Water Quality Monitoring in Fox Sagar Lake, Jeedimetla, Hyderabad, Telangana

A. Rajani[1], E. M. Sunitha[2], A. Kavitha[3], D. Pankaja[4] and S. Anitha[5]

[1, 3]Assistant Professor, Department of Botany, RBVRR Womens College, Narayanguda, Hyderabad, Telangana, India
[2]Head, Department of Botany, RBVRR Womens College, Narayanguda, Hyderabad Telangana, India
[4]Assistant Professor, Department of English, RBVRR Womens College, Narayanguda, Hyderabad Telangana, India
[5]Assistant Professor, Department of Zoology, RBVRR Womens College, Narayanguda, Hyderabad, Telangana, India

ABSTRACT

Fox Sagar lake pump house was constructed in a typical Nizams architecture. It is the main source of drinking and irrigation. Due to rapid increase of urbanization and population, the lake is converted into a waste dumping site, particularly industries and sewage in view of this the present work has been undertaken for the monitoring of water quality. The water samples from the surface were collected from the three sampling stations every month in polythene cans for a period of 2 years from June 2013 to May 2015. For the monitoring of water quality in the lake, the following water quality parameters were analyzed by standard methods (APHA, 1995). The main objective of physico-chemical analysis of water is to determine the nutrient status of the medium. Since the water contains dissolved and suspended constituents in varying proportions it has different physical and chemical properties along with biological variation. The quality of water may be affected in various ways by pollution.

Keywords : Fox Sagar Lake, Physico-Chemical Parameters and Water Quality

I. INTRODUCTION

Water is the most important in shaping the land and regulating the climate. It is one of the most important compounds that profoundly influence life. Water quality of surface, stored and groundwater sources deteriorates by natural phenomena and as a result of human activities making it less suitable for drinking and other uses as water pollutants could highly affect human health along with other living organisms (Jain and Seethapathi, 1996). This essentially requires that the quantitative analysis of major pollutants in water be continuously monitored.

Algae are involved in water pollution in number of ways. Surface water often has taste and odour problems particularly in regions of dense population of algae, aquatic vegetation and decaying vegetation and runoff from agriculture regions (Javid Ahmad Shah and Ashok K.Pandit, 2012). The microscopic algae in water system greatly affect the chemical components and the nutrient cycles. Trophic levels of lakes are characterised by the level of algal production and the types of algal species present (Mahadev and Hosmani, 2005). Generally a high algal production and deoxidation caused by the replacement of Chlorophyceae by Cyanophyceae species indicate the eutrophic nature of waters.

II. METHODS AND MATERIAL

Fox Sagar lake is located in Jeedimetla near Kompally, Hyderabad. It is famous for its natural beauty known locally as Kotta Cheruvuthe, Nizam constructed a dam on the lake naming it Fox Sagar in 1897, as part 31 lakes created for improving water sources for the city of Hyderabad. The lake is polluted by emissions from an adjoining industrial estate, killing fish and migratory birds.

Three sampling stations were selected from the Fox sagar lake and are characterized as follows: The water samples from the surface were collected from the three sampling stations every month in polythene cans for a period of 2 years from June 2013 to May 2015. For the monitoring of water quality in the lake, the following water quality parameters were analyzed by standard methods (APHA, 1995). (1) pH (2) Temperature 3) Total Alkalinity 4) Chlorides (4) Total dissolved solid

(TDS) (5) Total Solids (TS) (6) Dissolved oxygen (DO) (7) Chemical oxygen demand (COD) (8) Total Hardness 9) Calcium 10) Magnesium 11) Phosphates and 12) Nitrates. Surface water samples for phytoplankton were collected from the 3 sampling stations. One litre of the sample was kept in sedimentation columns after adding 4% Formaldehyde solution.

