

Algal Diversity of Nandan Pahar Pond Deoghar

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ABSTRACT

Algae are large group of prokaryotic and eukaryotic photosynthetic organisms showing diversity in their structure. In this work distribution of algae of Nandan Pahar pond has been investigated. Total fifty-six water algal samples were collected from different unexplored sites of Nandan Pahar pond. They were unicellular, filamentous, branched and colonial. They were identified based on microscopic observation and characters such as filament length, colonial diameter, pigments colour, shape and cell dimensions. Results revealed that these algae belong to four major classes. These are Chlorophyceae, Bacillariophyceae, Charophyceae and Cyanophyceae. Maximum algal taxa belong to green algae followed by blue green algae, diatoms and Charophyceae.

Key Words - Green algae, Nandan Pahar Pond, Cyanophyceae, Bacillariophyceae, Algal indicators, Water quality.

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INTRODUCTION

Algae has drawn much attention due to their primary productivity in the water food chain of water ecosystem diversity, their biological assessment of water quality, pollution abatement capacity and as a source of structurally novel and biologically active metabolites with antimicrobial capacity etc. Water ecosystem varies in size and composition and contains a large variety of organisms. Algae are large group of prokaryotic and eukaryotic photosynthetic organism found in many different forms viz, individual cells, colonial or filament and exhibit vast diversity in the ecosystem. Algae are found everywhere in nature like ocean, lakes, river, ponds, puddles, moist surface and fresh water. Algae are the indicator of water quality due to their rapid response to environmental changes related to larger animals, plants and human being. Algae are used for biological assessment of water quality and bioindicator of eutrophication. The algal community both planktonic and benthic are also important ecological indicator. The dominance of

green algae and diatoms presence in relatively clean and oligotrophic water bodies whereas blue green algae bloom formation indicate that the water body is polluted or eutrophic. The present investigation has been carried out to observe the algal diversity of Nandan Pahar Pond.

MATERIALS & METHODS

Study site:

Nandan pahar pond is my study site. This pond is located on this western part of Nandan pahar at Deoghar. The catchment area of Nandan pahar pond is 15 acres.

Water storage capacity is 70 million gallons. Water is supplied to the people of Deoghar town from this pond throughout the year. Algal samples were collected on a monthly basis. For this, scalpel, forceps, plankton net etc. were used. The materials collected were placed in plastic containers along with some water of the habitat. They were brought to the laboratory, kept in properly clean in fresh

water and examined in fresh and also preserved condition. Preservation was done in 2 to 4% formalin. Identification was done with the help of relevant monographs and research papers by various authors (Desikachary, 1959; Philipose, 1967; Tiffany & Britton. 1952; Gandhi, 1958c; Gandhi. 1966; Gonzalves and Gandhi. 1952).

RESULTS & DISCUSSION

The author has collected, studied and identified 56 taxa of algae belonging to 4 divisions from the Nandan Pahar pond. Of these, 56 taxa, 20 belong to division Cyanophyta, 28 belong to division Chlorophyta, and 6 to Bacillariophyta and 2 belong

to Charophyta. Maximum algal taxa belong to green algae followed by blue green algae and diatoms. Among the green algae dominant forms were *Scendesmus* spp. *Chlamydomonas* spp. *Chlorella* spp. *Spirogyra* spp. *Ulothrix* spp. *Chaetophora* spp. *Oedogonium* spp. Rarely found green algae were *Cosmarium* spp. and *Pediastrum* spp. Among the blue green algae *Microcystis* spp. *Oscillatoria* spp. *Phormidium* spp. *Spirulina* spp. were dominant, while *Merismopedia* spp. were rare forms. Among the diatoms *Fragillaria* spp., *Navicula* spp., *Synedra* spp., were dominant while *Cymbella* spp. were rare forms. Among Charophytes *Chara* spp. and *Nitella* spp. were dominant.

Table 1: List of algae collected from Nandan Pahar pond. (Arranged Division-wise)

