DIVERSITY OF PHYTOPLANKTON OF LAKKINAKOPPA POND SHIVAMOGGA DIST. KARNATAKA

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ABSTRACT

The present studies were carried out on the diversity of phytoplankton of Lakkinakoppa pond Shivamogga Dist. Karnataka for a period of six months (November 2012 to April 2013). Fifty Four species were identified belonging to the four major classes Bacillariophyceae, Chlorophyceae, Cyanophyceae, Euglenophyceae and they are represented throughout the study period. During the present study dominant species found *are Cymbella ventricosa, Pinnularia gibba, Synedra capitata, Closterium moniferum, Spirogyra sp., Merismopedia tenuissima* and *Trachelomonas hispida*.

Key Words: Phytoplankton, Indices, Diversity

INTRODUCTION

Water is an elixir of the body and is a primary need of all the living creatures. It is a valuable commodity available in very limited quantities to man and other living beings. 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 purpose (Rajagopal *et al.*, 2010). Water quality criteria are developed on the basis of scientific information about the effects of pollutants on a specific use of water. The plant originated phytoplankton play the vital role in synthesizing the light energy with utilization of CO2 and water in to the food. The higher values of oxygen are associated with rise of phytoplankton population (Bhatt and Negi, 1985). The phytoplankton growth and abundance is closely related to the physico-chemical characters of water. As the concentration of the nutrients in the water is higher, thicker the population of phytoplankton especially Cyanophyceae (Prasad *et al.*, 2001). Since the occurrence of an indicator species can reflect either clean or polluted conditions; indicator organism cannot be sensitive to all types of pollution (Hosmani, 2010).

MATERIALS AND METHODS

Study Area

As a District Shimoga lies in the tropical region with13°52' North lattitude and 75°34' East longitude. It receives an average annual rainfall of 18.139cm with an average of 86 days in the year being rainy days and average annual temperature of Shimoga District is around 26°C. The village Lakkinkoppa lies in the road of Shimoga to Koppa and also 17kms from Kuvempu University. This village is belongs to the Bhadravathi Taluk. This Basavanakere pond exactly situated at the entrence of the Lakkinakoppa village while entering from Shimoga. It covers the total area of about 13.7 acres. It also receives domestic effluents from Lakkinkoppa village and surface run off from agricultural field. The study was carried out from November 2012to April 2013.

Biological Analysis

Water samples were collected periodically every month during morning hrs between 8.00 and 10.00 A.M. Sedimentation was done in glass columns. From each vial one drop was mounted on a slide and a cover slip was carefully put over it. Five high power fields (10x, 45x), one in each corner of the cover slip and are at the center were made and the algal populations were estimated. This procedure was repeated for each sample and the number of each organism was extra plotted to extract number of organism/ltr (Rao,

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1995). Few of indexes like Boyd's index, Shannon- weaver diversity index and Density, Abundance, frequency of species have been discussed.

RESULTS AND DISCUSSION

Diversity of Phytoplankton

The complete inventory of the sample constituent a total of 54 individuals of which *Pinnularia maior* is denser (4.33) with abundance (4.33), frequency (100%) and *Raphidiopsis sp.* recorded the lowest density (0.16), abundance (1) and frequency (16.6%). It appears that the presence of pH, oxygen, TDS, Phosphate, Calcium and BOD are the factors which favored the growth of diatoms. Zafar (1967) Opinioned that calcium rich and high pH of the water bodies have high number of diatoms. However the fluctuation of Cyanophycean members is because of the sunshine and temperature (Thirugnanamoorthy and Selvaraju, 2009; Kumar and Sahu, 2012). Cyanophyceae are highly tolerant organisms and prefer to grow at slightly alkaline conditions (Kumar and Sahu, 2012).

Sl No.	Species Name	No. of indiv idual	Total no of sites studied	No. of in sites which the spp	Densit y	Abun dance	Frequ ency (%)
1		S		occur			
1	Cyanophyceae	_					
1.1	Anabaena sp.	1	6	4	1.166	1.75	66.6
1.2	Chrococcus sp.	5	6	3	0.833	1.66	50
1.3	Gleopcapsa sp.	8	6	4	1.33	2	66.6
1.4	Lyngbya sp.	18	6	6	3	3	100
1.5	Merismopedia punctata	17	6	6	2.83	1	100
1.6	Merismopedia tenuissima	18	6	5	3	3.6	83.3
1.7	Oscillatoria curviceps	15	6	5	2.5	3	83.3
1.8	Oscillatoria subsalsa	9	6	5	1.5	1.8	83.3
1.9	Raphidiopsis sp.	1	6	1	0.16	1	16.6
1.10	Spirulina platensis	5	6	4	0.83	1.25	66.6
2	Chlorophyceae						
2.1	Ankistrodesmus sp.	5	6	3	0.83	1.66	50
2.4	Cosmerium sp.	7	6	4	1.16	1.75	66.6
2.5	Desmidium swartzii	7	6	4	1.16	1.75	66.6
2.6	Eustrum sinuosum	11	6	4	1.83	2.75	66.6
2.7	Mougeotia sp	9	6	5	1.5	1.8	83.3
2.8	Oedogonium sp.	3	6	2	0.5	1.5	33.3
2.9	Pediastrum sp.	3	6	3	0.5	1	50
2.10	Pleurotaenium repandum	15	6	6	2.5	2.5	100

