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Spatial Distribution and Seasonal Periodicity of Freshwater Algae in Telangana Lakes

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ABSTRACT

The present investigation includes a systematic study on the algal diversity of Ali Sagar lake of Nizamabad district in Telangana, which is an unexplored virgin land enriched with great many species of algae. Lake water is used for drinking and irrigation purposes. It serves the basic needs of people living in and around the district. Keeping a few of these points in view, the present experimental work was undertaken to elucidate certain aspects like the distribution and periodicity of algae and assess physico-chemical, biological parameters. Aquatic pond chains were first established by phytoplankton, which are tiny populations of algae found in water. A diverse community of phytoplankton is directly proportional to an aquatic system's productivity. Various aquatic creatures, including zooplankton and fish, rely on them as a food supply. The distribution, abundance, and variety of plankton species are impacted by physicochemical factors. Phytoplankton diversity is very sensitive to changes in nutrient availability and other aquatic environmental factors, such as silica.

Keywords: *Algal diversity, physico-chemical parameters, Nizamabad district.*

INTRODUCTION

Phytoplankton are photosynthetic floating organisms in aquatic environments both freshwater and seawater. Plankton algae are microscopic suspended plants that live at the mercy of the water movements .[1] Their photosynthetic activities remove carbon dioxide from the environment and release oxygen, thus they are responsible for mitigating some of the effects of increased carbon dioxide in the atmosphere. For aquatic ecosystems, they are the foundation of the food web. Zooplankton, fish, and other aquatic creatures rely on them as a primary source of nutrition. Many colonies of algae in aquatic environments are quite productive, according to [2].

All aquatic species relies on phytoplankton for survival, as they are the building blocks of the aquatic food web. In addition, they produce a significant amount of the oxygen that we breathe. As their population grows, these microscopic plants draw more carbon dioxide from the air to fuel their photosynthesis process. Phytoplankton are incredibly adaptable to their surroundings. There are plankton algae in water bodies like lakes and streams. Water composition, temperature, and salinity are just a few of the variables that these organisms are able to withstand.The age of water, lightand temperature are the major regulating factors , [3,4,5] for the development of phytoplankton and many physico-chemical factors and factor complexes are responsible for the distribution and periodicity of algae.

MATERIAL AND METHODS

The lake is used for both irrigation and drinking water. Soil moisture, water, light, pH, and other physico-chemical factors are crucial for aquatic plant growth. From February to December of the same year, a comprehensive inventory of marshy and aquatic plants was compiled.

Study Area

The district of Nizamabad was chosen for this research. The name of the district, Nizamabad, comes from the Deccan ruler of the 18th century, Asaf Jahi VI, Nizam of Hyderabad. The area was once known as Indur, which is thought to have been derived from the name of the prosperous 5th-century A.D. ruler Indradutta. The borders of Nizamabad District are as follows: Adilabad District to the north, Karimnagar District to the east, Medak District to the south, Nanded District to the west, and Bidar to the south-west, as shown in Figures 1 and 2.The district covers an area of 9,80,595 acres, which is equivalent to 7,956 sq. kms. The exact coordinates of the district can be found between 770.40 and 780.370 on the east coast and 1805 and 190 in the north. The area has tropical weather because of its distance from the shore. There is a large range of temperatures. Temperatures can drop to 50 degrees Celsius in the winter and soar to 470 degrees Celsius at the height of summer, with a typical average minimum of 13.70 degrees Celsius and an average maximum of 39.90 degrees Celsius. It rains between 878 and 1220 millimeters each year. The area includes 1064 wetland areas. Major wetland types existing in the district are reservoirs followed by tanks, ponds, rivers and streams.

Godavari is arriver that runs from western to southern India and it enters Telangana at Basara in Adilabad District. Nizamsagar is a reservoir built on the Manjira River, a tributary of the Godavari River, situated between the villages of Achampet and Banjapalle in Nizamabad district.Ashok sagar is a major irrigation lake situated at a distance of 7Km from Nizamabad town.

