

## Diversity of Blue Green Algae from Paddy Fields

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**Abstract:** Blue green algae are found in all types of aquatic bodies. Paddy fields represent one such habitat. An attempt has been made to isolate cyanobacteria from paddy fields of Siddipet region in Telangana State. Blue Green Algae are the most important nitrogen fixing organisms because of their autotrophic nutrition and flourish in paddy fields and known to sustain the fertility of this ecosystem. This paddy ecosystem allows BGA to function properly, selectively and effectively. To initiate the study, soil samples were collected in clean polythene bags. At the time of collection, the surface of the sampling station was cleaned by removing small stones, pebbles and grasses. The collected samples were brought to the laboratory, cultures were maintained and periodical observations were made on alga appearing in the cultures. As many as 34 species of cyanobacteria were identified. Both heterocystous and non-heterocystous forms were observed. The *Nostocaceae* has been reported by maximum number of genera and species. The genera *Scytonema*, *Oscillatoria*, *Nostoc* and *Lyngbya* were represented by maximum number of species.

**Keywords:** Paddy fields, Heterocystous and non-heterocystous forms

### Introduction

The Blue Green Algae are unicellular or filamentous that sometimes form structures recognizable with naked eye, but usually requires a microscope for identification, they differ from other groups in this flora in that they are prokaryotes. Their cell contents are not differentiated in to membrane bound structures such as the nucleus, chloroplast, mitochondria. The popular name for the group Blue Green Algae comes from the color of the cells seen under the microscope. The pigments in their cells like chlorophyll-a, phycocyanin, phycoerythrin express their colour (Kondo and Yasuda 2003). This is because many species have a sheath around individual cells or the whole filament and this sheath is often golden or dark brown, though sometimes a shade of red. The capacity of several cyanobacteria to fix the atmospheric nitrogen is a significant biological process of economic importance (N.Anand 1989). These prokaryotic organisms are capable of fixing nitrogen. Cyanobacteria play an important role in maintenance and build-up of soil fertility (Board 2004), consequently increasing rice growth and act as a natural biofertilizer (Song et.al.2005)

The paddy field ecosystem provides a favorable environment for the growth of cyanobacteria with respect to their requirements for light, water, high temperature and nutrient availability. This could be the reason for more abundant cyanobacteria growth

in paddy soils than in uplands soils ( Roger and Reynaud 1982, Konda and Yasuda 2003,). Information on the diversity of blue greens is essential to understand the algal dynamics and interaction with other microorganisms. Studies on Cyanobacteria have gained much importance especially after the recognition of their role in the natural environment and their ability to provide an alternate source of energy (Uheda 1980).

The aim of the present work is to identify the cyanobacteria enriched in the paddy fields of chosen area. Observations revealed that most of them were from the orders Nostocales, Chroococcales and Stigonematales (Fritsch 1907 a,b).

### Materials and Methods

#### Study Area

Medak, one of the 10 districts of Telangana state lies between 17° 27' and 18° 18' Northern latitude and 77° 28' and 79° 10' of Eastern longitude with a total annual rainfall of 50-55 cm and temperature ranging between 30-35°C. The three sites (Paddy field site-I Siddipet Village, Paddy field site-2 Narsapoor Village, Paddy field site-3 Dubbak Village) were chosen for carrying out the experimental work in identifying the heterocystous and non-heterocystous forms of cyanobacteria (Nayak and Prasanna 2007).

