SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Subject Code: 19BY701

Subject: Biology for Engineers

Unit-V/Biology and Industrial Applications

Topic: Bio-Fertilizers

Bio-fertilizers

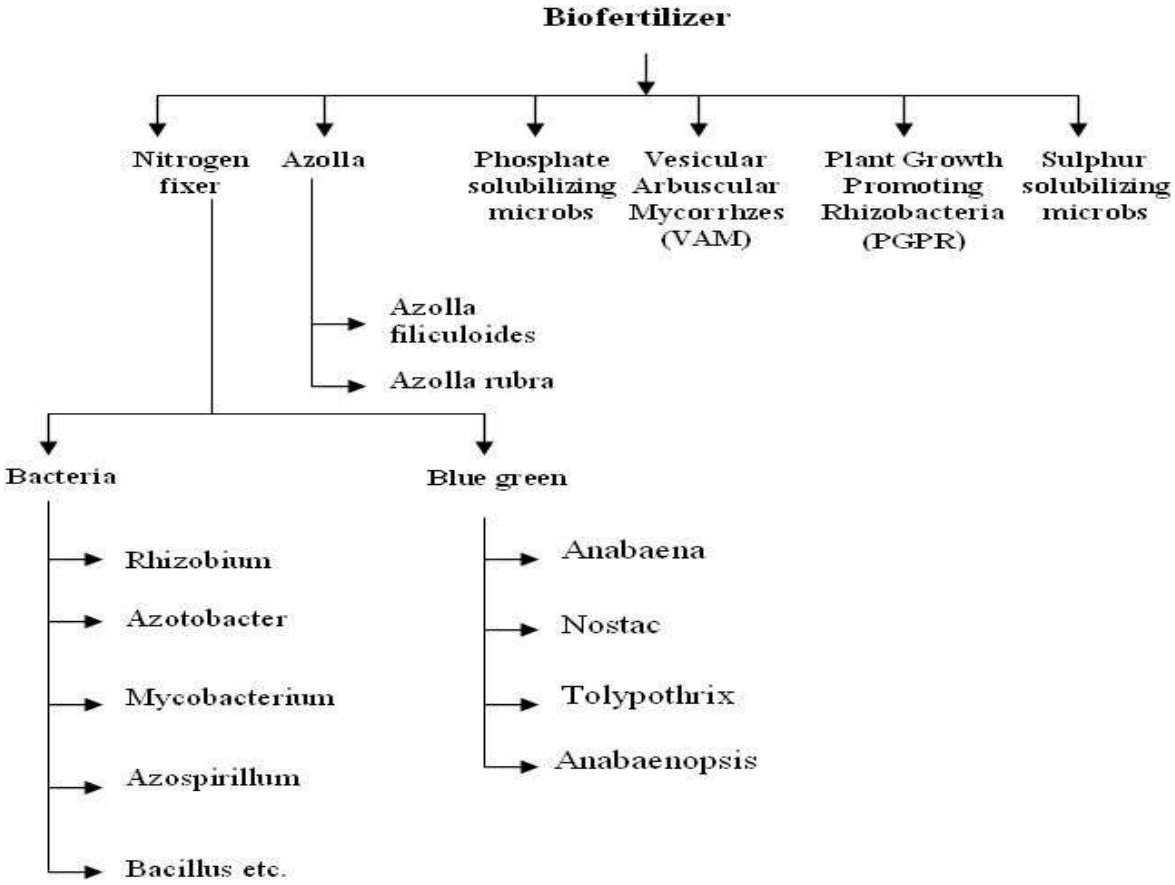
- Biofertilizers are the compounds that enrich the nutrient quality of the soil by using microorganisms that establish symbiotic relationships with the plants
- These are the microbial inoculants which are artificially multiplied cultures of certain soil microorganisms that can improve soil fertility and crop productivity
- Biofertilizers add nutrients through their activities like nitrogen fixation, phosphorus solubilization and stimulating plant growth through the synthesis of growth promoting substances.

Bio-fertilizers

- Plant growth promoting microorganisms include bacteria such as *Azospirillum spp., Pseudomonas spp., Bacillus spp. w*hile fungus include *Trichoderma spp.*

- Biofertilizers include organic fertilizers which are rendered in an available form due to interactions of microorganisms or their association with plants majorly *Rhizobium spp.*

Bio-fertilizers



Bio-fertilizers

- Majorly, biofertilizers include the following types:
- *Rhizobium spp. as symbiotic nitrogen fixers*
- *Azospirillum spp.* and *Azotobacter spp.* Asymbiotic nitrogen fixers
- Algae biofertilizers
- Phosphate solubilizing bacteria
- Mycorrhizae

