

Physico-Chemical and Biological Analysis of Mantrala Lake, Hyderabad

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ABSTRACT

The present paper deals mainly with the study of physico-chemical and biological analysis of Mantrala lake, Hyderabad. Mantrala lake is situated at Hyderabad. Present paper deals mainly with the study of physico-chemical parameters conditions on the phytoplankton community in Mantrala lake. The present study on Mantrala lake, Hyderabad, Telangana was undertaken from December, 2013 to November, 2015 to study abundance of phytoplankton and their relation with physico-chemical conditions of water. The various physico-chemical parameters like Temperature, pH, carbonates, bicarbonates, chlorides, Total hardness, calcium, Magnesium, Dissolved oxygen, Nitrates, Nitrites, Phosphates and sulphates were analysed. A total of 54 phytoplankton belonging to Bacillariophyceae, Chlorophyceae, Cyanophyceae and Euglenophyceae were identified. A clear dominance of Cyanophyceae over Chlorophyceae, Euglenophyceae and Bacillariophyceae was observed throughout the study period. On the basis of both physico-chemical and biological parameters the lake is highly polluted and eutrophic.

Keywords : Phytoplankton, Mantrala Lake, Water Quality and Physico-Chemical Parameters.

I. INTRODUCTION

The earth is water world with 71% of water coverage. Marine water with mean Ocean depth of 3.8 km and fresh water in the form of lakes, rivers, ponds, streams and ground water. Water is the most vital resource for life to survive. An anthropogenic change in the ecology of lakes is very common (Gupta and Verma, 2007). These physical, chemical, and biological changes have resulted in the loss of biological integrity in lakes (Gose and Pingale, 2007). Eutrophication can produce problems such as bad tastes and odours as well as green scum algae. Also, the growth of rooted plants increases, which decreases the amount of oxygen in the deepest waters of the lake. It also leads to the death of all forms of life in the water bodies (Sandhya, 2011). Absolutely

pure water is not available in nature because surface water absorbs particulates, carbon dioxide and other gases and mixes with silt and inorganic matters from the environment. The physico-chemical characteristics of water plays an important role in algal biodiversity and population dynamics of planktons (Javid Ahmad Shah and Ashok K.Pandit, 2012). Phytoplanktons, which include blue - green algae, green algae, diatoms, desmids, euglenoids etc, are important among aquatic flora. Phytoplankton constitutes the vary basis of nutrient cycle of an aquatic ecosystem (Imdranio Gupta et al., 2009). They play a crucial role in maintaining proper equilibrium between biotic and abiotic components of an aquatic ecosystem. They are ecologically significant as they form the basic link in the food chain of all aquatic floras (Ravikumar *et al.* 2006)

II. METHODS AND MATERIAL

The surface water samples were collected from the selected water body at an interval of one month, from December, 2013 to November, 2015. The samples were analyzed on the same day for different physico-chemical factors following the standard methods. The following factors has been analysed: Temperature, pH, carbonates, bicarbonates, chlorides, Total hardness, calcium, Magnesium, Dissolved oxygen, Nitrates, Nitrites, Phosphates and sulphates were analyzed following the APHA (1998). One litre of sample was separately collected and sedimentation was made in acid Lugol's solution. The supernatant was discarded. The phytoplankton sediment was concentrated to 30ml by centrifugation.

III. RESULTS AND DISCUSSION

The average values of physico-chemical parameters are reported in the table: 1.

Hydrogen ions (acidic) as well as hydroxyl ions (alkaline) are the result of the ionization of water. During the period of investigation the pH value ranged from 8.00 to 8.80 at all the stations. The average values of carbonates are 30.45 mg/L, 30.74 mg/L, 36.44 mg/L in station-I, station-II and station-III respectively. Bicarbonates were dominant in inorganic carbon complex in the lake. The average values were 22887 mg/L at station-I, 261.73 mg/L at station-II and 252.96 mg/L at station-III. Chlorides from pollution sources can modify natural concentration to a great extent. The average values were 260.89 mg/L at station-I, 285.30 mg/L at station-II and 271.26 mg/L at station-III. The average of DO were 1.77 mg/L at station-I, 1.62 mg/L at station-II and 1.12 mg/L at station-III.

The average values of organic matter were 25.07 mg/L at station-I, 30.8 mg/L at station-II and 17.39 mg/L at station-III. The averages of total hardness are 466.87 mg/L at station-I, 466.93 mg/L at station-II

and 428.04 mg/L at station-III. The average values of calcium were 73.13 mg/L at station-I, 78.01 mg/L at station-II and 56.53 mg/L at station-III. The average values of Total Dissolved Solids were 437.2 mg/L at station-I, 544.4 mg/L at station-II and 424.13 mg/L at station-III.