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Published at: <http://www.ijsciences.com/pub/issue/2016-05/>

DOI: 10.18483/ijSci.1010; Online ISSN: 2305-3925; Print ISSN: 2410-4477



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### Collection and Storage Of Soil Samples

Soil samples were collected from all the three sites, labeled as Site-I, Site-II and Site-III. Soil samples were analyzed from Nov-2015 to Apr-2016 at monthly intervals during forenoon hours (8:00am to 11:00 am). Samples were collected by removing the surface debris from randomly selected spots and scrapping about 20 gm of soil from upper 1 cm soil layers. After thorough mixing, these were air-dried (25-35<sup>o</sup> C; relative humidity 30-60%), sieved and 200 gm of sample, representing each spot were stored in poly bags for further observation. The soil samples from different parts of the paddy fields were also collected by lifting the soil-algal biomass floating in and on water during crop season. Algae growing on soil surface were also carefully scrapped with a scalpel, from an area of few cm<sup>2</sup> in each sampling. The samples were preserved in 4% Formaldehyde and Lugol's iodine solution. All the samples were deposited in laboratory. Algal samples were then examined immediately using binocular research microscope whenever possible. Identification was done by using keys and monographs (Desikachary 1959 and Anand 1989). Microphotographs were taken using Sony Digital camera.

### Results and Discussion

An extensive study made to find out the diversity and occurrence of Blue green algal population in different study sites of Siddipet region, Medak district,

Telangana state has revealed a total of 40 species of blue green algae belonging to families *Nostocaceae*, *Chroococaceae*, *Scytonemataceae* and *Oscillatoriaceae* as shown in **Table:1**

As per the diversity and abundance of cyanobacteria, the members of the family *Oscillatoriaceae* and *chroococaceae* were found to be dominant in all the three sites. *Anabeana*, *Scytonema*, *Nostoc* and *Rivularia* were few among the heterocystous forms identified and among non-heterocystous forms *Oscillatoria*, *Lyngbya*, *Chroococcus* and *Gleocapsa* were most abundant forms (Desikachary 1959). **Table- II** shows heterocystous forms and **Table –III** shows non-heterocystous forms. The results obtained are in coincidence with the findings of Prasanna and Nayak, 2007 where they observed more heterocystous forms while studying the diversity of BGA in rice field soils of India. Blue green algae are one of the major components of the nitrogen fixing biomass in the rice fields. Finally, it might be concluded that the documentation on cyanobacteria may enhance the understanding of the nutrient status of the field and might be applied for sustainable agricultural practices by reducing the application of chemical fertilizer to avoid the appearance of non-nitrogen fixers in the soil that might compete with nitrogen fixers for nutrients (Venkataraman 1957).

**Table-1: List of Blue Green Algae from Three Different Paddy Fields**

S. No	Name of the cyanobacterium	Paddy field Site-1	Paddy field Site-2	Paddy field site-3
1	<i>Chroococcus tenax</i>	++	+	+
2	<i>Gloeothecha rupstrus</i>	++	+	+
3	<i>Gloeocapsa nigrecens</i>	+	+	+
4	<i>Oscillatoria sancta</i>	+	+	+
5	<i>Phormidium subfuscum</i>	+	-	+
6	<i>Microcoleus acutissimus</i>	+	-	-
7	<i>Lyngbya semiplana</i>	+	++	+
8	<i>Anabaena variabilis</i>	++	+	+
9	<i>Anabaena oscillarioides</i>	+	++	-
10	<i>Cylindrospermum major</i>	-	-	-
11	<i>Cylindrospermum musicola</i>	-	+	+
12	<i>Calothrix castelii</i>	+	+	-
13	<i>Scytonema hofmannii</i>	+	+	+
14	<i>Stigonema dendroideum</i>	+	+	++
15	<i>Chroococcus minutus</i> (Kuetz.) Naeg.	++	+	+
16	<i>Gleocopsa livida</i> (cam.) Kuetz.	+	+	+
17	<i>Gleocapsa punctata</i> Nae.	+	-	+
18	<i>Anabaena oryzae</i> Fritsch	+	+	-
19	<i>Anabaena spiroides</i> Klebain	-	+	+
20	<i>Cylindrospermum majus</i> Kuet. Bhatli and Bheden.	+	+	+
21	<i>Nostoc carnaeum</i> Ag.ex.Born. et.Flah.	+	++	+
22	<i>Nostoc linckia</i>	+	+	+
23	<i>Nostoc muscorum</i> Ag.ex Born.et.Flah.	-	+	-
24	<i>Nostoc rivulare</i> Kuetz.ex.born.et.Flah.	+	+	-
25	<i>Lyngbya subtilis</i> West,W.	+	++	+
26	<i>Oscillatoria princeps</i> Vaucher ex Gomont.	+	+	++
27	<i>Oscillatoria amphibia</i> Ag.ex Gomont.	+	++	+
28	<i>Tolypothrix sp.</i> Kuetz.	+		-
29	<i>Calothrix marchica</i> Lemn.	-	+	+
30	<i>Clothrix elenkini</i> Koss.	+	+	+
31	<i>Calothrix parietina</i> Thuret ex Born.et.Flah.	+	+	-
32	<i>Calothrix brevissima</i> West,G.S.	+	+	-
33	<i>Rivularia sps.</i> (Roth,) Ag.	+	+	+
34	<i>Calochirus sps.</i> Ag.	+	-	-

