

PHYTOPLANKTON DIVERSITY OF TAJBAJ KHAN POKHARA, HAJIPUR, VAISHALI (BIHAR)

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ABSTRACT : The seasonal variation of phytoplankton of TajBaj Khan Pokhra, Hajipur, Vaishali, Bihar in relation to different abiotic and biotic factor were studied. The major constituent of phytoplankton was Chlorophyceae (60.72%) followed by Cyanophyceae (29.55%) and Bacillariophyceae (9.69%). Each group showed different peaks period and was found to be related with duration of sunshine, temperature, turbidity, pH, D.O. and free carbon dioxide content of the pond water.

Key words : Seasonal variation, Phytoplankton, TajBaj Khan Pokhra.

INTRODUCTION

The phytoplankton play an important role to sustain food web in aquatic ecosystem. In an aquatic ecosystem the base of the food chain is formed by the phytoplankton (Tas & Gonulal, 2007 and Saravan Kumar *et al.*, 2008). They are responsible for more than 40% of earth photosynthetic production (Schmidt, 2000). The phytoplankton of an aquatic ecosystem are directly related to the productivity of that water body and their fish production.

Phytoplankton -----> Zooplankton -----> Fish
(Producer) (Pri. Consumer) (Sec. Consumer)

Welch (1952) stated that adverse effect of turbidity on phytoplankton was probably due to the blanking effect of suspended material which interfere with photosynthesis. Wetzel (2001) have considered that phytoplankton diversity is inversely correlated with TDS. Ghosh & Keshri (2011), Das & Keshri (2012, 2013) and Das *et al.* (2011, 2015) observed that phytoplankton population is greatly influenced by agricultural and industrial waste.

Kumarvosky (1953) stated that the bulk of phytoplankton consisted of Bacillariophyceae (20-60%) Cyanophyceae (7-23%) followed by Chlorophyceae (6-20%). Mc. Combie (1953) suggested that high pH value were the result of significant growth of phytoplankton. While George (1966) observed that high temperature was the principal factor for the growth of Cyanophyceae.

Moitra & Bhattacharya (1965) and Jana (1973) were found that the volume percentage of phytoplankton showed a direct relationship with the increase in D.O. content of water. Singh (1992) reported that Chlorophyceae consisted the major group (62%) followed by Cyanophyceae and Bacillariophyceae each (19%). Mansoori *et al.* (1996) reported Chlorophyceae, Bacillariophyceae and Desmidiaceae in order of dominance among phytoplankton.

MATERIAL AND METHODS

The TajBaj Khan Pokhra, is situated in Vaishali district Hajipur (25°.68' N latitude and 85°.21' E. longitude) of Bihar. Water samples were collected monthly for the analysis of plankton population and abiotic parameter. Chemical analysis were made according to standard methods of Welch (1952) and APHA (1975) in the year of 2017-2018. For the plankton analysis 100 litres of surface water samples of the pond was filtered from different locations through plankton net made of No. 21 bolting silk (150 meshes per linear inch). The plankton thus collected were transferred to a graduated jar. 5% formaldehyde solution was added to it and left it for 24 hours undisturbed. Next day the supernatant liquid was centrifuged separately and the residue was mixed and made upto 100 ml by adding distilled water and subjected to quantitative and qualitative analysis.

RESULTS AND DISCUSSION

The phytoplankton showed bimodal curve. It was maximum in May and the second peak was observed in August September (Late monsoon). The minimum phytoplankton population was observed in winter month (Table.1). Wright (1955) reported phytoplankton abundance during Autumn in lake of England. Mathew (1975), Mir & Kachroo (1990), Singh (1998) and Choudhary *et al.* (1966) during summer and Mandal (1979) reported during winter month. Mandal *et al.* (2005) observed that the phytoplankton population were increases from late winter and reaching peak in late summer in karwar lake Bihar.

Bhatnagar *et al.* (2007) observed three peaks for phytoplankton population in the month of early summer, summer and post monsoon, however a greater peak was observed in summer in Jaumri dam. Hujare and Mule (2007) high phytoplankton density in the month of April and low value in september in two perennial tanks of Kolhapur district. Umavathi *et al.* (2007) in Sultur pond, Tamilnadu observed phytoplankton productivity were maximum in post monsoon

and low in rainy season. The present investigation showed that summer to monsoon months were the best period for the growth and reproduction of phytoplankton.

