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PHYSICOCHEMICAL STUDIES OF LAKE AMBEGOSALE, THANE, INDIA

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ABSTRACT

Lake Ambegosale shows periodic infestation by *Pistia* sp. for last two - three years. The physicochemical parameters of this lake were studied for one year. The Phosphates were always to be higher (0.0476 mg/l to 0.264mg/l). Lower values of phosphates coincided with full growth of *Pistia* sp. while higher values coincided with decaying of *Pistia* sp. and its sinking with rainfall. Dissolved Oxygen drops down to zero with full growth of *Pistia* sp. but Calcium, Silicates and hardness do not show any relation with growth of *Pistia* sp. in the lake.

Key words : Macrophytes, Pistia sp., Physicochemical parameters.

INTRODUCTION

Lake Ambegosale is one of the 15 lakes from Thane city, which has reached to the stage of eutrophication. It gets periodically infested by *Pistia stratiotes,* though a commonly occurring weed in other lakes from Thane city is *Eichornia sp. Pistia stratiotes* starts spreading from November and by December the lake is covered fully with green carpet of the same. It remains till about March and April, then starts decaying and by rainy season sinks down to the bottom. Later the lake remains clean till September. The phytoplankton starts appearing along with *Lemna* sp. and again *Pistia* reappears. This cycle of *Pistia* was regularly observed for last two years. Hence to find out the exact status of physicochemical parameters specifically the nutrients, the study of lake was undertaken.

MATERIALS AND METHODS

This lake is of historic importance as it is one of the oldest lakes from Thane city. It covers an area of about 2.3 hectares and has maximum depth of about 12 - 15 feet. The lake has the encroachment of slums on its bank, due to which the total area of the lake is reduced. Few years back a floating hotel was built in this lake, the broken remnants of it are still lying in the lake. The local population uses the lake regularly for washing clothes, cleaning vessels and also as a toilet.

Water samples were collected seasonally, corresponding to the changes in growth of *Pistia stratiotes* from May 2000 to January 2001. The physicochemical analysis of the water samples was

performed as per the standard procedures described in APHA (1981) and Trivedi and Goyal (1986).

RESULTS AND DISCUSSION

In majority of the lakes phosphorus is normally the limiting element. An increase in phosphate will result in an increase in the productivity (Mason 1981). Schindler and Fee (1973) have suggested that the phosphorus control is an efficient primary step in preventing the eutrophication. The limited phosphorus in the form of orthophosphate or soluble reactive phosphate is mainly contributed by sewage, detergents and effluents from fertilizer and chemical industries (Kodarkar 1995).

Today the increasing human population and sewage-linked eutrophication are posing great danger to scarce freshwater resources all over the world (Kodarkar 1999).

During the present study the phosphates from lake 'Ambegosale' were found to be always higher (-0.0476 mg/l to 0.264 mg/l), than the other uninfested lake 'Masunda' from same locality with PO_4-P ranging from 0.0064 to 0.0876 mg/l (Somani *et al* 2001). Salaskar and Yeragi (1997) recorded the phosphates ranging from 1.5 to 1.65 mg/l in Shenala Lake, Kalyan; while at Saroornagar lake Hyderabad, Chandrashekar (1996) recorded phosphates varying between 0.05 to 3.1 mg/l. The values of phosphates from 'Lake Ambegosale' showed a peculiar trend. They were maximum during monsoon (0.264 mg/l) and then decreased in post-monsoon and winter, while in summer values of phosphates were the lowest (0.0476 mg/l). Higher values of phosphates coincided with decaying of *Pistia* sp. and it's sinking with rainfall and hence can be attributed to the release of phosphates from decaying matter.

Accumulation of coarse, particulate and fine organic matter in the sediment encourages the anaerobic metabolism (Wetzel 1979). The increment of nitrogen and phosphorus contents at the end of decomposition can be attributed to this anaerobic metabolism of colonized microorganisms (Neiff & Neiff 1988; Billore 1998).

The aquatic weeds are known to absorb nutrients from water about 5 - 7 times higher than required by the plant for maximum production and thus have luxuriant consumption of major nutrients than phytoplankton (Padmavathi &

Durga Prasad 1997). This was observed during the present study as the lowest value of phosphate (0.0474 mg/l) coincides with fully developed carpet of *Pistia* sp.

The lowest values of nitrates (0.052 mg/l) are also observed with full grown *Pistia* sp. but the highest values (1.760 mg/l) do not show direct relation with decomposition and sinking of *Pistia* sp. Hence it might be due to the use of this water body for anthropogenic activities.

Calcium, silicates and hardness do not show similar trend like PO_4-P and NO_3-N with the growth of *Pistia* sp. Prokrovskaya (1983) suggested that macrophyte overgrown lakes show important indication of eutrophication such as drop in oxygen content of water. Similar observation was made during the present study, because oxygen drops down to zero with full growth of *Pistia* sp.

Carbon dioxide content was very high during post-monsoon and winter (17.6 mg/l and 13.2 mg/l) but got reduced to 0.66 mg/l with the development of *Pistia* sp. then dropped to 0.00 mg/l during monsoon.

The macrophytes act as pollution indicators of water bodies. They play an important role in energy input, nutrient budget and recycling of nutrients in the water bodies (Pokrovskaya 1983; Kushari 1985; Naskar *et al* 1985; Neiff & Neiff 1988; Jamil 1990; Padmavathi & Durga Prasad 1997; Billore 1990; 1998). Egbert (2000) has worked on various species of macrophytes like *Eichhornia* sp, *Lemna* sp, *Azolla* sp and *Vallisneria* sp and shown their role in the recycling of nutrients like phosphates and nitrates. But references on use of *Pistia* sp. for such purpose were not available. The present study suggests the significant role of *Pista* sp. in the removal of nitrates and phosphates.

Billore (1990) has shown the denitrifying role of dominant native plant species *Corchorus trilocularis* and *Echinochlodea colonum* in nitrate removal. According to him these native plant species are capable of removing nitrate - nitrogen from the pond almost completely (94%) and hence has suggested the use of local species in denitrification process.

Purposeful construction of wetland ecosystems is a new technology in which shallow water bodies are specifically engineered using macrophytes for

water quality treatment. These have now been recognized as an accepted low cost technology in developed countries especially beneficial to small towns (Billore 1998).

Table 1: Physico-chemical parameters of lake Ambegosale

Season	Temperature °C Air	Water	pH	DO mg/l	CO_3 mg/l	Hardness mg/l	Ca mg/l	Sio_3-Si mg/l	PO_4-P mg/l	NO_3-N mg/l
Summer ↓ May 2000	36.0	34.0	7.27	0.00	0.66	194	54.50	68.0	0.0476	0.052
Monsoon Aug 2000	32.0	30.0	7.84	11.0	0.00	120	37.68	23.1	0.264	0.176
Post-Monsoon Oct 2000	32.0	32.0	6.8	5.8	17.6	130	27.25	21:3	0.1046	0.176
Winter Jan 2001	24.0	23.0	6.8	1.2	13.2	158	44.08	24.75	0.136	1.760

Hence we suggest the regular harvesting of *Plstia stratiotes,* which is a native macrophyte for cleaning this lake. This will help in reducing the phosphates and nitrates from the lake, which are the main culprits for eutrophication and thus the lake, can be revived back to mesotrophic.

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