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Relationships between Algal Taxa and Physico-Chemical Characteristics of Kapshi Lake, Kapshi Dist. Akola (M.S)

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ABSTRACT

A study of algae flora was performed on 3 samples collected from 3 different sites of every month during June 2012 to May 2014 of Kapshi Lake in order to evidence the relationships between algae assemblages and physico-chemical parameters of the sphere. A total of40 algae species were identified, the most represented class being *Chlorophyceae* (16 Species), *Cyanophyceae* 8 species) *Bacillariophyceae* (3 species), followed by the *Characeae (*2species) and finally Euglen*ophyceae* (1 species). Physicochemical analysis of water samples suggest evidences of organic pollution related to anthropogenic activities, running waters being less affected than stagnant ones. This organic pollution is inferred from highest values of TDS and conductivity. The Correspondence Analysis (CA) displayed four groups of algae on the two first axes. On axis 1 the discriminating factor is the current, because running water sites are opposed to stagnant water ones. Unfortunately measured values of water current are not available to precise that hypothesis, our interpretations in this paper are based on relative data. The second axis reveals the opposition between oligotrophic and eutrophic waters, and could be considered as a gradient of organic pollution. The species *Navicula*, *Nostoc* sp., *Amphora* sp., *Pinnularia* sp. and *Lyngbya* sp. are associated to low values of TDS and conductivity while *Closterium* sp.*, Euglena* sp. thrive better in high polluted waters. The distribution of these algae identified as indicators of high organic pollution, evidenced a spatial variability of organic pollution in accordance with thewater physicochemical parameters monitored. This variability is probably modulated by the presence in the sampling sites of macrophytes that are efficient in removing pollutants.

Key words: Kapshi Lake, algae, Physico-chemical. Organic pollution.

I. INTRODUCTION

The present study has been undertaken in Kapshi lake, Kapshi situated in Akola district, Maharashtra State, India. The main objective of this study is to relationships between algal taxa and physico-chemical characteristics of Kapshi lake. During the whole study period, a total of 40 algal species belonging to 5 different families were found distributed in the lake. A few studies of algae exist in Kapshi lake, most of which are focused on the inventory of algae taxa in Kapshi Lake in relation with their physicochemical characteristics. The trophic status of Kapshi lake was evidenced through the detailed study of the of algae flora. Algae have

been intensively studied in other regions of the world for several reasons. Because of their rapid growth and the ability of most taxa to flourish in specific aquatic conditions, they are used in inferring water quality, organic pollution, acidification, and salinity. Moreover, diatoms (Bacillariophyceae) can be conserved in fossil sediment thanks to their siliceous cell wall; hence they represent an important tool to retrace paleo limnological changes and infer past climates. This pioneer work in the Kapshi lake intends to make an inventory of algae taxa that develop in lake.

II. STUDY SITE

Kapshi Lake is one of the oldest lake in Akola district, situated about 20 km from the district place and existing since the British regime. The lake is one of major drinking water source in the area. The people in the vicinity are also using the lake water for agriculture purposes, household acts, fishing, and other necessary things like washing of animals, clothing etc. Therefore, it is essential to know the water quality parameters to avoid the major hazardous conditions and health hazards. Keeping all this in view, the present investigation was planned to analyze various physiochemical parameters of Kapshi lake with special reference to the algal diversity of the lake.

Fig.1.Map of Kapshi Lake Dist. Akola, Maharashtra

Fig:- 2 Google Map of Kapshi Lake, Kapshi.

III. MATERIAL AND METHODS

Algal Analysis

Three water samples from three sites of lake were collected seasonally for the phytoplanktonic analysis. The collected samples were preserved in Lugols solution with acetic acid. The samples were allowed to settle down for 5-6 days and then proceed for analysis. The slides for phytoplankton analysis were done using dilution methods for better screening. The slides were stained and identified under compound microscope. The photography was done using photo micrographic camera attached to microscope. The identification of the phytoplankton was done using standard reference (Hutchinson, 1957, Renolds, 1980, Saha, 2004 and Kumar et.al., 2005).

Physico-Chemical Parameters of Water

Environmental parameters of water were measured in 3 sampling locations presumably representative of the study area. These physicochemical parameters of water include: Conductivity, Total dissolved solids (TDS), pH, turbidity, color, and temperature. In the open water sites water depth was also estimated. Total dissolved solids (TDS) and conductivity were measured using the TDS/Conductivity meter. The pH was measured using a pH/Temperature controller. The turbidity and apparent color of water were measured using a Calorimeter, and expressed in Formazin Turbidity Units respectively.

