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SEASONAL VARIATIONS OF PHYTOPLANKTON IN THE FRESHWATER TANK OF TALSANDE, MAHARASHTRA

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ABSTRACT

Studies on monthly variations of phytoplankton in a freshwater tank of Talsande, Maharashtra were carried out from May 1999 to April 2001. The phytoplankton in tank was represented by Chlorophyceae, Cyanophyceae, Bacillariophyceae, Euglenophyceae and Dinophyceae. The values of percentage composition of each group of phytoplankton indicated that Cyanophyceae (35.77%) formed largest group followed by Bacillariophyceae (34%), Chlorophyceae (27.4%) and Euglenophyceae (2.24%). Maximum density of phytoplankton was reported during summer, and minimum during monsoon.

INTRODUCTION

As a community of primary producers in aquatic ecosystems, the study of phytoplankton is essential to evaluate the feasibility of pisciculture in any freshwater body. Several species of phytoplankton play great role in early detection and monitoring the pollution. Talsande tank is located in Kolhapur district between 17°17' to 15°43' north latitudes and 13°40' to 70°42' east longitudes. The maximum length and width of the tank are 660.0m and 382.5m respectively. The maximum depth is 5.0 m and the basin slope is gentle. Water depth around the edges of tank is less.

Formerly the tank water was used for irrigation. Now it is the main source of water for washing, bathing and pisciculture. The tank is much influenced by human activities. Many hydrobiological investigations have been carried out on the lakes and tanks of this region (Kamat 1965, Goel et al. 1988, Goel & Chavan 1991 and Bhosale et al. 1994). The reports on the studies of water bodies in rural areas are meagre. As there is lack of baseline data on phytoplankton communities in the Talsande tank, present investigation has been carried out to determine species composition and seasonal variation in phytoplankton of this tank.

MATERIALS AND METHODS

The plankton samples were collected fortnightly from four sampling sites of the tank by filtering hundred litres of surface water through plankton net made up of bolting silk No. 125. The concentrated samples were preserved with 4% formalin and 1mL Lugol's iodine solution. Identification of phytoplankton was made following Fritch (1944), Adoni et al. (1985) and Cox (1996). Counting of phytoplankton was done by Lacky's drop (Lacky 1938) count method.

RESULTS AND DISCUSSION

Phytoplankton species observed in the tank are recorded in Table 1. Phytoplankton population was mainly represented by Chlorophyceae, Cyanophyceae and Bacillariophyceae, with low representation of Euglenophyceae and Dinophyceae. A total number of 27 species of Chlorophyceae distributed over 18 genera were identified. Chlorophyceae was dominated by species of *Pediastrum, Ankistrodesmus, Scenedesmus, Cosmarium, Closterium* and *Chlorella*. *Pediastrum tetras* was numerically the most abundant. Other species such as *Oocystis crassa, Zygnema* sp. and *Oedogonium*

Table 1: Phytoplankton species recorded during May 1999 to April 2001 in the Talsande tank.

