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# Effect of Composting on Growth of Blue Green Algae

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**Abstract:** ***Composting of soil is important for the productivity of crop plants. Enrichment of manure is favorable for succession of blue green algae. It has been suggested that blue-green algae (BGA) assist higher plant growth by supplying growth substances. Blue green algae are a group of microalgae that can fix the atmospheric nitrogen which is important for the fertility of soil. Isolation of these cyanobacteria from natural sources in pure form is essential step for their efficient use as biofertilizer. In present investigation four species of blue green microalgal forms were isolated from composted soil samples from maize fields of Sangola tehsil of Solapur district. The isolation of pure cultures were carried out by selecting a single colony from mix cultures and were allowed to grown on selected media like BG-11, bold basal media, ASN III media as different BGA strains can grow on different media. The same media in solid form is used for further purification and sub culturing. The pure cultures were then transferred in solid and liquid media for further studies.***

**Keywords:** Blue green Algae, Cyanobacteria, Composting

## 1. Introduction

Blue green algae i.e. cyanobacteria 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. 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 & 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).

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 chemical fertilizers by microbial bio fertilizers many studies have been done. 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.

Svircev *et al.* (1997) also reported that plant growth 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, Thajuddin & Subramanian 2005, Maqubela *et al.* 2008, Karthikeyan *et al.* 2007). Several reasons have been proposed for beneficial effects of cyanobacteria on the growth of different plants.

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, to date, 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 the impact of addition of compost prepared from weed on growth and succession of cyanobacteria species from soil of maize fields of Sangola tehsil of Solapur district.

## 2. Materials and Methods

**Bio-composting from weeds**

Compost was prepared from weeds such as *Parthenuim, Cassia, Achyranthus*growing in fields. Compost was prepared and added into the soil. Maize crop was raised and samples were collected intermitantly at various stages of growth of crop.

**Collection of Soil Sample:**

Soil samples were collected from the depth of 0–5 cm on several maize fields in Sanngola Tahasil of Solapur district of Maharashtra following standard method demonstrated by Rangaswamy, 1996.

**Isolation of Blue Green Algae:**

Soil samples were transferred to sterile Petri dishes 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 at artificial 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

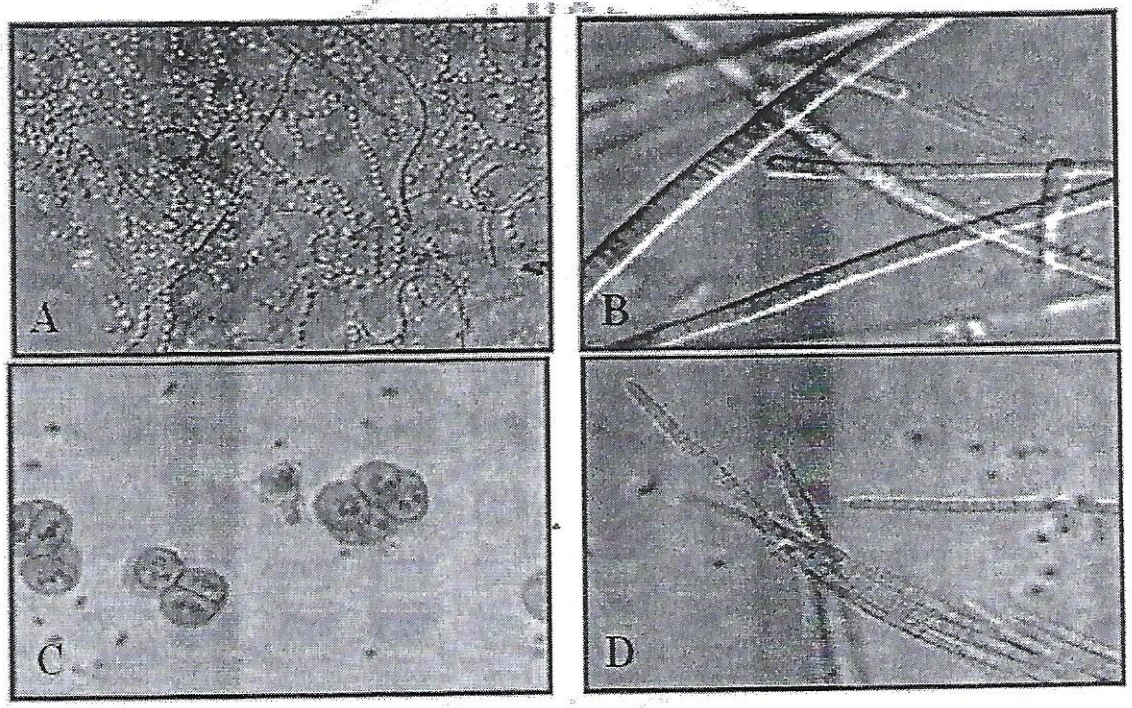
Desikachary (1959), Prescott (1970) and Wehr *et al.* (2002), and corrected based on algae base website (www.algaebase.org).

