

ECOLOGICAL AND COMPARATIVE STUDIES OF MICROCYSTIS BLOOMS OF TWO PONDS LOCATED AT DIFFERENT GEOGRAPHIC LOCATIONS IN PUNE AREA.

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Abstract :

Microcystis aeruginosa Kutz is one of the most cosmopolitan species among the planktonic cyanobacteria. Intracellular gas vacuoles cause this species to float in stagnant water, leading to accumulation of bulk population at water surface. This phenomenon is called as bloom.

In the present study two ponds of Pune region, which are located at different geographical conditions and altitude levels were investigated for survey of algal blooms of *Microcystis aeruginosa* Kutz. Studies were conducted to determine the occurrence and abundance of cyanobacteria in relation to physico-chemical parameters of Dehu Road pond and Sinhgad Fort pond, which is 1440m above from sea level. The chemical parameters selected for analysis were dissolved oxygen, free CO_2 , pH, total hardness, total suspended solids, sulphates orthophosphates and chlorides. The results showed that pH of water in both ponds were alkaline (were similar) in both ponds. In case of bicarbonates, total hardness, total suspended solids and sulphates showed very high concentration in Dehu road pond while chlorides were totally absent. Whereas orthophosphates were absent in Sinhgad pond. It was also observed that density of *Microcystis* was maximum in sinhgad pond.

Keywords: Algal blooms, *Microcystis*, Pune region, Physico-chemical parameters.

Introduction

The occurrence of Cyanobacterial blooms is a global problem. They grow in fresh water, saline &

marine water bodies . The ecological studies of water bodies have gained immense importance in recent year. The use of algae as an indicator of water quality & pollution has been used studied by many researchers.

Microcystis aeruginosa kutz is one of the most cosmopolitan species among planktonic Cyanobacteria. A dense growth of planktonic algae often involving just one or few species usually imparting a distinct colour to the water body is referred as 'Algal blooms'. Micro cysts blooms typically thrive in warm, turbid & slow moving water . *M. aeruginosa* Kutz occur in fresh to moderately brackish water producing bad smelling & unsightly scum , preventing use of water bodies. The production & release of range of cyanotoxins is often associated with algal blooms under such condition the productivity of zooplankton and thereby fish is reduced.

Materials and methods:

Dehu Road Pond B:

This pond is located along new Pune-Mumbai highway about 17 km North of pune .Pond B is wedged shaped slightly bigger pond . This pond is also with permanent blooms of *Microcystis aeruginosa* (Kutz). Length of the pond is about 300ft. Width of the pond towards its widest region is 200ft while towards its narrow region it is 5ft only. Depth of the pond is about 25ft. This pond receives water from rain, ground sewage water through the canal. The pond water is used for brick construction. Excess water along with the raw material used for brick construction finds its way back in to the pond. Close to the brick work there is a small unit that deals with stone crushing, from this unit the waste water along with fine gravels flows in to the pond.

Sinhgad Entry Gate Pond:

Sinhgad is one of the historic fort of Maharashtra and had strategic importance in the history of Maratha's .The fort lies on a hill having an altitude of above 1440 meters from sea level. The fort is about 1000 meters in length and 647 meters in width. There are number of ponds located on the fort. Large number of tourist visits the fort almost every day. Most of the ponds are in a bad shape and highly polluted.

Entry Gate Pond:

This pond lies in the close vicinity of the main gate (Pune gate) of the fort. This pond is well constructed and rectangular in shape. The pond measures above 150 in length 75ft in breadth and 25ft in depth. The pond is provided with steps. The pond water is used for washing off cloths and

cleaning of utensils by residents of the fort.

Water samples from concerned localities were collected and analysed for various Physico-chemical Parameters such as pH, Temperature, Colour, Dissolved oxygen(DO), Biochemical Oxygen Demand(BOD), Free CO₂, Total alkalinity(carbonate and bicarbonate), Hardness, Total suspended solids(TSS), Sulphates and Ortho-phosphates. The methods recommended by APHA (1980) have been followed in most cases.

For the purpose of analysis H₂O samples from the ponds were collected between 8.00am to 1.00 pm. The selected parameters were analysed using standard methods. Separate samples were collected for the estimation of dissolved O₂ and free CO₂ using 300ml Borosil bottles. DO was immediately fixed on the site before further analysis to reduce error. For estimation of other chemical parameters samples were collected in 5 liter plastic cans and analysed within 4 hours of sample collection. (Table no.1)

Methods used for analysis of Water Parameter:

Sr.No	Parameters	Methods
1.	Dissolved Oxygen	Modified Winkler method
2.	pH	pH Paper
3.	Chloride	Titrimetric method
4.	Total Hardness	Titrimetric method
5.	Ortho-phosphate	Ammonium molybdate stannous chloride method
6.	Sulphate	Colorimetric method

Discussion:

The factors that promote blue green algal blooms are shallowness, warm temperature, high nitrogenous and phosphorus contents and good supply of half bound CO₂ [Deshikachary, (1959)]. Analysis of the water samples collected from Dehu road pond and Sinhgad entry gate pond showed the following results. Temperature records by Indian worker indicate prevailing temperature range from 5⁰c-35⁰c during the bloom of *Microcystis*. Temperature recorded during our study was 22⁰c -23⁰c

Bloom forming blue green algae usually occur in the hard water than the soft water (Reynolds 1975). Cherunoussva et.al (1968) demonstrated dependence of *Microcystis* on bi-carbonates for their photosynthesis. Hydrobiological data by Indian workers in the water bodies

with *Microcystis* blooms indicate presence of bi-carbonates ranging from 34.39 mg/l to 328.25mg/l. The estimated amount of bi-carbonates in Dehu road pond was 405mg/l & in Sinhgad pond was 165 mg/l. The pH in this water ranged from 7.3 to 7.5. The hardness values were also much higher in studied pond water bodies from 66 to 156 mg/lit.

