Study of Fresh Water Algae From Dahisar Lake, Mumbai

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Abstract:-Dahisar Lake, Mumbai, Maharashtra is situated in the western region of India; which shows variation in terms of moist heat climate and pollution in the environment, which is surrounded by buildings and face problems of excessive anthropogenic activities. Several Phytoplanktons and Zooplanktons are found in the lake. Algal blooms are at their peak which gives green colored surface to the lake, which may cause green pollution later. Since this lake was untouched by the researchers, it has been surveyed to know the algal diversity. During the present studies of the lake, total 21 algal taxa belonging to Cyanophyta (5), Chlorophyta (8), Bacillariophyta (6) and Euglenophyta (1) were recorded.

Key words - Fresh Water Algae, Green pollution

I. INTRODUCTION

Algae are widely present in freshwater environments, such as lakes and rivers, where they are typically present as micro-organisms – visible only with the aid of a light microscope. Although relatively inconspicuous, they have a major importance in the freshwater environment, both in terms of fundamental ecology and in relation to human use of natural resources. The word 'algae' has originated from the Latin word for seaweed and is now applied to a broad assemblage of organisms that can be defined both in terms of morphology and general physiology. They are simple organisms, without differentiation into roots, stem and leaves. Their sexual organs are not enclosed within protective coverings. In terms of physiology, they are fundamentally autotrophic (obtaining all their materials from inorganic sources) and photosynthetic– generating complex carbon compounds from carbon dioxide and light energy. Some algae have become secondarily heterotrophic, taking up complex organic molecules by organotrophy or heterotrophy (Tuchman, 1996), but still retaining fundamental genetic affinities with their photosynthetic relatives (Pfandl *et. al*., 2009).

The term 'algae' (singular alga) is not strictly a taxonomic term but is used as an inclusive label for a number of different phyla that fit the broad description noted above. These organisms include both prokaryotes (cells lacking a membrane bound nucleus) and eukaryotes (cells with a nucleus plus typical membrane-bound organelles). Humans have long made use of algal species, both living and dead. Fossil algal diatomite deposits, for example, in the form of light but strong rocks, have been used as building materials and filtration media in water purification and swimming pools. Some fossil algae, such as *Botryococcus*, can give rise to oil-rich deposits. Certain species of green algae are cultivated for the purpose of extracting key biochemicals for use in medicine and cosmetics. Even blue-green algae, often regarded as nuisance organisms, may have beneficial uses. This is particularly the case for *Spirulina*, which was harvested by the Aztecs of Mexico and is still used by the people around Lake Chad as a dietary supplement. *Spirulina* tablets may still be obtained in some health food shops. Blue-green algae are, however, are better known in the freshwater environment as nuisance organisms, forming dense blooms having adverse effects on human activities by producing toxins, clogging water courses and impairing recreational activities. As fixers of carbon and generators of biomass, algae are one of three major groups of photosynthetic organism within the freshwater environment. They are distinguished from higher plants (macrophytes) in terms of size and taxonomy, and from photosynthetic bacteria in terms of their biochemistry. Unlike algae, photosynthetic bacteria are strict anaerobes and do not evolve oxygen as part of the photosynthetic process. The level of primary production by algae in freshwater bodies can be measured as fixed carbon per unit area with time (mgCm−3 h−1), and varies greatly from one environment to another. This is seen, for example, in different lakes – where primary production varies with trophic status and with depth in the water column. Eutrophic lakes, containing high levels of available nitrogen and phosphorus, have very high levels of productivity in surface waters, decreasing rapidly with depth due to light absorption by algal biomass. In contrast, mesotrophic and oligotrophic lakes have lower overall productivity – but this extends deep into the water column due to greater light penetration. Algae are fundamentally autotrophic (photosynthetic); some species have become secondarily heterotrophic. They obtain complex organic compounds by absorption over their outer surface or by active ingestion of particulate material. Although, such organisms often superficially resemble protozoa in terms of their lack of chlorophyll, vigorous motility and active ingestion of organic material, they may still be regarded as algae due to their phylogenetic affinities.