Bio-fertilizers

Name of bio-fertilizer	Contribution	Beneficiaries
A) Nitrogen 1) *Rhizobium* {Symbiotic}	a) Fixes 50-30 kg N/ha b) Leaves residual nitrogen c) Increase yield by 10 –30% d) Maintains soil fertility	**Pulses legumes:** Cowpea, Green gram, Black gram, Pea, Gram **Oil legumes:** Groundnut, Soyabean **Fodderlegumes:** Berseem, lucerne **Fodderlegumes:**Subabul,Shisan,Wheat, Jowar,Bajra, Maize
2) Azotobacter	a) Supplies 20-40mg N/g of carbon source b) Promotion of growth substances like vitamins, B Group, IAA and Gibberellic acid c)10-15% increase in yield d)Maintains soil fertility e)Biological control ofplant disease, suppresses plant pathogens	Mustard, sunflower, banana, sugarcane, grapes,papaya,watermelon, tomato, chilly ladyfinger,coconut,spices,flower,plantation crops, forest sp.
3. Azospirillum	a) Fixes 20-40 kg Nitrogen b) Results in increase mineral and water uptake. c) Root development d) Vegetative growth and crop yield.	Rice, sugarcane, fingermillet, wheat, sorghum bajra etc.;
4. Blue Green Algae {bga}	a) 20-30 kg N/ha in submerged rice fields. b) Production of growth substances like auxins, IAA, giberellic acid	Rice
5. Azolla	a) Fixes 40-80 kg N/ha b) Used as green manure because of large bio-mass	Rice

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Bio-fertilizers

Rhizobium

- Rhizobium is a Gram negative bacterium which inhabits the root nodules of most of the leguminous plants
- Rhizobia are soil inhabiting bacteria that fix nitrogen after becoming established inside the root nodules
- Rhizobia donot produce spores and are aerobic and motile too
- Rhizobia maintain symbiotic relationships with legumes by responding chemotactically to flavonoid molecules released as signals by the legume host plant.

Bio-fertilizers

There are some steps involved in mass production of Rhizobium to use them as biofertilizers.

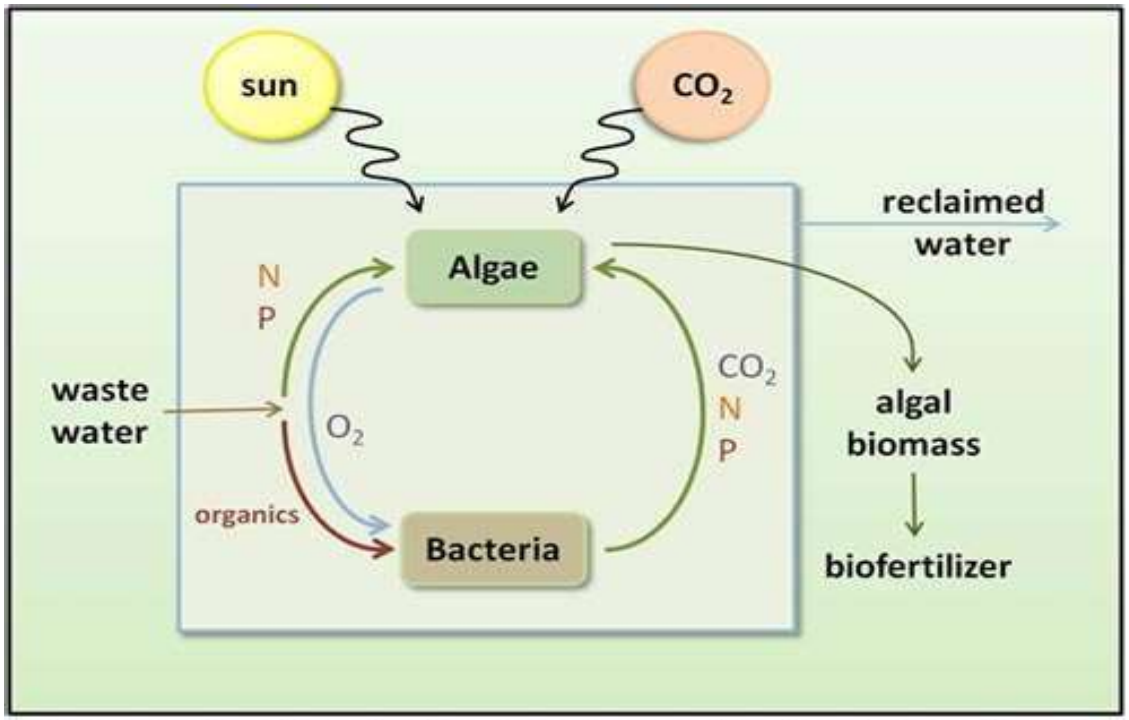
These are as follows:

- Preparation of mother or starter culture
- Preparation of broth culture
- Preparation of carrier
- Preparation of inoculate (Mixing)
- Maturation
- Filling and packaging
- Quality checking
- Storage

Bio-fertilizers

- Cyanobacteria which are also known as blue-green algae, are photoautotrophic and prokaryotic in nature
- They are free living and fix the atmospheric nitrogen in moist soils
- They also include unicellular as well as filamentous species having specialized cells known as heterocysts such as *Anabaena* and *Nostoc*
- These cells are the site for nitrogen fixation and few of those which are non heterocystous can reduce N2 into NH3 i.e nitrogen fixation.