The average of sulphates values were 39.17 mg/L at station-I, 52.83 mg/L at station-II and 51.44 mg/L at station-III. The average values of phosphates were 2.56 mg/L at station-I, 2.49 mg/L at station-II and 2.47 mg/L at station-III. Nitrites form an intermediate oxidation state of nitrogen both in the reduction of ammonia and nitrates. Average values were 0.30 mg/L, 0.32 mg/L, 0.34 mg/L in station-I, station-II and station-III. The average values were 6.27 mg/L at station-I, 7.61 mg/L at station-II and 7.29 mg/L at station-III.

The higher value of pH during monsoon was due to the uptake of CO₂ by photosynthesizing organisms. In the current investigation, the chloride content was high due to discharge of domestic sewage (Banatwala *et al.*, 2004). Dissolved oxygen affects the nutrient availability resulting in the altered productivity of the entire water body (Das, 1991). In the present investigation, the DO content was very low due to pollution in the lake. High loads of industrial sewage and domestic sewage from the surrounding areas being dumped into the lake. A high pollution load may also decrease the DO values to a considerable level (Mahadev and Hosmani, 2005). Organic matter exhibited an inverse relation with dissolved oxygen this trend confirms the utilization of dissolved oxygen to decomposition of organic matter which is accelerated at high temperatures. In the present investigation reported high values of phosphates in the water due to receiving of domestic sewage. Increased loading of inorganic nitrogen into lakes frequently results from agricultural activities, sewage

and atmospheric pollution by man (Premalatha Vikal and Sandhya Tyagi, 2009).

The algal communities that are adapted to the hypertrophic conditions are represented by the genera belonging to the classes Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Four groups of algae were recorded in the lake i.e., Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Among the four groups of algae Cyanophyceae constituted the dominant group (Table-2).

Cyanophyceae is represented by blooms of *Oscillatoria limosa*, *Merismopedia punctata*, *Microcystis aeruginosa* and *Arthrospira punctata*. The presence of Chlorophyceae members are *Chlorella vulgaris*, *Coelastrum microporum*, *Scenedesmus acutiformis*, *Eudorina elegans*, *Chlamydomonas angulosa* and *Pandorina morum*. Euglenophyceae were represented by *Euglena polymorpha*, *Euglena acus*, *Euglena oxyuris*, *Phacus acuminatus*, *Phacus curvicauda*. Bacillariophyceae is represented by *Cyclotella meneghiniana*, *Navicula rhynchocephala* and *Nitzschia palea*.

IV. CONCLUSION

The present study continued for the period of 2 years (2013-2015) by collecting periodic water samples for the estimation of physico-chemical and biological aspects with reference to the existing social and cultural factors that affect the lake. The activities of man have a profound influence on the degradation of water quality in the lake. The main source of nitrates is the entry of untreated domestic sewage into the lake from the surrounding residential areas. The results of various physico-chemical factors were compared with WHO and ISI Standards. All the physico-chemical parameters are well above the permissible limits. Hence on the basis of both

physico-chemical and biological parameters the lake is highly polluted and eutrophic.

V. REFERENCES

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Table-1
AVERAGE VALUES OF PHYSICO-CHEMICAL PARAMETERS

All Parameters are expressed in mg/L except pH and Temperature (°C)

S.No	Physico-Chemical Parameters	Station - I	Station - II	Station - III
1	Temperature	23.95	23.38	23.19
2	pH	8.50	8.39	8.50
3	Carbonates	30.45	30.74	36.44
4	Bicarbonates	228.87	261.73	252.96
5	Chlorides	260.89	285.30	271.26
6	Dissolved Oxygen	1.77	1.62	1.12
7	Organic Matter	25.07	30.8	17.39
8	Total Hardness	466.87	466.93	428.04
9	Calcium	73.13	78.01	56.53
10	Magnesium	50.16	57.56	37.85
11	Total Dissolved Solids	437.2	544.4	424.13
12	Total Suspended Solids	232.63	155.93	241.2
13	Sulphates	39.17	52.83	51.44
14	Phosphates	2.56	2.49	2.47
15	Nitrites	0.30	0.32	0.34
16	Nitrates	6.27	7.61	7.29

Table-2
Percentage of Phytoplankton

Groups	Station-I	Station-II	Station-III
Cyanophyceae	74.89	76.35	75.70
Chlorophyceae	18.08	17.10	17.01
Euglenophyceae	4.53	4.62	4.03
Bacillariophyceae	2.50	1.93	3.25