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Recent Research in Science and Technology 2009, 1(5): 235–238
ISSN: 2076-5061
www.recent-science.com

AQUATIC BIOLOGY

PHYTOPLANKTON DIVERSITY IN RELATION TO PHYSICO-CHEMICAL PARAMETERS OF GNANAPREKASAM TEMPLE POND OF CHIDAMBARAM IN TAMILNADU, INDIA

K. Thirugnanamoorthy, M. Selvaraju*
Department of Botany, Annamalai Univeristy, Annamalainagar – 608 002, Tamilnadu, India

Abstract
Twelve physico-chemical parameters, diversity and abundance of phytoplankton of fresh water pond of Chidambaram have been studied during September 2007 and August 2008. A total of 14 phytoplankton genera, 4 belonging to cyanophyceae, 4 to chlorophyceae, 3 to Bacilariophyceae and 3 to Euglenophyceae were recorded. To know to the variations in Periodicity and distribution of phytoplankton, various physico-chemical and biological parameters of the pond water have been observed. The values of TDS, BOD phosphate and nitrate and the current status of phytoplankton population imply that the study pond are mesotrophic in nature.

Key Words: Physico-chemical factors; Phytoplankton; Temple pond.

Introduction

The pond water is considered as one of the major sources for fishery and domestic uses in Chidambaram region. The consideration of the physico-chemical factors in the study of limnology is basic to the understanding of trophic dynamics of the water body. Each factor does play its individual role but at the same time the final effect is the actual result of the interaction of these factors. Planktons are sensitive to the environment in which they live and any alteration in them leads to change in the plankton communities in terms of tolerance, abundance, diversity and dominance in the habitat. Phytoplankton are the basic members in the aquatic ecosystems and hence changes in phytoplanktonic population has a direct link with the change of water quality in any aquatic medium (Dutta *et al*., 1954). Goldman and Horne (1983) have reported that the dynamic featurers of lakes such as colour, clarity, trophic state, and Zooplankton and fish production depend to a large degree on the phytoplankton.

The phytoplankton community on which whole aquatic population depends is largely influenced by the interaction of a number of physico-chemical factors. Jana (1973), Sankala *et al*., 1981. Badola and Singh (1981) have made valuable contributions on the phytoplankton of lentic or lotic fresh water ecosystems. The present study is an attempt to investigate the dynamics of phytoplankton in relation to physico-chemical factors of fresh water in Gnanaprakasam temple pond of Chidambaram.

Materials and methods

Monthly samplings were carried out in the fresh water pond of Chidambaram from September 2007 to August 2008 the Gnanaprakasam temple pond 35m long, 15m wide and 3 meters deep. The pond water is used for washing of cloth, bathing and recreational activities. Water sample and phytoplankton were collected on monthly basis for a period of one year from different sites of the pond. The procedure for collection, storage and analysis of samples were followed as described in standard methods (APHA 1998). Physico-chemical factors such as temperature, pH, carbondioxide, Total alkalinity, dissolved oxygen, Total dissolved solids, phosphate, nitrate and BOD by following the standard methods of APHA (1998).

* *Corresponding Author, Email: selvapretha@yahoo.com*

Plankton study

Phytoplankton samples were collected monthly for a period of one year. Phytoplankton material at different sampling point was collected by filtering 200ml of water through the nylon bolting cloth (mesh 25nm). Plankton samples 200ml were kept for about 24h to settle samples were stored in small vials and diluted to 50ml with distilled water. The diluted samples were used for further investigation. For microscopic investigation one ml sample was taken on "sedgewick Rafter cell". The average of 5 to 10 counts were made for each sample and the results are expressed as numbers of organism per litre of sample.

The identification of phytoplankton was done with the help of standard books and monographs (Smith, 1950; Ward and Whipple 1959; Desikachary, 1959; Prescott, 1962; and Turner, 1982).

Results and Discussion

The results on various physico-chemical parameters viz; Air and water temperature, pH, free carbondioxide, total alkalinity, nitrate, phosphate, bicarbonate, total dissolved solids and BOD are given in Table 1. Data on important water quality parameters having a direct bearing upon the distribution and ecology of various phytoplankton communities in the fresh water pond were collected. Monthly fluctuations of different phytoplankton groups are presented in Table 2.