Other lakes are Choudamma lake Boddummidi Lake, Oora Lake Jaggasagar lake, Pochammakunta lake, Choutpally lake, Dharpally lake, Sakera lake, Bibipet lake, Jangampally lake, Yalamakuntla lake, Suddapally and PipriPonds are very beautiful. Pochampad dam (SRSP) is one of the major projects in Nizamabad.

Fig-10: Overview of Ali Sagar Lake

Fig-11: Satellite View Ali Sagar Lake

RESULT S AND DISCUSSION

DISTRIBUATION AND PERIODICTIY OF PHYTOPLANKTON:-

Increase in growth of population, wide range of human activates, grazing, and industrialization had led to greater stress on food production, it lead to an increase in pollution of aquatic ecosystem these causes changes in abiotic and biotic organisms. Phytoplanktons are restricted to lentic waters and large rivers with reduced current velocity .This evident plays most important in phytoplankton as very limited powers of locomotion is subjected to distribution by water movements. The phytoplankton diversity of lake was investigated from October 2013 to September 2015. This study examines the lake of Alisagar four groups of algae belonging to Chlorophyceae, Bacillariophyceae, Cyanophyceae and Euoglenophyceae were identified.

DISTRIBUTION OF PHYTOPLANKTON IN ALI SAGAR LAKE:-

In Ali Sagar Lake also members of chlorophyceae were found dominant. The percentage of this lake are 34.65%, 36.40 % and 34.30% in station I,II, and III, respectively cyanophyceae group occupied the second position. The percentage is 32.95% 32.47%, 33.03% at station I,II, and III. Bacilloriophyceae members occupied the third position constituting about 31.81%, 30.43%, 31.93% at station I,II and III. Euglenophyceae members occupied the fourth position, constituting 0.57%, 0.68%, 0.72% at station I,II and III Respectively. (Fig. 1 & 2)

DISTRIBUTION AND PERIODICITY OF CHLOROPHYCEAE IN ALI SAGAR LAKE:-

At each of the three locations, the chlorophyceae group was at the top. According to the current study, this group's performance in Alisagar Lake was best during the monsoon and worst during the summer and winter. All three locations maintained the presence of chlorophyceae throughout the experiment. Both lakes included members of the chlorophyceae class, which includes the orders volvocales, chlorococcales, oedogoniales, zygnematales, and charales. In environments with high nutrient concentrations and rising water temperatures, chlorophyceae thrive. Several researchers have periodically stressed the importance of temperature in green algae genesis and proliferation. In the present study pH is more than 7 in both lakes at all stations. pH of water has a direct impact on the distribution. [5] Concluded that the composition and relative frequencies of chlorococcales occur in inland fresh water depend upon a member of factors which operate temperature, sunshine, water level, pH, phosphates and organic matter. [6] Revelaed that pH and denser population of chlorococcales followed a sequence the present data support above findings. In the present investigation in all the three stations in lake found to be an alkaline showed high concentrations of desmids. The presence of desmids indicates the unpolluted water quality. They serve as the biological indicates of fresh water bodies. In was observed that high dissolved oxygen and a temperature range of 21ºc- 30ºc favor the desmids population. According to [7] multiplication of desmids in summer is due to high temperature ranging between temperature ranging between 21ºc-30ºc [8] points out those desmids are generally believed to favor of oligotrophic nature which supports present observation.

DISTRIBUTION AND PERIODICITY OF CYNOPHYCEAE IN ALI SAGAR LAKE:-

Cyanophyceae rank II in station – I, II and III of in Ali sagar lake it rank II in station I,II and rank III in station – III cyanophyceae exhibit a well-marked periodicity in all three stations of Ali sagar lake. In all three stations of the lake exhibit higher in summer is due to the different chemical composition of three stations viz., average concentration of organic matter, sulphates, chlorides, carbonates etc., water temperature is an important factor for blue green algae. [9] emphasized the importance of water temperature on blue-green algae. They pointed out that blue green algae develops in high temperature which coincides well with present results that high temperature developed the growth of blue green algae in both the lakes.