II. MATERIALS AND METHODS

Collection and study of algal samples:

Total 12 samples were collected from six different locations from the lake during June, 2016 before

monsoon when rain fall begins. This is to avoid dilution of water (Fig. 1). Geographical position, altitude and physic-chemical parameters like, temperature, pH, conductivity and transparency (by sachhi disc) were measured on the spot (Table 1). Each sample was preserved in formaldehyde (4 %, v/v) and stored at the Department of Botany, Thakur College of Science & Commerce; Mumbai, India for further processing. Microphotograph of each specimen was taken. The organisms were identified by following the monographs of Kützing (1865), West and West (1897, 1904, 1905), Huber-Pestalozii (1942), Desikachary (1959), Ramanathan (1964), Philipose (1967), Gonzalves (1981), Krammer and Lange-Bertalot (1986, 1988), Ettl and Gärtner (1995), Krammer (2003), Komárek and Anagnostidis (2005), Wołowski and Hindák (2005), Komárek (2013) and research publications e.g. Iyengar and Vimala Bai (1941), Prescott (1961), Prasad and Misra (1992), Cox (1996), Kant and Gupta (1998), Misra and Srivastava (2003).

Table 1: Physico – Chemical Parameters

Site (S)	Locations (L)	Latitude	Longitude	Altitude (M)	Temperature (°C)	pH	Conductivity (µS)
Dahisar Lake	L1	19.2571 9	72.8541	3	22.1	6.0	029
	L2	19.2572 3	72.85413	3	22.8	6.5	027
	L3	19..25704	72.85419	3	22.1	5.8	018
	L4	19.2571 5	72.85418	3	22.3	5.5	021
	L5	19.2571 1	72.85454	3	23.0	6.0	027
	L6	19.2569 6	72.85431	3	22.7	6.4	026


Location 1 Location 2


Location 3 Location 4


Location 5 Location 6

Collected Samples

III. RESULTS AND DISCUSSION

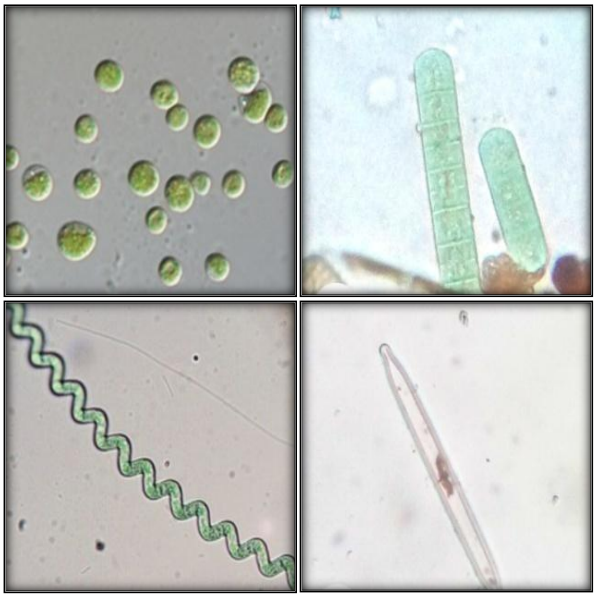
Total twenty one algal taxa were recorded from six different locations of Dahisar Lake. These belonged to Cyanophyta (5), Chlorophyta (8), Euglenophyta (1) and class Bacillariophyceae under Heterokontophyta (6).They were recorded as planktonic or epilith of the submerged stones inside the water. The Cyanophyta and Cyanoprokaryota taxa were enumerated systematically as per the classification of Komárek and Anagnostidis (1989, 2005). For algal taxa belonging to Chlorophyta, Euglenophyta, Heterokontophyta the classification of Lee (1999) was followed.

Sr. No.	Class			
	Chlorophyta	Cyanophyta	Bacillariophyta	Euglenophyta
1	*Chlorella*	*Oscillotoria*	*Synendra*	*Euglena*
2	*Spirogyra*	*Anabaena*	*Cyclotella*	---
3	*Oedogonium*	*Microcystis*	*Navicula*	---
4	*Chlamydomonos*	*Chlorococcus*	*Gomphonemma*	---
5	*Closterium*	*Spirulina*	*Cocconis*	---
6	*Coelastrum*	---	*Nitzschia*	---
7	*Botryococcus*	---	---	---
8	*Arthrospira*	---	---	---

The low algal diversity in these places showed the uniqueness with species which are representative ones, indicating oligotrophic character of the water bodies of the region (Palmer 1962).

