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PHYTOPLANKTON FOR BIOMONITORING OF ORGANIC POLLUTION IN TWO TANKS OF DAVANGERE DISTRICT, KARNATAKA, INDIA

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Abstract. *Two tanks situated in Davangere district were selected for their phytoplankton diversity and the possibility of using it as bio monitors of organic pollution. Bathi tank has very low diversity with blooms of Microcystis aeruginosa, Phormidium sp., Arthospira platenesis and Spirulina nordestedtti. These algae occurred as regular blooms in all the seasons. Kundavada tank supports a wide diversity of phytoplankton and less polluted. The use of algae for bio monitoring of organic pollution indicates that Bathi tank, which regularly receives sewage is heavily polluted and Kundavada tank is mesotrophic in nature because of mild anthropogenic.*

Key words: *phytoplankton, tanks, biomonitoring.*

INTRODUCTION

Phytoplankton from the main producers in an aquatic ecosystem, which control the biological productivity. Lake is said to Eutrophic, when it is characterized by high concentration of Nitrogen, Phosphorus and nutrients which support unusually high concentration of Algae, Turbidity, opaque, green or brown, dense algae bloom in the surface water with possibility of floating mats of algae. Dense shade cast by Plankton of the surface prevents Photosynthesis in the lower parts of the water column. Productivity is high, community respiration is high and oxygen demand is

high The Lake water in extreme cases is unfit for boating, swimming and other recreational activities. Economically valuable fish population is replaced by undesirable fish population. Moreover excessive Algae can cause taste and odour character (Colinvaux 1986, Ramalingaiah 1985). In an investigation of pollution and non polluted waters of Davangere district many interesting algal species were observed in tanks. Some of them resulted in blooms (Naganandini & Hosmani 1990) reported pollution tolerant algae and suggested the use of algae as indicators of organic pollution. Present paper is based on the data collected over a period of one year from distribution of algae into two fresh water bodies of Davangere district. The occurrences of algae during one year have been recorded and their possible role as bio monitors of organic pollution has been discussed.

MATERIALS AND METHODS

These water bodies are situated at longitude of 75.60, latitude of 14.40 N and altitude. The area of Bathi tank is 74 acres, while Kundavada tank is 265 acres .Samples were collected in 2 liter plastic cans from the two tanks at monthly intervals during February 2007 to 2008.The methods for collection, preservation and analysis of physic-chemical parameters were used as described by Trivedy & Goel (1986) and APHA (1995). The geographical and physical parameters of the tanks are given Table 1.

RESULT AND DISCUSSION

Total solids, pH, calcium, phosphate, and organic matter are important factors influencing the growth of algae (Hosmani 1975, Puttaiah & Somashekar 1987) have observed that desmids have low tolerance limits to polluted waters phosphates and nitrate in low concentration encourage the growth of desmids (Table 2). Desmids were absent in Bathi tank .The common species of desmids that occurred in Kundavada tank were *Closterium tuidium*, C*losterium lunula*, C*osmarium regnelli* and S*taurastrum titracerum* which appeared in appreciable numbers in Kundavada tank which is comparatively a non-polluted water. Euglenoid species were observed in both the water bodies.(Paravateesam & Mishra 1993, Hegde & Sujatha 1997, Thirpaty & Pandey 1990) have reported that

high water temperature, phosphate, nitrate low dissolved oxygen and carbon dioxide supported the growth of euglenoids Table 2 indicates that density of euglenoids is low in Kundavada tank and high in Bathi tank, indicating that Bathi tank is more polluted than Kundavada tank. The few members of euglenoids that occurred in Kundavada tank indicate that the water is contaminated with sewage. The common species of euglenoids that occurred were *Euglena elastic*, *Euglena elongata*, *Lepocincils ovum*, *Pacus curvicauda, Phacus longicauda* and *Trachelomonas volvocina.*

Table 1. Geographic Position and Physical Features of Tanks.

