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Study of phytoplankton population in lake Masunda, Thane, employing multivariate analysis

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ABSTRACT

Phytoplanton population in lake Masunda, Thane (Maharashtra) was studied. Chlorophyceae was the most dominant class. Its dominant species formed a cluster at very high similarity. Cyanophyceae members dominated during summer where as diatoms constituted 6.7 % of total phytoplankton. The valid regression equation supported influence of nutrients on phytoplankton abundance.

Introduction

The abundance and seasonal variation of phytoplankton is important to determine the water quality and trophic status of a waterbody. The present study was carried out in lake Masunda, the ancient lake of Thane city (Maharashtra). The lake is included in beautification programme by Thane Municipal Corporation. It is under anthropogenic influence including food vendors, boating and regular aquaculture practice.

Materials and Methods

Lake Masunda has approximate area of about 1, 23, 545 Sq.ft. Surface water samples were collected monthly from April 1999 to June 2000. The Physiochemical analysis of water was performed as per APHA (1981) and Trivedy and Goel (1986). 500 mL sample was preserved sepilrltely using Lugols Iodine solution, for phytoplankton analysis. Identification of phytoplankton was carried out using Fritsch, (1979) and Bellinger, (1992). Haemocytometer method (Trivedy and Gool, 1986) was employed for quantitative analysis. Cluster and Regression analysis was carried out using minitab, statistical software.

The phytoplankton community comprises of Chlorophyceae, Cyanophyceae, Bacillariophyceae and Dinophyceae, represented by 30 genera (Palmer, 1969) Chlorophyceae was observed to be the most dominant class. The observation of clusters formed are given in form of dendrogram (Fig. 2.), based on correlation matrix. The regression equation, obtained for phytoplankton with respect to water parameters is given in Table 1.

Results and Discussion

Chlorophyceae, the dominant class, was followed by Cyanophyceae members in order of abundance. Maximum of bluegreens was attained in summer. This is in accordance with observation of *Pachgade et al.*, (1994). *Oscilatoria* which is considered as pollution tolerant genera (Palmer, 1969) contributed to highest cyanophycean peak in summer. *Microcystis Sp.* though recorded, never attained blooming con-

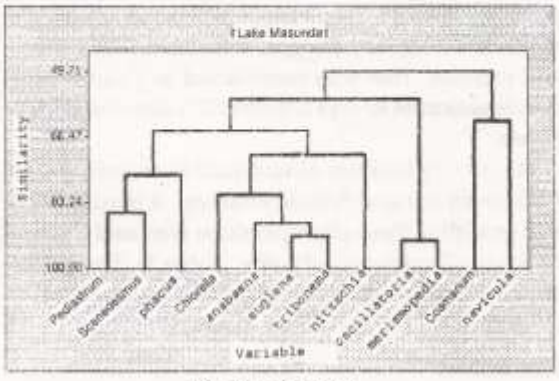

Fig. Dendrogram

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Table 1. The regression equation is phyto = - 101115+1759 w.temp. + 45.1 s. solids - 5665 pH - 180 chlorides + 11950 DO + 145 Thardness + 128378 + 570 silicates S = 4080.17 R-Sq = 90.3% R-Sq (adj) = 77.4%

Analysis of Variance

Sourced	Df	SS	MS	F	P
Regression	8	932055424	116506928	7.00	0.014
Residual Error	6	99886869	16647812		
Total	14	1031942293			

Shannon Index

For Masunda Phyto Plankton, H = EPiLn (Pi), H = 1.95659

ditions in this lake. Diatoms formed 6.7% of total phytoplankton. According to George (1966), apparent numerical inferiority can be due to grazing of carp fishes. Pinnate diatoms were observed to dominant centric genera.

The clusters formed at more than 80% similarity level were considered to show the affinity among the different species. These confirmed close association of *Pediastrum spp.* and *Scenedesmus spp.* favouring similar environmental conditions for growth. (Fig. 1) as they were grouped in one cluster. This was also observed for bluegreen members *Oscillatoria* spp and *M. merismopedia* spp. both showing high densities in summer and forming the second cluster. Association of *Euglena spp* and *Tribonema spp* was observed in the third cluster. *Anabaena spp.* though is a cyanophycean member, shows more affinity with the third cluster and not with the dominant cyanophycean genera.

Best subset of water parameters affecting phytoplankton population was evaluated at step I, to obtain predictors and then using these predictions, regression equation is obtained.

Validity of this equation was tested using ANOVA table coefficient of determination R^2 and adjusted R^2 values. Analysis of variance (Table 1) showed the regression, between phytoplankton population and water temp, suspended solids, pH, chlorides, dissolved oxygen, total hardness, silicates and nitrates. This was considered as valid regression equation as R^2 and adjusted R^2 values were close to one.

As phytoplankton abundance is mainly due to *Pediastrum spp* and *Scenedesmus spp.* it is suggestive that growth of these phytoplankton is related to abundance of silicates and nitrates. (Table 1). The preference of these algae for high DO concentration (Mishra *et al.*, 1992) is also supported.

Conclusion

The study reveated presence of chlorophyceae members and chlrophycean members dominating the total phytoplankton density in Mansuda lake; Cyanophycean genera were recorded in higher density during summer. The dominant genera of both the the classes, formed clusters with higher similarity. Association of phytoplankton abundance, with silicates and nitrates, is thus statistically supported.

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