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Biofertilizers

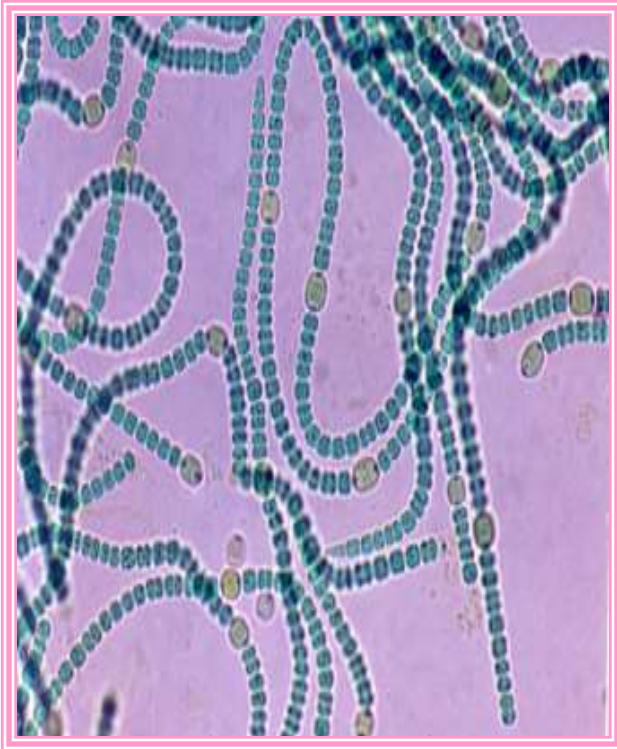
Cyanobacteria - Biofertilizer

- Cyanobacteria, or blue-green algae, is one such example of a bio-fertilizer, a type of organic fertilizer which contains living organisms and harnesses naturally occurring inputs like solar energy, nitrogen, and water to ensure soil fertility and plant growth.

- Bio-fertilizers can help to maintain the natural soil habitat, while also improving fertility. More specifically, cyanobacteria fix nitrogen, which is an essential nutrient for supporting plant growth. The cyanobacteria tap the sun's energy captured during photosynthesis to fix nitrogen from the air and turn it into a form which plants can use.

- Cyanobacteria (BGA) can be found in all conceivable environment.
- They are photosynthetic and fix nitrogen
- Besides fixing nitrogen they also produce vitamins, hormones which also promote growth of plants. (rice)

- The cyanobacterial fertilizer production begins with cultures which are seeded in shallow ponds and are ready to use a few weeks later.



- **Blue green algae found in almost every environment, from oceans to fresh water to bare rock to soil. They occur as planktonic cells or form phototrophic biofilm in marine environments, in damp soil, moistened rocks ,deserts**

- **Cyanobacteria include unicellular and colonial form.**
- **Colonies form filaments, sheets , hollow balls.**
- **Filaments differentiate into vegetative cells, heterocysts and resistant spores.**
- **Heterocyst is the site of nitrogen fixation .**
- **Heterocyst fix nitrogen into ammonia and nitrate
Nitrate and ammonia are absorbed by plants.**

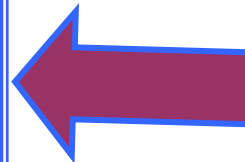
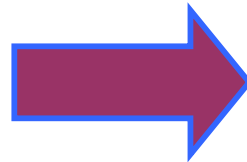
- Some cyanobacteria used:
- Anabaena
- Nostoc
- BGA application @10kg/ha one week after rice plantation contribute 25-30 kg of N /ha with a yield increase of 10-15%.

BLUE GREEN ALGAE

MASS PRODUCTION OF BGA CULTURE

Shallow trays (2m x 1m) of galvanized sheet

Spread 8-10 kg soil plus 200 g SSP



Add water (5-15cm)

Sprinkle algal culture

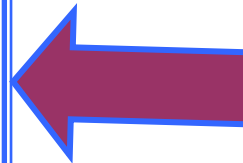
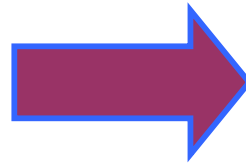
Expose to sunlight

BLUE GREEN ALGAE

MASS PRODUCTION OF BGA CULTURE

**Thick algal mat forms
at 15 days**

**Allow water to
evaporate**



**Collect dry algal
flakes**

**Make into powder and
pack in polybags**

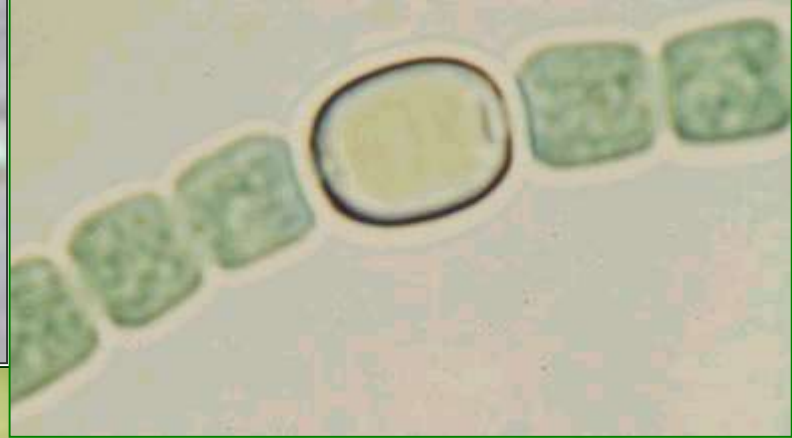
- Cyanobacteria can fix atmospheric nitrogen in aerobic conditions by means of specialized cells called heterocysts. Heterocysts may also form under the appropriate environmental conditions (anoxic) when fixed nitrogen is scarce. Heterocyst-forming species are specialized for nitrogen fixation and are able to fix nitrogen gas into ammonia (NH_3), nitrites (NO_2^-) or nitrates (NO_3^-), which can be absorbed by plants and converted to protein and nucleic acids (atmospheric nitrogen is not bioavailable to plants,

- ***Anabaena*** is a genus of filamentous cyanobacteria that exists as plankton. It is known for its nitrogen fixing abilities, and they form symbiotic relationships with certain plants



Bacteria in root surface

- Under nitrogen-limiting conditions, vegetative cells differentiate into heterocysts at semi-regular intervals along the filaments. Heterocysts are cells that are terminally specialized for nitrogen fixation.
- nitrogen fixed in heterocysts moves into the vegetative cells, at least in part in the form of amino acids.



**Photosynthetic
Cells**

Heterocyst

- ***Nostoc*** is a genus of cyanobacteria found in a variety of environmental niches (in [soil](#), on moist rocks, at the bottom of lakes and springs both fresh- and saltwater), and rarely in marine habitats.
- forms [colonies](#) composed of [filaments](#) of moniliform cells in a gelatinous sheath.
- These bacteria contain photosynthetic pigments in their cytoplasm to perform [photosynthesis](#).

- with cells arranged in beadlike chains that are grouped together in a gelatinous mass. Ranging from microscopic to walnut-sized
- A special thick-walled cell (akinetete) 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

- Thank You

