A study of Physico-chemical parameters and phytoplankton diversity of Deverkulam pond in Kurunthancode Village, Kanyakumari Distirict

***B. Anusha[1], A. Iren Amutha[2] and R. JacklinJemi[2]**

***Research Scholar, [2]Assistant Professor, Department of Botany,**

Women's Christian Collage, Nagercoil, Kanyakumari – 629003,

Affiliated to Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India.

ABSTRACT

The present study was carried out in the selected pond Deverkulam in Kurunthancode village from September 2017- February 2018. The samples were collected during morning hours and were analysed monthly for physico-chemical and biological parameters. The various physico-chemical parameters like water temperature, pH, Dissolved oxygen, Total dissolved soilds, Chloride, Biological oxygen demand, were analysed. Results have shown an increased concentration in physico-chemical parameters is more in summer compared to other seasons. The plankton studies were noticed that a total of 58 species belonging to 26 genus under the 4 classes. Among these, Chlorophyceae comprised of 27 species (belonging to 8 genera) followed by Bacillariophyceae 18 species (belonging to 11genera)Euglenophyceae 9 species (belonging to 3 genera) and Cyanophyceae 5 species (belonging to 4 genera) were recorded. During the study it was found that Chlorophyceae algal growth is dominated over Bacillariophyceae, Euglenophyceae and Cyanophyceae.

Keywords: Deverkulam, Phytoplankton, Physico-chemical analysis, Chlorophyceae.

INTRODUCTION

Natural resources are the important wealth of our country, water is one of them. "No life without water" is a common saying depending upon the fact the water is one of the naturally occurring essential requirement of all life supporting activities. Water is a valuable commodity available in very limited quantities to man and other living beings. Water is a vital resource used for various activities such as drinking, irrigation, fish production, power generation etc.Ponds as a source of water are of fundamental importance to man. However pond may have been natural water sources exploited by man at different time to meet different needs or may have been created for a multitude of different purposes (Rajagopal*et al*., 2010). Ponds constitute an ecosystem that supports a wide array of organisms ranging from lower plants to higher plants. Ponds have been used immemorial as a traditional source of water supply in India. Tamilnadu is bestowed with a large number of perennial and temporary ponds. People construct ponds in rural areas for instant ponds are common in the Indian rural areas. However, the water of the ponds, lakes and river are polluted mainly due to discharged

waste water from residential areas, sewage outlets, solid wastes, detergents, automobile oil wastes, fishing facilities and agricultural pesticides from farmlands.

Phytoplankton are photoautotrophic, microscopic, organism containing chlorophyll with in their cells that inhabit the upper sunlight layer of almost all bodies of water. Phytoplankton obtains energy through the process of photosynthesis and must therefore live in the euphonic zone of water body. Phytoplanktons are responsible for much of the oxygen present in the atmosphere. The most important algal group of phytoplankton includes Chlorophyceae, Bacillariophyceae, and Cyanophyceae.Phytoplankton are small microscopic, photosynthetic organisms. They are among the primary producers in the aquatic ecosystems. They are vital parts of food chain in the aquatic ecosystems. The abnormal increase in their number indicates pollution.(Mahale and Malvankar, 2013).Devi and Antal (2013) were carried out on the diversity of phytoplankton in relation to physico-chemical parameters with respect to water quality status of a subtropical pond. The physico-chemical parameters showed well-marked seasonal variations. A total of 21 genera belonging to three different groups (Bacillariophyceae, Chlorophyceae and Cyanophyceae) were recorded during the study period with maxima in winter season and minima in summer season.The present study was conducted with an aim to investigate the current limnological conditions in the pond so that the water quality and phytoplankton status of the Deverkulam pond in Kurunthancode village, Kanyakumari Dist.

MATERIALS AND METHODS

Staudy Area:

Devarkulam pond is situated in the place of kattuvilai, Kalkulam taluk, Devarkulam. It is a large pond. This pond is occupied nearly 2.6 acres. This pond is surrounded by coconut tree, paddy fields and banana fields. This pond is used for and agricultural purposes, bathing and washing cattles etc.

