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PHYTOPLANKTON ECOLOGY OF A FRESHWATER FISH TANK, BIBINAGAR, HYDERABAD, A.P.

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INTRODUCTION

Extensive work on ecology of phytoplankton of some freshwater bodies of India have been carried out by many workers (Ganapati, 1940, Das and Srivastava, 1956, George, 1962, Lakshminarayana, 1965, Singh 1960, Zafar 1964 and Patil 1976, Trishal 1978, Gopal *et al.* 1982, Patil *et al.* 1935, Singh and Patil 1991, Sharma and Gupta 1994 and others). Such studies are focussed towards understanding the ecology of phytoplankton and their importance as fish food, indicators of pollution and to assess the trophic status of waterbody. In this paper an attempt has been made to investigate seasonal variations in phytoplankton along with physico-chemical parameters.

DESCRIPTION OF THE TANK

The present tank called as Bibinagar tank is situated (lat. 17°38′ N and Long. 78°46′ E) 40 kms away from Hyderabad on Warangal road near a small town called Bibinagar. The shoreline is wavy with an earthern embackment on one side. The depth of the water varies from 1 to 5 meters. The water of the tank is used for irrigation purpose. The tank water gets polluted due to human activities of the nearby villages. Cattles are also washed here, consequently considerable amount of cowdung and urine are also added in the tank besides the domestic sewage of the nearby town. The tank is not yet under fish cultivation on large scale.

MATERIALS AND METHODS

Plankton samples were collected once in a month with the help of nylon plankton net (200 mesh/cm). 40 litres of water was filtered through the net at different sampling

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stations from Bibinagar tank. The quantitative estimation of phytoplankton was made by "Drop Method" under high magnification 400x. Average three counts were made and the mean was calculated. The total count per litre was calculated from the mean value.

RESULTS AND DISCUSTION

The phytoplankton was composed of Myxophyceae, Euglenophyceae, Chlorophyceae and Bacillariophyceae. Chlorophyceae was the dominant group in the phytoplankton population. The average annual percentage composition of chlorophyceae was 39·37%. This percentage is comparatively low as compared to the Mesotrophic tanks studied by Patil (1976).

Considering the Myxophyceae population as an indicator of the trophic status of the water body, the present tank studied at Hyderabad can be judged as one of the "Mesotrophic" system as the Myxophyceae population was comparatively poor (Welch, 1952). Fritsch & Rich (1913), Pearsall (1932), Chu & Tiffany (1951), pointed out that Myxophyceae showed periodicity in summer months. The present study corroborates the above view, as the maxima of Myxophyceae was observed in the month of May when the temperature of water was quite high. The appearance of Euglenophyceae was irregular and that too in certain restricted months of the year.

George (1966) observed that green algae was well represented in Delhi water both qualitatively and quantitatively. Pennak (1949) pointed out that probably the green algae are almost always numerical subordinate and are generally the only minor constituent of pulses of blooms. In the present investigation chlorophyceae was major dominant group. Chlorococales was maximum when pH of water was high. This is in conformity with Gonzalves & Joshi (1946) and Munawar (1970b). However, Kant & Anand (1978) did not find any effect of pH on the growth of Chlorococales.

Pearsall (1932) has observed late winter maxima and early spring maxima of diatoms. George (1966) has noticed maxima of diatoms in winter. In the present study the maxima of diatoms was observed in the month of December, Pennak (1949, 1955) did not find any regular diatom pulse. Singh & Swarup (1979) stated that diatoms prefers to group during warmer part of the year and they have less population during winter.

Vyas and Kumar (1968) observed that the temperature and pH were high when the peaks of phytoplankton were seen in summer, but the pH value was comparatively lower during the monsoon and winter when the peaks of phytoplankton attained a maxima. Lakshminarayana (1965) stated that the pH of the water was high when the phytoplankton

was rich. In the present study the maxima of phytoplankton were seen in the months of May, October aud December when the pH varied between 8·2 to 9·7.

George (1966) stated that diatoms did not form major part of plankton in Delhi tanks. Alikunhi *et al.* (1955) also reported the same thing in freshwater tanks of Cuttuck. George (1963) pointed out that this apparent numerical inferiority of the diatoms appear to be related with food chain and stated that preference of the various planktonic algae to carps was not equal. Diatoms are completely digested, and there is no other chance of appearing again once it is taken inside, whereas most of the blue-green algae and few green algae can appear again through the alimentary canal practically without any harm.