The abundance of these members during summer months with bright sunshine is for their predominant growth or multiplication Contrary to this [9] observed the abundance of blue-green during low temperatures.[10] have observed that physical factors such as warm water influence the growth of blue green it was observed that the periodicity of cyanophyceae fluctuated with the temperature . Blue green algae were in abundance during March – June in both lakes this clearly indicates that they can tolerate wide range of temperatures similar observation was reported by [11] in the lakes around Hyderabad city lower abundance of blue green algae were recorded from the sample lakes during monsoon and winter compare to summer season.

In the present investigation, bicarbonates appear to be more related to cyanophycean blooms it was observed that bicarbonates were parallel to abundance of blue green alqol.

This is in conformity with the observations of [12] that members of Cyanophyceae are Physiologically capable of utilizing carbon dioxide from bicarbonate source. The withdraw of carbonates from bicarbonates resulted in the libration of hydroxide ions which makes water more alkaline. [13] also covelatd that higher bicarbonates resulted in maximum occurrence of canophycean blooms. Similar observations made [13]. Physico – Chemical parameters like pH, Dissolved oxygen, total alkalinity may have influenced the abundance of cyanophyceae population [14] have also established the analogous donimence among cyanophyceae phytoplankton, high temperature favors the abundant growth of blue green algae. This findings coincidence with present work. High concentration of orgamic mater with low dissolved O2 Content favoured the growth of cyanophyceae members.

Similar observations were made [15]. This present study is in conformity with the above observation. Some others have also related their growth with the presence of Dissolved Oxygen. According to [16] their multiplication was observed due to their tendency to produce oxygen but this relationship couldn't be observed in the present study.

The present study showed that peak sulphate values during summer months coincide with the increased quantity of cyanophyecean members. However negative correlation was observed with Bacillariophyceae and Euglenophyceae. [17] observed that part of sulphates was reduced to sulphides which dissociates in water gradually.

Increase in chloride concentration showed a positive relationship with cyanophyceae. The present study confirms same other workers also observed the maximum chloride contents during summer like [18] suggested that high concentrations indicated the presence of organic matter, presumably of animal origin.

DISTRIBUTION AND PERIODICTIY OF BACILLARIOPHYCEA IN ALI SAGAR LAKE:

In the present investigation in all stations, these group were identified throughout the period of study in both lakes. Study of diatoms are one of the most abundant and diversified groups of algae. Multiplication of diatoms was maximum during winter months when the temperature was between 23ºc- 26ºc. Similar observations were made by [19] who found out that colder months are favourable for multiplication of Plankton diatoms bodies.

However, diatoms were represented in large numbers in summer also in both the lakes showing a positive relationship with temperature. This could be due to the fact that the diatoms have the ability to withstand higher temperature ranges for their maximum development this is in conformity with the findings of [20] has emphasized the importance of temperature as more significant factor than the importance of food for the development of diatoms.

Diatom periodicity is usually associated with Silica, Nitrate and Phosphate [21] added oxygen and carbondioxide also plays a significant role in the development of diatoms.

For the growth of diatoms influence of pH plays an important role[22] have opined that pH favours the maximum growth of diatoms population. In the present study also in all three stations of both lakes are alkaline in nature.

In the current study, dissolved oxygen favoured the growth of diatoms it is minimum factor essential for the maximum growth of the alage. [23] Have reported a similar relationship with this group of algae some of diatoms like Navicula, Cyclotella multiplied in the presence of high concentrations of dissolved oxygen.

Diatoms prefer to grow in low temperature showing the negative influence on the growth of this group of algae. Similar inverse relationship between water temperature in diatom number was observed [23]. In the present investigation the average water temperature was between 23c-26c which has favored the growth of these algae along with other factors.

