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Abundance of Cyanobacteria from Maize Fieldsofsangola Tahasil in Solapur

R. G. Pawar[1], D. S. Suryawanshi[2]

Department of Botany, Jawahar Arts, Science and Commerce College, Andur, Tal. Tuljapur, Dist. Osmanabad

Abstract: ***Fertility of soil depends upon its composition of nutrients and biotic factors such as algae, fungi and microorganisms which helps in recycling of nutrients. Composition of Blue-green algae also makes a major contribution to the fertility of the soil. It has been suggested that blue-green algae (BGA) assist higher plant growth by supplying growth substances. There are numerous works about roles of blue-green algae on growth of maize fields. Increase in use of synthetic fertilizers in the field badly affected the fertility of the soil. These synthetic fertilizers are effecting on flora and fauna of the field responsible for productivity of the crop plants. Efforts were made to evaluate dosage of fertilizers and occurrence of blue green algae. During the investigations, 23 species belonging to three families of heterocystous and non-heterocystousof bluegreen algae were encountered from Sangola Tahasil of Solapur.***

Keywords: Blue green Algae,Heterocyst's, Synthetic fertilizers

1. Introduction

Cyanobacteria have drawn much attention as prospective and rich sources of biologically active constituents and have been identified as one of the most promising groups of organisms capable of producing bioactive compounds (Fish and Codd 1994, Schlegel *et al*.1999). Production of bioactive molecules such as auxins, production of secondary metabolites linked to bio control of bacterial and fungal diseases as well as improving soil structure and porosity through secretion of polysaccharides aiding in soil aggregation are the most important functions of these microorganisms (Karthikeyan *et al*. 2007, Sergeeva *et al*. 2002). Blue green algae represent a small taxonomic group of photosynthetic prokaryotes which some of them are able to N_2 fixation and also possess a tremendous potential for producing a wide range of secondary metabolites.

De (1939) attributed the natural fertility of maize field soil and its maintenance to the process of biological nitrogen fixation by cyanobacteria. This was the first report, which recognized the agronomic potential of cyanobacteria in India. The widespread application of single element fertilizers (especially N in Asian countries) in the cultivation of major crops has led to accelerated exhaustion of other major and minor nutrients leading to nutrient imbalances and poor soil fertility. In the current scenario therefore, an urgent need has been felt to deploy microbial bio-fertilizer which are multifaceted such as cyanobacterial biofertilizer. As yet for substitution of synthetic fertilizers by microbial bio fertilizers many studies have been carried out. Gupta & Shukla (1967) studied the algal influence on growth, yield and protein content of maize plants and showed that pre-soaking maize seeds with BGA cultures or extracts enhances germination, promotes the growth of roots and shoots, and increases the weight and protein content of the grain.

Plant growth is enhanced in the presence of cyanobacterium, even without organic Nitrogen fertilizer application(Svircev *et al*. 1997). Beneficial effects of cyanobacterial inoculation were reported, not only for maize, but for other crops such as wheat, soybean, oat, tomato, radish, cotton, sugarcane, chili, bean, muskmelon and lettuce (Venkataraman 1972, Rodgers *et al*. 1979, Singh 1988, Arif *et al*. 1995, Thajuddin & Subramanian 2005, Saadatnia & Riahi 2009, Maqubela *et al*. 2008, Karthikeyan *et al*. 2007). Several reasons have been proposed for beneficial effects of cyanobacteria on the growth of different plants. The capacity for biosynthesis of growth promoting substances such as auxins, amino acids, sugars and vitamins(Vitamin B12, Folic acid, Nicotinic acid and Pantothenic acid) was reported by Misra & Kaushik (1989 a, b) thatcan enhance growth of plant.

Additionally, cyanobacteria excrete complex organic carbon compounds that bind to the soil particles and improve soil aggregation, hence improve soil structure, soil permeability and water holding capacity of soil (Kaushik 2007). However, todate, the effect of single species cyanobacteria biofertilizer on plant growth has not yet been fully investigated. The primary aim of this research was to study cyanobacteria species isolated from soil.

