A Study on the Physico-chemical parameters and Phytoplankton in Fox Sagar Lake, Hyderabad.

A.Rajani[1], E.M.Sunitha[2], P. Vani[3], T. Sree Lakshmi[4] and S.Anitha[5]

[1, 3]Assistant Professor, Dept.of Botany, RBVRR Womens College, Hyderabad.
[2]Head, Dept.of Botany, RBVRR Womens College, Hyderabad.
[4]Assistant Professor, Govt.Degree College, Ranga Reddy
[5.]Head, Dept.of Zoology, RBVRR Womens College, Hyderabad.

Abstract: **A Study was carried out in Fox Sagar lake, Hyderabad. In the present study, seasonal variaton of physico-chemical parameters and phytoplankton in Fox sagar lake carried out for a period of two years during 2013 June to May 2015. Fox sagar lake is located in Jeedimetla near Kompally, Hyderabad. All the physico-chemical parameters such as temperature, salinity, pH, dissolved oxygen and nutrients like nitrate, nitrite, inorganic phosphate and reactive silicate were studied in Fox sagar lake, Hyderabad for a period of two years. The phytoplankton revealed the presence of four major groups: Cyanophyceae, Chlorophyceae, Euglenophyceae and Bacillariophyceae. Out of which Cyanophyceae was dominant. The group wise population density is as Cyanophyceae > Chlorophyceae > Bacillariophyceae > Euglenophyceae . Blooms of Oscillatoria species were very common in lake Fox Sagar. Bloom of Microcystis and Arthrospira species were present throughout the year thus showing vast degres of tolerence to widely varying environmental conditions prevailing in different seasons of the year. The presence of these blooms indicate eutrophic nature of the lake.**

Key words: **Fox sagar lake, Physico-chemical parameters, phytoplankton and distribution**

I. INTRODUCTION

Water quality refers to the chemical, physical, biological, and radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or more biotic species and or to any human need or purpose (Banatwala *et al.*, 2004).

The monitoring of water quality can be done either by direct measurement of physico- chemical properties of water or by analyzing the inhabiting biota. The quality of an aquatic ecosystem is dependent on the physico-chemical qualities of water and the biological diversity of the system. Plankton is an important component of ecosystem, which responds to ecosystem alterations rather rapidly. It is due to the fact that plank tonic organisms play a key role in the turnover of organic matter and energy through the ecosystem (Dhere and Gaikwad, 2006). Planktonic organisms are known to react to different types of water pollution. This reaction is very rapid because of relatively short lifetime and high reproduction rates of the organisms. Since the phytoplankton plays a key role of primary producer in aquatic environment, it is the first component in the trophic tier affected by pollution (Gose and Pingale, 2007). They provide a crucial source of food to aquatic organisms such as fish and crustacean. They are found in all types of water as their presence or absence in water indicates the quality of water (Kumar and Singh, 2000). Phytoplankton being dominant photoautotrophic organisms in the aquatic environment play a significant role as a tool in assessing the quality of the water. This is because of the high degree of sensitivity these organisms, exhibit to the altering environment. Algae have long been used to assess environmental conditions in aquatic habitants throughout the world (Mohan and Reddy, 1987). Phytoplanktons, which include blue - green algae, green algae, diatoms, desmids, euglenoids etc, are important among aquatic flora. They are ecologically significant as they form the basic link in the food chain of all aquatic floras (Ravikumar *et al.*, 2006).

II. MATERIAL AND METHODS

Fox Sagar Lake, also Jeedimetla Cheruvu or Kotta Cheruvu, is the fifth largest lake, spread over 2 km^2, in Hyderabad, India. It Coordinates 17.524°N, 78.470°E. The lake is popular for fishing and a popular spot for picnics.

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. Water samples were collected in separate 250 ml glass bottles (BOD bottles) for the estimation of dissolved oxygen. All the samples were carried to the laboratory. The samples were analyzed on the same day for different physico-chemical factors following the standard methods (APHA, 1998).

