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STUDIES ON PHYTOPLANKTON DIVERSITY OF POLSAYPARA & DEEPAK NAGAR POND OF DURG CITY; DISTT. DURG (C.G.)



*G. S. Thakur**Nishant Meshram
***Devendra Kumar

* ** ***Dept. of Botany & Microbiology, Govt. V. Y. T. PG. Autonomous College Durg

ABSTRACT

Phytoplankton are common inhabitants of surface water and pioneer of an aquatic food chain. The phytoplankton has great significance in the biology of the creek as they provide food for the organisms, especially for Zooplankton. The present investigation is an attempt to study the phytoplankton community & physicochemical parameters in two ponds (Polsaypara & Deepak Nagar) of Durg city area” district Durg. During the study the total number of phytoplankton were counted. Total 28 phytoplankton species were recorded in Polsaypara pond, and 24 phytoplankton species were recorded in Deepak Nagar pond. The high temperature & pH favors the growth of cyanobacteria & chlorophyceae group of phytoplankton.

Key word: Physicochemical parameters, ponds, phytoplankton.

Introduction

The Phytoplankton study is a very useful tool for the assessment of water quality in any type of water and also contributes to an understanding of the basic nature and general economy of the pond. Number and kinds of phytoplankton grow in surface waters depend on environmental conditions. Sewage and organic waste water increase the productivity of the waters and their crops of algae and other plankton organisms. Phytoplankton being the primary producer from the lowest tropic level in the food chain of fresh water ecosystem and play a key role in fish culture. According to Gerlach (1975) they produce 360 gm organically bound carbon in a year per square meter. The number and species of phytoplankton serves to determine the quality of water body. The structure of aquatic community is important in monitoring the

quality. The number of workers such as Saxena (1982); Malhotra (1988) studied the composition and seasonal abundance of phytoplankton in Tropical fresh water pond at Aligarh. Many workers have published their work on aquatic environment and ecology of phytoplankton in fresh water Khan (1992), Yogesh Shastri et al. (1999), Dwivedi and Pandey (2002), More and Nandon (2003). Water is an important ecological factor and universal solvent too. It also maintains many physiological activities of living organisms. It is most important natural resource and we depend on water for irrigation, industry and domestic needs.

The present study has been undertaken to study the phytoplankton population and characteristics of water in two ponds of Durg city. Durg generally has a dry tropical weather which is moderate but on a warmer side in summer season. The peak temperature usually

reached in May / June and can be as high as 45° centigrade. The onset monsoon usually from July and the season extends up to September with monsoon peaking during July and August, Durg district (20° 23' - 22° 02' N latitude, and 80° 46' - 81° 58' E Longitude) occupies geographical area of 8701.8 sq KM. and rich in mineral resources.

Materials and Methods

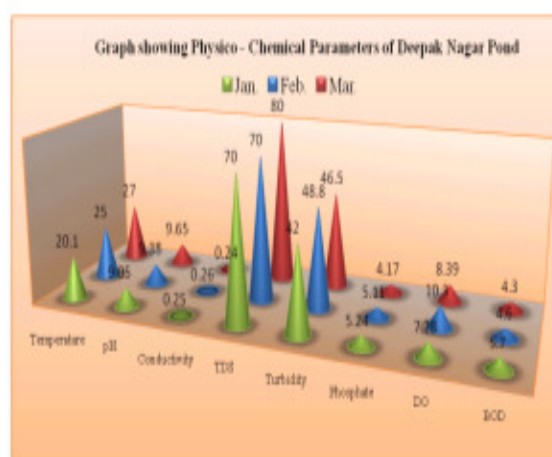
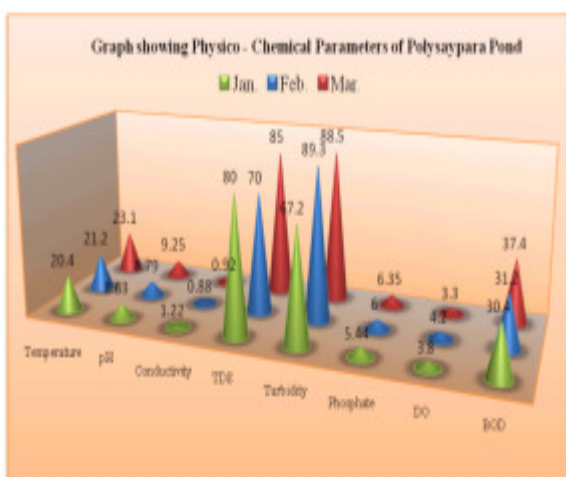
Sampling - Stagnant surface water sample for physico - chemical analysis were collected from two ponds (Polsaypara pond P1 & Deepak Nagar pond P2) during study period (January, February and March 2009) between 9 to 10 am with the help of sampler designed by us. The sampler was made up of a thick walled glass bottle of one liter capacity. The rubber stopper was having two holes, one inserted with a long tube one end of which was almost touching the