Sl. No.	DIVISION CYANOPHYTA	Sl. No.	DIVISION CHLOROPHYTA
01	<i>Microcystis flos-aquae</i> Kirchner	01	<i>Chlorococcum infusionum</i> Meneghini
02	<i>Gleocapsa polydermatica</i> Kutz	02	<i>Tetraedron trilobulatum</i> Hansgirg
03	<i>Aphanocapsa montana</i> Cramer	03	<i>Nephrocytium agardhianum</i> Naegeli
04	<i>Merismopaedia tenuissima</i> Lemm	04	<i>Ulothrix rorida</i> Thuret
05	<i>Oscillatoria chilensis</i> Biswas	05	<i>Ulothrix tenuissima</i> Kuetzing
06	<i>Oscillatoria gloiophila</i> Grun.	06	<i>Uronema gigas</i> Vischer
07	<i>Lyngbya kuetzingii</i> Schmidle	07	<i>Hormidiella parvula</i> Iyengar
08	<i>Spirulina major</i> Kutz Ex Gomont	09	<i>Geminella mutabilis</i> Wille
09	<i>Lyngbya ceylanica</i> Wille	10	<i>Geminella interrupta</i> Lagerheim
10	<i>Lyngbya palmarum</i> Biswas	11	<i>Hormidium flaccidum</i> A Braun
11	<i>Phormidium ambigum</i> Gomont	12	<i>Microspora willeana</i> Lagerheim
12	<i>Lyngbya putealis</i> Mont. Gomont	13	<i>Microspora stagnorum</i> Lagerheim
13	<i>Lyngbya magnifica</i> Gardner	14	<i>Sphaeroplea annulina</i> C.A. Agardh
14	<i>Cylindrospermum musicola</i> Dixit	15	<i>Zygnema conspicuum</i> Transeau
15	<i>Anabaena ambigua</i> Rao, C.B.	16	<i>Spirogyra hyaline</i> Cleve, Nova
16	<i>Aulosira fertilissima</i> Ghose	17	<i>Spirogyra regularis</i> Krieger
17	<i>Plectonena radiosum</i> Gomont	18	<i>Closterium venus</i> Kutz.
18	<i>Plectonena tomasinianum</i> (Kutz)	19	<i>Closterium ehrenbergii</i> Menegh
19	<i>Scytonema bohneri</i> Schmidle	20	<i>Cosmarium absoletum</i> Hantzsch
20	<i>Tolypothrix tenuis</i> Kutz Johs.	21	<i>Cosmarium cucurbitinum</i> Lutkem
		22	<i>Cosmarium moniliforme</i> f punctata
	DIVISION BACILLARIOPHYTA	23	<i>Cosmarium granatum</i> Brebisson
01	<i>Fragillaria</i> sp.	24	<i>Cosmarium angulatum</i> Rab.
02	<i>Navicula sphaerophora</i> Kuetzing	25	<i>Chlamydomonas</i> sp.
03	<i>Pinnularia braunii</i> Hust.	26	<i>Scendesmus abundans</i> Chodat
04	<i>Rhopalodia gibba</i> O.Mull	27	<i>Tetraedron trigonum</i> Turner
05	<i>Gomphonema constrictum</i>	28	<i>Chlorella vulgaris</i>
06	<i>Synedra ulna</i> Ehrenberg		
			DIVISION CHAROPHYTA
		01	<i>Nitella terrestris</i> Iyengar
		02	<i>Chara braunii</i> Gmelin

These findings are in conformity with the fact that the Nandan pahar is reservoir of so many algal floras. Now a days visitors are throwing waste in and around the pond, recreation activities like swimming, boating etc., bathing and washing of utensils by local people, using low quality detergents, immersion of idols of Gods/Goddesses during festivals and annual picnics were observed. Of the 60 genera listed as pollution tolerant by Palmer, some are found growing in the Nandan pahar pond. These are, in order of decreasing emphasis, *Oscillatoria*, *Scenedesmus*, *Chlorella*, *Nitzschia*, *Navicula*, *Stigeoclonium*, *Synedra*, *Phormidium*, *Closterium*, *Spirogyra*, *Anabaena*, *Fragilaria*, *Ulothrix*, *Spirulina* *Coelasstrum*, *Pinnularia* and *Cosmarium*.

Of the 80 most pollution tolerant species of algae in the order of decreasing emphasis listed by Palmer, 15 are being reported from the Nandan pahar pond. These are *Nitzschia palea*, *Oscillatoria limosa*, *Oscillatoria tenuis*, *Synedra ulna*, *Oscillatoria*

chlorina, *Chlorella vulgaris*, *Oscillatoria princeps*, *Gomphonema parvulum*, *Closterium acerosum*, *Scenedesmus obliquus*, *Navicula viridula*, *Nitzschia sigmaidea*, *Coelastrum microporum*, *Scenedesmus dimorphus* and *Fragilaria capucina*.

This is clear from Palmers (1969) list which includes many of its species. In the nandan pahar pond, many different species of *Oscillatoria* have been found to grow; *Nitzschia palea*, *Synedra ulna*, *Chlorella vulgaris*, *Gomphonema parvulum*, *Closterium acerosum* and *Scenedesmus obliquus*, included in the top half in Palmer’s list also grow in this pond under study. *Chroococcus turgidus* and *Merismopedia punctata* have been obtained during this study. It has been observed that 3 species of *Merismopedia*, including *M. punctata* form water blooms in the Nandan pahar pond Bloom formation is a sign of eutrophication. In eutrophic water bodies, the water is enriched by plant nutrients. It supports abundant microscopic plant life mainly algae.