DISTRIBUTION AND PERIODICITY OF EUGLENOPHYCEAE IN ALI SAGAR LAKE:-

Euglenophyceae was the least dominated class of phytoplankton. This group was irregularly found in both samples during the study period. In the present investigation least number of Euglenophyceae were reported from the study sample. Further water quality Parameters, especially total alkalinity, has been focused on the higher growth and abundance of Euglenoids Euglenophyceae species were less in number and their percentage composition value was very low in both lakes.

Similarly, in chatla lake, Assam, the density of euglenoids was found to be lowest during the monsoon months, highest during the post-monsoon months, and then highest during summer, according to [23]. Though most often found in organic-rich freshwater environments, euglenophyceae may be found in marine or dark environments, and even in acidic water, where certain species prefer to flourish. [24]

pH has an influence on Euglenophycean population and lower pH is responsible for Euglenoid growth. In the present study low pH during summer and monsoon season favored the growth of this algae. The growth of euglenoids in a water bodies resulted in a no of chemical changes in water [24].

Fig-1
MONTHLY VARIATION OF PHYTOPLANKTON
ALI SAGAR LAKE- STATION-I

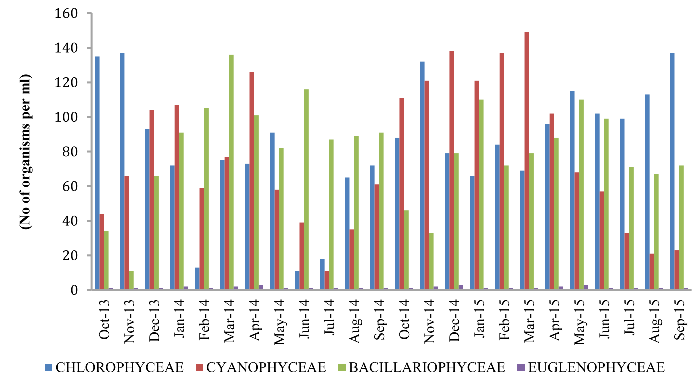
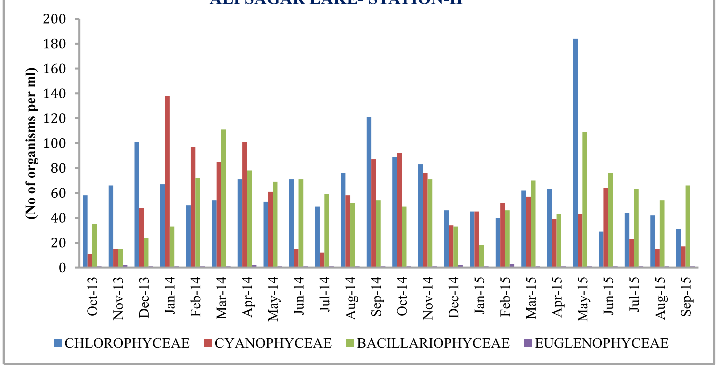


Fig-2
MONTHLY VARIATION OF PHYTOPLANKTON
ALI SAGAR LAKE- STATION-II



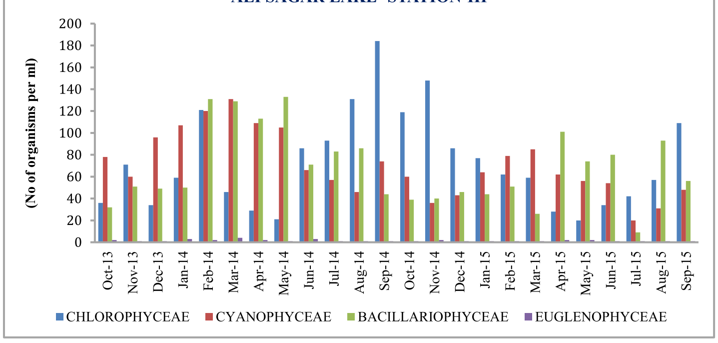


Fig-3
MONTHLY VARIATION OF PHYTOPLANKTON
ALI SAGAR LAKE- STATION-III

TABLE-1 MONTHLY VAIATION OF PHYTOPLANKTON of Ali Sagar lake (Station-I) (No of organisms per ml)