Methodology

Monthly water sample were collected on specific dates by using clean sample bottles (Pyrex glass) for the study of various physico-chemical parameters. Samples were collected from selected sampling sites at each pond between 6 a.m. and 8 a.m. during the period of September 2017- February 2018. Measurement of parameters like water temperature, pH, DO, BOD, TDS, and Chloride were analysed. Identification of phytoplankton was done with the help of suitable literature (Prescott, 1978)

RESULT and DISCUSSION

The result of physico-chemical parameters were shown in the table 1 and fig 1. Physico-chemical parameters are the important constituents of the aquatic system as they reflect the water quality of aquatic ecosystem. Temperature controls behavioural characteristics of aquatic organism, solubility of gases and salts in water. No other factor has so much influence as temperature. One of the factors that determine the functioning of an aquatic ecosystem is temperature. Temperature is a physical factor in controlling the fluctuation of plantation and functioning of aquatic ecosystem (Singh and Mathur, 2005). The water temperature ranged between minimum (24.9℃) to maximum (26.9 ℃). The maximum water temperature showed during summer in all the ponds. The present observation was supported by the findings of Kavitha (2006) in few ponds of Kanyakumari district.

The pH is a limiting factor and works as an index of general environmental condition. During the study period the pH varied from minimum value (5.83) and maximum value (8.40). The maximum pH value obserbed in the month of December. Similar observation was recorded by Christi *et al.* (2011). High value of pH was recorded in the summer season because of due to utilization of bicarbonate and carbonate buffer system. Water is a universal solvent and have a large number of salts dissolved in it which largely governs in physico-chemical properties.

The minimum value of total dissolved solids were recorded in December (29.1mg/l) and maximum was recorded in February (37.9 mg/l). This result was confirmed with the findings of Sing and Sharma (2012). The high value of TDS during rainy may be due to addition of domestic waste, garbage and sewage etc. In the natural surface water body (Varma et al., 2012).

BOD is dissolved oxygen required by micro-organism for aerobic decomposition of organic matter. BOD as an important parameter in aquatic ecosystem to establish the status of pollution. Biological oxygen demand depends on temperature, extent of biochemical activities and concentration of organic matter and microbial population such as fungi. The biological oxygen demand (BOD) is a parameter that enables the determination of relative oxygen requirements especially of waste water, polluted waters and effluents. BOD is an index of pollution by nutrients. The present study recorded high values during the month of September. This result was confirmed with the findings of Sing and Balasingh (2011).

Dissolved oxygen was found maximum of (7.22 mg/l) in the month of February and minimum value of (6.85 mg/l) in the month of December. The negative correlation of temperature at all study area is in agreement with Sharma (2007). Water temperature is inversely proportional to the dissolved oxygen concentrations. This may be due to the discharge of huge quantities of waste water accompanied by increasing inorganic matter and the results are inconsistency with the earlier.

Highest level of chloride concentration was observed during the month of February 2018, when the pond has very low level of water. They also stated that the high chloride

concentration of the pond water may be due to high rate of evaporation or due to organic waste of animal origin. Chloride is an important indicator of organic pollution.

The distributin of phytoplankton were shown in the table 2. In Deverkulam pond,Phytoplankton contributed 48.4% of chlorophyta, 30.7% of Bacillariophyta, 10.1% of Cyanophyta, 10.6% ofEuglenophyta. Among the 4 family Chlorophyta contributed maximum percentage and Euglenophyceae contributed minimum percentage. The class chlorophyta was 8 genera with 27 species, the class of Bacillariophyta was 11 genera with 18 species, the Cyanophyta was 4 genera with 5 species and the class of Euglenophyta was 3 genera and 9 species were recorded. The distribution is noted in decending order as Chlorophyceae>Bacillariophyceae>Euglenophyceae>Cyanophyceae.

Chlorophyta dominated the phytoplankton community during summer in all experimented ponds. This results in accordance with the findings of Marashoghr and Gonulol (2015). The density of phytoplankton is mainly controlled by physico-chemical parameters it is very much essential to know the correlation co-efficient between them. From the present study, it is clear that Chlorophyceae showed a positive correlation with dissolved oxygen, Temperature, pH, BOD, TDS, and Chlorride. This findings was in accordance with the earlier works of Das (2002).Analysis also shows some pollution tolerant algae like *Oscillatoria sp., Pediastriumsp., Closterium sp., Navicula sp.*, and *Microcytis sp*. Presence of *Oscillatoria, Spirogyra, Navicula, Chlorella* and *Microcystis*through in low densities indicated the slightly organic pollution in both ponds (Shekar*et al*., 2008).

CONCLUSION

The chlorophyceae members play an important role by acting as primary producers and increases soil fertility. Chlorophycean algae are efficient absorbers of atmospheric carbon, thus plays an important role in controlling the concentration of carbon dioxide (Co_2) one of the most important green house gas. In the present study seasonal variations in the total number of plankton were noted and found that the summer season was favourable season for the growth and development of phytoplankton. The quanlitative status of quantitatively it is rich in with chlorophyceae as dominant group. This clearly shows preference of green algae to higher concentration of dissolved oxygen, good water quality, relative high water temperature, dissolved oxygen and high primary productions make aquatic organisms including microscopic plants suitable for culture based aquaculture.