Bio-fertilizers



Nutrient reclamation via algae. Bacteria present in microalgal ponds break down organics to yield CO_2, N, and P, while algae utilize CO_2 and remove ~90% of N and ~ 95% of P from tertiary wastewater streams. The result is N and P-rich algal biomass suitable for use as a biofertilizer.

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Bio-fertilizers

The mass production of BGA can be processed in the following ways mainly:

1. Trough method
2. Pit method
3. Field method

Bio-fertilizers

Trough Method

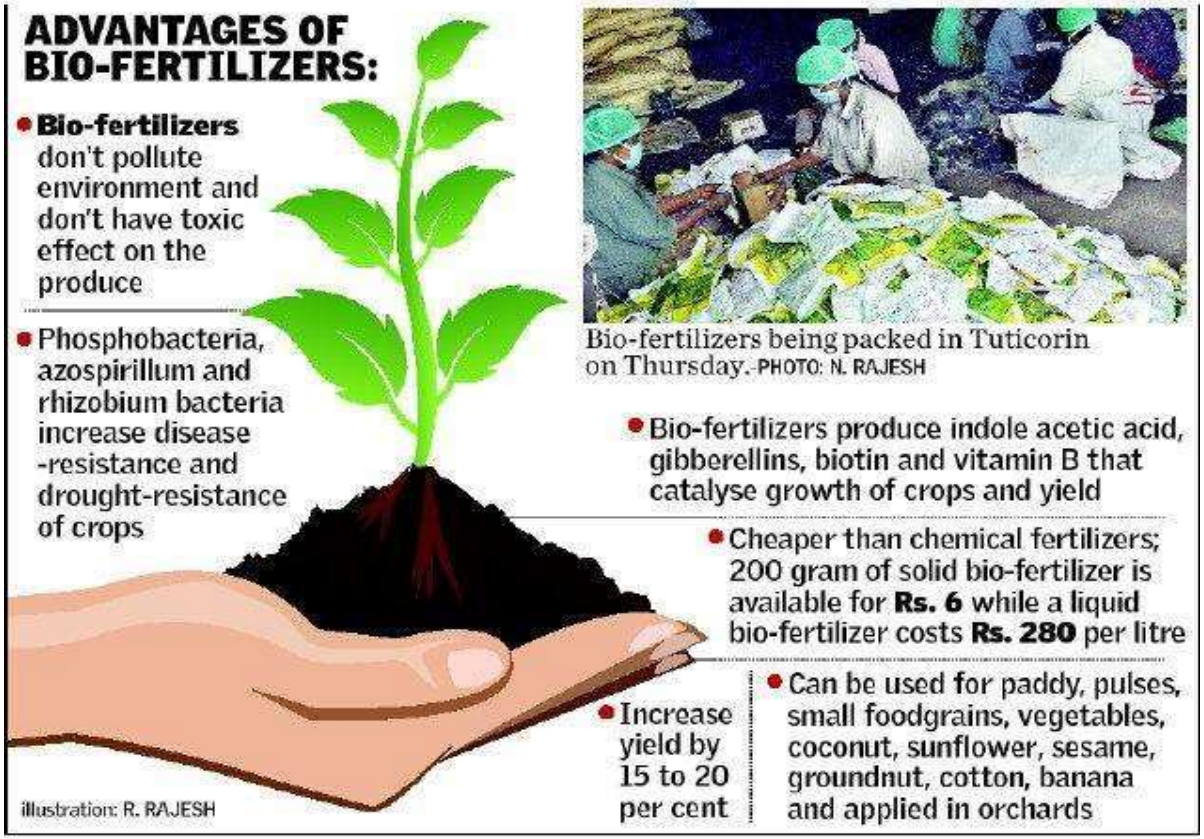
- This method is basically used in laboratory where zinc and iron troughs are used
- These are dimensionally 2 x 3 cm in width and 22 cm in height
- Trough is filled with about 10kg of soil and 200g of superphosphate is spread on it
- Water is poured upto 5-10cm height and calcium carbonate is added to adjust pH around 7
- Then, starter culture is sprinkled over it
- Trough is kept in sunlight where BGA is developed
- Watered everyday
- After sufficient growth of BGA, soil is allowed to dry and the dry flakes are collected and packed for algalization

Bio-fertilizers

Pit Method

- In this method, under full sunlight, shallow pits are maintained
- To avoid percolation, polythene sheets are lined inside the pit
- Soil is filled in pit upto 20 cm and watered for 10 cm height
- Then, carbofuran and saw dust are added along with the starter culture sprinkling
- Then, similarly after the growth of BGA, the dry flakes are collected and packed.

Bio-fertilizers



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