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HYDROBIOLOGY AND PHYTOPLANKTON POPULATION IN CERTAIN PONDS OF NORTH BIHAR

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ABSTRACT

The hydrobiological parameters influencing indirectly to the trophic composition in any water reservoirs. A hydrobiological study conducted in three ponds in Gopalganj district of Bihar showed that water parameters are within the permissible level in water quality standard for fishery. The water quality parameters were estimated by standard methods. The micronutrients showed higher iron content in most of the ponds. This study concludes aquaculture potential in ponds and its conservation is essential.

Keywords: Hydrobiology, chemical factors, phytoplankton

INTRODUCTION

The world's water resources are under pressure and must be managed for human survival. It is, therefore, necessary to have most relevant information for arriving at rational decisions that will result in the maximum benefit to most people. The real and reliable water management is vital for sustainable utilization in next future.

The small ponds have been also used earlier times as a traditional source of water supply in India. However, the pollution in local water resources are resulting through sewage disposal, soil organics, detergents, fishing operations and agricultural chemicals (Usha et al., 2006; Hasan et al., 2007). In recent years, their importance has somewhat declined due to technological advancements leading to more centralized water supply systems. There is a similar attitude among ecologists and planners to conserve ponds as perspective water resource in rural populations (Park and Park, 2005). The present study is an effort about the water quality of selected ponds for their sustainable exploitation for multi-purpose task in future.

METHODS AND MATERIALS

The study was carried out in three different selected ponds in Gopalganj district. Water samples were collected fortnightly from February to April, 2017

from the upper surface of ponds in PVC and BOD bottles (for estimating dissolved oxygen).

The trace elements like Ca, Mg, Fe, Cu and Zn were also estimated (Gupta, 1996) by atomic absorption spectro-photometer. The detection limits for Ca, Mg, Fe, Cu and Zn were 1.0, 0.1, 3.0, 1.0 and 0.8 $\mu gl,^{-1}$ respectively. The plankton sampling was performed by filtering a known volume of water through plankton net. These planktons were fixed in formalin and sedgewick rafter used for quantitative determination. Statistical analysis was done by using window based minitab software.

RESULTS AND OBSERVATIONS

The water quality variables in studied ponds showed also diverse phytoplankton, zooplankton and fish populations. There are different phytoplankton groups in these ponds due to variation in water parameters.

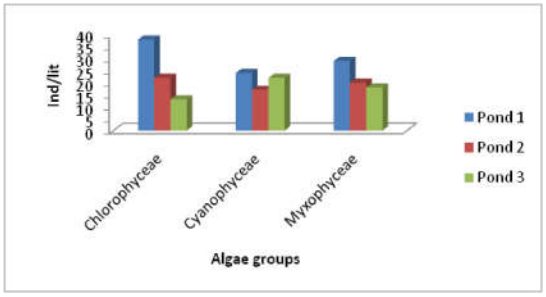

Figure1. Dominant Phytoplankton groups in studied ponds

Table - 1: Variation of chemical parameters in ponds.

Variables	Pond 1	Pond 2	Pond 3
DO	6.37(1.01)	8.19(1.07)	5.91(2.38)
Free CO_2	12.47(3.36)	13.27(4.68)	23.47(16.66)
TA	20.00(3.60)	11.00 (3.6)	47.87(56.23)
pH	7.40 (0.34)	7.47(0.25)	7.5(0.21)
Cnd.	123.8 (8.26)	29.63(1.7)	114.3(36.96)
TDS	56.30 (3.79)	14.00(1.0)	52.67(16.56)
Nitrate	0.720 (0.38)	0.210(0.11)	0.38(0.32)
Phosphate	0.850 (0.01)	0.00	2.56(0.25)
Calcium	0.013 (0.01)	0.03(0.01)	0.14(0.001)
Magnesium	5.15 (0.05)	2.05(0.05)	3.37 (0.01)
Iron	1.13 (0.01)	0.71(0.045)	0.49 (0.01)
Copper	0.081 (0.01)	0.07(0.01)	0.09 (0.02)
Zinc	0.820 (0.03)	0.39	0.30 (0.01)

Correlation coefficients computed among the chemical parameters of three ponds showed a number of significant relationships (Table 2).

DISCUSSIONS

The quality of an aquatic ecosystem is dependent on the physicochemical qualities of water as also on the biological diversity of the system (Tiwari and Chauhan, 2006).

The ponds 1 and 3 were previously used for washing and bathing and so *Cyanophyceae* and *Euglenophyceae* also encountered during the study which are generally seen to appear near sewage outfall (Pandit, 2002). The highest dissolved oxygen value and nearly neutral pH in pond 2 can be attributed to the diversified plankton population. All ponds have been found to be favorable for fish productivity as nitrate value of these sites ranged between 0.1-2.56 mgl^{-1}. The low range of phosphate value in all the ponds is due to high temperature (Manna and Das, 2004).

In this study, it has been observed that iron is below limit in pond 1 and pond 3, whereas in pond 2 comparatively lower iron value is associated with moderate abundance of *Euglenophyceae*. This confirms that magnesium also has a great role in stimulating and maintaining Euglena blooms (Dutta Gupta, 2004). This is possible because calcium increases the availability of other ions and magnesium acts as a carrier of phosphorus (Wetzel, 1984). The concentration of copper and zinc in these ponds are very low.

The classical inverse relationship between dissolved oxygen and carbon dioxide was found to be significant (Wetzel, 1984), however, it also confirmed in this study with low nitrate value except pond 2 which ultimately resulted in phytoplankton variation. Significant positive correlations of conductivity with phosphate and magnesium indicate that they are the key factors governing the conductivity regimes of the ponds investigated.

Calcium and magnesium are significantly correlated which can be attributed to the fact that both are integral part of plant tissue and contribute to the hardness of water (Wetzel, 1984). Further they play an important role in neutralizing the excess acid

produced in the system (Das, 2002). This also justifies the significant positive relationship of calcium with alkalinity. Iron showed significant positive correlation with copper and zinc. These are essential micronutrients for plants and many animals, required in trace amounts, and thus vital in the molecular architecture of various proteins, enzymes and vitamins.

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