III. RESULTS AND DISCUSSION

Table 1. Comparison of the Present Data with ISI and who And Standards

Parameters	Station-I	Station-II	Station-III	ISI 1991	WHO 1971
pH	8.25	8.20	8.18	6.5 - 8.5	6.5-8.5
Alkalinity	223.14	247.63	266.68	.	.
Cl^-	364.95	375.99	365.72	.	250 mg/L
DO	2.90	3.10	2.95	6 mg/L	3 mg/L
OM	17.00	16.43	18.05	.	.
TH	529.27	530.08	530.94	300 mg/L	300 mg/L
Ca^{2+}	79.15	82.46	82.13	200 mg/L	75 mg/L
Mg^{2+}	67.14	70.78	71.21	75 mg/L	30 mg/L
PO_4^{3-}	3.60	3.10	3.50	.	.
NO_2^-	0.28	0.20	0.25		
NO_3^-	6.80	6.25	4.20	45 mg/L	.
SO_4^{2-}	43.00	38.00	33.00	200 mg/L	150 mg/L

During the period of investigation the pH value ranged from 8.00 to 8.80 at all the stations. pH is indicative of hydrogen ion concentration and it expresses the intensity of acidity

or alkalinity. Any change in pH of water is accompanied by changes in other physico-chemical aspects of the medium. The pH of water determines the solubility and biological availability of certain chemical nutrients such as phosphorus, nitrogen, carbon and heavy metals like lead, copper, cadmium. Pawar and Mane, (2006) has stated that the higher value of pH during monsoon was due to the uptake of CO_2 by photosynthesizing organisms.

Alkalinity is a measure of the buffering capacity (ability to resist changes in pH) of the water, and since pH has a direct effect on organisms as well as an indirect effect on the toxicity of certain other pollutants in the water, the buffering capacity is important to water quality. Commonly occurring materials in water that increase alkalinity are carbonates, bicarbonates, phosphates and hydroxides. In the present study the chloride values were very high indicating high salinity and heavy sewage pollution. In the Fox Sagar lake chlorides were high at all the stations. The average values are 364.95 mg/L, 375.99 mg/L, and 365.72 mg/L respectively, at station-I, Station-II and station-III. The high values of chlorides could be attributed to greater amount of domestic and industrial sewage dumping that off-sets dilution effect.

Similar observations were made by Kodarker *et al.,* (2003).

The dynamics of dissolved oxygen concentration is one of the fundamental and important factors influencing the aquatic environment both chemically and biologically. During summer month's low dissolved oxygen were recorded in the first year of investigation which could be attributed to high water temperature which reduces the solubility of gas and accelerates the oxidation of organic matter (Wetzel, 1983). In the present investigation accumulation of organic matter in water was observed at high temperature. This is in accordance with the observations made by Gowd and Kotaiah, (2000) that the long sunshine days more favourable for the concentration of oxidizable organic matter in water.

In the present investigation the highest total hardness recorded in summer (322 mg/l) and the lowest values were recorded in winter (309 mg/l). In the present study, the accumulation of calcium content was more in Fox Sagarlake. This may be due to discharge of sewage from the city. The observations of the current study are in agreement with the of Rajeev Sharma and Ajay capoor (2010) and Rajakumar *et al.,* (2006). The high values observed in summer could be due

to evaporation, increasing the concentration of magnesium (Ravikumar, 2006). During the period of investigation, magnesium contents were found to be high in Fox Sagar lake.

The most significant form of inorganic phosphorus is orthophosphate (PO_4^{3-}). It is the only directly utilizable form of soluble inorganic phosphorus. Apart from small quantities of phosphates present in a lentic system, domestic sewage, agricultural drainage, cleaning detergents. Nitrites in the lake was formed dominantly by the process of reduction from nitrates, in the presence of denitrifying bacteria which are active at moderately high temperature in the oxygen deficient condition, rather than by oxidation of ammonia. Thus the summer observations were higher than winter values. In the present investigation the determination of nitrates is significant in that it is a measure of the status of eutrophication as it gives the content and availability of decomposable organic matter. The major sources of

sulphur in natural waters are rocks, fertilizers and waste discharges from industries.

In Fox Sagarlake four groups of algae were recorded i.e, Cyanophyceae, Chlorophyceae, Bacillariophyceae and Euglenophyceae. Among the four groups of algae Cyanophyceae dominated over the other groups of algae, followed by Chlorophyceae. The diatoms were represents very less in number. In general the Cyanophyceae constituted the high peaks during summer and diatoms in winter. Chlorophyceaee dominant in early summer.