Month/ Class	CHLOROPHYCEAE	BACILLARIOPHYCEAE	CYANOPHYCEAE	EUGLENOPHYCEAE
Oct-13	135	44	34	1
Nov-13	137	66	11	1
Dec-13	93	104	66	1
Jan-14	72	107	91	2
Feb-14	13	59	105	1
Mar-14	75	77	136	2
Apr-14	73	126	101	3
May-14	91	58	82	1
Jun-14	11	39	116	1
Jul-14	18	11	87	1
Aug-14	65	35	89	1
Sep-14	72	61	91	1
Oct-14	88	111	46	1
Nov-14	132	121	33	2
Dec-14	79	138	79	3
Jan-15	66	121	110	1
Feb-15	84	137	72	1
Mar-15	69	149	79	1
Apr-15	96	102	88	2
May-15	115	68	110	3
Jun-15	102	57	99	1
Jul-15	99	33	71	1
Aug-15	113	21	67	1
Sep-15	137	23	72	1
TOTAL	**2035**	**1868**	**1935**	**34**
AVERAGE	**34.65**	**31.81**	**32.95**	**0.57**

TABLE-2 MONTHLY VAIATION OF PHYTOPLANKTON of Ali Sagar lake (Satation-II) (No of organisms per ml

Month/ Class	CHLOROPHYCEAE	BACILLARIOPHYCEAE	CYANOPHYCEAE	EUGLENOPHYCEAE
Oct-13	58	11	35	1
Nov-13	66	15	15	2
Dec-13	101	48	24	1
Jan-14	67	138	33	1
Feb-14	50	97	72	1
Mar-14	54	85	111	1
Apr-14	71	101	78	2
May-14	53	61	69	1
Jun-14	71	15	71	1
Jul-14	49	12	59	1
Aug-14	76	58	52	1
Sep-14	121	87	54	1
Oct-14	89	92	49	1
Nov-14	83	76	71	1
Dec-14	46	34	33	2
Jan-15	45	45	18	1
Feb-15	40	52	46	3
Mar-15	62	57	70	1
Apr-15	63	39	43	1
May-15	184	43	109	1
June-15	29	64	76	1
Jul-15	44	23	63	1
Aug-15	42	15	54	1
Sep-15	31	17	66	1
TOTAL	**1537**	**1285**	**1371**	**29**
AVERAGE	**36.40**	**30.43**	**32.47**	**0.68**

TABLE-3 MONTHLY VAIATION OF PHYTOPLANKTON of Ali Sagar lake Satation-II (No of organisms per ml

Month/ Class	CHLOROPHYCEAE	BACILLARIOPHYCEAE	CYANOPHYCEAE	EUGLENOPHYCEAE
Oct-13	36	78	32	2
Nov-13	71	60	51	1
Dec-13	34	96	49	1
Jan-14	59	107	50	3
Feb-14	121	120	131	02
Mar-14	46	131	129	4
Apr-14	29	109	113	2
May-14	21	105	133	1
Jun-14	86	66	71	3
Jul-14	93	57	83	1
Aug-14	131	46	86	1
Sep-14	184	74	44	1
Oct-14	119	60	39	1
Nov-14	148	36	40	2
Dec-14	86	43	46	1
Jan-15	77	64	44	1
Feb-15	62	79	51	1
Mar-15	59	85	26	1
Apr-15	28	62	101	2
May-15	20	56	74	2
Jun-15	34	54	80	1
Jul-15	42	20	09	1
Aug-15	57	31	93	1
Sep-15	109	48	56	1
TOTAL	**1752**	**1687**	**1631**	**37**
AVERAGE	**34.30**	**33.03**	**31.93**	**0.72**

