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Diversity and species composition of cyanophyceae from Kaylana Lake, Jodhpur (Rajasthan)

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Abstract
In the present study, 21 species belonging to 12 genera of the class Cyanophyceae have been identified during a year round study (July 2013 - June 2014) from Kaylana Lake, Jodhpur. Out of 21 species, 15 species belongs to Nostocales order and 6 to Chroococcales order. Maximum number of species was observed during summer season (21 species) followed by rainy season (16 species) and least in winter season (14 species). *Microcystis aeruginosa* was observed dominant during the study period. *Oscillatoria* was represented by maximum number of species (5). Cyanophyceae showed distinct seasonal variations in density as well as in number of species.

Keywords: cyanophyceae, haemocytometer, seasonal distribution, species composition, algal species

Introduction
Algae form a vital part in almost all the fresh water ecosystem & play an important role through primary productivity in the food chain and are also a useful tool for the assessment of water quality. The district Jodhpur experiences arid to semi arid type of climate. The major part of the district covers desolate and dreary region and form an important part of the Great Indian Desert. Climate of this region is characterized by extreme of temperature, high wind velocity, low relative humidity and low precipitation. There are several natural and artificial freshwater bodies are distributed more frequently in and around Jodhpur city. Kaylana Lake is a fresh water lake and situated about 8 km in the west of Jodhpur city. The lake was constructed by Pratap Singh in 1872. The lake is spread over 84 square km and it has a capacity of 191 mcft. of water. A very little attention has been paid to study the algal flora of Jodhpur region of by some workers Bhandari, 1951 [1], 1952 [2]; Goyal, 1964 [7]; Odhwani, 1992 [11]; Meena *et al.,* 2014 [8]. Singh (1961) [14] stated that blue green algal group is a pioneer in the unfavorable condition and can tolerate wide range of climatic factors. The present study was deals with the species composition, life span (period of occurrence), seasonal distribution and density of Cyanophyceae in Lake water.

Material and Method
Random sampling technique has been applied in the algal collection from shallow water zone and deep water zone fortnightly during the study period (July 2013 - June 2014). Living material was used for the morphological studies and then preserved in 4% formalin for further study. For staining 1% aqueous solution of either neutral red, crystal blue or methylene blue were used. Algal taxa were sketched by the line drawing with the help of camera lucida drawing method. Microphotography was taken with the help of binocular research microscope attached with NIKON Camera. Identification of the material was done following the key given by Desikachary (1959) [4]. The density of the taxa was done with the use of Haemocytometer counting chamber and the value of the original water sample was calculated.

Result and Discussion
Algae are one of the smallest and most plentiful organisms on planet. It is the major primary producers in many aquatic systems and is important food source for other organism. Algae not only serve as food for aquatic organism but also play an important role in maintaining the biological balance and quality of water. Thus, the qualitative as well as quantitative knowledge of these organisms growing in an aquatic ecosystem is of fundamental importance. Cyanophyceae constitutes a major group of algae in any fresh water aquatic system. Total 21 taxon of the Cyanophyceae were observed in a year round study with maximum in summer season (21 species) followed by rainy season (16 species) and least in winter season (14 species). *Oscillatoria* was represented by maximum number of forms (5) followed by *Lyngbya* (3), *Microcystis* (2), *Chroococcus* (2), *Anabaena* (2) *Aphanocapsa* (1), *Merismopedia* (1), *Arthrospira* (1), *Spirulina* (1), *Phormidium* (1), *Nostoc* (1) and *Homoeothrix* (1). It showed 1168 $Ind.ml^{-1}yr^{-1}$ density with maximum 754 $Ind.ml^{-1}yr^{-1}$ during summer season followed by 335 $Ind.ml^{-1}yr^{-1}$ and 79 $Ind.ml^{-1}yr^{-1}$ during rainy and winter season, respectively. Dhakar (1979) [5], Billore (1981) [3], Shekhawat (1983) [12], Rao (1984) [11] and Shukla (1986) [13] recorded higher density of blue green algae during summer and lower during winter. Murlidharan *et al.* (2002) [9] observed average density of blue greens was low in winter season and was higher during summer. Tiwari and Chauhan (2006) [15 & 16] and Gehlot and Barupal (2010) [6] reported the abundance of cyanophyceae during summer month. Similar trends were recorded in the present study. The peak was observed during

June in both species composition (21 species) and density (223 Ind.ml^{-1}yr^{-1}). The life span of different species of phytoplanktons in shallow water zone revealed that *Microcystis aeruginosa* was present round the year. *Chroococcus micrococcus* for 10 months and *Oscillatoria subbrevis*, *Lyngbya martensiana* and *Anabaena constricta were observed* for 9 months.