Physicochemical parameters recorded from the Deverkulam Pondduring September 2017-February 2018

Month	Temperature	pH	DO	BOD	Chloride	TDS
September	26.1 ± 0.04	6.52 ± 0.56	7.11 ± 0.55	2.32 ± 0.12	2.4 ± 0.03	32.2 ± 0.25
October	25.8 ± 0.12	7.24 ± 0.61	7.03 ± 0.13	1.95 ± 0.24	2.2 ± 0.06	30.3 ± 0.54
November	25.6 ± 0.12	8.13 ± 0.13	6.92 ± 0.43	1.82 ± 0.34	1.8 ± 0.05	29.7 ± 0.47
December	24.9 ± 0.07	8.40 ± 0.24	6.85 ± 0.94	1.73 ± 0.44	1.5 ± 0.03	29.1 ± 0.35
January	25.1 ± 0.03	6.14 ± 0.14	7.15 ± 0.20	2.44 ± 0.24	2.9 ± 0.05	35.3 ± 0.24
February	26.9 ± 0.03	5.83 ± 0.41	7.22 ± 0.36	2.63 ± 0.36	3.1 ± 0.01	37.9 ± 0.33

Distribution of Phytoplankton in experimental pond Deverkulam (September 2017 to February 2018)

No	Name of Phytoplankton	Septe mber	Octo ber	No ve mb er	Dece mbe r	Januar y	Febru ary	Frequ ency
	Chlorophyceae							
1.	*Chlorococcum*	++	+	-	-	+	+	2.4
2.	*Closteriumleibleinii* var. recurrum	++	+	+	+	-	-	1.98
3.	*Closteriumacerosum*	+	+	+	+	-	+	1.98
4.	*Closteriumcyanthia*	+	+	+	-	+	++	1.98
5.	*Closterium decorum*	+	++	+	+	+	-	2.05
6.	*Closteriumehrenbergi*	++	+	-	+	-	-	1.91
7.	*ClosteriumincurvumBrch*	-	+	-	+	+	-	0.60
8.	*Closteriumlibilulla* var. inamolium	-	+	-	+	-	++	1.77
9.	*Closteriummoniliterum* (Bory) Ebr	+	-	-	-	+	+	0.85
10.	*Closteriumparacerosum*	-	+	-	-	+	-	0.56
11.	*Closteriumpritehantznum*	+	-	-	-	+	-	1.1
12.	*Closteriumrecurvum*	+	-	+	-	+	++	1.94
13.	*Closteriumrecurvum*	++	-	-	-	+	++	2.55
14.	*Closteriumtumidum* Johns	+++	-	+	-	+	+++	0.63
15.	*Closteriumvenus*	-	+	+	-	++	+++	2.76
16.	*Cosmariumcucurtritinum*	-	+	-	-	++	+	2.05
17.	*Cosmoriumthangaicum*	-	+	+	-	++	-	1.56
18.	*Costeriumlittorate*	++	+	+	+	-	-	2.056
19.	*Microsteriaradiosa* Turner	+	+	+	+	+	-	1.1
20.	*Oedogoniumglobossum*	+	-	-	-	+	+	1.06

21.	*Oedogoniuminclusum*	++	-	+	+	_	+	2.05
22.	*Pediastrum duplex*var.asperum	+	+	-	-	+	-	1.41
23.	*Pediastrum simple*	-	+	+	+	++	+++	3.04
24.	*Spirohyrapurcispora*	-	++	-	-	+	++	1.91
25.	*Spirohyraweheri*kutz	+	+	+	-	-	-	1.06
26.	*Ulothrixzonatakuetz*	-	+	+	-	+	++	1.98
	Bacillariophyceae							
27.	*Acanthus minutissim*	-	+	-	+	-	+	1.48
28.	*Achnanthesminutissimakutz*	+	+	-	-	+	++	2.05
29.	*Asterionella japonica*	+	-	-	-	+	+	1.1
30.	*Eunatiabilunaxis*	+	++	+	-	+	-	1.41
31.	*Fragilariaconstrum* (Her) Grun	-	+	+	+	-	-	0.49
32.	*Fragilaria ulna*	-	-	+	-	+	-	0.63
33.	*Fragilariavirenscenes*	+	-	-	-	++	++	2.83
34.	*Gamphonemaspharophnum*	-	+	+	-	+	+++	2.26
35.	*Melosiradubia*	+	-	-	+	-	++	1.77
36.	*Naviculagregaria*	+	+	-	-	-	++	2.05
37.	*Naviculalenga*	-	+	-	+	++	++	2.97
38.	*Naviculapupila*	+	+	-	+	+	-	2.05
39.	*Navicularhynchocephala*	-	-	+	+	+	-	2.97
40.	*Nitzschia obtuse*w.smith	+	+	-	+	+	-	1.63
41.	*Pinnulariagibba*	+	+	-	+	-	+	1.25
42.	*PinnulariagibbaEhr*	++	-	+	-	-	+++	2.55
43.	*Rhopalodiagibba* (Ehr) O.Mull	++	-	+	+	+	++	2.26
44.	*Synedra ulna*	+	-	-	+	+	-	1.56