## 3. Experimental Results

**Pure Cultured Algal Samples:**
Following four pure cultured strains of algae are obtained Identification was done by using morphological characters, thallus structure and colony characters considered as diagnostic feature for identification and these morphological structures were identified by the standard Desikachary 1959 and some other books and various research articles.

*1. Gloecapsa sp.*:
Class: Cyanophyceae; Order: Chlorococcales; Family: Microsystaceae The colonies of *Gloecapsa* starts to growing generally after third day of inoculation. The pure culture of *Gloecapsa*is observed as heavy green mass generally settles down at the bottom of media. It is mucilaginous, compact, cells are spherical, having 3-4 µ diameter. Blue green in colour. The cells are having sheath very thick as thick as protoplast, very distinctly any many times lamellated (Desikachary 1959).(Pate-A)

*2. Nostoc sp*:
Class: Cyanophyceae; Order: Nostocales; Family: Nostocaceae. *Nostoc*,genus of blue-green algae with cells arranged in beadlike chains that are grouped together in a gelatinous mass. Ranging from microscopic to walnut-sized, masses of *Nostoc* may be found on soil and floating in quiet water. Reproduction is by fragmentation. A special thick-walled cell (akinete) has the ability to withstand desiccation for long periods of time. After 70 years of dry storage, the akinete of one species germinates into a filament when moistened. Like most blue-green algae, *Nostoc* contains two pigments, blue phycocyanin and red phycoerythrin, as well as chlorophyll, and has the ability to fix nitrogen in specialized cells called heterocysts.




A terrestrial species has been used as a supplementary food source in Asia).(Pate-B)

*3. Oscillatoria sp.*:
Class: Cyanophyceae; Order: Oscillatoriales; Family: Oscillatoriaceae *Phormidium*starts to grow after fifth day of inoculation on the plates. In the form of pure culture *Oscillatoria* appears like bluish green sticky mass which settles down in the media. In this algae trichomes are blue green, more or less brownish, violet or reddish, mostly forming a thallus, mostly straight, not constricted at the cross wall, 16-60 µ broad, commonly 25-50µ, blue green to dirty green, slightly or briefly attenuated at the apices and bent; cells 1/11-1/4 as long as broad, 3.5-7 µ long; end cells flatly rounded, slightly capitate without or with slightly thickened membrane (Desikachary 1959).).(Pate-C)

*4. Phormidium sp.*:
Class: Cyanophyceae; Order: Oscillatoriales; Family: Oscillatoriaceae. The colonies of *Phormidium* start to grow slowly as compared to *Gloecapsa*. Pure culture of *Phormidium* in the flask appears in the form of bluish green lumps which generally floats on the surface of media.Itis more or less expanded, bright blue green. It is filamentous, variously entangled, having thin sheath, firm or diffluent sometimes thick and more or less lamellate, violet coloured. Generally cells are shorter than broad, 1.5-2.71µ long, rarely granulated at the cross wall, end cell rounded, calyptra absent (Desikachary 1959). ).(Pate-D)

## 4. Conclusion

In present investigation four different strains of cyanobacteria namely*Gloecapsa, Nostoc, Oscillatoria,*

*Phormidium* were encountered from maize fields of Sangola Tahasil of Solapur. Algal strains are isolated in axenic culture by the improved antibiotic method using streptomycin and fluconazole. Biodiversity of these blue green algae has been studied by different workers like Debnath (2009) from west Bengal studied diversity of *Phormidium, Oscillatoria, Gloecapsa* have been studied by Biban and Singh (2011) from kurukshetra. While very less work has been carried out on pure culturing of cyanobacteria from maize fields. The cultures in the flask are formed in light green to dark blue green in colour.Identification and culture of Blue green algae is necessary to study soil fertility and productivity of crop plants such as Maize. Composting plays vital role in enrichment of blue green algae.

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