One litre of the sample was kept in sedimentation columns after adding 4% formaldehyde solution. The samples were kept in dark undisturbed for about fifteen days for complete settling of the organisms. Finally the sample was concentrated to 100 ml.
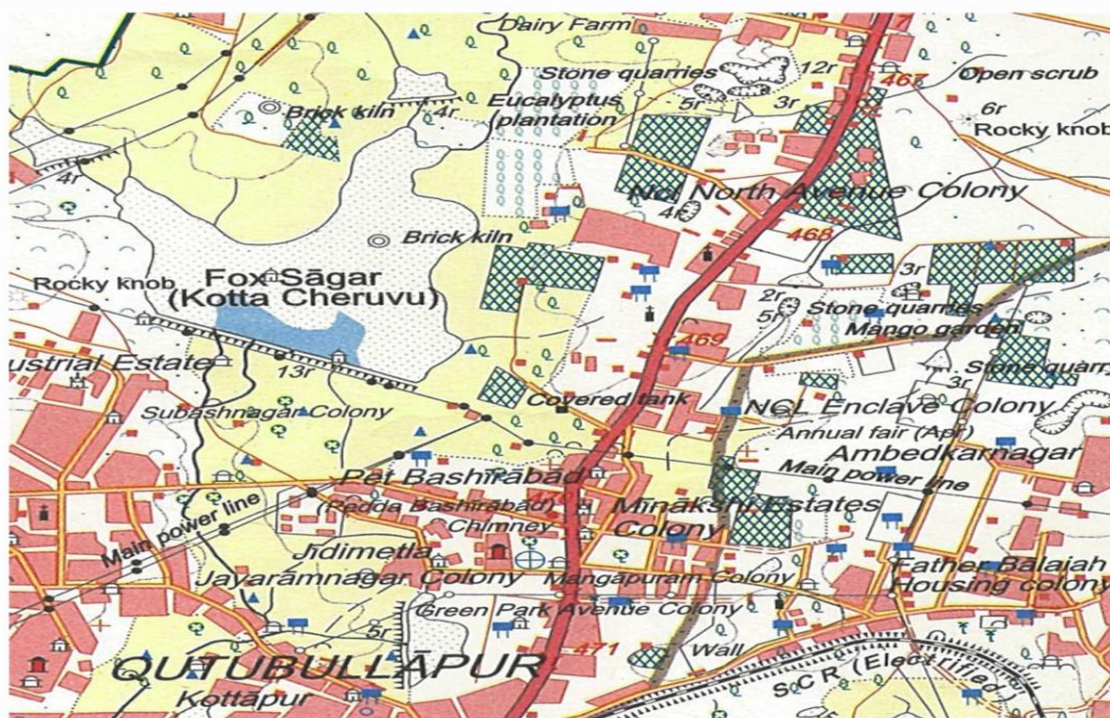
## III.	RESULT AND DISCUSSION

Physico - chemical parameters :

Average values of Physico-chemical parameters are incorporated in Table– 1

pH was measured using (model WTM pH 90) meter. The dissolved oxygen content was determined using oxygen meter, phosphate and nitrate were determined using the methods described in APHA(1998).

Temperature is one of the most significant factors that affect the aquatic environment (Sedamkar and Angadi, 2003). During the two years of investigation the mean atmospheric temperature was 29 ^{0}C in winter, 41^{0}C in summer , and 35 ^{0}C in monsoon. Carbonates were present in low concentration when compared to bicarbonates.

Carbonates exhibit a positive relationship with pH. In the present study the chloride values are very high indicating high salinity and heavy sewage pollution. In the Fox Sagar lake chlorides were high at all the stations. Higher values of dissolved oxygen during winter season is due to the increased algal population and its subsequent increased rate of photosynthesis at lower temperature Ravikumar *et al*., (2006) . In the present investigation COD values were low in winter , high in summer and moderate in monsoon.