The major constituent of phytoplankton was Chlorophyceae (60.72%) followed by Cyanophyceae (29.55%) and Bacillariophyceae (9.69%) (Table.1) which is in tune with Kumarvosky (1953). In the present study altogether 26 species of phytoplankton were collected. As for qualitative (Species wise) abundance was concerned Chlorophyceae had 12 species followed by Bacillariophyceae

with 8 species and Cyanophyceae with 6 species (Table.2). Chlorophyceae showed its peak in May and September. Cyanophyceae in July and Bacillariophyceae in October (Table.1). Kant & Kachroo (1974), Singh (1992) and Choudhary (1999) also observed that different groups of phytoplankton have their own peaks in different seasons. Fluctuation of phytoplankton have their own peaks in different seasons it might be the result of interaction between biotic and abiotic parameters therefore, simultaneous study and correlation of these parameter will reveal the proper cause of such fluctuations.

Table. 1 Monthly fluctuation of phytoplankton (Unit per litre of water) in TajBaj Khan Pokhra during the year 2017-2018.

Months	Chlorophyceae	Cyanophyceae	Bacillariophyceae	Total
July,2017	115	135	9	259
August,2017	68	112	30	210
September,2017	212	69	27	308
October,2017	118	74	32	224
November,2017	96	54	28	178
Decemer,2017	72	39	18	129
January,2018	97	32	17	146
Febuary,2018	117	68	27	213
March,2018	185	71	21	277
April,2018	276	35	17	328
May,2018	283	73	26	382
June,2018	89	79	24	192
Total	1728	841	276	2846
Percentage	60.72	29.55	9.69	
Mean	144.00	70.08	23.00	237.17

Table. 2 Qualitative observation of phytoplankton of TajBaj Khan Pokhra.

S. Class	Summer	Winter
1. Chlorophyceae (Green algae)	1. <i>Spirogyra</i> sp. 2. <i>Ulothrix</i> sp. 3. <i>Volvox</i> sp. 4. <i>Panderina</i> sp. 5. <i>Pediastrum</i> sp. 6. <i>Zygnema</i> sp. 7. <i>Oedogonium</i> sp. 8. <i>Endorina</i> sp. 9. <i>Cladophora</i> sp. 10. <i>Denticula</i> sp. 11. <i>Closterium</i> sp. 12. <i>Mongeotia</i> sp.	1. <i>Ulothrix</i> sp. 2. <i>Volvex</i> sp. 3. <i>Pandorina</i> sp. 4. <i>Oedogonium</i> sp.
2. Bacillariophyceae	1. <i>Pinnularia</i> sp. 2. <i>Cyclotella</i> sp. 3. <i>Gyrosigma</i> sp. 4. <i>Nitzchia</i> sp. 5. <i>Navicula</i> sp. 6. <i>Synedra</i> sp. 7. <i>Fragilaria</i> sp. 8. <i>Melosira</i> sp.	1. <i>Synedra</i> sp. 2. <i>Nitzchia</i> sp. 3. <i>Navicula</i> sp.
3. Cyanophyceae or Myxophyceae	1. <i>Nostoc</i> sp., 2. <i>Anabaena</i> sp. 3. <i>Oscillatoria</i> sp. 4. <i>Microcystis</i> sp. 5. <i>Rivularia</i> sp. 6. <i>Phormidium</i> sp.	1. <i>Oscillatoria</i> sp. 2. <i>Microcystis</i> sp. 3. <i>Rivularia</i> sp. 4. <i>Phormidium</i> sp.

A positive relationship was observed between phytoplankton population and temperature. Dwivedi *et al.* (1986), Arvola (1983), Mir & Kachroo (1990), Singh (1992) and Choudhary *et al.* (1999) also reported the same relationship. However, in monsoon months although the temperature was higher a low density of phytoplankton was observed suggesting an important role of duration of sunshine as the weather was cloudy and due to higher turbidity of the water there was relatively less penetration of light into the pond. Decrease in transparency of water and cloudy or foggy weather condition causing low rate of photosynthetic activity, increase of CO₂ consequently decreases pH value and decrease of DO in the water, all probably adversely affect the plankton productivity of a water body.

Redden & Rukminasari (2008), Floder *et al.* (2010), Larson and Belovsky (2013) indicate that high salinity in aquatic system can decrease phytoplankton concentration as

well as it affects the species composition.

A positive relationship between pH, CO₂, DO content and phytoplankton productivity of a water body observed. A positive relationship during the investigation period which was in tune with the Zarfar (1964) and Trivedi *et al.* (1984) and Khan & Siddiqui (1971) who correlated increase phosphate content with high growth rate of phytoplankton.

A distinct inverse relationship between zooplankton and phytoplankton was also recorded during the study period. This was probably due to observance of food chain of the aquatic ecosystem. Phytoplankton are producer which are eaten away by primary consumer (Zooplankton). Nasar (1974) and Khan & Siddique (1974) also related the depletion of phytoplanktonic population with grazing effect of zooplankton and found a significant inverse correlation ($r = -0.793$) between zooplankton and phytoplankton.

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