	Cyanophyceae							
45.	*Apanocaapsapulchera*kutz	-	+	-	-	-	++	1.56
46.	*Chrococcusgigus*	-	++	-	-	+	-	1.3
47.	*Microcystis aeruginosa*	++	+	-	+	+	++	3.04
48.	*Oscillatoriaprinceps*	+	+	-	-	+	++	2.34
49.	*Oscillatoriasps*	++	-	+	-	-	++	1.84
	Euglenophyceae							
50.	*Euglena acus*Ehr	+	+	+	-	+	+	1.27
51.	*Euglena gracilis*Wallisch	+	-	+	+	-	-	0.35
52.	*Euglena polymorpha*Dangeard	-	+	-	+	-	-	0.35
53.	*Euglena pseddovirdis*Chadef	++	-	-	+	+	-	1.7
54.	*Euglena sps*	-	-	+	-	-	+	0.99
55.	*Phacusagilis*Skuja	+	-	-	-	+	+	1.27
56.	*Phacusanaeoelus* Stokes	-	+	-	-	+	++	2.12
57.	*Trachemonassp* 1	+	+	+	-	-	+	1.27
58.	*Trachemonassp* 2	-	-	+	-	+	-	0.56

REFERENCES:

Rajagopal, T, Thangamani, S, Serarkodi, P, Seker, M, and Arehunan, G 2010, 'Zooplankton diversity and physico-chemical conditions in three perennial ponds of Virudhunagar District, Tamilnadu', Journal of Environmental Biology, vol. 31, pp 265-272.

Mahale, K, and Malvankar, M 2013. The Study of Physico-Chemical Parameters And Plankton Diversity of the ponds in The V.P.M. Campus, Thane, Maharashtra, India. National Conference on Biodiversity.978-981.

Devi, A, and Antal, N 2013, 'Variation in Phytoplankton Diversity and its Relationship with Abiotic Environment of a Temple Pond in Birpur (JandK) India', Universal Journal of Environmental Research and Technology, vol. 3, no. 2, pp. 181-189.

Prescott, GM, 1978, 'The freshwater algae, C. Brown Company Publication Dubuque, lowa.

Christi, RM, Samuel, AS, Bai, NR and Kala, AC 2011. Diversity of chlorococcales with respect to physico-chemical parameters in three selected perennial ponds of Agatheeswaram Taluk, Kanyakumari district (Tamilnadu), India. Plant Archieves vol. 11, no. 1, pp. 17-20.

Singh, KK, and Sharma, BM 2012. 'Ecological productivity studies of the macrophytes in Kharungpatlake, Manipur northeast India'. International Journal of Geology Earth and Environment Science, vol. 2, pp. 58-71.

Verma, PU, Purohit, AR and Patel, NJ 2012, 'Pollution Status of Chandlodia Lake Located in Ahmedabad Gujarat, IJERA vol.2, pp. 1600-1606.

Singh, PR, and Balasingh, RGS 2011 ''Limnological Studies of Kodaikanal Lake (Dindugal District), in special reference to Phytoplankton Diversity", Indian Journal of Fundamental and Application Life Science, vol. 1, pp.112-118.

Das, AK 2002, 'Phytoplankton primary production in some selected reservoirs of Andhra Pradesh, Geobioscience, vol. 29, pp. 52-57.

Shekhar, RT, Kiran, BR ,Puttaiah, ET, Shivaraj, Y and Mahadeven, KM 2008. Phytoplankton as index of water quality with reference to industrial pollution'. Journal of Environmental Biology, vol. 29, pp. 233-236.

Marashoglu, F, and Gonulol, A, 2015.Phytoplankton Community, functional Classification and Trophic State Indices of Yedikir Dam Lake (Amasya). Journal of Biology and Environmental Science, vol. 8, no. 24, pp. 133-141.