++ = Dominant ; + = Present ; - = Absent

**Table -ii : Heterocystous Forms**

S. No	CYANOBACTERIA TYPE
1.	<i>Anabaena variabilis</i>
2.	<i>Anabaena oscillarioides</i>
3.	<i>Cylindrospermum major</i>
4.	<i>Cylindrospermum musicola</i> Kuetz.ex Born.et Flah.
5.	<i>Calothrix castelii</i>
6.	<i>Scytonema hofmannii</i>
7.	<i>Stigonema dendroideum</i>
8.	<i>Anabaena oryzae</i> Fritsch.
9.	<i>Anabaena spiroides</i> Klebain.
10.	<i>Cylindrospermum majus</i> Kuet. Bhatli and Bheden.
11.	<i>Nostoc carnaeum</i> Ag.ex.Born. et.Flah.
12.	<i>Nostoc linckia</i> (Roth.) Born.ex Born.et Flah.
13.	<i>Nostoc muscorum</i> Ag.ex Born.et.Flah.
14.	<i>Nostoc rivulare</i> Kuetz.ex.born.et.Flah.
15.	<i>Tolypothrix sp.</i> Kuetz.
16.	<i>Calothrix marchica</i> Lemm.
17.	<i>Clothrix elenkini</i> Koss.
18.	<i>Calothrix parietina</i> Thuret ex Born.et.Flah
19.	<i>Calothrix brevissima</i> West,G.S.
20.	<i>Rivularia sps.</i> (Roth,) Ag.

**Table –11i : Non-Heterocystous Forms**

S. No	CYANOBACTERIA TYPE
1.	<i>Chroococcus tenax</i> (Kutz.)Nag
2.	<i>Gloeotheca rupstrus</i>
3.	<i>Gloeocapsa nigrecens</i> Kuetz.
4.	<i>Oscillatoria sancta</i>
5.	<i>Phormidium subfuscum</i>
6.	<i>Microcoleus acutissimus</i> Gardens
7.	<i>Lyngbya semiplana</i>
8.	<i>Chroococcus minutus</i> (Kuetz.)Naeg.
9.	<i>Gleocapsa livida</i> (cam.) Kuetz.
10.	<i>Lyngbya subtilis</i> West,W.
11.	<i>Oscillatoria princeps</i> Vaucher ex Gomont
12.	<i>Oscillatoria amphibia</i> Ag.ex Gomont.
13.	<i>Gloeotheca samoensis</i> Will.e

### Conclusion

From the present study, it could be concluded that paddy soil enhance the impressive species diversity of Blue Green Algae present in different sites of siddipet region. Further studies are necessary for species variation in dominant genera in selected paddy field sites.

### Acknowledgement

We are grateful to **Prof. Vidyavati**, Former Vice-Chancellor of Kakatiya University, Warangal, Telangana State for her constant encouragement and valuable suggestions.

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