Statistical analysis

The correspondence analysis (CA) was used to identify in the algae flora data the dominant pattern of variation. The data set submitted to CAcomprises samples in columns and genera in rows. The technique consists of plotting points (individuals or variables, here samples or species) in a space of n-1 dimension (where n is the number of variables). This method allows visualizing the pattern of multidimensional distribution; in fact this technique extracts continuous orthogonal axes (thus uncorrelated) of variation from variables abundance. The first extracted axes are those of maximum variability. Each axis, considered as hypothetical gradient ofenvironmental variable is subsequently interpreted in the light of measured environmental variable and the observed flora.

IV. RESULTS

Water characteristics

Table 1 presents the summary of the data statistics (minimum, maximum, mean and standard error) of the water physicochemical parameters. It shows that pH range of lake slightly alkaline. The range of pH in three water samples from lake was between pH 7.95 to 8.44 for the year 2012-14 respectively. It was noted that the pH of water samples does not showed any significant difference in average. However, slight change might be seen over the period. The might be due the effect of temperature change and reaction of the organic physical received by water bodies during preceding period of rain fall. The temperature range from 23.1ºC to 30.1ºC. The lowest temperature was recorded in January – February and highest in the month of May. From June onward, the temperature drops to February. The various observed in the temperature of three sampling site indicates slight difference. The average of water temperature of all three sampling size in both the year was 26.59ºC to 27.38ºC.The TDS of site 1 ranged from 138 to 235; site 2- 132 to 318; site 3- 132 to 217 mg/L during 2012-2013 respectively. And 146-236; 147-310; 145-222mg/L during 2013-14 for site 1, 2 & 3 respectively. It

was observed that the TDS showed collective impact of all Physico- chemical parameters. The lowest percent of transparency was recorded during July (82.5%site-1); August-September (94%site-2) and June-July (90.5%site-3) during 2012-13. Similar trend was observed during 2013-14. The highest percent of transparency was noted during January to April and again start decreases from May onward for both 2012-13 and 2013-14.The range of total alkalinity in water samples of site 1 was 10-109 and 15-122 mg/L during 2012-13 and 2013-14 respectively, in case of site-2, 12- 132 and 18-146mg/Land in samples of site-3, 12-135 and 17-112mg/L during 2012-13 and 2013-14 respectively. It was found to be lowest in the month of September and high during February-March of the assessment year 2013-14.

Table 1- Summery statistic of the measured environmental variables (Minimum, maximum, Mean, and Standard Error) (For pH , Temperature, TDS, Total alkalinity, Transparency n=2)

Variables	Minimum	Maximum	Mean	Standard Error
pH	7.7	9.0	8.35	0.65
Temperature oC	23.1oCoC	30.1oC	26.6oC	3.5
Transparency%	82.5	95.5	89.0	6.5
TDS mg/L	132.0	289.0	210.5	78.51
Total Alkalinity mg/L	12	135	73.5	61.50

Algal analysis

A total of 40 algal species were encountered in the 3 samples studied. Algae were well preserved; chloroplasts were present in all the cells observed, their color depending on their taxonomic group (Figure 4). The state of preservation of algal cells indicates that these organisms were alive at the moment of their collection; this implies that they are able to thrivein such physicochemical conditions. Figure 3. Pie chart represents the distribution of the 40 species in different classes of algae. The class Chlorophyacae member reported 16 members were Actinastrum hantzschi, Chlorella vulgaris, Cosmarium sp., Coelastrum microsporium, Hydrodictyon reticulatum, Lyngbya sp. Microspora amoena, Oedogonium sp., Pediastrum duplex, Scenedesmus sp., Spirogyra sp., Tetraedron regulare and Zygnema sp., it was followed by Cyanophyceae and about eight different members were identified. The members identified were Anabeana sp., Arthrospira sp., Chroococcus turgidis, Merismopedia tenuissim, Microcystis aeruginosa, Nostoc commune, Oscillatoria proboscida and Rapidopsia sp. It was followed by Bacillariophyceae, two members of Characeae and one of Euglenophyceae. It was also noted that sampling site 1 & 2 has more number of algal members diversity than sampling site 3 of the lake. It was also found that the seasonal variation and anthropulogical changes also effect the occurrence and abundance of the algal community.