Nitrates and phosphates have been considered as key elements in the growth of phytoplankton. Based on experimental study Gerloff & Skogg (1954-57) concluded that excessive nutrient densities are not essentials for the production of *Microcystis*. The phosphate values determined by Indian worker during the bloom ranged from 0.1 to 115 µg/lit. Among the water bodies studied for *Microcystis* bloom, Sinhgad pond exhibited lack of phosphates. In Dehu road pond phosphates was 0.68mg/lit. Sulphates in Dehu road pond was 1.53 mg/lit and in sinhgad pond it was 61mg/lit. It should be mentioned here that, nutrient concentration in the water is not a true measure of availability since it ignores fluxes and contents of the algal cells. Many algae in fact absorb and store far many more than their immediate needs when nutrients are freely available (Reynolds, 1975)

Pearseal (1932) was of the opinion that the growth of the blue green algae is favoured by dissolved organic compounds. During our study the estimated values of biochemical oxygen demand in Dehu road pond was 121 mg/lit & Sinhgad pond was 132 mg/lit. This very high value of biochemical oxygen demand indicates heavy load of organic matter. However, precise role played by organic matter in promoting blue green algae is still a mystery (Reynolds, 1975)

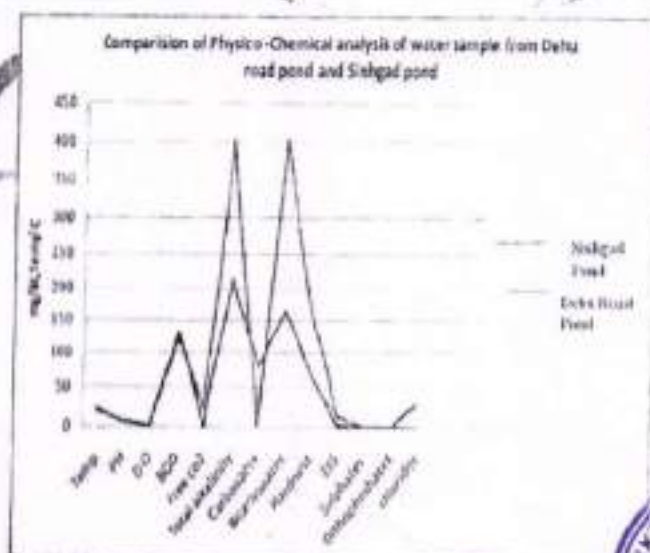
In Pune waters the *Microcystis* blooms are not confined to any narrow range of physico-chemical conditions. Shallow water condition, alkaline pH, high bi-carbonates and organic matters appeared to be most favourable for *Microcystis* blooms to occur.

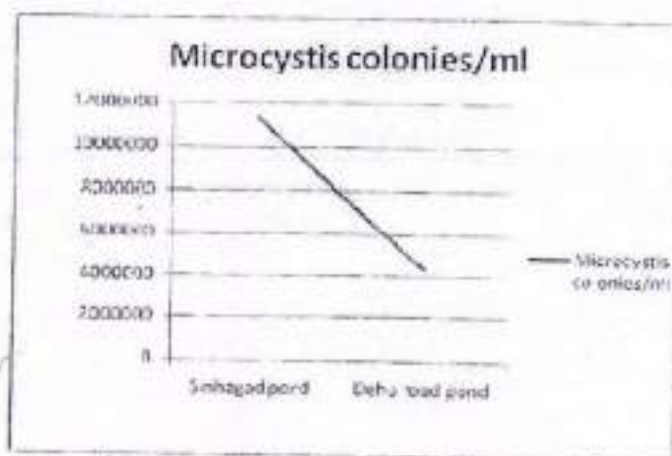
Chaeko (1954) reported several instances of O₂ depletion and large scale mortality of fishes and other fauna causing considerable damage and loss during his study. However such mortality of fish as well as direct toxic effect of *Microcystis* did not encounter during the study.

Thus shallow water conditions, alkaline pH, high bi-carbonates and high organic matter are the features appeared to be most favourable for *Microcystis* to grow in to a bloom.

Physico-Chemical Observations on Microcystis Bloom (Comparitive):

Parameters	Dehu road pond	Sinhgad road
Colour	Blue green	Green
Temp	23	22
PH	7.3	7.5
D.O	1.21	2.62
BOD	121	132
Free CO ₂	24.2	Ab
Total alkalinity	405	215
Carbonates	00	80
Bicarbonates	405	165
Hardness	156	66
TSS	14	3.15
Sulphates	1.53	0.61
Ortho phosphates	0.68	00
Chlorides		29.48
<i>Microcystis</i> colonies/ml	438 X 10 ⁴	114 X 10 ⁵





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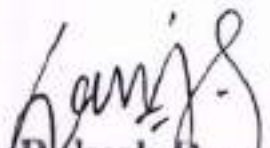
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