There are numerous works about roles of blue-green algae on growth of maize fields. Increase in use of synthetic fertilizers in the field badly affected the fertility of the soil. These synthetic fertilizers are effecting on flora and fauna of the field responsible for productivity of the crop plants. Most of the farmers are utilizing these fertilizers blindly to increase productivity. Efforts were made to study effect of dosage of synthetic fertilizers on relative abundance of the blue green algae.

2. Materials and Methods

Soil was fertilized with synthetic as well as green manure duly designed with RBD.
Soil samples were collected from the depth of 0–5cm on several fields (Rangaswamy 1996).

Isolation of cyanobacteria

Soil samples were transferred to sterile Petridishes and added to them sterilized BG-11 medium with pH: 7.1. The Petri dishes were placed in a culture chamber at 25° C and a 12/12 h light dark cycle atartificial illumination (2000–2500 Lux) for two weeks. After colonization, for purification, identification and multiplication of colonies, a part of each

colony was removed by a loop and transferred to a new plate. After purification of taxa, taxonomic determination was carried out by light microscopy and based on Desikachary(1959), Prescott (1970) and Wehr *et al.* (2002),and corrected based on algae base website (www.algaebase.org).

3. Results

During the present study, eleven taxa of heterocystous and12 taxa of non-heterocystous cyanophyta were identified. *Nostocaceae* with four genera and seven species, *Oscillatoriaceae* with three genera and six species and *Chroococcaceae* with four genera and six species were included in the list of isolates (Table 1).

Table 1: The list of Cyanobacterial taxa occurred in Mohol Tahasil

Chroococcaceae	*Nostocaceae*	*Oscillatoriaceae*
Aphanothece gelatinosa (Hennings)Lemmermann	*Anabaena vaginicola* F.E. Fritsch & Rich	*Oscillatoria angustissima* W.West & G.S.West
Chroococcus minutus(Kützing) Nägeli	*Cylindrospermum michailovskoense* Elenkin	*Oscillatoria chilkensis* Biswas
Chroococcus minimus (Keissler) Lemmermann	*Nostoc punctiforme* (Kützing) Hariot	*Phormidium terebriforme* (C. Agardh ex Gomont) Anagnostidis & Komárek
Chroococcus pallidus (Nägeli) Nägeli	*Nostoc muscorum* C. Agardh ex Bornet & Flahault	*Phormidium granulatum* (Gardner) Anagnostidis
Gleocapsa sp.	*Nostoc calcicola* Brébisson ex Bornet & Flahault	*Lyngbya* sp.
Gloeothece sp.	*Nostoc* sp.	
	Nodularia harveyana (Thwaites) Thuret	

Among these taxa, three species of heterocystouscyanobacteria, *Anabaena vaginicola*, *Nostoc* sp. and*Nodularia harveyana*, which were isolated from maize fieldsoils.

Table 2: Total percent abundance of cyanobacteria genera (summed up over all locations)

Genus	Localities in Sangola Tahasil				Total No. of species	Percent abundance
	Sonand	**Mahud**	**Ekhdpur**	**Wadegaon**		
Anabaena	+	+	+	+	2	5.2
Aphanothece	+	+	+	+	1	5.2
Chroococcus	+	+	+	+	3	16
Cylindrospermum	-	-	+	+	1	5.2
Gleocapsa	+	-	+	+	3	5.2
Gloeothece	+	+	-	-	1	5.2
Lyngbya	+	+	+	+	1	5.2
Nodularia	+	+	+	+	2	5.2
Nostoc	+	+	+	+	4	25
Oscillatoria	+	+	-	+	2	10.6
Phormidium	-	-	-	-	3	16
				Total	**23**	**100**

Abundance of cyanobacteria was studied from four locations of Sangola Tahasil. It was observed that *Nostoc* was most abundant with 25 % occurrence followed by *Phromidium* and *chroccus*up to 16 percentage followed by *Oscillatoria* with 10.6 %. This was followed by Anabaena, *Cylendrospermu*, *Nodularia*, *Aphanotheca*, *Gloeotheca* and *Gloeocapsa* with 5.2 %.