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. Total hardness and calcium exhibited a positive relation between each other. In the present investigation the total hardness recorded highest values in summer (322 mg/l) and the lowest values were recorded in winter. In the present study, the accumulation of calcium content was more in Fox Sagar lake. This may be due to discharge of sewage

from the city. The observations of the current study are in agreement with tha of Rajeev Sharma and Ajay capoor, (2010) and Rajakumar *et al.,* (2006). In the lake, the phosphate values were on higher side in winter and monsoon with minimum values during summer. Similar observation was made by Kumar and Singh, (2000) and Mustapha, (2003). 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. Javaid Ahmad Shah and Ashok K Pandit, (2012). High values of total solids were recorded in early summer (520 mg/L and low values prevailed in winter (610.0 mg/L during Dec). This is in accordance to the observations made by Ugale and Hiware, (2005). The maximum values of total dissolved solids monsoon or summer values were followed by minimum winter values. Maximum monsoon values in lake could be attributed to the increased surface runoff into the lake, resulting in an increased level of allochothnous organic matter which results in dissolved solid content.

Phytoplankton :

Distribution of phytoplankton is incorporated in Fig : 1-3.

In Fox Sagar lake 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 Fox Sagar lake Cyanophyceae exhibited a well marked periodicity in the lake. They were present throughout the period of investigation reaching summer peaks (Fig: 1- 3). Kansime, *et al*., (1995) stated that the Blue-green algae development depends Cyanophycean members constituted 80% of the total algae when the

water temperature fluctuated between 24-26 ^{0}C. The species *Oscillatoria* and *Microcystis* were dominant in the lake. on the ability of lakes to maintain low concentrations of dissolved oxygen for a long period. In Fox Sagar summer forms were dominated by the species of *Oscillatoria limosa, Merismopedia punctata, Microcystis aeruginosa, Arthrospira punctata.*

Chlorophycean members continued to be present in the same respect at all the stations throughout the period of investigation. According to Purohit and Saxena (1999) and Pulle and Khan (2003) the presence of Chlorophyceae in eutrophic water is due to their nutrient contents. 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 fracton of the phytoplankton in the waters of the present investigation. The species of *Euglena polymorpha* and *Phacus longicauda* were present. Euglenophyceae represented by the species of *Euglena polymorpha, Euglena acus, Euglena proxima, Euglena oxyuris, Phacus acuminatus, Phacus curvicauda* and *Phacus longicauda*

In the present study the diatoms were recorded very less number. Some diatoms existed throughout the period of investigation while many occurred rarely and were not in abundance, due to high concentration of organic matter. The species of *Cyclotella, Melosira, Nitzschia, Navicula* and *Gomphonema* were present.

IV. CONCLUSION

In the present investgation a broad insight into the chemical parameters of the lake suggests that the concentration of bicarbonates, organic matter, nitrates, phosphates and calcium generally high. Though oxidizable organic matter plays an important role in determining the trophic status has been taken into consideration. In the lake high levels of organic matter was recorded. This is clearly indicates that the lake categorized as eutrophic based on these parameters like chlorides (375.99 mg/L), organic matter (18 mg/L), total solids (782 mg/L), phosphates (3.5 mg/L), nitrates (6.8 mg/L).

The phytoplanktonic diversity and the dominance of blue greens is an indication to organic pollution. Organic pollution in the present study is evident from the luxurient growth of *Microcystis aeruginosa, Oscillatoria limosa and Merismopedia punctata* and blooms of *Cyclotella meneghiniana, Navicula rhynchocephala and Nitzschia palea.*

Hence on the basis of both physico-chemical and biological parameters the lake is highly polluted and eutrophic

V. REFERENCES

[1]. APHA (1998). Standard Methods for the evaluation of water and Wastewater Zothed, American public Health Assoication, Washington, D.C.

[2]. Banatwala, R.C., S.D.Dongre, P.K. Mishra and R.G. Verma. 2004. Limnological study of Sapna Reservoir at Bethi (M.P.). Env. Conserv.J. 5(1-3): 71-75.