bottom while the hole was inserted a shorter tube that ended near the mouth. The neck of the bottle was tied with a nylon thread. The samples were collected by air replacement principle. Phytoplankton were collected from two ponds (P1 & P2) between 9 to 10 am with the help of phytoplankton net, and 25ml of 4% formaldehyde was added (Welch 1948) and sedimentation was done.

The sediments were finally reduced to 20 ml by centrifugation and were preserved in glass vial. The identification was done up to generic level as described by Fritsch (1979) and Desikachary (1959). The water temperature, pH, & Dissolved Oxygen (DO) were determined at sampling sites while Turbidity, Total Solid, Conductivity, Phosphates and Bio - chemical oxygen demand (BOD) were determined in the laboratory. (APHA, 1985 and Trivedi & Goel, 1986).

Table—1 (Polsaypara Pond P1)

PHYSICO-CHEMICAL PARAMETERS	JAN	FEB	MARCH
Temperature (° C)	20.1	25.0	27.0
pH	9.05	9.38	9.65
Conductivity(µmhos)	0.25	0.26	0.24
Total dissolved solids(mg/l)	70	70	80
Turbidity (NTU)	42.0	48.8	46.5
Phosphate (mg/l)	5.24	5.11	4.17
Dissolved Oxygen(mg/l)	7.28	10.3	8.39
Bio-chemical Oxygen Demand (mg/l)	5.7	4.6	4.3



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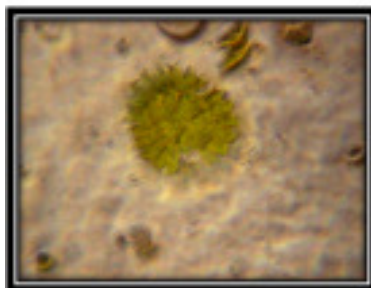
Serial No.	Occurred Phytoplankton	Jan	Feb	March
Group	<i>Chlorophyceae</i>			
1	<i>Chlamydomonas globosa</i>	+	+	+
2	<i>Gonium compactum</i> Iyenger	+	-	+
3	<i>Pandorina morum</i> (Mull) Bory	+	-	+
4	<i>Pediastrum simplex</i> Meyen	+	+	+
5	<i>Chlorella vulgaris</i> Beijerinck	+	+	+
6	<i>Volvox globater</i>	+	-	-
7	<i>Tetraedron muticum</i> A. (Braun)Hansgirg	+	+	-
8	<i>Oocystis ecballocystiformis</i> Iyenger	+	-	+
9	<i>Scenedesmus armatus</i> G.M.Smith	+	+	+
10	<i>Senedesmus var.bogalariensis</i> G.M.Smith	+	+	+
11	<i>Senedesmus dimorphus</i> (Terpi) kuetz	+	+	+
Group	<i>Bacillariophyceae</i>			
12	<i>Navicula grimmii</i> Krasske	+	+	+
13	<i>Nitzschia palea</i> (Kutz) W.Sm.	+	+	+
14	<i>Primularia interrupta</i> W.Sm. Forma <i>subcapitata</i> Fritsch	+	-	-
15	<i>Fragilaria pinnata</i> Ehr	+	+	+
16	<i>Cyclotella catenata</i> Brun	+	+	+
17	<i>Melosira granulate</i> (Ehr)Ralfs	+	-	+
18	<i>Coscinodiscus</i>	+	+	+
19	<i>Sysendra rumpens</i> Kutz.	-	+	+
20	<i>Gomphonema lanceolatum</i> Ehr	+	-	-
Group	<i>Myxophyceae</i>			
21	<i>Arthrospira platensis</i> (Nordst)Gom.	+	+	+

