

Phytoplankton Seasonal Abundance In Relation To Physico-Chemical Features In Mahapoli Lake, Bhiwandi, Maharashtra

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Abstract-

Physico-chemical analysis and Phytoplankton survey of the Mahapoli Lake was carried out on monthly basis for the period of one year from February-2016 to January-2017. PH determined alkaline nature of the lake ranging 7.2 to 7.9, Dissolved oxygen 4.2-7.77mg/l was recorded. Alkalinity (97 to 183mg/l), total Hardness (69 to 142 mg/l), chlorides (45 to 63 mg/l) and the nutrients like phosphates and nitrates were at maximum in summer and minimum in rainy season. During the study period, out of 19 algal genera, Cyanophyceae with 6 genera, Chlorophyceae with 9 genera and Bacillariophyceae with 4 genera were recorded. The highest numbers of Phytoplankton were recorded in post monsoon and lowest in monsoon.

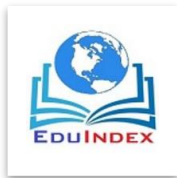
Keywords: *physico-chemical, Phytoplankton, Cyanophyceae, Chlorophyceae, Bacillariophyceae, mahapoli village.*

Introduction

Phytoplankton is the microscopic floating plant life of lakes. Phytoplankton is widely distributed in the estuarine environments. Phytoplankton forms the foundation stone of world fishery. According to Rao (1975) phytoplankton are the primary producers of water bodies, these are the main source of food directly or indirectly for various animal groups.

According to Wetzel (2001) and Ariyadej et al., (2004) phytoplankton are highly diverse group of photo autotrophic organisms with chlorophyll-a and unicellular reproductive structures, which are important for aquatic habitats. Laskar et al., (2013) explain that phytoplankton are important primary producers in the base of the food chain, constitute a vital link and an important biological indicator of the water quality.

According to Ponmanickam et al., (2007) the qualitative and quantitative studies of phytoplankton have been utilized to assess the quality of water. An algal group such as Cyanophyceae, Chlorophyceae, and Bacillariophyceae present in the aquatic medium provides a



probable indication of the tropic nature of the specific waters. According to Pawar et al., (2006), study of phytoplankton is very useful tool for the assessment of water quality in any type of water body. They are directly affected by physical and chemical factors in the lake. According to Harikrishnan et al., (1999) maintenance of a healthy aquatic ecosystem depends on the biotic properties of water and the biological diversity of the ecosystem.

In the present investigation algal groups belonging to Cyanophyceae, Chlorophyceae and Bacillariophyceae were recorded during investigation period i.e. from February-2016 to January-2017. Qualitative and quantitative assessment of phytoplankton was done through phytoplankton density, biomass and biological indices. From all the four stations selected for study, in all Total 19 algal genera have been observed from the selected four stations of Mahapoli Lake. Out of 19 algal genera, Cyanophyceae with 6 genera, Chlorophyceae with 9 genera and Bacillariophyceae with 4 genera were recorded. The present study deals with the impact of various physico-chemical factors on the abundance of Phytoplankton in Mahapoli Lake.

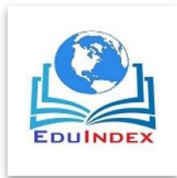
II. Material and Methods

a) Study area

The present study was undertaken in the Mahapoli village. Mahapoli is a village panchayat located in the Thane district of Maharashtra state, India. The district is situated between 18° 42' and 20°20' north latitudes and 72°45' and 73°48' east longitudes. The latitude 19.4010673 and longitude 73.0847979 are the geo-coordinate of the Mahapoli. It is located around 56.40 km away from Mumbai.

b) Sample collection and analysis

The present investigation was conducted for the period of one year from February-2016 to January-2017. The samples were collected in morning between 7 to 9 am. The water samples were collected from 4 different points of the lake. Water samples were collected by using one liter wide mouth plastic container at each sampling station. Water quality parameters were analyzed as per methods of APHA (2005), Trivedy and Goel (1984). DO was fixed at sampling stations itself and further analysis was done in the laboratory. For the quantitative and qualitative estimation of plankton, 50 liters of water samples were filtered by using the 125 μ mesh size



plankton net and preserved in 4% formalin. Literature was used for taxonomic position and identification of the plankton (Tonapi, 1980; APHA 2005).

III. Results and Discussion

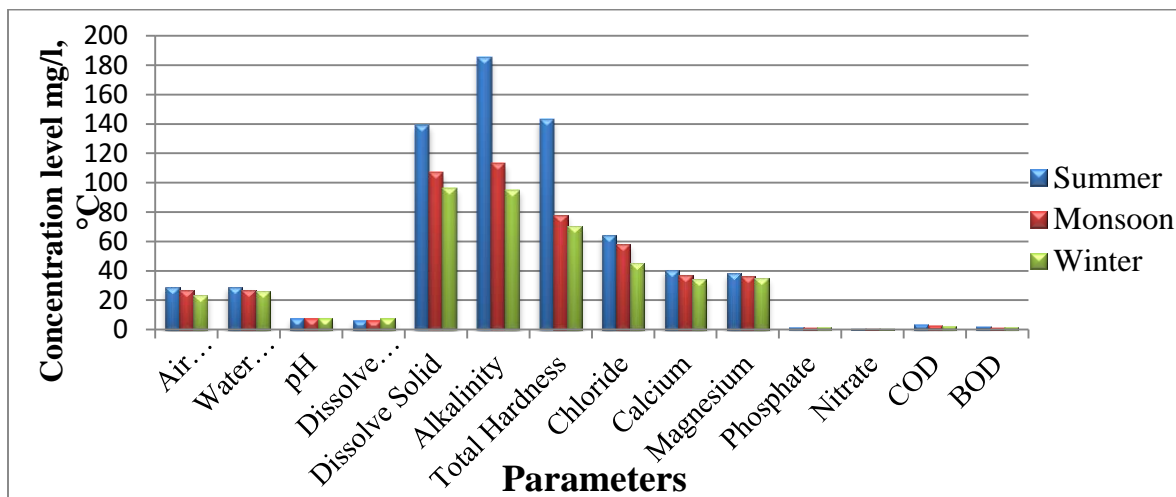
In the present investigation, seasonal variation in the physico-chemical parameters of Mahapoli Lake has been illustrated in Figure 1. Water temperature, a regular factor for various physico-chemical as well as biological activities in ecosystems, is found to fluctuate markedly with the variations in air temperature was investigated by Sharma and Kumar (2002). It was maximum during summer comparatively less during monsoon and minimum during winter. Recorded pH of water confirms the alkalinenature of the lake. The parameters like Alkalinity, Total Hardness, minerals and nutrients like phosphates and nitrates were recorded maximum in summer and minimum in monsoon season (Figure 1).