Table 2- Relative dominance and floristic diversity of Chlorophyceae (Sushma Das Guru, 2007)

Sl. No.	Name of organism	Dominant	Common	Rare
1.	<i>Scenedesmus abundans</i> Chodat	+++	-	-
2.	<i>Scenedesmus carinatus</i> Chodat	+++	-	-
3.	<i>Scenedesmus quadricauda</i> Berb	+++	-	-
4.	<i>Scenedesmus armatus</i> G.M.Smith	+++	-	-
5.	<i>Scenedesmus acoleolatas</i> Chodat	+++	-	-
6.	<i>Scenedesmus arcuatus</i>	+++	-	-
7.	<i>Chlorella vulgaris</i>	+++	-	-
8.	<i>Chlamydomonas angulosa</i> Dill	+++	-	-
9.	<i>Chaetophora anceolat</i> hazen	-	++	-
10.	<i>Ulothrix tenuissima</i> kuetzing	-	++	-
11.	<i>Cosmarium angulosum</i> Berb	+++	-	+
12.	<i>Caracium angustum</i> A. Braun	-	-	+
13.	<i>Oedogonium</i> sp.	-	++	-
14.	<i>Spirogyra</i> sp.	+++	-	+
15.	<i>Geminella mutabilis</i> Wille	-	-	+
16.	<i>Pediastrum simplex</i> Meyen	-	-	+

Table 3- Relative dominance and floristic diversity of Cyanophyceae (Desikachary, 1959)

Sl. No.	Name of organism	Dominant	Common	Rare
1.	<i>Oscillatoria</i> sp.	+++	-	-
2.	<i>Phormidium retzii</i> Gomant	+++	-	-
3.	<i>Phormidium ambigum</i> Gomant	+++	-	-
4.	<i>Microcystis aeruginosa</i> kutz	+++	-	-
5.	<i>Merismopedia gluca</i> nag	-	-	+
6.	<i>Spirulina major</i> kutz.Ex Gomont	-	++	-

Table 4- Relative dominance and floristic diversity of Bacillariophyceae (Gonzalves & Gandhi, 1952)

Sl. No.	Name of organism	Dominant	Common	Rare
1.	<i>Cymbella affinis</i> kuitz	-	-	-
2.	<i>Fragillaria</i> sp.	+++	-	-
3.	<i>Cymbella</i>	-	-	-
4.	<i>Fragillaria capucina</i> Desmazieres	+++	-	-
5.	<i>Synedra ulna</i> Ehrrenberg	-	-	-
6.	<i>Gamphonema herculeana</i> cleave	-	-	-
7.	<i>Navicula crytocephala</i> kuet-zing	-	++	-
8.	<i>Syndra ulna ehrrenberg</i>	-	++	-

CONCLUSION

Biomonitoring is the use of biological responses to assess changes in the environment, generally changes due to anthropogenic causes. Algae is a valuable tool that is being used increasingly in water quality monitoring programs of all types. It is thus suggested that biomonitoring should be done in the case of this pond under the present study because Nandan pahar pond is reservoir of many algal taxa.

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REFERENCES

- Chaterjee G. and Raziuddin M. 2006. Status of water body in relation to some physico-chemical parameters in Asansol Town, west Bengal Proc Zool. Sac. India. 5(2): 41-48.
- Desikachary T. V. 1959. Cyanophyta Monograph on Blue Green Algae. Indian Council of agricultural Research, New Delhi, India.
- Gandhi H. P. 1966. The fresh water Diatoms flora of the Jog Falls, Mysore State. Nova Hedwigia. 11(1/4):89-147.
- Gandhi H.P. 1958c. The Fresh Water Diatoms flora of the Hirebhasagar -Dam area, Mysore State. J. Indian Bot. Soc. 37(2):249-265.
- Gonzalves E. A. and Gandhi H. P. 1952. A systematic account of the Diatoms of Bombay and Salsette. Part-I. *J.Indian bot. Soc.* 31: 117-151.
- Palmer C. M. 1969. Composite rating of algae tolerating organic pollution. *J. Phycol.* 5:78
- Philipose M. T. 1967. Chlorococcales, monograph on algae. Indian Council of Agricultural Research, New Delhi.
- Sushma Das Guru, 2007. A comparative study of the species richness and diversity of Chlorophycean assemblage of two city based polluted tanks of Ranchi. *Biospectra.* 2(2):343-345.
- Tiffany L. H. & Britton M. E. 1952. Monograph on the algae of Illinoids, the University of Chicago press.