Table 1: Diversity of phytoplankton

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2.11	Scenedesmus acutiformus	12	6	6	2	2	100
2.12	Scenedesmus acutus	11	6	5	1.83	2.2	83.3
2.13	Spirogyra sp.	14	6	4	2.33	3.5	66.6
2.14	Staurastrum leptocladum	13	6	6	2.16	2.16	100
2.15	Staurastrum pyramidatum	11	6	4	1.83	2.75	66.6
2.16	Zygnema sp.	9	6	4	1.5	2.25	66.6
3	Bacillariophyceae						
3.1	Cymbella lanceolata	12	6	6	2	2	100
3.2	Cymbella stuxbergii	15	6	5	2.5	3	83.3
3.3	Cymbella subtinii	15	6	5	2.5	3	83.3
3.4	Cymbella ventricosa	18	6	5	3	3.6	83.3
3.5	Gyrosigma attanuatum	7	6	5	1.16	1.4	83.3
3.6	Gyrosigma fasciola	16	6	5	2.6	3.2	83.3
3.7	Hantzschia sp.	12	6	4	2	3	66.6
3.8	Navicula cuspida	6	6	4	1	1.5	66.6
3.9	Navicula greagria	15	6	6	2.5	2.5	100
3.10	Nitzschia acicularis	10	6	6	1.66	1.6	100
3.11	Nitzschia recta	17	6	5	2.83	3.4	83.3
3.12	Nitzschia vermicularis	7	6	4	1.16	1.75	66.6
3.13	Pinnularia gibba	17	6	5	2.8	3.4	83.3
3.14	Pinnularia maior	26	6	6	4.33	4.33	100
3.15	Pinnularia strptoraphae	19	6	6	3.16	3.16	100
3.16	Surirella sp.	7	6	4	1.16	1.75	66.6
3.17	Syndra capitata	14	6	4	2.3	3.5	66.6
3.18	Synedra ula	14	6	6	2.3	1	83.3
4	Euglenophyceae						
4.1	Phacus acunitus	6	6	5	1	1.2	83.3
4.2	Phacus acutus	6	6	3	1	2	50
4.3	Phacus brevicaudatus	16	6	5	2.6	3.2	83.3
4.4	Phacus lismorensis	18	6	6	3	1.33	100
4.5	Trachelomonas hispida	15	6	4	2.5	3.75	66.6
4.6	Trachelomonas oblonga	16	6	6	2.6	2.66	100
4.7	Trachelomonas olvicina	10	6	3	1.6	3.33	50
4.8	Euglena oxyuris	4	6	3	0.6	1.33	50
4.9	Euglena sp.	2	6	2	0.3	1	33.3

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Shannon – Weaver index:

Table 4: Shannon- Weaver index

Month	November	December	January	February	March	April
Parameter	0.296	0.307	0.294	0.307	0.309	0.266

To elucidate the community structure in the pond Shannon- weaver index is calculated. As a result of the study carried out during six months in pond a total of Shannon and Weiner index (1949) represents entropy. It is a diversity index taking into account the number of individuals as well as the number of taxa. This index can also determine the pollution status of a water body. Normal values range from 0 to 4. This index is a combination of species present and the evenness of the species. Examining the diversity in the range of polluted and unpolluted ecosystems, (Wilham and Dorris, 1968) concluded that the values of the index greater than 3 indicate clean water, values in the range of 1 to 3 are characterized by moderate pollution and values less than 1 are characterized as heavily polluted. According to this (Table 4) index, the values are ranged from 0.309 to 0.266. The maximum diversity shown in the month of March and less diversity found the month of April. Since, according to Shannon and Weaver greater the diversity, lesser is the pollution level (Sudeep and Hosmani).

Boyd's Diversity Index

The diversity index of Boyd indicates the order of pollution of a water body. The resultant values indicate the pollution status of the water body under study. If the values obtained are >4 it indicates less pollution and clean water, values of 3 - 2 indicate moderate pollution and values <1 indicate that water is heavily polluted (Sudeep and Hosmani). The distributions of phytoplankton in pond presented in Table 2. The calculated value of diversity index is shown in Table 3. As per the diversity index of Boyd (1981), the basavanakere pond which is protected from major disturbances is always moderately polluted (Table 3).

Month	No. of	Total no. of	Ln N	DI (H)= S-1/ln	Order of pollution
	genera (S)	phytoplankton (N)		Ν	
Nov	27	1550400	14.25	1.82	Moderately polluted
Dec	25	1656800	14.32	1.67	Moderately polluted
Jan	28	1474400	14.20	1.90	Moderately polluted
Feb	23	1732800	16.27	1.35	Moderately polluted
Mar	27	1641600	14.31	1.81	Moderately polluted
Apr	22	1170400	13.97	1.50	Moderately polluted

Table: 5 Boyd's Diversity index

4= Clean water 3-2= moderately polluted <1 = heavily polluted.

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