Table I. Monthly variations of Physico-chemical parameters (mg^{-1}/l) in pond from September 2007 to August 2008

Month	Tem Air	Tem Wat	pH	CO_2	Total Alkalinity	DO	TDS	$Po_3{}^{-P}$	$No_3{}^{-N}$	BOD
Sep	30.1	26.0	8	2.5	85.2	7.0	0.29	0.032	0.041	17.2
Oct	29.8	25.6	8.1	3.1	83.1	6.2	0.38	0.030	0.030	25.0
Nov	30.1	26.5	7.8	2.7	78.1	5.5	0.32	0.041	0.051	17.9
Dec	27.3	24.2	8.1	1.3	61.0	5.9	0.34	0.041	0.042	23.0
Jan	27.1	23.1	8	1.2	71	5.1	0.41	0.071	0.078	28.0
Feb	27.0	23.0	7.9	2.4	62.2	6.5	0.53	0.065	0.070	25.2
Mar	27.2	23.2	7.7	2.1	64.1	6	0.59	0.079	0.085	29.1
Apr	27.6	23.5	8.3	2	68.3	8.2	0.41	0.061	0.071	31.5
May	34.1	30.1	7.9	2.4	90.2	6.1	0.40	0.080	0.082	39.7
Jun	34.6	30.3	7.7	3.2	112	9.8	0.39	0.071	0.062	37.5
July	34.5	30.2	7.5	3.1	85.6	7.1	0.35	0.031	0.032	12.1
Aug	30.4	29.1	7.1	3	95.3	6.2	0.40	0.062	0.069	13.5

All values expressed in mg/lit except Temperature and pH

In the present study phytoplankton community in fresh water pond represented by the members of cyanophyceae, bacillariophyceae, chlorophyceae and Euglenophyceae. The phytoplankton members comprised of 14 genera of which 4 belonging to cyanophyceae, 4 to chlorophyceae, 3 to bacillario phyceae and 3 to Euglenophyceae. Among the total phytoplankton, cyanophyceae contributed to 48.47% of the total population during the study period. The next dominant group was the euglenophyceae which comprised of 19.86% followed by bacillariophyceae that were 16.15% and chlorophyceae 15.49% during the study period.

Table II. Monthly variation of phytoplankton groups (organism/l) in pond from September 2007 to August 2008

Month	Phytoplankton				
	Cyanophyceae	Chlorophyceae	Bacillariophyceae	Euglenophyceae	Total Phytoplankton
Sep	30	8	12	6	56
Oct	15	4	7	12	38
Nov	19	15	8	16	58
Dec	26	20	4	15	65
Jan	6	2	4	18	30
Feb	7	2	6	20	35
Mar	29	7	30	12	78
Apr	49	19	12	16	96
May	52	10	8	3	73
Jun	56	11	10	14	91
July	47	13	9	15	84
Aug.	30	6	12	3	51
Total	366	117	122	150	755
Percentage	48.47	15.49	16.15	19.86	100

Cyanophyceae

Maximum density of *Cyanophycean* members occurred from April to July during the study period. The density was gradually decreased during winter and rainy seasons as their number was very low. The Cyanophyceae members are represented by the species like *Microcystis aeruginosa*, *Spirulina* major, *Oscillatoria sp, Anabaena circularis*.

The physico-chemical factors such as high pH, CO_2, DO, TDS, phosphate, nitrate and BOD might have favoured the growth of the blue green algae. However from the results of our investigation it may assumed that in addition to the above factors, sunshine and temperature had played an important role in increasing the cyanophycean members in the pond.

Philipose (1959) has emphasized that natural factors like alkalinity, nitrates and phosphates are responsible for the luxuriant growth of cyanophyceae which in turn attributed abundance of cyanophyceae to higher values of pH, temperature, phosphate, and nitrate.

Naik *et al*., (2005) stated that maximum value of pH and nitrate supports the growth of cyanophyceae.

Chlorophyceae

Chlorophyceae were represented by *Pediastrum duplex*, *Coelastrum microporum*, *Cosmorium sp* and *Euastrum.* The presence of higher members of chlorophyceae due to some of the factors like high pH, alkalinity, dissolved oxygen, TDS and BOD. The variations in periodicity may be because of fluctuation observed in the physico-chemical factors. Similar studies on chlorophyceae population in the ponds of Dharwad made by Hosmani (1988).

Gonzalves and Joshi (1964) and Gahotri *et al*., (1980) have recorded higher percentage of chlorophyceae in alkaline waters which has been proved true in the present study.

Kulshrestha and Joshi (1991) have reported maximum chlorophyceae density during winter. This observation is in agreement with our findings.

Bacillariophyceae

Seasonally this group was more abundant in rainy season and registered a very low number in summer period. This group was represented by *Pinnularia virridis Synedra ulna*, and *Navicula sp.* The growth of bacillariophyceae members in the pond was influenced by the presence of high, DO, TDS, phosphate and BOD. Similar investigations on the distribution and periodicity of bacillariophyceae members in fresh water bodies were also made by Jose and Patel (1991). Chitra and Meena (2004) in lakes of Kerala.

Maximum bacillariophyceae population during rainy and winter season was also reported by Velecha and Bhatnagar (1988), Tripathy and Pandey (1990).

Bacillariophyceae members are normally found in both fresh water and marine habitats. They have been considered to be the best indicators of quality and trophic status of water (Hencock 1973).

