoplanktons from winter to summer could be attributed to progressively increasing water temperature and photoperiod. According to Cabecadas and Brogueira (1987), the growth and photosynthesis of algae are influenced by the pH and alkalinity of water. SenthiKumar and Siva Kumar (2008) identified total 160 species of phytoplanktons in Veeranamlake in Tamil Nadu with bacillariophyceae being the dominant group. The phytoplankton density was high during summer season and low during the winter season.Their studies corroborate with that in present investigation of Tighra reservoir.

Lashkar and Gupta (2009) found a total 34 phytoplanktons, belonging to cyanophyceae, chlorophyceae, bacillariophyceae and euglenophyceae in Chatla flood plain lake, Barak Valley Assam. They recorded highest number of species (29) in pre-monsoon and lowest (23) in winter. In their studies, they observed the chlorophyceae to be the most abundant in pre-monsoon and monsoon. Bacillariophyceae and cyanophyceae did not show much seasonal variations.

Synudeen Sahib (2011) recorded 35 species of phytoplanktons in the Parappar reservoir, Kerala. The chlorophyceae represented the maximum density. He observed maximum density of planktons in winter and the minimum during rainy season. The low temperature and velocity coupled with good transparency of water may be considered as the factors that favored the optimum growth of phytoplanktons of the Parappar reservoir during winter.

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TABLE : 11

MONTHLY VARIATIONS IN PHYTOPLANKTONS(NO./LIT) OF WATER AT FOUR STATIONS OF TIGRA RESERVOIR,GWALIOR

FOR NOVEMBER2010 TO OCTOBER2011

		Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	TOTAL
Chlorophyceae	STATION 1	168	235	412	310	360	415	310	320	355	275	290	300	3750
	STATION 2	170	202	300	300	265	315	265	310	400	210	210	250	3197
	STATION 3	175	215	455	275	250	415	300	275	390	255	200	190	3395
	STATION 4	160	155	390	300	300	390	275	290	300	200	165	155	3080
	MEAN	168.25	201.75	389.25	296.25	293.75	383.75	287.5	298.75	361.25	235	216.25	223.75	13422
Myxophyceae	STATION 1	328	355	375	390	422	580	556	465	445	402	310	318	4946
	STATION 2	365	352	360	400	405	572	565	412	430	352	366	365	4944
	STATION 3	375	375	380	375	412	566	505	455	402	312	315	290	4762
	STATION 4	255	265	310	312	410	515	502	410	400	333	300	290	4302
	MEAN	330.75	336.75	356.25	369.25	412.25	558.25	532	435.5	419.25	349.75	322.75	315.75	18954
Bacillorophyceae	STATION 1	425	400	265	525	625	952	810	772	675	415	465	482	6811

	STATION 2	420	390	300	550	590	1052	900	800	690	401	315	352	6760
	STATION 3	390	275	275	412	598	915	812	798	602	452	300	252	6081
	STATION 4	455	265	352	398	552	985	810	655	570	490	355	290	6177
	MEAN	422.5	332.5	298	471.25	591.25	976	833	756.25	634.25	439.5	358.75	344	25829
Euglenophyceae	STATION 1	175	125	215	205	238	312	120	115	98	90	90	75	1858
	STATION 2	112	155	165	210	210	285	100	110	90	75	90	100	1702
	STATION 3	165	110	190	190	175	255	110	200	115	90	65	85	1750
	STATION 4	110	100	100	175	110	210	90	170	75	65	90	65	1360
	MEAN	140.5	122.5	167.5	195	183.25	265.5	105	148.75	94.5	80	83.75	81.25	6670

Table :2ANNUAL VARIATION IN PHYTOPLANKTONS COMPOSITION IN TIGHRA RESERVOIR FROMNOVEMBER 2010 TO OCTOBER 2011

	Number of Organisms	Percentage
Chlorophyceae	13422	20.689
Myxophyceae	18954	29.216
Bacillorophyceae	25829	39.813
Euglenophyceae	6670	10.281

Table :3
GROUP WISE SEASONAL VARIATION INPHYTOPLANKTONS COMPOSITION IN TIGHRA RESERVOIR FROM NOVEMBER 2010 TO OCTOBER 2011

SEASON	ChlorophyceaeMyxophyceaeBacillariophyceaeEuglenophyceae			
Summer	1263.75	1938	3156.5	702.5
Monsoon	1036.25	1407.5	1776.5	339.5
Winter	1055.5	1393	1524.25	625.5

