

Ecological Survey of Phytoplankton (Nostocaceal) of Chakhan Lake, District, Dadu, Sindh, Pakistan

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Research Article

Received date: 21/06/2016
Accepted date: 17/10/2016
Published date: 22/10/2016

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Keywords: Saline water, Ecological survey, Nostocaceae, Chakan lake

ABSTRACT

The present studies of phytoplankton algal species belonging to genera. Anabaenopsis, Anbaena and Nostoc of family Nostocaceae along with physico chemical analysis from Chakan lake, district, Dadu, Sindh, Pakistan. Ecological studies of phytoplankton in saline water was done from December 2013 to November 2014.

INTRODUCTION

Chakan Lake is the largest and oldest salt water lake in Sindh, it is located Palh village 26° 57'3394N 67° 51'0610E nearly 25 km in north from Dadu city. The lake covers an area of 142 meters. The lake collects water from numerous small agricultural channels from (Dadu canal). It was nearly 12 meters deep in the beginning but continuously silting and deposition decaying has decreased the depth up to 5 to 7 meters. The importance of ecological studies of these organisms can be released from the fact that *Planktonic* species are important component of aquatic environment they make significant contribution to the ecological condition of these water ^[1]. *Phytoplankton* species are essential components of aquatic ecosystems especially for productivity of water bodies hence they play role of producers in aquatic ecosystem. Fish population is dependent on the species directly either indirectly ^[2]. Species of *Phytoplankton* (Nostocaceal) have been studied by many authors from various area of Pakistan ^[3-5]. Present study of Phytoplankton (Nostocaceae) was made from three station of Chakhan lake.

MATERIALS AND METHODS

Chakhan lake, Dadu, Sindh was surveyed from December 2013 to November 2014 from three places (**Tables 1-6**). The collection and studies material was the same as described with previously the phytoplankton (Nostocaceae) samples were stored in plastic bottles, and preserved 4% formalumic. Identification of phytoplankton was made by literatix ^[6]. The algae were classified ^[2].

Table 1. Water quality analysis of samples collected from Chakan lake on 26-12-2013.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	18.6	8.3	3.6	18.1	9370	9.1	2118	4170	905
Station II	19.3	8	4.1	18.3	9330	9.3	2040	3970	946
Station III	19.8	9.1	5.1	17.9	9226	9.2	1860	3630	1040

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 2. Water quality analysis of samples were collected from Chakan lake on 25-01-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	18.2	8.5	3.8	17.9	9255	9.1	2190	4050	980

Station II	19.4	8.5	4.0	18.2	9210	9.2	2006	3850	920
Station III	19.6	9.0	5.0	18.0	9305	9.3	1890	3520	1010

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 3. Water quality analysis of samples were collected from chakan lake on 24-02-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalinity Mg/l
Station I	19.6	8.8	3.6	18.2	9430	9.4	2140	3970	915
Station II	20.9	9.0	3.9	18.0	9390	9.3	2105	3970	918
Station III	22.5	9.4	4.9	18.3	9295	9.2	1890	3240	1030

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 4. Water quality analysis of samples were collected from Chakan lake on 27-03-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalinity Mg/l
Station I	21.2	8.3	3.6	18.3	9676	9.6	2220	3960	930
Station II	20.9	8.6	3.9	18.1	9570	9.5	2110	4160	915
Station III	22.5	9.0	4.8	18.2	9605	9.6	1840	3370	980

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 5. Water quality analysis of samples were collected from Chakan lake on 26-04-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalinity Mg/l
Station I	27	8.5	3.3	18.4	9703	9.7	2190	3910	990
Station II	26	8.9	3.7	18.3	9618	9.6	2270	4180	980
Station III	26.4	9.0	4.7	18.4	9690	9.4	1910	3690	980

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 6. Water quality analysis of samples were collected from Chakan lake on 25-05-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalinity Mg/l
Station I	35	8.7	3.1	18.3	9915	9.9	2010	4010	920
Station II	38	10	3.6	18.4	9780	9.8	2290	4390	910
Station III	41.5	8.9	4.6	18.6	9770	9.5	1930	3840	930

