DIATOMS AS INDICATOR OF WATER POLLUTION

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Abstract: Diatoms were the first group of bioa used for detecting organic pollution (e.g. the Saprobian system by Kolkwitz and Mersson in 1909) (Ramachandra T.V., 2009). Diatoms respond directly and sensitivity to many physical, chemical and biological changes such as temperature, nutrient concentration and hervivory. They are sensitive to many habitat conditions and show variability in biomass and species composition.

Biological monitoring is valuable method used in conservation studies to protect and preserve the biological integrity of natural ecosystem, which includes preventive measures. Bioindicators of pollutants are useful in producting the level and degree of the pollutants before the effects of the pollutants starts, which caused large proportions (Pai, 2002, Verma, 2002, Ward and Whipple, 1966). Study of these organisms is generally linked to the use of methamatical distribution (Legendre and Legendre, 1983) of these organisms in the communities to which the bioindicator species belong (Sing and Singh, 2003, Joy and Joseph, 1995).

Introduction: The lakes and reservoirs all over the world under different degrees of environmental degradation. The degradation is due to eutrophication. There has been a quantum jump in population during the last few centuries the lakes and reservoir especially in the urban ones become source of contamination. The division Bacillariophyta comprises a single class Bacillariophyceae, the members of which are popularly known as the **diatoms:** Diatoms are uniquestions in the habitat. They are abundant in the phytoplankton and phytobenthos of marine and fresh water. Within aquatic habitat diatoms further extends their habitat from the pelagic to benthic environment and are also found to colonise various submerged living and non-living surface. In the aquatic environment the growth and behaviour of the diatom community structure is controlled by various environmental conditions. The researchers explain that the remediation and protection of freshwater ecosystems is increasingly important but water quality management requires reliable long-term data on water quality and how remediation work affects the water. Moreover, information about natural, baseline, conditions in undisturbed ponds, lakes and rivers is needed against which polluted bodies of water undergoing remediation might be gauged. Diatom shows a broad range of tolerance along a gradient of aquatic productivity, individual species have specific water chemistry requirement (Round, 1991).

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Pollution tolerance indices are metrics that summarize the pollution sensitivity of diatom taxa in a particular community. The assemblage become an indicator of the relative health of waterbodies.

Diatoms one more specific in their preference tolerance of environmental conditions their most other aquatic biota. Diatoms were the first groups of biota used for detecting organic pollution. Diatoms respond directly and sensitive to many physical, chemical and biological changes such as temperature, nutrient concentration and harbivory. They are sensitive to many habitat condition and show variability in biomass and spices composition. Diatoms can provide valuable information for monitoring organic pollution, Palmer (1969).

Round (1993) Kelly et al. (1998) Prygiel et al (2002) Taylor (2004) considered that small bolders are the perfect substratum for monitoring diatoms in the aquatic environment (e.g., the saprobian system by Kolkwaitz and Massom in 1909 cited in Stoermer and Smol, 2001).

Qualitative and quantative analysis of different group of organism have led to establishment of bio indicators indices and system which can be used to asses the pollution and trophic status of water bodies.

Material and Methods: Palmers (1969) has published a composite rating of algae tolerant of organic pollution assembled from the reports of 165 authors. He constructed algal pollution studies which he developed for use in rating water samples for high or low organic pollution. Two indices are given, one for algal genera and the other for species. Palmer assigned each genus or species a pollution index value from 1 to 6. This value is determined by the

relative number of total points credited to the listed algae based upon their points total in his list of pollution tolerant genera or species. A score greater than 20 for a water sample signifies high organic pollution, while a score of 15 to 19 suggests probable evidence of high organic pollution. Value less than 15 indicate low organic pollution.

Present study deals with assessment of water qualities status of all selected sites of lake each sites by using Palmers Pollution Index (PPI) values based on qualitative and quantitative analysis of diatoms community and physico chemical quality of water.

For this purpose water sample were collect from all elect sites of lakes in plastic bottles and lugols reagents was added to preserve the diatom samples. The technique was used to prepare sample for diatoms enumeration was as follows:

The content of material was poured into a Millipore filter apparatus model xx1002500 equipped with grid Millipore filter. Each sample was aspirated for 15 min. under low vaccume on to millipore filters.

