PHYTOPLANKTON DENSITY IN RELATION TO ENVIRONMENTAL VARIABLES IN DALVOI LAKE AT MYSORE, INDIA

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SUMMARY

Water samples of the Dalvoi lake was collected from different spots during May 2001 to June 2002 and phytoplanktons were studied in relation to 16 environmental variables during this period. A total of 44 species of phytoplankton were identified under four classes *viz.* Chlorophyceae Euglenophyceae Bacillariophyceae cyanophyceae. Maximum density was recorded under Cyanophyceae and Chlorophyceae showed considerable fluctuations with environmental variables.

Key words : Environmental variables, Phytoplankton, Dalvoi Lake, Fluctuation, Distribution.

Now-a-days all major lakes are facing acute pollution problem and emitting foul odour, slit deposits and chocking due to excessive algal growth. The lake water physico-chemical and biological factors change with reference to the season. Phytoplanktons, include green algae, blue green algae, diatoms, desmids.Euglenoids etc. are the important among the aquatic flora. They are ecologically significant as they form the basic link in the food chain of all aquatic animals. Hosmani and Mallesh (1985), Hosmani and Naganandi (1998), stated that when there is large numbers of phytoplankton, they make the water greenish and cause deterioration of water quality as a result of various domestic purposes. In order to understand the impact of sewage on lake, the present work was undertaken. Dalvoi Lake is situated in the meadow of 10km South of Mysore city. The area of the lake is about 15 acres and in depth 9 mt. It receives sewage from city regularly. Growth of *Typha* and *Potomogeton* are abundant along the bunds. Water hyacinth spread all over the lake almost covers the surface. *Leman, Eichhornia, Nymphea* and *Azolla* species are dominant.

MATERIALS AND METHODS

The method of collection, preservation of phytoplanktons and estimation of physico-chemical parameters are same as described by Trivedi and Goel (1986) and APHA (1995). Separate water samples were collected for phytoplankton studies. Sedimentation of water was made in 4% formaldehyde. Phytoplanktons were counted in 1ml samples under a compound research microscope (40 x magnification) and identified according to Fritsch (1975).

RESULTS AND DISCUSSION

The results of physico-chemical characteristics of water are given in Table 1. The water temperature was moderately high during March and May, associated with

Table 1 : Physico-chemical parameters of Dalvoi lake (June 2001-May 2002)

Months	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Variables												
Temperature	29.1	28.5	27.4	27.8	28.9	28.6	29.0	29.4	29.6	31.6	30.2	31.8
pH	8.3	6.3	7.9	8.4	8.7	8.6	8.8	8.5	8.6	8.6	8.8	8.7
Free CO_2	-	10.3	6.6	-	-	-	-	-	-	-	-	-
DO	3.0	3.6	3.7	3.9	3.3	3.9	4.0	5.2	3.8	5.2	4.2	3.9
Total solids	860	760	890	810	880	890	920	960	940	890	910	910
Dissolved solids	630	670	630	610	590	580	680	680	580	620	630	650
Total alkalinity	346	345	394	386	480	368	420	378	386	390	412	396
Total hardness	398	378	410	418	396	397	427	460	580	408	434	480
Calcium	208	190	174	167	124	144	174	168	182	208	170	178
Magnesium	98	84	87	70	68	70	120	124	113	118	124	104
Chloride	176	140.6	166	181	202	204	210	188	210	208.2	220	240
Nitrate	48.8	42.2	43.8	41.42	40.30	40.30	39.9	39.3	38.7	38.0	39.2	39.3
Phosphate	13.7	12.72	13.5	12.2	12.23	11.21	11.64	11.02	10.9	11.76	11.3	11.6
BOD	28.0	26.0	32.0	38.0	46.0	44.0	30.4	28.6	32.0	34.0	30.0	36.0
COD	30.0	32.0	39.0	45.0	54.0	52.0	38.5	35.4	46.2	38.0	40.0	42.40
$CaCO_3Sl$	+1.44	+1.96	+1.80	+1.38	+1.66	+1.71	+1.54	+1.77	+1.88	+1.56	+1.71	+1.66

decreased solubility of gases in the lake. The foul odour emitted in the lake may be due to the accumulation of gases like ammonia and hydrogen sulphide (Hosmani and Naganandini, 1998). pH except in July and August was always above 8. Dessolved oxygen range from 3.0 to 5.2 mg/l during study period. Lowdissolved oxygen may be due to presence of minor algal blooms (Verma and Mohanty, 1995). Free carbon dioxide was absent except in the month, of July and August, 2001.