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

RESULTS AND DISCUSSION

The regular record of physico-chemical parameters at interval of 30 days carried during December 2013 to November 2014. The pH water was high 10.00 in month of June and December and it was lower at 7.9 in the month of September and October. The maximum water temperature was 45 °C in the month of June and it was decreased i.e. 18.2 °C in the month of January. Total dissolved solid (TDS) was 1050 mg/l in the month of July. The oxygen was highest i.e. 5.1 mg/l and it was lowest i.e. 3.1 mg/l in the month of May. The maximum conductivity was 19.2 µs/cm in July 2014. Concentration of sodium was much higher throughout the study period than other cations. Sodium fluctuated from 9.1 in December 2014 and 2013. Chloride maximum concentration in May (4390 mg/l) and minimum in February (3240 mg/l). Total alkalinity increased in winter fluctuating between 905 mg/l in station I and 1040 mg/l in station III the maximum value of hardness was recorded in May (4390 mg/l) while 1810 mg/l minimum value occurred in November. During the study period species of *Phytoplankton* (Nostocaceae), were collected from Chakan lake during the period of study are noted in **Tables 7-11**. These species were appeared huge quantity due to salt water, filamentous algae belonging to *Anabaenopsis* and *Nostoc* were present in huge range in this water the available of these species in Chakan lake, huge Fishes such as The *Nile tilapia* (*Oreochromis niloticus*), *Mozambique tilapia* (*Oreochromis mossambicus*) feeding on the *Phytoplankton*. Species have been satisfactory in Chakan Lake^[7,8]. Species of (Nostocaceae) *Anabaena wisconsinense*, *Anabaena oscillariodes* have been reported from Kenjhar lake but species, *Anabaena vigorous*, *A. flosaque*, *A. variabilis* and *A. oryzae* recorded in the Chakan lake. *Anabaena* species and *Nostoc* in reported for the first time as cyanophyceae at Chakan lake. *Anabaenopsis reciborcki* was observed huge quantity in this lake. Our results were agreed with the studies of^[9,10]. In *Anabaenae* and *Nostoc*, *Anabaena vigutri*, *Anabaena flosaque*, *Anabaena variables*, along with species of *Nostoc calcicola*, *Nostoc pentiformes* and *Nostoc sphaerium* were observed in the lake. *Nostoclikia* and *Anabaena oryzae* were found through the year in the lake. But two species of *Nostoc paludosum* and *Nostoc cellipsosporum* were found low gently in the lake^[11]. It is observed low species

composition of the Chakan lake. The lake was changed in different reasons and some species were appeared in different areas. Ecological studies and Phytoplankton (Nostocaceae) of Chakan lake indicate further studies are required to document seemed variations of Phytoplankton at its different location (Table 1).

Table 7. Water quality analysis of samples were collected from Chakan lake on 26-06-2014.

Site of Collection	Temp: of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	40	8	3.8	18.5	9980	9.8	1917	4024	940
Station II	42	9	3.7	18.5	9805	9.8	2115	4270	936
Station III	45	10	4.7	18.8	9890	9.8	1970	3970	916

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 8. Water quality analysis of samples were collected from Chakan lake on 27-07-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	43	8	3.9	19.2	1012	10.0	1980	4038	990
Station II	45.5	9.2	3.9	19.1	1030	10.1	1970	4156	1015
Station III	45	9.4	4.1	19.0	1050	10.2	1940	3990	938

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 9. Water quality analysis of samples were collected from Chakan lake on 24-08-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	41	8.5	3.9	18.6	9830	9.8	1995	3770	1012
Station II	43	8	4.0	18.9	9920	9.9	1996	3960	990
Station III	44	9.5	3.9	18.6	9870	9.8	1930	4105	938

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 10. Water quality analysis of samples were collected from Chakan lake on 24-09-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	33	8.4	4.4	18.3	9560	9.6	2012	3910	930
Station II	35	7.9	4.2	18.6	9618	9.4	1840	3850	980
Station III	38	8.2	3.8	18.3	9640	9.4	1860	3915	970

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Table 11. Water quality analysis of samples were collected from Chakan lake on 25-10-2014.

Site of Collection	Temp of Water	pH	DO Mg/l	EC µs/cm	TDS Mg/l	Salinity	Hardness	Chloride Mg/l	Alkalanity Mg/l
Station I	26.5	8.7	4.6	18.2	9220	9.2	2060	3905	940
Station II	29.6	7.9	4.5	18.4	9430	9.2	1850	3540	970
Station III	30.6	8.2	3.9	18.5	9520	9.3	1860	3660	926

Sampling stations: 1) Palah village, inlet water source from Dadu canal through River Indus, 2) Fishing spot, centre of the lake, 3) Miyani Village, outlet of the lake

Anabaenopsis

- *Anabaenopsis reciborcki* wolosz

Anabaena

- 1) *Anabaena viguieri* Deris and freemy
- 2) *Anabaena flos-aque* treleasii
- 3) *Anabaena variabilis* kutzing
- 4) *Anabaena oryzae* frtsch

Nostoc

- 1) *Nostoc calcicala* Brebission ex-Born-et Flash

- 2) *Nostoc punctiforme* (kutz) Hariot
- 3) *Nostoc sphaericum* voucher ex-Bornet-et Flash
- 4) *Nostoc linchia* Bornet ex-Born-et Flash
- 5) *Nostoc paludosum* kutzing ex Bornet-et Flash
- 6) *Nostoc ellipsosporum* var *violaceae* Rao C.B

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