

ECONOMIC IMPORTANCE OF BACTERIA

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ECONOMIC IMPORTANCE OF BACTERIA

- **Include both beneficial and harmful aspects.**

A : Beneficial aspects of Bacteria

1. Role of Bacteria in soil fertility

- **Nitrogen is an essential constituent of many biologically significant organic molecules like proteins, nucleic acids, vitamins, coenzymes, alkaloids etc.**
- **Certain bacteria play an important role in nitrogen fixation, ammonification, nitrification and thus help to increase the fertility of soil**

Nitrogen fixing bacteria

- **Although 79% of the atmosphere is Nitrogen, it can not be used directly by plants. Plants can absorb Nitrogen only in the form of nitrates. Nitrogen fixing bacteria can fix the free nitrogen of the atmosphere into absorbable form of nitrates.**
- **Nitrogenfixing bacteriaare of two types viz. symbiotic nitrogen fixers and free living (asymbiotic) nitrogen fixers.**

Symbiotic nitrogen fixing bacteria

- Establish symbiotic relationship with leguminous plants and fix free Nitrogen of the atmosphere into absorbable form of nitrates and increase the fertility of the soil.
 - These are rod shaped, gram negative , motile bacteria that can grow in symbiotic association with leguminous plants and both the partners are mutually benefitted. The bacteria receive nutrients from the plants and the plant in turn get nitrogenous compounds.
 - Infection of the roots of a leguminous plant with suitable species of these bacteria leads to the formation of root nodules.
- e.g. Bacteria like *Rhizobium leguminosarum*, *Bradyrhizobium japonicum*, *Sinorhizobium meliloti* etc.

Free- living, aerobic nitrogen fixing
bacteria

- Live independently in the soil and fix free Nitrogen of the atmosphere into absorbable forms.
- These bacteria are the chief suppliers of Nitrogen in grass lands and other similar ecosystems that lack plants with nitrogen fixing symbionts.

e.g. *Azotobacter vinelandii*, *Azospirillum lipoferum* etc.

Free – living , anaerobic nitrogen fixing bacteria

- Some species of *Clostridium* such as *Clostridium pasteurianum*, *Desulphovibrio vulgaris* etc. also fix atmospheric Nitrogen and help to improve fertility of the soil.

Nitrogen fixation by Cyanobacteria

- Cyanobacteria like *Nostoc punctiforme*, *Anabaena azollae* etc. can also fix free nitrogen of the atmosphere by means of heterocysts and thus increase fertility of the soil.

Ammonification

- Species of bacteria like *Bacillus subtilis*, *Bacillus macerans*, *Proteus terrae*, *Pseudomonas fluorescens* etc. degrade dead organic matter of plants and animals into simple compounds like ammonia and help to enhance the fertility of the soil.

Nitrification

- Nitrifying bacteria like *Nitrosomonas europaea*, *Nitrosococcus* *us* *Nitrosomonas* *(Nitrosomonas as (Nitrosococcus oceani)* etc. oxidise ammonia to nitrites and *Nitrobacter* species (e.g. *Nitrobacter vulgaris*) oxidise nitrites to nitrates and increase the fertility of the soil.

Nitrogen fixation by Filamentous bacteria (Actinomycetes)

- Form nodules in the roots of non –leguminous plants like *Casuarina*. e.g. **Frankia**

Phosphorous solubilizers or Phosphobacteria

- Solubilize different forms of insoluble phosphates by producing citric acid, succinic acid, fumaric acid etc.

e.g. *Bacillus polymyxa*

B. megatherium var. phosphaticum

Pseudomonas striata

Bacteria as Biofertilizers

- **Cultures of improved strains of beneficial bacteria which when applied to the seed or soil, colonize the rhizosphere or the interior of the plants and stimulate plant growth by increasing the availability of nutrients.**
- **Improve cycling of nutrients and increase soil fertility .**
- **Increase porosity and water holding capacity of the soil and provide protection against drought.**
- **Enhance seed germination.**

THANK YOU

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