Total solids and dissolved solids were high in the months of December 2001 and January 2002. Total alkalinity range was from 345 to 480 mg/L. The high alkalinity indicates greater pollution of water body. Total hardness was always beyond 600m/L, the range being 460 to 580 mg/l for the entire period of study. Trivedi and Goel (1985), stated that hardness of water is mainly due to cations of calcium and magnesium. Calcium ranged from 124 to 208 mg/L and the range of magnesium was 68-124 mg/L. Calcium and magnesium showed a slight decrease in the month of October 2001 (124 and 68 mg/L) and November 2001 (144 and 70 mg/L), respectively.

Chloride ranged from 140.6 mg/L to 240 mg/L being high in summer months. Hosmani and Naganandi (1998) stated that higher level of chloride exists probably due to higher evaporation rate. Phosphate was more in the months of June and August 2001 ranging from 10.9 to 13.7 mg/L. Nitrate was almost constant during the period of study except in June (48.8) and August (43.8). BOD and COD ranged from 26 to 46 mg/L and 30 to 54 mg/L, respectively. Calcium carbonate saturation index indicated slight scale deposition period of study (Table 1).

All the phytoplanktons were classified under four classes like Chlorophyceae, Euglenophyceae, Bacillariophyceae and Cyanophyceae (Table 2). Chlorophyceae were dominant, compared to the other three groups. *Tetradron tribobulatum, Spirogyra micro punctata and Scenedesmus armatus,* were in abundant and they formed a thin bloom on the water surface. *Phormidium fragile, dominated under* Cyanophyceae group. *Navicula rhomboids and Synedra ulna,* among diatoms and frequency of *Euglena elastica* and P*hacus lengicauda* was more under the category of Euglenophy. Based on their density, Chlorophyceae occupied the first place followed by Bacillariophyceae, Euglenophyceae and Cyanophyceae.

The considerable decrease in dissolved oxygen, increase in calcium, phosphate, nitrate in the month of June, July and August supported the growth of Chlorophyceae members. Carbon dioxide was almost absent through out the study period due to the alkaline nature of water (pH>8.8). Similar observations were made by Schwoerbal (1991) and Hosmani and Mallesh (1985).

Cyanophyceae members showed a slight decrease in their growth with increase in pH, Calcium, Chloride and total solids. Bacillariophyceae showed peak growth with increasing pH, temperature, phosphate, chloride and total solids, as observed earlier by Pearsall (1932), Patrick

Table 2 : Average density of individual species/ml

Chlorophyceae	Individual species
Antistrodesmus falcatus	12
Oocytis gigas	9
Scenedesmus armatus	15
Scenedesmus bijugatus	9
Scenedesmus obliques	12
Pediastrum duplex	13
Pediastrum tetras	11
Tetradron tribobulatum	18
Coelastrum cambricum	4
Spirogyra micropunctata	18
Zygnema gangetium	12
Oedogonium undulatum	9
Tetrahedron trigonium	14
Euglenophyceae	
Euglena acus	8
Euglena elastica	10
Euglena elongate	5
Euglena limnophylla	8
Euglena proxima	4
Lepocinclis fusiformis	8
Phacus acuminatus	7
Phacus curvicauda	8
Phacus lengicauda	10
Phacus orbicularis	4
Phacus lemmermannie	8
Bacillario phyceae	
Cocoonies placentula	6
Cyclotella striata	5
Cymbella aspera	6
Gyrosigma accuminatum	4
Gomphonema sumatrense	5
Navicula rhomboids	11
Navicula sphaerophora	6
Nitzschia palea	7
Stauroneis phoenicentron	2
Synedra ulna	10
Rhopalodia gibba	7
Cyanophyceae	
Anabaena spiroides	5
Arthrospira platensis	8
Merismopedia tennusima	3
Microcystis aeruginosa	7
Microcystis crassa	5
Phormidium fragile	13
Spirulina major	7
Oscillotoria princes	3

Table 3 : Density of Phytoplanktons under different classes during different months (June 2001 – May 2002)

Classes	June	July	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May
Chlorophyceae	33000	24000	36000	12000	18000	15000	18000	18000	12000	9000	18000	12000
Fuglenaphyceae	15000	12000	9000	21000	6000	9000	12000	18000	18000	21000	24000	27000
Bacillariophyceae	12000	24000	33000	27000	15000	18000	12000	18000	15000	3300	27000	30000
Cyanophyceae	18000	15000	18000	12000	9000	12000	3000	6000	12000	9000	6000	9000

(1948), Zafar (1967) and Hegde (1983). However, Euglenophyecae showed average growth except during July, August and December in 2001.

This study revealed that the environmental variables such as pH, water temperature, dissolved oxygen, phosphate, nitrate, play a decisive role in altering the phytoplankton distribution and density (Table 3). Anthropogenic activities are the main causative agents in the increase of nutrient (chloride, calcium, magnesium) level in the lake that support the growth of *Tetrahedron triogonium, Spirogyra micropunctata, Scenedesmus armatus*. (Chlorophyeceae), *Microcystis aeruginosa* (Cyanophyceae) whose presence in water will render it unfit for domestic purposes.

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