Maximum bacillariophyceae population during rainy season was also reported by valecha and Bhatnagar (1988), Tripathy and Pandey (1990). Munawar (1970) diatoms are less in number during summer.

Euglenophyceae: The Euglenophyceae members mainly represented the species like *Euglena sp. Phacus sp and Lepocinclis ovum*. The growth of euglenophyceae members in the reservoir was influenced by the presence of high pH, CO_2 alkalinity, dissolved oxygen, Nitrate, phosphate Total dissolved solids, and BOD.

Conclusion

In conclusion the present study revealed that the distribution and population density of phytoplankton species depend upon the physico-chemical parameters of the environment. It is clear from the results that the pond is mesotrophic and aging towards eutrophication. Hence measures should be taken to minimize the fresh water pollution by preventing washing of clothes and other human activities. In addition the data generated in the form of memoir are essential so that this information may be used as the decision maker for conservation and effective utilization of water bodies.

Reference

APHA (1998). Standard method for the examination of water and waste water, (19th Ed). New York: American Public Health Association, Inc.

Bodola, S.P., and Singh, H.R.(1981). Hydrobiology of rivers Alaknanda of Garhwal Himalaya. Indian Journal of Ecology, 8, 269-276.

Gahotri, O.D., Chaturvedi, L.D., and Joshi, B.D. (1980). Ecological studies of sewage fed pond including seasonal fluctuation of its planktonic component. 5th All India Conference of Zoology Abstract L.4, p 152

Hencock, F.D. (1973). The ecology of the diatom of the klip rivers, southern Transvaal. Hydrobiologia, 43 (243), 243-284).

Kulshrestha, S.K., and Joshi M. (1991). Periphyton community of lower lake of Bhopal in relation to

sewage pollution. In Gopal Athana V. (Eds), Aquatic Science in India. Indian Association for Limnology and Oceanology, pp. 65-75.

Naik, U.G., Bhosale, S.H., Rathod, J.L., and Bhat, V.G. (2005). Diversity of phytoplanktonic groups in the river kali, wast coaste of India. Proceeding of Senior, Lecture University Grants Commission Haveri, pp. 192-196

Munawar, M. (1970). Limnological studies on fresh. Water ponds of Hyderabad India II. The biocoenose distribution of Cellular and colonial phytoplankton in polluted and unpolluted environments. Hydrobiodogia, 36/05428

Philipose, M.T. (1959). Chlorococcales, New Delhi ICAR.

Sankala, S.K., Jain, S.L., Dhakar, M.L., and Vyas L.N (1981). Phytoplankton Periodicity in three lakes around Udaipur. Acta Limnology India, 1, 11-16.

Tripathy, A.K., and Pandey S.N. (1990). Water Pollution. Ashish Publishing House, 1, 326.

Velecha, V., and Bhatnagar, G.P. (1988). Seasonal changes of phytoplankton in relation to some physico-chemical factors in lower lake Bhopal. Geobios, 15, 170-173.

Gonzalves, E.A., and Joshi, D.B. (1964). The seasonal succession of the algae in tank of Bandra. Journal of Bombay Natural History Society, 46, 1544, 154-176.

Goldman, C.R., and Horne, A.J. (1983). Limnology p. 1464. Japan: Mc Graw Hill Inc.

Jana, B.B. (1973). Seasonal periodicity of plankton in fresh water in west Bengal, India. International Review Ges. Hydrobiologia, 58, 127-143.

Chitra, P. and Meera, S. (2004). Flora of temporary water bodies along with the semi coastal line chackai to Shagusham in Thiruvananthapuram. India Hydrobiology. 7(1&2): 47-51.

Hosmani, S.P. (1988). Seasonal changes in phytoplankton communities in a fresh water pond at Dharwad, Karnataka state, India. Phykos. 27: 82-87.

Jose, L. and patel, R.J. (1991). An ecological study of algae in the central waste water treatment plant of India petrochemical corporation Ltd., Baroda. Geobios. 18 (2-3): 87-91.

Smith, G.M. (1950). The fresh water Algae of the united states, MC. Graw Hill Book Company-Inc, Newyork Toronto London. 719 pp.

Dutta, N., Malhotra, J.C. and Bose, B.B. (1954). Hydrobiology and Seasonal fluctuations of the phytoplankton in the Hooghly estuary in IPFC. Proc. 35-47.

Turner, W.B. (1982). The Fresh Water Algae of East India. K. Svenska Vetensk. Akad. H and Le, 25(5): pg 187.

Ward, H.B. and Whipple, G.C. (1959. Fresh water biology . 2nd edition (Ed W/T. Edmondson L. John) Wiley and sons, New York.

Desikachary, T.V (1959). Cyanophyta. ICAR. Monograph, ICAR, New Delhi.

Prescott, G.W (1962). Algae of the Western Great lakes area Wm. C Brown CO. Dubuque Towa.