FIGURE : 1

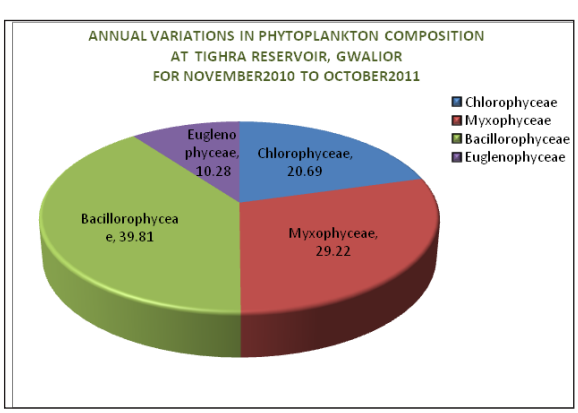

FIGURE : 2

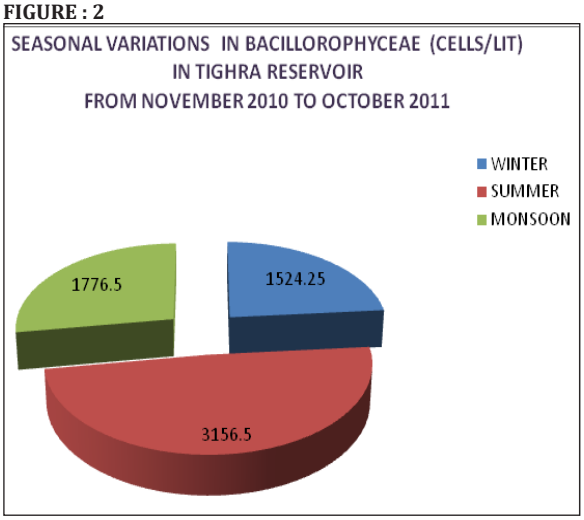

FIGURE : 3

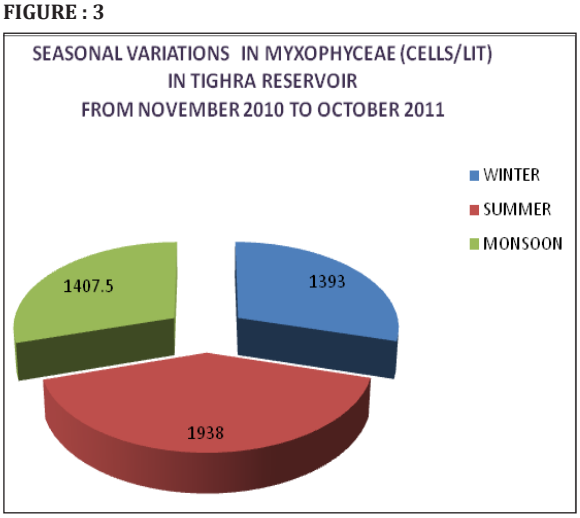

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FIGURE : 4

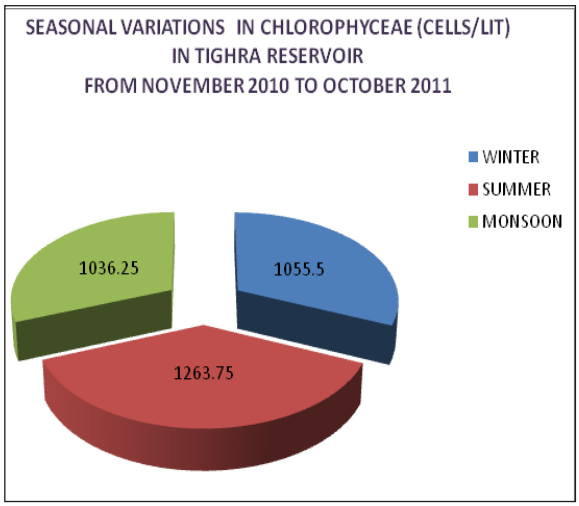
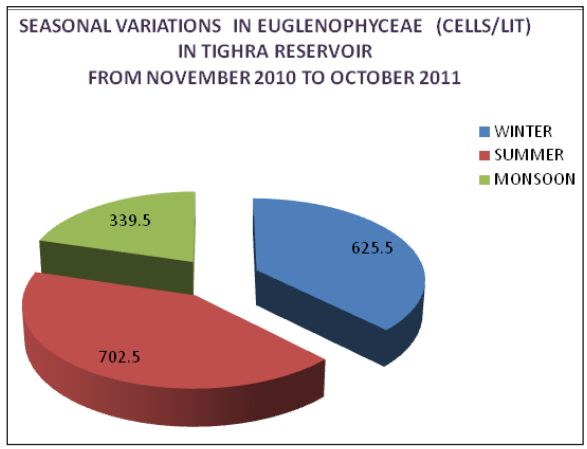


FIGURE : 5



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