Features	Kundavada Tank	Bathi Tank
Water spread area (Acres)	265	74.00
Ayacut command area	96.33	63.00
Catchment area (sq.km)	3.6	1.63
Shape	Oval	Oval
Depth; minimum to maximum	6 to12 mt	3 to7 mt
Source of water	Rain water/agriculture runoff	Rain water/agriculture runoff/domestic sewage water
Pollution level	Low	High

Several workers have studies the ecology of diatoms of fresh water bodies. (Rajendra Nair 1999, Hosmani 1975) reported that nitrate and phosphate are important for the growth of diatoms. Higher water temperature, pH, total solids, total hardness, phosphate, nitrate, nitrite, BOD and COD influence the scale deposition, but did not favor the growth and development of *Bacillariophyceae* (Naganandini & Hosmani 1990, Goel et.al. 1992) have stated that *Bacillariophyceae* occur commonly in all the types of water. The diatoms were almost equal in both the water bodies and therefore, cannot be consider as a whole group as biomonitoring agents. *Nitzschia palea, Synedra ulna*, *Nitzschia obtuse*, *Gomphonema parvulum*, *Navicula rhomboids*, *Gyrosigma granulates* and *Pinnularia simplex* indicate pollution in Bathi tank that occurred commonly.

Table 2. Average Value of Physico-Chemical Parameters in (mg/l) Except pH and Phytoplankton (in Organism/Litre) During February 2007-January2008.

Parameters	Kundavada tank	Bathi tank
pH	6.3-8.2	7.8-7.9
FreeCo_2	4.0-8.0	Nil
DO	3.03-12.9	2.9-5.3
Total solids	14-90.9	70.3-189.0
Chlorides	9.09-49	12.0-147.9
Phosphate	0.001-0.43	0.12-3.6
Nitrite	0.011-0.24	0.18-0.34
Nitrate	0.001-0.10	8.9-23
BOD	1.33-4.5	4.8-32
COD	2.0-6.5	12-18
Desmids	430-1200	Nil
Euglenoids	6220-7020	1430-1680
Diatoms	1860-9300	3636-8630
Blue-greenalgae	9000-16000	9330-171000

In the two tanks diatoms were the most dominant and occurred throughout the study period. A number of earlier studies have supported the view that phosphate rich waters promote the abundance of diatoms (Harish 2002, Gulati et al. 2002, Dodds 2003). In the Kundavada tank phosphate does not appear to be a significant parameter and yet diatoms were present in collection throughout the study period .

In the present study, *Cyanophyceae* were the most abundant algal group. Most of the investigators such as (Hegde & Sujatha 1997, Paravateesam & Mishra 1993) have reported a direct relation between nitrate, phosphate, BOD and COD to the abundances of blue-green algae. Blue-green algae . Occurred in Bathi tank continuously, while in Kundavada, tank it occurred occasionally. Pollution is reported to be high when the diversity of organisms is less. *Anabaena spiroides*, *Phormidium fragile, Spirulina nordestedtii* , *Oscillatoria sp* and *Microcystis aeruginosa* were frequent as they formed in Bathi tank.

It can be summarized from the results that Kundavada tank is unpolluted and one of the most productive water body, which supports good phytoplankton diversity we concluded that the aquatic environment of the Kundavada tank is not polluted till date and is suitable for drinking, irrigation

and aquaculture. The anthropogenic activity has drastically increased in Bathi tank as it is polluted planters respond quickly to the environmental changes and hence their standing crop and composition are more likely to indicate the quality of water mass in which they are found. They strongly influence the water quality such as pH, colour, taste and odour, pesticides and fertilizers used by agriculturists and domestic wastes in these areas ultimately reach the Bathi tank water increasing pollution. Thus the result indicates that different ecological factors have influenced the phytoplankton abundance. The present study ensures that variation in the abundance of phytoplankton can be influenced by the impact of environmental factors .Thus phytoplankton have been used as indicator of water quality some species thrive well in oligotrophic as well as in eutrophic waters. Because of their short lifecycle it may be concluded that the density of phytoplankton is dependent on different abiotic factors either indirectly or directly in the aquatic ecosystem

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