[3]. Dhere, R.M and Gaikwad, j.m. 2006. Physico-chemical characteristics of Karpara Reservoir dist. Parbhani, Maharashtra. J.Aqua.Biol., 21(2): 86-88.

[4]. Gose, A.B and Pingale, S.D. 2007.Physico-chemical study of Ujani dam backwater. Indian Hydrobiology, 10(1): 171-174.

[5]. 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.

[6]. Kansime, F., Kateyo, E and Okot-okumu, J. 1995. Effects of pollution on Inner Murchison bay (Lake Victoria- Uganda) on the distribution and abundance of plankton, A report of Makerere institute of environment and natural resources.

[7]. Kumar.A. and N.K. Singh. 2000. Phytoplanktors of a pond at Deoghar, India. hykos. 39 (1&2) : 21-33.

[8]. Mohan, K.S and N.S .Reddy . 1987. A study of cations in two freshwater lakes of Hyderabad .India Poll.res. 6:pp. 5-8.

[9]. Mustapha, M.K. 2003. A pre-impoundment study of the limno-chemical conditions of Oyun lake in Ilorin, kwara State, Nigeria, Africa Journal of Applied zoology and Environmental Biology.

[10]. Pulle, J.S and Khan, A.M. 2003. Studies on dissolved nutrients of Isapur dam, India. Poll.Res.22(3) : 393-396.

[11]. Purohit,S.S and Saxena , M.M. 1999. Water, life and pollution in physical, chemical and biological characteristics of water.Agro Botanical Publishers (India) New Delhi. pp.250.

[12]. 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.

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

[14]. Ravikumar M Manjappa S Kiran BR and Puttaiah ET. 2006. Phytoplankton periodicity in relation to Abiotic factors in Kulahalli tank near Harapanahalli, Karnataka. *Nature Environment and Pollution Technology* 5 (1): 157-161.

[15]. Sedamkar, E and Anagadi, S.D. 2003.Physico-chemical parameters of freshwater bodies of Gulbarga, India, with special reference to

phytoplankton, Pollution Research. 22(3) : 411-422.

[16]. Ugale, B.J and Hiware, C.J. 2005. Limnological study of an ancient reservoir, Jagatunga samudra located at Kandhar, Maharastra, Eco, Env. Cons. 11(3-4) : 473-475

Table-1
AVERAGE VALUES OF PHYSICO-CHEMICAL PARAMETERS
All Parameters are expressed in mg/L except pH and Temperature(^{0}C)

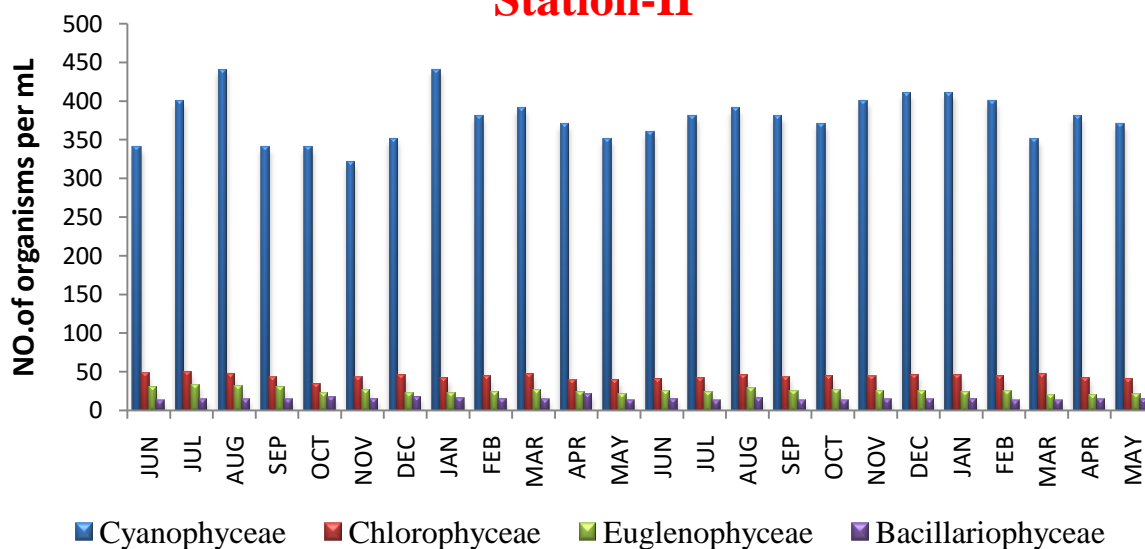| S.No	Physico-Chemical Parameters	Station - I	Station - II	Station - III
1	Temperature	23.30	23.50	23.80
2	pH	8.25	8.20	8.18
3	Carbonates	17.30	14.13	12.62
4	Bicarbonates	213.14	217.63	216.68
5	Chlorides	364.95	375.99	365.72
6	Dissolved Oxygen	2.90	3.10	2.95
7	Organic Matter	17.00	16.87	18.05
8	COD	97.49	95.08	85.00
9	Total Hardness	529.27	530.08	530.94
10	Calcium	79.15	82.46	82.13
11	Magnesium	67.14	70.78	71.21
12	Total Solids	782.66	767.38	771.1
13	Total Dissolved Solids	425.61	452.38	484.40
14	Phosphates	3.57	3.03	3.50
15	Nitrates	6.80	6.25	4.20

