

# Uses of Bio-Agents in Crop Production

Bio agents are biologically active products or microbial inoculants of bacteria and fungi.

## Examples of Bio-agents

### Biocontrol Agents

*Pseudomonas flourescence*  
*Trichoderma viridae*  
*Beauveria*  
*Metarhizium*

### Biofertilizers

*Azotobacter*  
*Azospirillum*  
PSB  
*Rhizobium*

## Benefits of using bio-agents



### Eco-friendly

Suppresses the incidence of insect pests and plant diseases.

Reduces usage and dependance on chemicals.

Improves soil structure

Improves soil fertility and nutrient availability.

## PRECAUTIONS

Store in a cool and dry place away from direct sunlight and heat

Synthetic chemicals (fertilizers and pesticides) should not be mixed with the biofertilizers

The package has to be used before its expiry, only for the specified crop and by the recommended method of application.

Sow the treated seeds (with biofertilizer) immediately, preferably in the morning or afternoon avoiding scorching sunlight.

## Methods of Application

### Potting mixture



Mix homogeneously 100 g each of PSB, *Azotobacter*, *Azospirillum*, *Pseudomonas* and *Trichoderma* microbial bio-agent formulations with prepared cocopeat, vermicompost and charred rice husk.

## Foliar spray



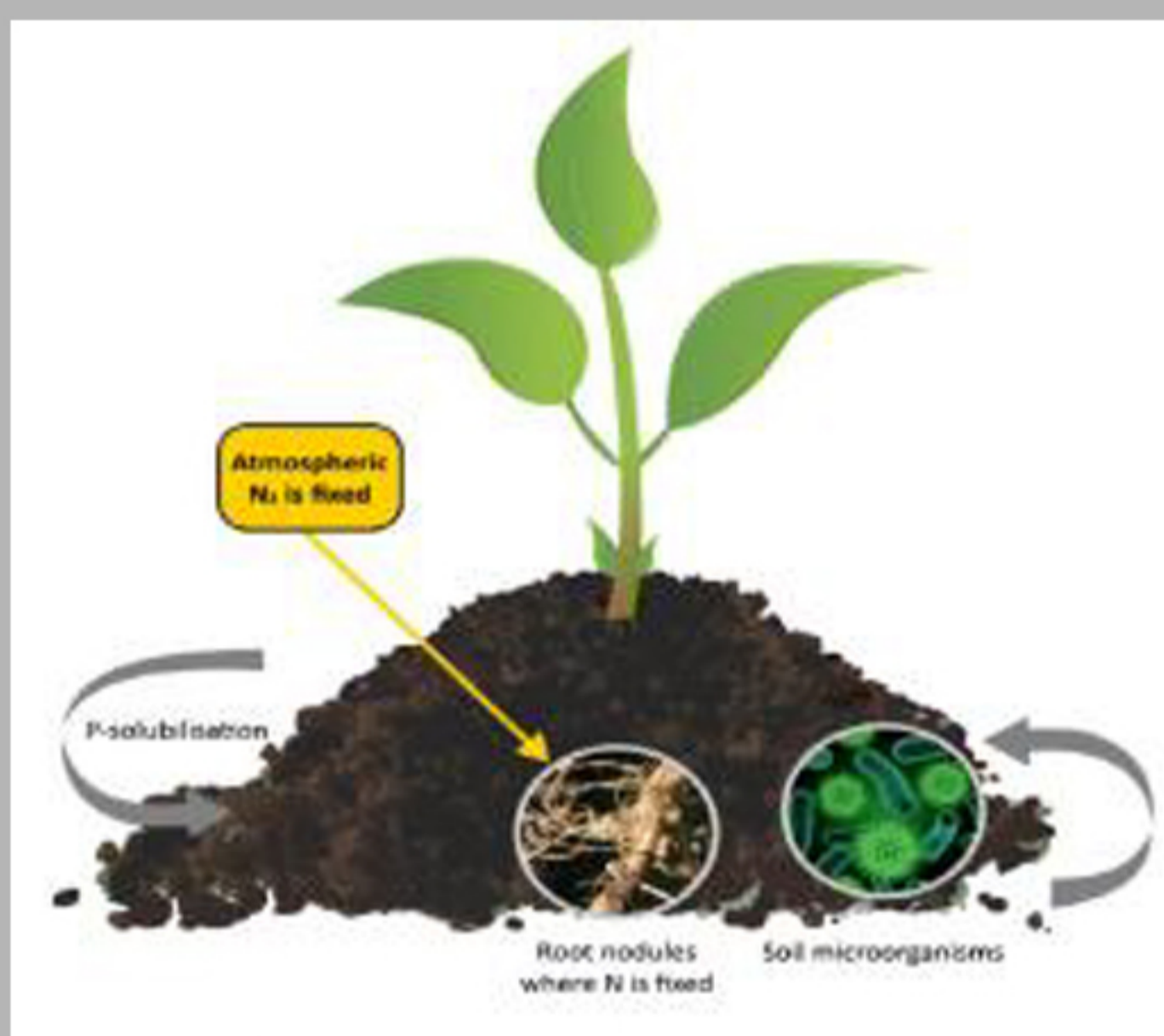
- Bioagents like *Beauveria*, *Metarhizium* can be sprayed as a foliar spray on the standing crop- @ 250 g per 0.15 ha @ 75 liters spray volume (i.e. 3 g per liter of water) once every 10 to 15 days based on pest populations.
- Foliar spray of *Beauveria* is effective against all lepidopteran larvae pests (*Helicoverpa*, *Spodoptera*) as per emergence of pests: while foliar spray of *Metarhizium* against coleopteran grubs.

## Enriched vermicompost



- Mix 400 grams each of PSB, *Azotobacter*, *Azospirillum*, *Pseudomonas* and *Trichoderma* formulations with 250 kg of well-matured vermi-compost.

## Root dipping



- This method can be used in case of *Azospirillum*, *Beauveria*, *Trichoderma*, *Pseudomonas* and *Metarhizium* inoculants.
- Dipping the roots of transplants for 15 seconds in the mixture of the respective inoculant and water before transplanting is effective against fungal diseases (fungal wilts & rots).

## How it Works ?

Agents	Benefits
<i>Azospirillum</i>	Increases crop performance considerably, fixes atmospheric nitrogen, enhances plant growth through production of phytohormones, reduces nitrogen fertilizer requirements.
<i>Azotobacter</i>	Contributes to solubilization of phosphorus and enhance plant growth, produces antibiotics that are antagonistic to crop pathogens
<i>Phosphate solubilizing bacteria (PSB)</i>	Converts insoluble soil phosphates into plant-available form, increases overall availability of soil phosphorus thereby reduces phosphorus fertilizer requirement.
<i>Pseudomonas flourescence</i>	Controls bacterial and fungal diseases, such as wilts and rots.
<i>Trichoderma viridae</i>	Mixing 2 grams of <i>Trichoderma</i> with 100 gm of seeds is effective against soil-borne fungal diseases.
<i>Beauveria</i>	Prophylactically, provides control of root grubs and other soil insect pests.
<i>Metarhizium</i>	Effective against coleopteran grubs.