23	<i>Spirulina labirinthiformis</i> Gom.	-	+	+
24	<i>Phormidium ambiguum</i> Gom.	-	+	-
24	<i>Anabaena utermohlii</i> Geitler	-	+	+
25	<i>Anabaenopsis circularis</i> Wolosz.	-	+	-
Group	<i>Euglenophyceae</i>			
26	<i>Euglena proxima</i> Dangeard	-	+	+
27	<i>Trachelomona scylindrica</i> Ehr	-	+	+
28	<i>Strombomonas ovalis</i> (Playf) Defl	-	+	+

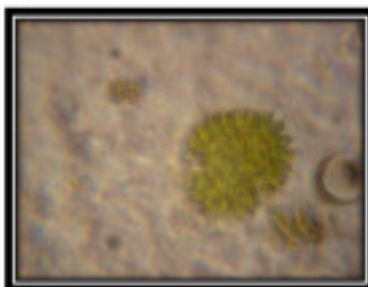
Table-4 Deepak Nagar Pond T2

S No.	Occurred Phytoplankton	Jan	Feb	March
Group	<i>Chlorophyceae</i>			
1	<i>Chlamydomonas globosa</i>	+	+	+
2	<i>Gonium compactum</i> Iyenger	+	+	+
3	<i>Pandorina morum</i> (Mull) Bory	+	+	+
4	<i>Pediastrum simplex</i> Meyen	+	+	+
5	<i>Chlorella vulgaris</i> Beijerinck	+	-	+
6	<i>Volvox globater</i>	-	-	+
7	<i>Tetraedron muticum</i> A. (Braun)Hansgirg	+	+	+
8	<i>Closterium cynthica</i> De.Not.Var.jenneri Kriger	+	+	+
9	<i>Scenedesmus armatus</i> G.M.Smith	+	+	+
Group	<i>Bacillariophyceae</i>			
10	<i>Nitzschia palea</i> (Kutz) W.Sm	+	+	-
11	<i>Primularia interrupta</i> W.Sm. Forma <i>subcapitata</i> Fritsch	-	+	+
12	<i>Fragilaria pinnata</i> Ehr	+	+	+
14	<i>Cyclotella catenata</i> Brun	+	+	+
15	<i>Melosira granulate</i> (Ehr)Ralfs	+	-	+
16	<i>Coscinodiscus</i>	+	+	+
Group	<i>Myxophyceae</i>			
17	<i>Spirulina labirinthiformis</i> Gom.	+	+	+
18	<i>Arthospira platensis</i> (Nordst)Gom.	+	+	-
19	<i>Phormidium ambiguum</i> Gom.	+	+	-
20	<i>Anabaena utermohlii</i> Geitler	+	+	+
21	<i>Anabaenopsis circularis</i> Wolosz.	+	+	-
Group	<i>Euglenophuceae</i>			
22	<i>Phacus cylindraceus</i> Popova	+	+	+
23	<i>Euglena caudate</i> Huebner	+	+	-
24	<i>Trachelomonas cylindrical</i> Ehr.	+	+	+

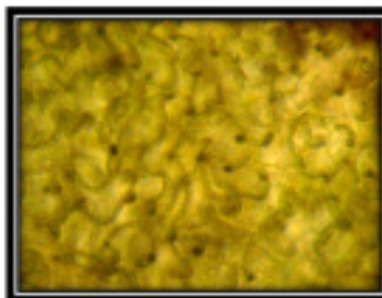
Images taken by Phase-Contrast Microscope for identification



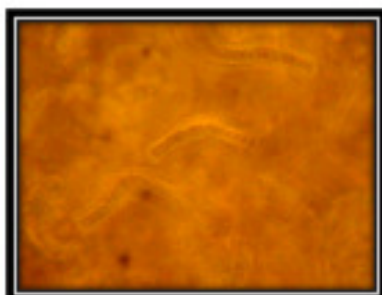
Pediatrum



Pediatrum



Anabaena



Anabaena



Spirulina & Senedemus



Phacus

Result & Discussion

Physico - chemical parameter

The result of Physico - chemical parameters and the phytoplankton study of the surface water of two ponds are presented in tables 1, 2, 3 & 4 for convenience of discussion. The ponds were represented by P1 (Polsaypara pond) and P2 (Deepak Nagar pond). Water temperature of P1 were recorded ranging from 20.1°C to 23.1°C during study period (Table -1); whereas the temperature of P2 (table 2) were recorded ranging from 20.3°C to 27.2°C (Table -2). Comparatively higher temperature of P2 was due to the protected by all sides. This high range of temperature favors the grow of phytoplankton life.