The diatoms were air dried then immersion oil rendered the filter transport filter were then placed on microscope slide with coversilp and sealed with nail polish to produces permanent slide.

For enumeration of the diatoms 10 dominant genera were taken to evaluated the pollution level in the both lakes and diatoms was calculated for the various sampling site.

According to the list of palmer pollution index the number scored by each genera with species were totaled to get the value of diatoms genus and species index. A score of 20 or more for a samples indication of organic pollution while a score of 15 to 19 is taken as provable evidence of high organic pollution.

Lower figures indicate the low level of organic pollution. The indicator value determined by each site relative number of total points credited to the list were compared with the pollution tolerance value of palmers list.

Observations and Results: According to the table lake Palmers Pollution Index shows highest value of diatom species index value was in Dhobi ghat site(B2) where the total number of calculation is (24) followed by trapafield site(B3) where the value is (15). The lowest value (9) was in main road site (B1). This confirms that the water quality of site(B3) and (B2) is having the higher organic pollution in both of the sites, while, in site(B1) the value is lesser than these two sites which is less polluted compared to the other two sites.

Table: Palmers Diatom species index at different stations of Badi lake

Diatom species	Palmers Tolerance rating	Site B1 (main road site)	Site B2 (Dhobi ghat site)	Site B3 (Trapa field site)
Nitzschia palea	5	-	+	+
Synandra ulna	3	-	+	+
Cyclotella meneghiniana	1	-	+	-
Gomphonema purvulum	1	-	+	+
Achnanthes exigua	3	+	+	-
Amphora ovalis	3	-	+	-
Cocconuis placentula	3	-	-	-
Navicula capitata	2	+	+	+
Caloneis bacill	3	+	+	+
Diatoma vulgare	3	-	+	+
Total	27	09	24	15

Conclusion:

- The data collected from all selected sites were considered throughout the study period. It has been found in the present study that maximum number of diatoms were observed when the water is unpolluted.
- The diatom species were present in the clean water are comparatively more than that in the mildly polluted waters
- Similarly the diatom species found in mildly polluted waters are more than those in severely polluted waters.
- With the increasing in pollution load the diatoms decrease in their numbers.

  B II (24) >B III (15) >B I (8)

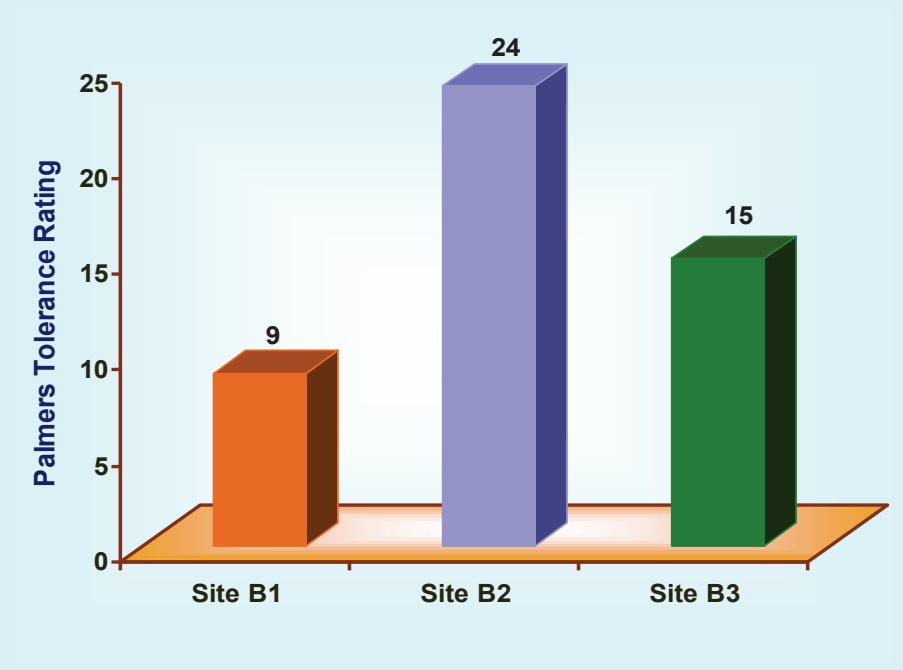

Fig. Palmers Diatom species index at different stations of Badi lake (B)

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