Table:- 1 Percentage of various group of Ali Sagar Lake Station-I

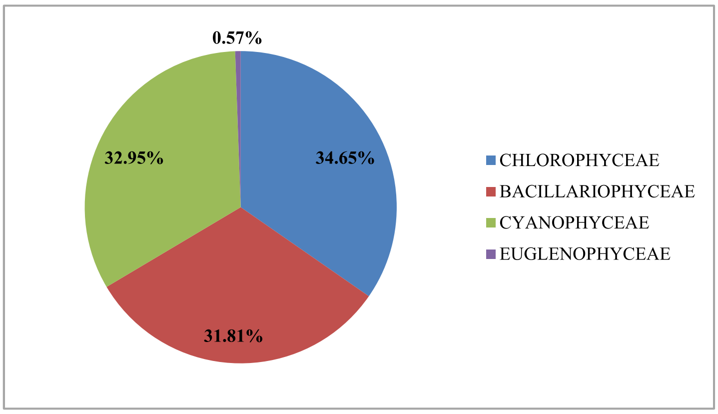
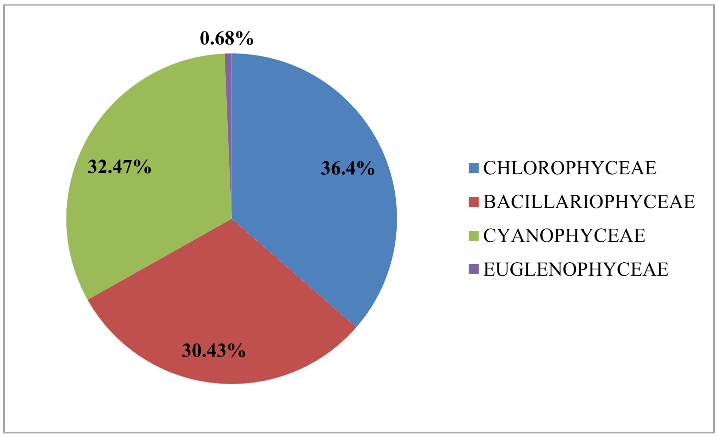