The pH value of P1 range from 8.63 to 9.25. It was minimum (8.63) in the month of January and maximum (9.25) during March 2009. Whereas pH of P2 range from 9.05 to 9.65. It was minimum (9.05) in month of January and maximum (9.65) in March. Singhai (1986) has obtained a direct relationship between water

temperature and pH, whereas, Mary Bai (1989) reported that the pH of polluted water fluctuates in the range of 8 to 9. The pH value of P1 was near about same the result of Mary Bai. The alkaline pH and reduced water level supports the dominance of cyanobacterial species due to increased photosynthesis activity.

Conductivity of P1 range from 0.88 to 1.22 μ mhos and P2 range from 0.24 to 0.26 μ mhos were recorded; higher value in P2 than P1. Turbidity (NTU) & Total Dissolved Solid value was higher in P1 than P2. The high content of total dissolved solids elevates the density of water and such a medium increases osmoregulatory stress on aquatic biota (Verma *et al* 1978). The value of phosphates ranged between 4.17 to 5.24mg/l in P2 and 5.44 to 6.35mg/l in P1. It was higher value than P2. The higher phosphate value of P1 could possibly be due to sewage pollution and human interfere by washing clothes and bathing. Dissolved oxygen in P1 was ranged from 3.3 to 4.2 mg/l whereas in P2 was ranged from 7.28 to 10.31mg/l. It

was high in P2. The dissolved oxygen almost all plants and animals need for respiration. Low dissolved oxygen creates favorable condition for phytoplankton growth. Biological Oxygen Demand value was recorded range from 30.4 to 37.4 mg/l in P1 and in P2 it was range from 4.3 to 5.7mg/l. This value indicated that the Polsaypara pond (P1) is more polluted than the Deepak Nagar pond (P2). The change in physicochemical parameters also influence water bodies as it is observed in the present study.

Phytoplankton composition

At pond P1 the total number of 26 species of phytoplankton consisting of 9 species of *Chlorophyceae*, 9 species of *Bacillariophyceae*, 5 species of *Myxophyceae* and 2 species of *Euglenophyceae* were identified (Table no. 1). At pond P2 the total number of 24 species comprising of 6 species of diatoms, 9 species of *Chlorophyceae* 5 species of *Myxophyceae* and 3 species of *Eulenophyceae* and were recorded. At pond P2 *Diatoms* were dominated species. Phytoplankton population among *diatoms* such as *Cyclotella*, *Melosira* & *Coscinodiscus* were found as most dominated species.

Polsaypara pond: - Group *Chlorophyceae* included

species *Chlamydomonas*, *Pediastrum*, *Closterium*, *Scenedesmus* with maximum while *Gonium*, *Pandorina*, *Tetraedron* with minimum occurrence. *Chlorella*, *Volvox*, *Oocystis* and *Ankistrodesmus* species were recorded occasionally. Among *Diatoms* *Navicula*, *Nitzschia*, *Fragilaria*, *Cyndrella*, *Syrendra*, *Melosira*, *Gomphonella* & *Cyclotella* species showed maximum density. Among *Cyanobacteria* population, five species namely *Arthospira*, *spirulina* were recorded maximum density while *Phormidium*, *anabaena anabaenopsis* with less frequency and density. Group *Euglenophyceae* was represented by *Euglena* and *Tracholemons* with maximum occurrence.

Deepak Nagar Pond: - Group *Chlorophyceae* included species *Chlamydomonas*, *Pediastrum*, *Closterium*, *Scenedesmus*, *Pandorina* with maximum while *Gonium*, *Tetraedron*, *Chlorella*, *Volvox* *Oocystis* species were recorded with minimum occurrence. Among diatoms *Navicula*, *Nitzschia* & *Fragilaria* species showed maximum density. Among cyanobacterial population *Spirulina*, & *Arthospira* were found with maximum density followed by *Phormidium*, *Anabaena* and *Anabaenopsis*. Group *Euglenoidae* was represented by *Phacus*, *Euglena* and *Trachetomonas* species.

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