Occurrence of Blue Green Algae from Maize Fieldsof Mohol Tahasil in Solapur

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Abstract: Blue-green algae make 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. Most of the farmers are utilizing these fertilizers blindly to increase productivity. To check proper dosage and relative abundance of the blue green algae efforts were made to evaluate abundance of blue green algae from Mohol tehsil of Solapur district. During the investigations, 19 species of bluegreen algaebelonging to three families of heterocystous and non-heterocystous from maize fields in MoholTahasil ofsolapurdistrict were identified, out of which seven species are new to this region.

Keywords: Blue green Algae, biofertilizer, Cyanophyta, Solapur

1. Introduction

Cyanobacteria represent a small taxonomic groupof photosynthetic prokaryotes which some of them areable to N₂ fixation and also possess a tremendouspotential for producing a wide range of secondarymetabolites. Cyanobacteria have drawn much attention asprospective and rich sources of biologically activeconstituents and have been identified as one of the mostpromising groups of organisms capable of producing bioactive compounds (Fish &Codd 1994, Schlegel et al.1999). Production of bioactive molecules such as auxins, production of secondary metabolites linked to bio controlof bacterial and fungal diseases as well as improvingsoil structure and porosity through secretion of polysaccharides aiding in soil aggregation are the mostimportant functions of these microorganisms(Karthikeyanet al. 2007, Sergeevaet al. 2002). De(1939) attributed the natural fertility of maize fieldsoil and its maintenance to the process of biologicalnitrogen fixation by cyanobacteria. This was the firstreport, which recognized the agronomic potential ofcyanobacteria in India. The widespread application ofsingle element fertilizers (especially N in Asiancountries) in the cultivation of major crops has led toaccelerated exhaustion of other major and minor nutrients leading to nutrient imbalances and poor soilfertility. In the current scenario therefore, an urgent needhas been felt to deploy microbial bio-fertilizer which aremultifaceted such as cyanobacterialbiofertilizer. As yetfor substitution of chemical fertilizers by microbialbio fertilizers many studies have been done. Gupta &Shukla (1967) studied the algal influence on growth, yield and protein content of maize plants and showed thatpre-soaking maize seeds with BGA cultures or extractsenhances germination, promotes the growth of roots and shoots, and increases the weight and protein content of the grain.

Svircevet al. (1997) also reported that plantgrowth was enhanced in the presence of cyanobacterium, even without organic N fertilizer application. 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 reasonshave been proposed for beneficial effects of cyanobacteria on the growth of different plants. The capacity for biosynthesis of growth promoting substancessuch as auxins, amino acids, sugars and vitamins(Vitamin B12, Folic acid, Nicotinic acid and Pantothenicacid) was reported by Misra&Kaushik (1989 a, b) that can enhance growth of plant.

Additionally, cyanobacteriaexcrete complex organic carbon compounds that bind tothe soil particles and improve soil aggregation, henceimprove soil structure, soil permeability and waterholding capacity of soil (Kaushik 2007). However, todate, the effect of single species cyanobacteriabiofertilizer on plant growth has not yet been fullyinvestigated. The primary aim of this research was tostudy 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. To check proper dosage and relative abundance of the blue green algae efforts were made to evaluate abundance of blue green algae from Mohol tehsil of Solapur district.

2. Materials and Methods

Soil samples were collected from the depth of 0–5cm on severalmaize fields in Moholtahasilof Solapur district of Maharashtra.(Rangaswamy 1996).

- Isolation of cyanobacteria:

Soil samples were transferred to sterile Petridishes and added to them sterilized BG-11 medium withpH: 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 wasremoved by a loop and transferred to a new plate. Afterpurification of taxa, taxonomic determination was carriedout light microscopy based by and on Desikachary(1959), Prescott (1970) Wehret al. and (2002),and corrected based on algaebase website(www.algaebase.org).

3. Results

In the present study, seven taxa of heterocystous and 12 taxa of non-heterocystouscyanophyta were identified.*Nostocaceae*with four genera and seven species,*Oscillatoriaceae*with three genera and six species and*Chroococcaceae*with four genera and six species wereincluded in the list of isolates (Table 1).

Table 1: The list of Cyanobacterial taxa occurred in								
MoholTahasil								
Nostocaceae	Oscillatoriaceae	Chroococcaceae						
Anabaena	Oscillatoria	Aphanothecegelat						
vaginicolaF.E. Fritsch	angustissimaW.W	inosa(Hennings						
& Rich	est&G.S.West)Lemmermann						
Cylindrospermummich	Oscillatoria	Chroococcusminu						
ailovskoenseElenkin	<i>chilkensis</i> Biswas	tus(Kützing)						
		Nägeli						
Nostocpunctiforme(Kü	Phormidiumtereb	Chroococcusmini						
tzing) Hariot	riforme(C.	mus(Keissler)						
	Agardh ex	Lemmermann						
NostocmuscorumC.	Gomont)	Chroococcuspalli						
Agardh ex	Anagnostidis&Ko	dus(Nägeli)						
Bornet&Flahault	márek	Nägeli						
NostoccalcicolaBrébis	Phormidiumgran	Gleocapsasp.						
son ex	ulatum(Gardner)							
Bornet&Flahault	Anagnostidis							
Nostocsp.	Phormidiumartic	Gloeothecesp.						
	ulatum(Gardner)							
	Anagnostidis&Ko							
	márek							
Nodulariaharveyana(T	Lyngbyasp.							
hwaites) Thuret								

Among these taxa, three species of heterocystouscyanobacteria, *Anabaena vaginicola*, *Nostocsp.* and*Nodulariaharveyana*, which were isolated from maize fieldsoils.

Table 2: Total p	ercent abundance of c	yanobacteria genera	(summed up	over all locations)
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Genus	Localities in MoholTahasil			nasil	Total No. of species	Percentabundance
	Anagar	Aasti	Penar	Kamati		
Anabaena	+	+	+	+	2	5.2
Nostoc	+	+	+	+	4	21
Cylindrospermum	-	-	+	+	1	5.2
Nodularia	+	+	+	+	2	5.2
Oscillatoria	+	+	-	+	2	10.6
Lyngbya	+	+	+	+	1	5.2
Phormidium	-	-	-	-	3	16
Chroococcus	+	+	+	+	3	16
Aphanothece	+	+	+	+	1	5.2
Gloeothece	+	+	-	-	1	5.2
Gleocapsa	+	-	+	+	2	5.2
				Total	22	100

Abundance of these species was studied of these species. It was observed that *Nostoc*was most abundant with 25 % occurance 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 plays its role in productivity of maize crop. *Promidium* and *Chroococcus* the second largest species play 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 plants such as Maize.

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Figure: A, Anabaena inaequalis; B, Anabaena fuellborni; C, Nostocpruniforme D. Calothrixfusca E. Cylendrospermum

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