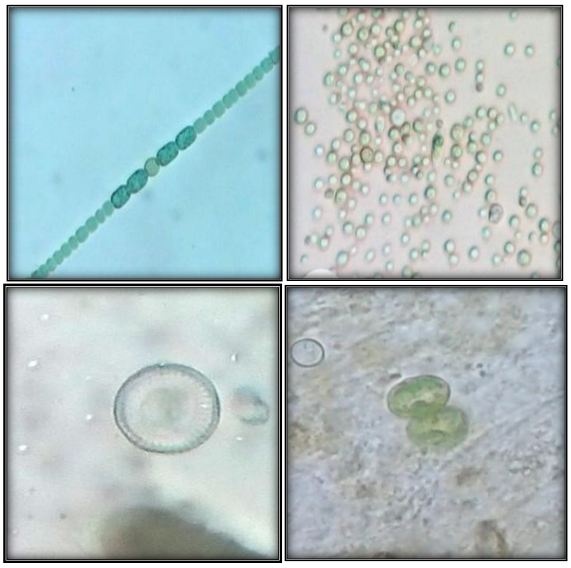
The temperature at the collection sites are very congenial being within the range of 20 to 25 °C, the pH was in acidic range varying from 5.5 to 6.5 and with low conductivity values from 018 to 029 μS which possibly are the regulating factors for the low diversity. Further, the lake is in the close vicinity of the locality which leads to the nutritionally sufficient due to loading of anthropogenic wastes and showed excessive growth of algal taxa predominantly under Cyanophyta, Chlorococcales under Chlorophyta, Euglenophytes and diatoms (Das *et al.*, 2009; Das and Adhikary, 2014; Siangbood and Ramanujam, 2014). Only one species of diatom (*Navicula spp.*) is common between all the six locations. This leads to the green pollution of the lake and makes water unusable for domestic purposes.

Closterium *Navicula*
Gomphonema *Nitzschia*

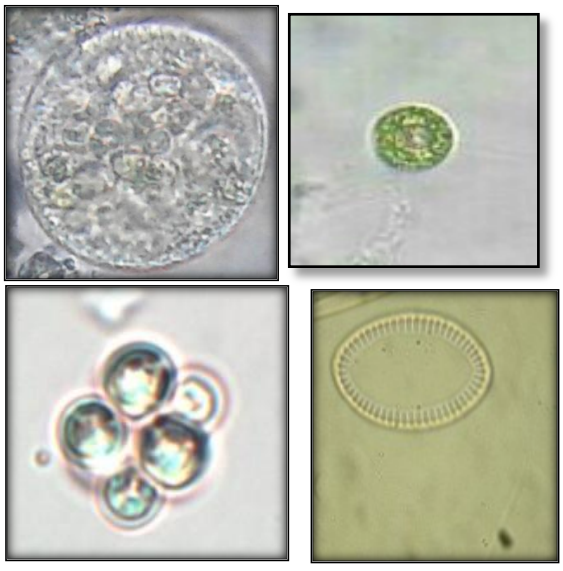


Chlorella *Oscillotoria*
Spirulina *Synendra*

Spirogyra *Oedogonium*
Arthrosipra *Euglena*



Anabaena *Microcystis*
Cyclotella *Chlorococcus*



Botryococcus braunii *Chlamydomonos*
Coelastrum *Cocconis*

IV. ACKNOWLEDGEMENT

Authors are indeed grateful to the Management and Dr. (Mrs.) C. T. Chakraborty, Principal of the College to provide infrastructural facilities and also the moral support throughout the tenure of the project. We are also very much thankful to Dr. C. P. Shukla, the Head; Mr. Bholanath Yadav, Laboratory Assistant and Mr. Pravin Singh (Sonu), Non Teaching Staff from the Department of Botany for their support and cooperation during the project.

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