Cyanophycean members showed well marked periodicity in the lake and formed the dominant group of the algal members. The periodicity of Blue-green algae is accelerated with water temperature. Cyanophyceae forms exhibited qualitative and quantitative abundance forming blooms almost throughout the period of investigation. Blooms of *Oscillatoria* species were very common in lake Fox Sagar.

Chlorophyceae occupied the second position in the lake. Chlorophycean members continued to be present in the same respect at all the stations throughout the period of investigation. Among the Chlorophyceae. Chlorococcales dominated the lake. Chlorococcales are represented by the species of *Chlorella vulgaries, Coelastrum microporum, Scenedesmus acutiformis, Scenedesmus armatus, Ankistrodesmus falcatus, Actinastrum hantzschii,*

Scenedesmus quadricauda. Euglenophyceae formed comparatively lower fraction of the phytoplankton in the waters of the present investigation. The species of *Euglena polymorpha* and *Phacuslongicauda* were present. Diatoms showed very low periodicity in the lake. The species of *Cyclotella, Melosira, Nitzschia, Navicula* and *Gomphonema* were present.

IV. CONCLUSION

In the current investigation, the chloride content was high due to discharge of domestic sewage. 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. *Microcystis, Arthrospira,*

Oscillatoria, Chlorella, Scenedesmus, Cyclotella, Gomphonema, Nitzschia, Euglena, Phacus were dominant in the lake, they can used as good indicators of pollution. On the basis of both physico-chemical and biological characteristics the lake is polluted and eutrophic.

V. ACKNOWLEDGEMENT

VI. REFERENCES

[1]. American Public Health Association, American Water Works Association and Water Pollution Control Federation. 1995. Standard methods for the examination of water and waste water 19th ed. Published by APHA, AWWA and WPCF, Washington, USA.

[2]. Gowd,S and Kotaiah, B. 2000. Seasonal variation of water quality in a tropical Kalyani reservoir near Tirupathi, Indian Journal of Environmental Protection, 20; 452-455.

[3]. Jain, CK. and Seethapathi, P.V. 1996. Limnological studies of Kayamkulam Lake.Indian J. Environ. Protection 16(8): 561-568.

[4]. Javid Ahmad Shah and Ashok K.Pandit. 2012. Physico-chemical characteristics of water in Wular-lake- A Ramsar site in Kashmir Himalaya. International Journal of Geology,Earth and Environmental Sciences. 2(3): 45-54.

[5]. Kodarkar, M.S., Chandrasekhar, S.V.A., Subbaiah, M. , Anitha G., and Malthi, D., 2003. 'Environmental status of lakes in India' (With special reference to water bodies in and around Hyderabad, Andhra Pradesh, India). Proc. of the national conference on "Urban lakes - Environmental Status. Economics and Management options "(5-6 April).

[6]. Mahadev J and Hosmani S.P. 2005. Algae for biomonitoring of organic pollution in two lakes of Mysore city, Nature. Env.Polln. Techno. 4(1): 87-97.

[7]. Pawar, B.A and Mane, U.H. 2006. Hydrography of Sadatpur Lake, near Parvanagar, Ahmadnagar district, Maharastra, J. Aqua. Biol, 21(1): 101-104.

[8]. Rajakumar, S.,K. Shanthi, P.M. Ayyasamy, P. Velmurugan and P. Lakshmana perumalasamy, P. 2006. Limnological studies of Kodaikanal Lake in Tamilnadu, India. Nat.Env. and Poll. Technol., 5(4) ; 533-544

[9]. Rajeev Sharma and Ajay Capoor. 2010. Seasonal Variations in physical, chemical and biological parameters of lake water of Patna Bird Sanctuary in Relation to fish Productivity, World applied sciences journal. 8(1): 129-132.

[10]. Ravikumar , M., Manjappa, S., Kiran, B.R , Puttaiah, E.T. and Patel, A.N., 2006. Physico-chemical characterization of Neelgunda Tank near Harpanahalli, Davanagere, Ind.J.Env. Prot. 26(2): 125-128.

[11]. Wetzel, R.G., 1983. Limnologyo.Second edition. Edited by Wetzel, R.G. Michigan State University, CBC College publishing philadelphia, New York, Chicago.763.