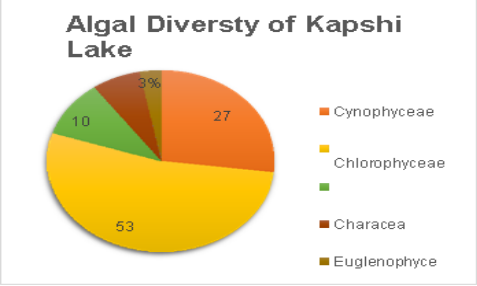

Fig. 3 Pie Chart of Algal Diversity

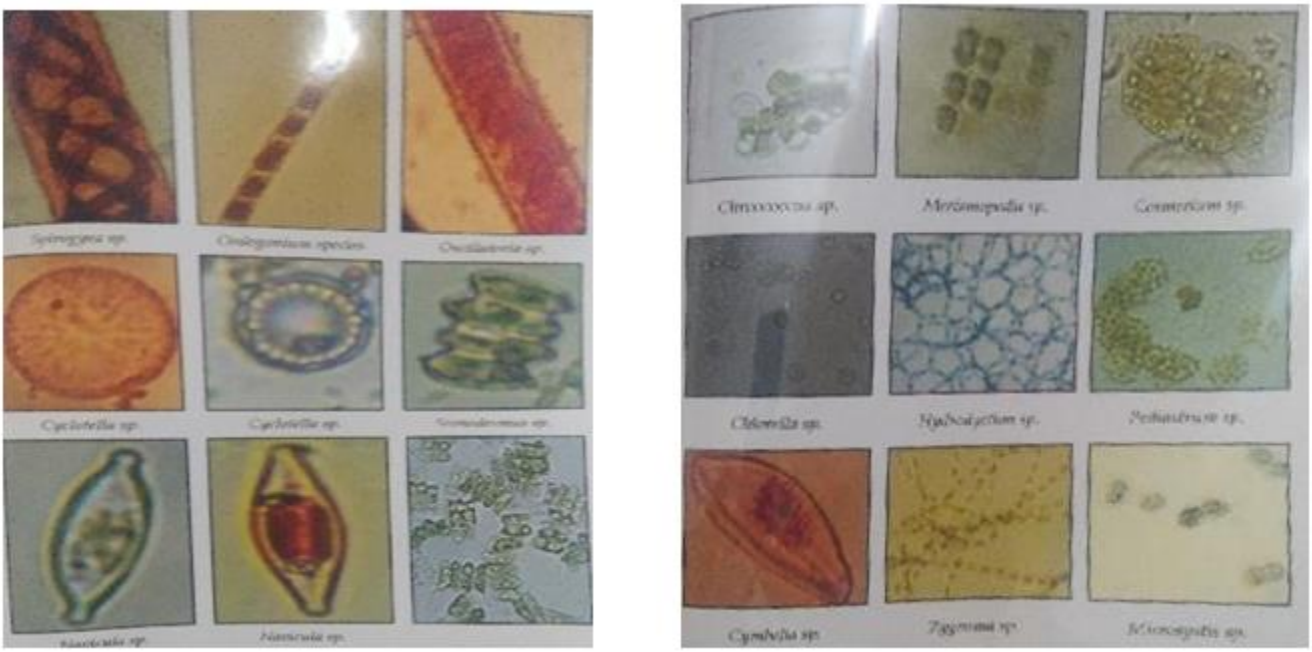

Fig. 4:- Selected Algae species identified in the Kapshi Lake

V. DISCUSSION

In the present investigation physico-chemical parameters like temperature of water, turbidity, transparency, pH, Total dissolved solids, Total alkalinity and their monthly and seasonal variations in water samples from different sampling sites are noted during 2012-14.

It was found that, the temperature of Kapshi lake water range from 23.1oC to 30.1oC. The lowest temperature was recorded in January- February and highest in the month of May. From June onwards, the temperature drops to February. The various observed in the temperature of 3 sampling sites indicates slight difference. The pH is one of the most important physico-chemical parameters, it play vital role in designing the role of water bodies in environment and its management. The pH range in the water samples of Kapshi Lake was analyzed. It was observed that, the pH range of lake was slightly alkaline. However slightly change might be seen over the period. This might be due to the effect of temperature change and reaction of the organic material received by water bodies during preceding period of rain fall.

The algal biodiversity of Kapshi Lake was investigated during 2012-14. In all 40 different algal members belonging to 5 different family are noted during study. It was found that about 50% of diatomaceous flora of the lake is composed of Chlorophyceae members. The availability of algal community was found to be affected by the seasonal Physico-chemical parameters. Thus, Kapshi lake showed that the values of Physico- chemical parameters slightly on higher side reaching or exceeding the permissible limit. The anthropogenic activities showed their impact in the form of deposition of organic materials and salts. This may leads probably dangerous situation for the biotic components of the lake. This may be the ultimate reason for the degradation of the lake in future.

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