According to Stephen et al., (1998) aquatic vegetation provides shelter to zooplankton which feed upon phytoplankton and at times reduces phytoplankton densities. According to Davis (1955), a number of physico-chemical, biological and environmental circumstances acting simultaneously should be taken into consideration while studying plankton. Vestergaard et al., (2000) reported that alkalinity and trophic state regulate aquatic plant distribution in Danish lakes. The biological processes are so complex that no single ecological factor can be identified to be responsible for the growth and production of plankton community. In general phytoplankton density has been reported to be moderate. Low nitrate, phosphate, transparency and conductivity are attributed factors for slightly low phytoplankton population.

Chaturvedi et al., (1999) and Ponmanickam et al., (2007) found that the qualitative and quantitative studies of phytoplankton have been utilized to assess the quality of water. The qualitative texture of phytoplankton community observed in MahapoliLake indicated a sequence of Chlorophyceae>Cyanophyceae>Bacillariophyceae. The Chlorophyceae group, which is the most successful competitor in waters, is well exposed to penetration of sunlight. Nazneen (1980) noted that water temperature played important role in controlling the growth and abundance of algal flora.

The importance of nutrients in the growth and abundance of phytoplankton is well recognized. Nutrients have a direct bearing on the cellular growth of algal flora (Wetzel, 2001).

Figure 1: Seasonal average value variation in physico-chemical parameters of Mahapoli lake during February-2016 to January -2017



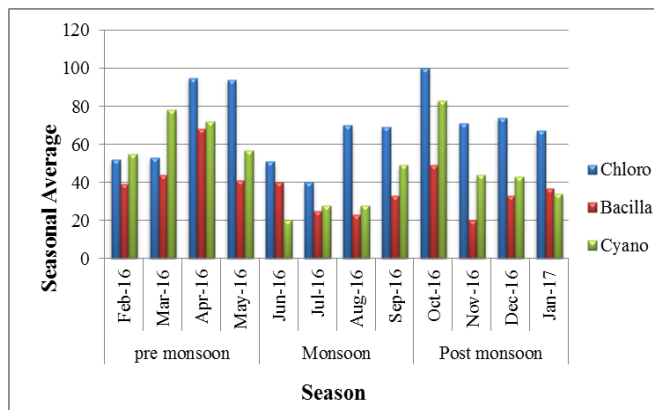
The increase in nitrogen content may increase the algal growth. According to George (1962) pH and alkalinity play an important role in the growth of algae. Philipose (1960) recorded Chlorophyceae in the pH range of 7.1 to 8.1. Present investigations are in accordance with the above findings. It is remarkable that the Chlorophyceae population was the most abundant group followed by Cyanophyceae and then Bacillariophyceae. Chlorophyceae population was most abundant during post monsoon and in pre monsoon. Devika et al., (2006) noted that high population during summer and suggested that this might be due to physical rather than chemical conditions in which the water temperature and transparency had a direct relationship with phytoplankton population.

Cyanophyceae shows its dominance next to Chlorophyceae. According to Ganapati (1960), temperature, sunshine, phosphate, nitrate, and calcium to be the important factors in the growth of Cyanophyceae. In the present study the maximum density of Cyanophyceae were observed during late monsoon and in post monsoon period.

Table 1: Of Zooplankton Species recorded in Mahapoli Lake during 2016-2017

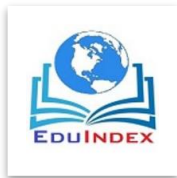
Chlorophyceae	Cyanophyceae	Bacillariophyceae
Spirogyra sp	Anabaena sp	Niotschiasp
Zynemasp	Nostocsp	Navicullasp
Odeogoniumsp	Merisnopediasp	Melosirasp
Pediastrumsp	Spirullinasp	Diatom sp
Scenedsmussp	Microcystssp	
Desimidiumsp	Oscillatoriasp	
Gleotriciasp		
Ankistrodesmussp		
Chlorella sp		

Figure 2: Seasonal Average value variations in Phytoplankton Abundance in Mahapoli Lake during 2016-2017

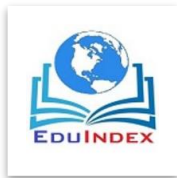


Bacillariophyceae members show variable fluctuation. Schroeder (1939) investigated waters having low pH are poor in diatom, while the more alkaline water has a restricted flora. According to Kolbe (1932) calcium in alkaline waters support higher number of Diatoms. In the present study maximum density of members was noted in the post monsoon period. Overall Phytoplankton population fauna of the lake was not much more diversified indicating the Mahapoli Lake as nutrient rich water body and good for aquaculture.

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