Table:- 1 Percentage of various group of Ali Sagar Lake Station-II



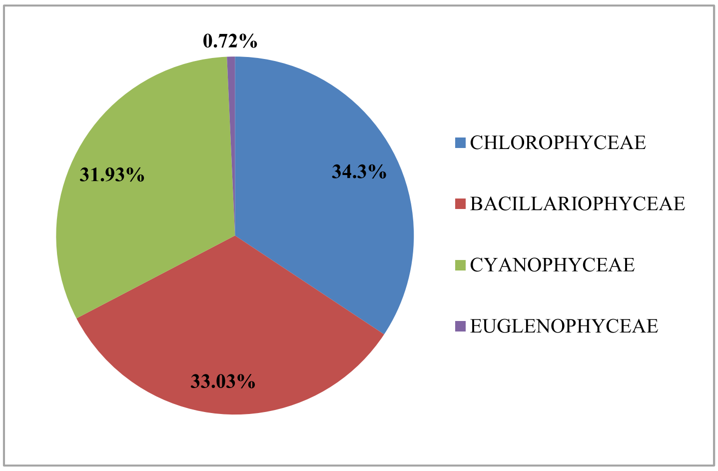


Table:- 1 Percentage of various group of Ali Sagar Lake Station-III

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REFERENCES

1. Brook, A.J. (1981). *Biology of Desmids*. Oxford: Blackwell.
2. Caryton, W.M. and Sommerfield, M.R. (1979). Composition and abundance of phytoplankton in tributaries of the lower Colorado River, Grand Canyon region. *Hydrobiologia* 66(1): 81–93.
3. Coesel, P.E.M. (2001). A method for quantifying conservation value in lentic freshwater habitats using desmids as indicator organisms. *Biodiversity and Conservation* 10(20): 177–187.
4. Ganapati, S.V. (1960). Ecology of tropical waters. *Proceedings of the Symposium on Algae*: 200–218.
5. Hutchinson, C.E. (1957). Concluding remarks. *Cold Spring Harbor Symposium on Quantitative Biology* 22: 415–527.
6. Hutchinson, G.E. (1967). *A Treatise on Limnology*, Vol. II. John Wiley and Sons Inc., New York. p. 115.
7. Srinivas, M. and Aruna, M. (2018). Diversity of phytoplankton and assessment of water in two lakes of Telangana State, India. *International Journal of Scientific Research in Science and Technology* 4(10): 245–256.
8. Munawar, M. (1966). *Limnology of Osman Sagar and Mir Alam Lakes*. Ph.D. Thesis, Osmania University, Hyderabad, India.
9. Phillipose, M.T. (1967). *Chlorococcales*. ICAR Monograph on Algae, New Delhi. 365 p.
10. Phillipose, M.T. (1967). *Chlorococcales*. ICAR Monograph on Algae, New Delhi. 365 p.
11. Prasad, B.N. and Singh, Y. (1980). Algal hydrobiology in India. *National Academy of Sciences, India* Golden Jubilee Commemoration: 271–300.
12. Rai, H. and Hill, G. (1980). Classification of central Amazon lakes on the basis of their microbiological and physico-chemical characteristics. *Hydrobiologia* 75: 85–99.
13. Round, F.E. (1957). Studies on bottom living algae in some lakes of the English Lake District. Part I. Some chemical features of sediments related to algal productivity. *Journal of Ecology* 45: 133–148.
14. Satya Mohan, K. (1980). *Limnology of the Osman Sagar and Mir Alam Lakes*. Ph.D. Thesis, Osmania University, Hyderabad, India.
15. Satyanarayana Reddy, N. (1984). *A Limnological Study of Himayath Sagar and Hussain Sagar Lakes*. Ph.D. Thesis, Osmania University, Hyderabad, India.
16. Seenayya, G. (1971). Ecological studies on the plankton of certain freshwater ponds of Hyderabad, India. Physico-chemical complexes. *Hydrobiologia* 37: 7–31.
17. Singh, S.R. and Swarup, K. (1979). Limnological studies on Suraha Lake (Ballia) II. The periodicity of phytoplankton. *Journal of the Indian Botanical Society* 58: 319–329.
18. South, R. and Whittick, A. (1987). *Introduction to Phycology*. Blackwell Scientific Publications.
19. Sulabha, V. and Prakasham, V.R. (2006). Limnological features of Thirumullavaram temple pond of Kollam Municipality, Kerala. *Journal of Environmental Biology* 27(2): 449–451.
20. Tripathi, A.K. and Pandey, S.N. (1989). Studies on algae of polluted ponds of Kanpur II. Qualitative, quantitative and periodical occurrence of blue-green algae of Chandrai Pond. *Research Journal of Plant and Environment* 5(1): 89–93.
21. Venkateswarlu, V. (1969). An ecological study of the algae of River Moosi, Hyderabad (India) with special reference to water pollution I. Physico-chemical complexes. *Hydrobiologia* 33: 117–143.
22. Verma, J.P. and Mohanty, R.C. (1995). Phytoplankton of Malyanta Pond of Laxmisagar and its correlation with certain physico-chemical parameters. *Pollution Research* 14: 243–252.
23. Wetzel, R.G. (1975). *Limnology*. W.E. Saunders Co., Philadelphia and London. p. 743.
24. Whitford, L.A. and Schumacher, G.J. (1963). Communities of algae in North Carolina streams and their seasonal relationships. *Hydrobiologia* 22(1–2): 137–167.