Distribution of algae

Figure: 1

Station-I
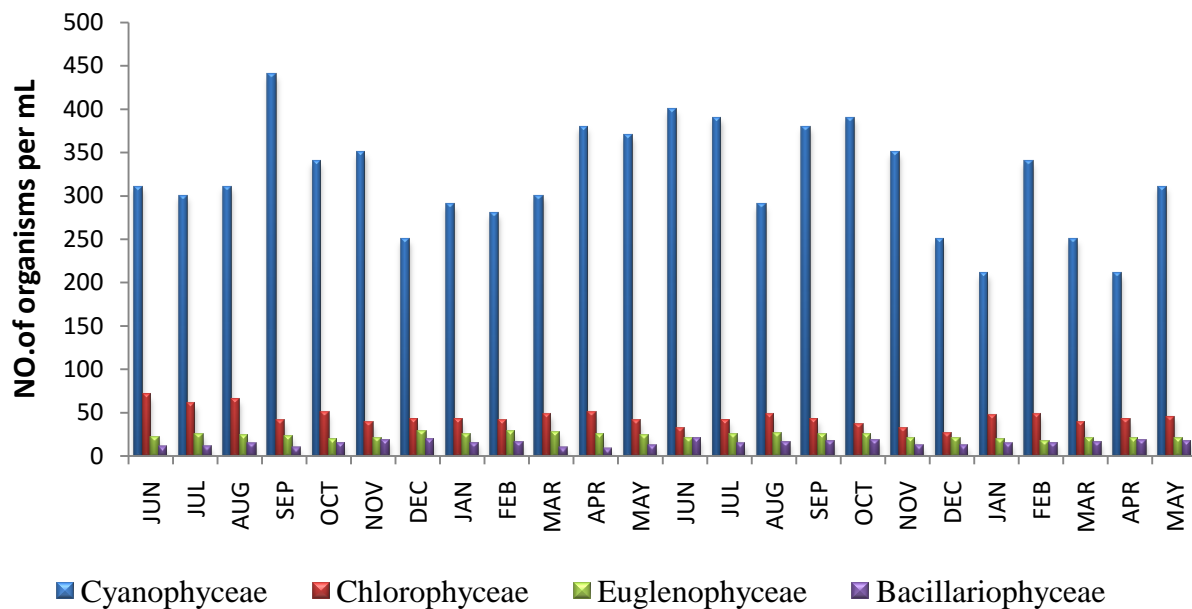
Figure: 2

Station-II

Figure: 3

Station-III