4. Conclusion

From the above results it could be concluded that *Nostoc* is the dominating blue green algae which plays its role in productivity of maize crop. *Promidium* and *Chroococcus*are the second largest species that plays their vital role productivity of crops and are the second largest group of blue green algae. If dose of synthetic utilized properly, they may nurture are favorable for the growth of blue green algae. This will lead to fertility of soil and will definitely effect on productivity of crop.

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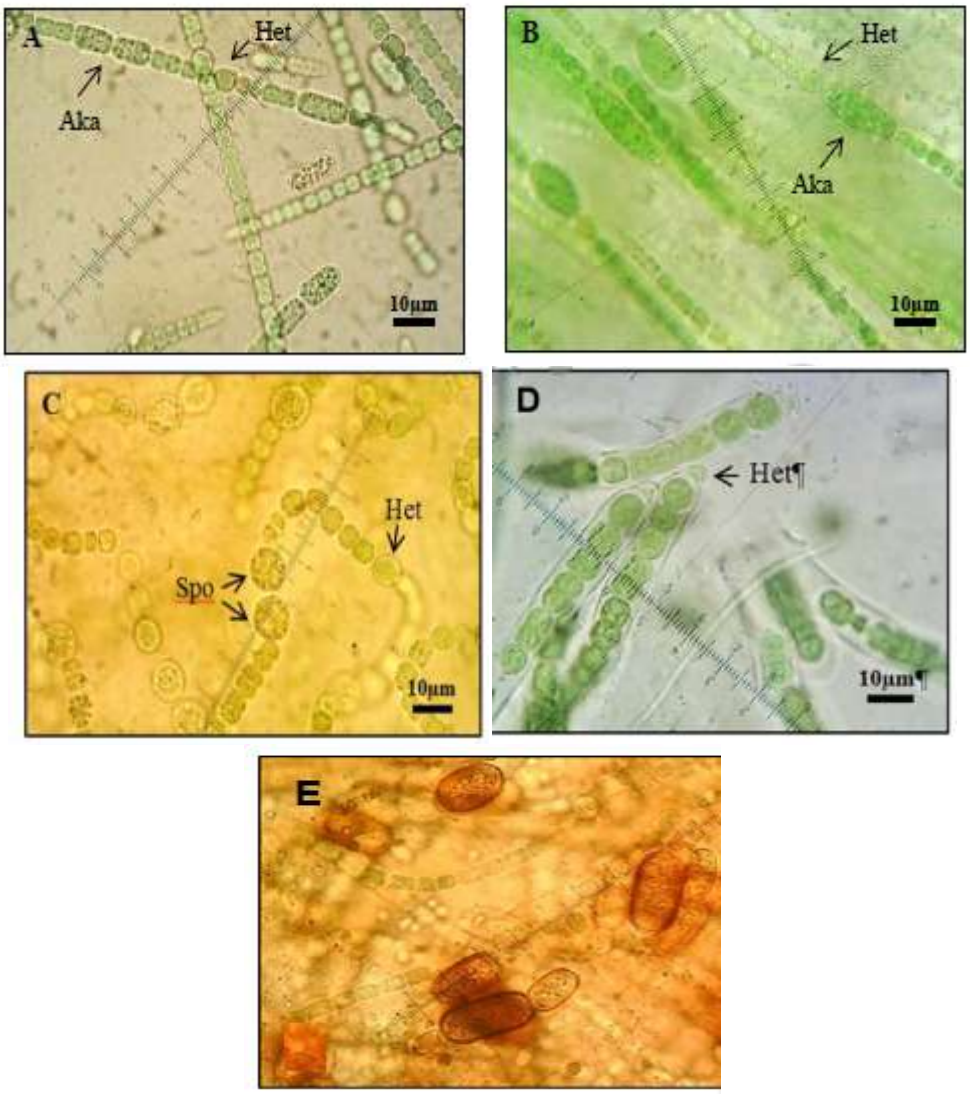

Fig: A, *Anabaena inaequalis;* B, *Anabaena fuellborni;* C, *Nostoc pruniforme*
D. Calothrix fusca ***E. Cylendrospermum***

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