Chlorophyceae	**Cyanophceae**	**Bacillariophyceae**	**Euglenophyceae**
1. *Ankistrodesmus falcatus*	1. *Anabaena spherica*	1. *Amphora venta*	1. *Euglena pisciformis*
2. *Ankistrodesmus convolutes*	2. *Anabaena constricta*	2. *Amphora maharashtrensis*	2. *Euglena proxima*
3. *Pediastrum tetras*	3. *Aphanizomenon flos-aquae*	3. *Amphora ovalis*	3. *Phacus* sp.
4. *Pediastrum duplex*	4. *Chroococcus varians*	4. *Aulacocera* sp.	4. *Trachelomonas hispida*
5. *Secnedesmus acuminatus*	5. *Chroococcus minor*	5. *Cymbella placentula*	
6. *Scenedesmus bijuga*	6. *Gleocaspsa granosa*	6. *Cocconeis hypotheca*	**Dinophyceae**
7. *Scenedesmus quadricauda*	7. *Microcystis aeruginosa*	7. *Cyclotella* sp.	1.*Ceratium hirudinella*
8. *Scenedesmus perforatus*	8. *Merismopedia convoluta*	8. *Diatoma vulgaris*	
9. *Scenedesmus dimorphus*	9. *Nostoc* sp.	9. *Gomphonema gracile*	
10. *Chlorella vulgaris*	10. *Oscillatoria obscura*	10. *Gomphonema* sp.	
11. *Oocystis crassa*	11. *Oscillatoria amphibia*	11. *Fragilaria* sp.	
12. *Staurastrum* sp.	12. *Oscillatoria phormosa*	12. *Nitzschia palea*	
13. *Coelastrum* sp.	13. *Phormodium sp.*	13. *Melosira granulate*	
14. *Spirogyra* sp.	14. *Rivularia* sp.	14. *Navicula mutica*	
15. *Cosmarium* sp.	15. *Spirulina major*	15. *Navicula cryptocephala*	
16. *Cosmarium tenue*	16. *Spirulina laxa*	16. *Pinnularia* sp.	
17. *Cosmarium distichum*	18. *Lyngbya* sp.	17. *Rhopolodia gibba*	
18. *Closterium* sp.	19. *Cylindrospermum doryphorum*	18. *Synedra ulna*	
19. *Closterium actum*	20. *Gleotrichia natans*	19. *Synedra acus*	
20. *Oedogonium* sp.		20. *Synedra* sp.	
21. *Chlorococcum* sp.			
22. *Zygnema* sp.			
23. *Ulothrix* sp.			
24. *Characaeum* sp.			
25. *Volvox aureus*			
26. *Kirchneriella microscopica*			
27. *Chlamydomonas epiphyta*			

sp. occurred in moderate numbers. Maximum population of Chlorophyceae was observed in the month of April, and minimum in October, during both the years of investigation. The considerable decline in Chlorophycean population was observed during rainy months (Fig. 1). The species such as *Scenedesmus quadricauda, S. dimorphus, Oocystis crassa, Chlorococcum* sp. and *Kirchneriella microscopica* have shown discontinuity in occurrence. The Chlorophyceae dominated in the number of genera and species, however, their percentage composition was 27.57% and 27.24% during first and second years respectively (Figs. 2 and 3).

Twenty species of Cyanophyceae with 14 genera were identified. The dominating species were *Microcystis aeruginosa* followed by *Oscillatoria obusura, O. amphibia* and *O. phormosa*. The genus *Anabaena* was represented by *A. spherica* and *A. constricta.* Considerable population of *Aphanizomenon-flos-aquae* was observed. The genus *Spirulina* was represented by *Spirulina major* and *Spirulina laxa*. Other members of Cyanophyceae such as *Chrococcus, Merismopedia, Phormidium, Lyngbya and Gleotrichia* were observed in moderate numbers. The blue green algae started increasing in numbers in early summer and attained peak at the end

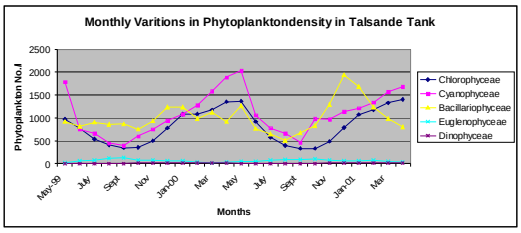

Fig. 1: Monthly variations in phytoplankton dendity in Talsande tank.

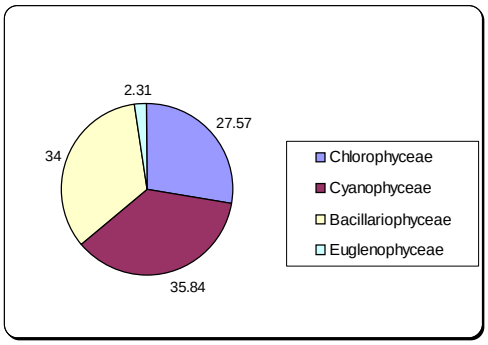

Fig. 2: Percent composition of phytoplankton in Talsande tank during May 1999 to April 2000.

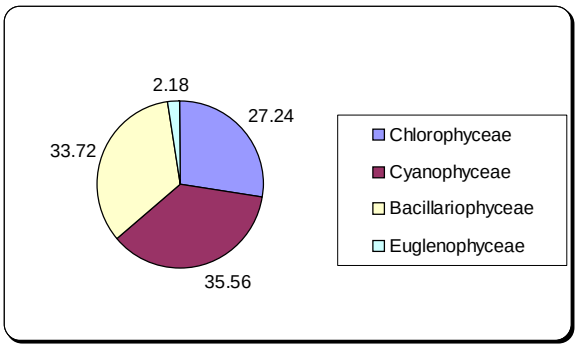

Fig.3: Percent composition of phytoplankton in Talsande tank during May 2000 to April 2001.

of summer. It was minimum during rainy season. The numerical abundance of Cyanophyceae was recorded 35.84% and 35.56% (Figs. 2 and 3) during first and second years of study. The monthly values of Cyanophyceac population shows that it dominated over others during monsoon and summer.