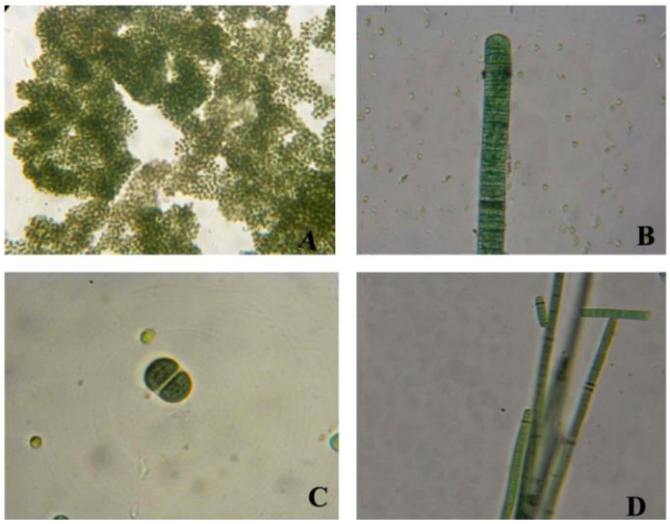
Conclusion

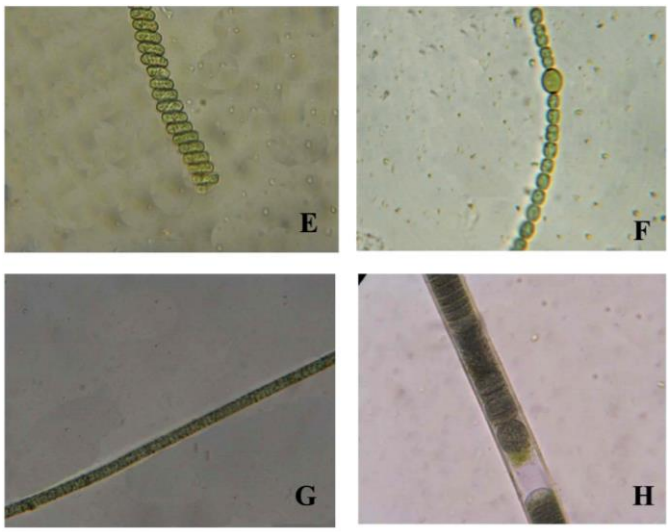
In the present study 21 taxon of the Cyanophyceae (Plate-1) were observed in a year round study with maximum in summer and minimum in winter. Similarly, the density of Cyanophycean algae was observed maximum in summer season. Cyanophyceae showed distinct seasonal variation in respect of number of species as well as density.

Table 1: Cyanophycean Population, Individual ml^{-1} in Kaylana Lake, Jodhpur during 20013-14.

Name of the Species	Cyanophycean population (individual ml^{-1})											
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun
Order: Chroococcales												
Family: Choococcaceae												
Microcystis aeruginosa Kutz.	46	28	24	32	10	10	8	8	16	22	28	30
Microcystis flos-aquae (Wittr.) Kirchner	15	17	16	10	-	-	4	4	10	12	12	14
Aphanocapsa grevillei (Hass.) Rabenh.	3	3	2	-	-	-	-	2	5	8	10	9
Chroococcus macrococcus (Kutz.) Rabenh.	8	6	4	4	1	-	-	9	12	12	17	18
Chroococcus tenax (Kirchn.) Hieron.	5	3	3	-	-	-	-	6	16	13	16	10
Merismopedia glauca (Ehrenb.) Nag	1	-	-	-	-	-	-	2	12	4	6	5
Order: Nostocales												
Family: Nostocales												
Arthrospira platensis (Nordst.) Gomont	-	-	-	-	-	-	-	-	4	4	8	6
Spirulina subsalsa Oerst. ex Gomont	4	3	2	-	-	-	-	-	6	8	5	5
Oscillatoria subbrevis Schmidle	11	7	3	3	-	-	-	2	10	16	22	18
Oscillatoria chlorina Kutz. ex Gomont	-	-	-	-	-	-	-	-	6	6	5	8
Oscillatoria ornata Kutz. ex Gomont	8	5	4	4	-	-	-	-	8	10	10	12
Oscillatoria schultzii Lemm.	-	-	-	-	-	-	-	2	6	6	6	8
Oscillatoria curviceps Ag. ex Gomont	-	-	-	-	-	-	-	-	4	6	8	7
Lyngbya martensiana var. *calcarea* Tilden	4	2	1	1	-	-	-	4	4	10	12	8
Lyngbya polysiphoniae Fremy	-	-	-	-	-	-	-	-	-	2	2	6
Lyngbya majuscula Harvey ex Gomont	3	2	-	-	-	-	-	-	8	9	9	12
Phormidium ambiguum Gomont	2	1	1	-	-	-	-	2	6	4	4	6
Family: Nostocaceae												
Nostoc ellipsosporum (Desm.) Rabenh. Born. et Flah	6	6	3	2	-	-	-	-	3	8	10	15
Anabaena constricta (Szafer) Geitler	3	2	1	1	-	-	-	2	4	4	6	12
Anabaena fertilissima Rao	8	2	-	-	-	-	-	3	6	6	19	14
Density (individual ml^{-1}yr^{-1})	**79 (Rainy season)**				**335 (Winter season)**				**754 (Summer season)**			

Plate 1





A. ***Microcystis aeruginosa*** **B.** ***Oscillatoria subbrevis***
C. ***Chroococcus tenax*** **D.** ***Oscillatoria curviceps***
E. ***Spirulina subsalsa*** **F.** ***Anabaena fertilissima***
G. ***Oscillatoria ornata*** **H.** ***Lyngbya majuscula***

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