In the present investigation also diatoms did not form a major part of the plankton. This is in conformity with the observation of Alikunhi (1955) and George (1966). In the present study the green algae and the blue green algae are found to be more in the phytoplankton population. This may be due to the preferential feeding on these algae by the fishes of this water body. Further, temperature does not seem to be important factors for the seasonal periodicity of phytoplankton (Jana, 1973) (Chari, 1980, 1985). This is contrary to the observations in temperate zone (Hutchinson 1944, Macombie 1953). The pH of water was between 8·2—9·7. The total phytoplankton was high when the pH was high. This is in agreement with the findings of Jana (1973), Moitra & Bhattacharya (1965). Apparently it seems that CO_2 does not play any role in controlling phytoplankton production and most of the algae utilise CO_2 from bicarbonate (Jana & Sarkar, 1971).

Generally the bloom of green algae was found associated with the low phosphates thereby utilising this nutrient which is essential for the growth of green algae (Pearsall 1932, Komorovasky 1953). This is in contrast to the finding of (Welch, 1952, Chari, 1980). Direct relationship was also observed between nitrate nitrogen and the chlorophyceae as stated by Chari (1980). Phosphates and diatom did not show clear relationship as also reported earlier by Jana, (1973) and Kamorovosky, (1953). Pearsall (1932) opined that diatoms occur when PO_4, NO_3 and silica are rich in water. In the present study the diatom population was poor.

D.O. contents (5·1 to 6·9 mg/L) were more when the phytoplankton was rich (Das and Srivastava, 1956, Biswas, 1966). The occurrence of low total phytoplankton might be due to rich bottom deposit which is continuously drained out for agricultural purposes in this irrigation reservoir. In the present study green algae predominate (Sreenivasan, 1969). Sharma and Durve (1980) stated that the most undesirable features of eutrophication is to change the lake flora from diatom and greens to blue greens which are favoured by increased nutrients.

SUMMARY

Seasonal variations in the population of phytoplankton were studied for a period of one year in a fish tank of Andhra Pradesh. In all 21 genera were recorded of which 4 belongs to Myxophyceae, 2 to Euglenophyceae, 9 to Chlorophyceae and 6 to Bacillariophyceae. The total phytoplankton peak was observed in the month of October with two minor peaks in May and December. Annual percentage distribution data reveal the fact that chlorophyceae population was dominant whereas Myxophyceae and Bacillariophyceae were better represented and Euglenophyceae population was poor.

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TABLE 1

Average annual range of various physico-chemical parameters.

Transparency Cm	...	30	—	90
Temp. of water °C	...	19	—	28
Temp. of air °C	...	27	—	33
pH	...	8·2	—	9·7
CO_2 mg/L	...	0	—	35
CO_3 mg/L	...	34	—	80
HCO_3 mg/L	...	170	—	370
D. O. mg/L	...	5·1	—	6·9
Total hardness mg/L	...	190	—	220
Ca mg/L	...	65	—	120
Mg mg/L	...	40	—	50
Chloride mg/L	...	64	—	130

Total PO_4 mg/L	...	0·32	—	0·40
Nitrate—Nitrogen mg/L	...	0·58	—	0·65
Sulphate mg/L	...	8	—	10
Sp. conductivity μ mhos/Cm.	...	486	—	600

TABLE 2

Percentage composition data of Phytoplankton

	Jan. 85	Feb. 85	Mar. 85	Apr. 85	May 85	June 85	July 85	Aug. 85	Sept. 85	Oct. 85	Nov. 85	Dec. 85	Average Annual% Composition of
Chlorophyceae	40·00	29·00	42·00	41·60	41·10	56·10	60·15	34·00	32·35	34·88	34·17	25·98	39·27
Myxophyceae	46·64	40·56	34·30	47·20	51·82	28·27	25·20	29·40	42·40	42·61	21·16	19·91	33·60
Bacillariophyceae	9·87	29·00	23·70	11·40	7·08	12·10	11·53	32·30	23·00	21·02	44·20	54·10	25·19
Euglenophyceae	3·40	1·50	—	—	—	3·51	3·10	4·25	2·00	1·55	0·70	—	1·95

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