The total numbers of 14 genera of Bacillariophyceae were comprised of over 20 species. The species of *Synedra, Amphora, Cocconeis, Navicula, Gomphonema* and *Melosira* were preponderant in Talsande tank. The genus *Synedra* was represented by *Synedra ulna* and *S. acus.* The genus *Navicula* was represented by *Navicula protracta, N. mutica* and *N. cryptocephala*. The genus *Melosira* had only one species *M. granulate,* which forms major diatom flora of the tank. The Bacillariophyceae constituted 34% of total phytoplankton and showed monsoon maxima and summer minima during 1999-2000. The winter maxima and summer minima was observed in 2000-2001 (Fig. 1).

The Euglenophyceae contributed 2.31% and 2.18% of total phytoplankton during the two years. It was represented by *Euglena, Phacus* and *Trachelomonas.* Two species of *Euglena* i.e., *E. pisciforms* and *E. proxima* were reported. The minimum population of Euglenophyceae was observed during summer season. The *Ceratium hirudinella* was the only member reported from Dinophyceae showing sporadic occurrence.

The seasonal trend in total phytoplankton density was reported as summer > winter > monsoon. The summer maxima and monsoon minima can be attributed to effect of temperature on plankton production and dilution of tank water in rainy months. Blooming of phytoplankton in summer season has been reported by Sreenivasan et al. (1974) and Aurumugon & Furtado (1980) in some tropical lakes. Bharadwaja (1940) also pointed out temperature and light as the factors responsible for higher phytoplankton population. Mustafa & Zubair (1997) encountered minimum number of phytoplankton in monsoon months. These observations go in agreement with these findings. Besides temperature, high pH during summers may be another factor responsible for summer maxima of total phytoplankton density. Verma et al. (2001) has reported phytoplankton density in different seasons in order of summer > winter > monsoon, which supports these findings.

The Chlorophyceae population in Talsande tank showed definite seasonal trend with maximum during summer and minimum during monsoon. Tripathi & Pandey (1990) reported maximum population of Chlorophyceae during summer. In the present investigation, it was observed that high temperature and pH are favourable for rapid development of Chlorophyceae.

The Cyanophyceae constituted important part of phytoplankton in Talsande tank. It was maximum during summer and minimum during rainy season. Mustafa & Zubair (1997) has reported high

population density of Cyanophyceae in summer and low in monsoon. Zafar (1967) observed that blue green algae started increasing in early summer and attained maxima at the end of summer. In Talsande tank Cyanophyceae was numerically dominant over Chlorophyceae and Bacillariophyceae. The blue green algae usually possess very efficient mechanism for uptake of nutrients at low concentrations. Year round occurrence of *Microcystis aeruginosa* can be attributed to stagnation of water, high alkalinity and nutrients. The polluted nature of tank is evident from the growth of *M. aeruginosa*.

Bacillariophyceae constituted major part of phytoplankton and encountered with high species diversity. Maximum population of Bacillariophyceae was observed during winter, and minimum during summer. Philipose (1960) mentioned that the diatoms are usually abundant in alkaline water. The water of Talsande tank was alkaline. The diatoms such as *Melosira* and *Fragilaria* grow well in polluted waters (Palmer 1969), which holds true in the present study as high population of *Melosira granulate* was recorded from this tank.

The Euglenophyceae, though found in less numbers, showed marked periodicity and abrupt disappearance. Maximum population density of Euglenophyceae was observed during monsoon, and minimum during summer season. Vyas & Kumar (1968) observed that euglenoides show their presence during rainy season. Kulshrestha & Johri (1991) reported high density of Euglenophyceae during monsoon and postmonsoon. Higher Euglenophyceae population during monsoon and winter, as observed in present study, can be attributed to high carbon dioxide content and low dissolved oxygen which favoured an abundance of Euglenophyceae.

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