Microbial Biofungicides in Plant Disease management



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Promoting the use of Biopesticides & Fertilizers



(Registered under the Insecticides Act, 1968

Ampelomyces quisqualis

Azadirachtin 0.030% (300 ppm)

Pseudomonas fluorescens

Bacillus subtilis

Trichoderma harzianum

Trichoderma viride

Trichoderma reesei









• Why use of Biopesticides in agriculture ?



- Proper pest management is important factor for healthy and high yielding crop to fulfill the food demand for increasing population.
- Chemical pesticides have accelerated land, air and water contamination.
- They have been the main cause of insect resistance as well as adverse impacts on natural enemies and humans.

Human exposure to pesticides occurs primarily through contaminated food, feed and drinking water.



➤Their adverse effects depend on toxicity of pesticides, method of application, the dosage applied, their adsorption on soil colloids, the weather conditions prevailing after their application, and how long the pesticides persist in the environment.



Why use biopesticides?

- Generally less toxic than conventional pesticides.
- Generally affect only the target pest and closely related organisms.
- Generally effective in 'relatively' small quantities with little residual.
- Generally short or no REI & PHI



When to Use a Biofungicides?

- Introduction of a biofungicides will not "cure" an already infected plant.
- Must be applied before the onset of disease development.
- Early application protects the roots against attacking fungi and encourages vigorous development of root hairs.
- Biofungicides should always be used in conjunction with the basic cultural control of sanitation
- Like any fungicide, the use of biological fungicide products should be applied according to the manufacturer's instructions.

How Do Biopesticides Work?







NIPHM is not endorsing any firm products





Mycoparasitism

Antagonist fungi parasitize other pathogenic fungi

Hyphae of Trichoderma either grow along the host hyphae or coil around it

E.g. : *T. harzianum* and *T. hamatum* were mycoparasite of both *Scelerotium rolfsii* and *R. solani*





Interaction -

- Coiling of hyphae around the pathogen,
- Vacuolization,
- Penetration by haustoria and
 - lysis

(Omero et al., 1999).

Recognize and attach to the pathogenic fungus and excrete extra-cellular lytic enzymes like β-1,3-glucanase, chitinase, proteases and lipase (Schlick *et al.*, 1994).



Trichoderma coils around, penetrates, and kills other fungi that are pathogenic (*i.e.* cause disease) to crops. It can digest their cell walls



A clear view with an electron microscope



Trichoderma spp.(T) fungal strands coil (C) around the Rhizoctonia (R)

Initial stages of degradation (D) as a result of Trichoderma generated enzymes.

T: Trichoderma R: Rhizoctonia

Plant growth promoter

Trichoderma strains solubilize phosphates and micronutrients

The application of *Trichoderma* strains in rhizosphere of plants increases the number of deep roots, there by increasing the plants ability to resist drought







In-vitro efficacy of native *Trichoderma* against Root rot

Different Methods of application of biopesticides

1. Seed Treatment

Are the most effective methods. Treating seeds with biocontrol cultures will improve plant production and productivity by protecting plants against phythopathogens. Dose 5-10 gm / kg of seeds

2. Seedling Dip

Application of strain mixtures by dipping the seedlings in bucket of water containing talk based formulation containing mixture of 20g/l for 2h and later transplanting it in the field helps to control diseases

3.Seed Bio-Priming

Treating of seeds with bio-control agents and then incubating under warm and moist conditions until just prior to emergence of radical is referred to as bio-priming. Trichoderma conidia germinate on the seed surface and form a layer around bio-primed seeds. Such seeds tolerate adverse various soil conditions better.

4. Foliar Spray Application

The efficacies of bio-control agents for foliar diseases are greatly influenced by microclimate. The concentration of nutrients like amino acids, organic acids and sugars exuded through stomata, lenticels, and wounds varies highly. It affects the efficacy and survival of antagonist in phylloplane. Dose : 10 gm / Litre of water

spray

6. Applying to the Infection Site

Application directly to the infection court at a high population level to swamp the pathogen (inundate application), seed coating and treatment with antagonistic fungi and bacteria, e.g., *Trichoderma harzianum* and *Pseudomonas fluorescens*, (Dose@10 gm/litre)

5.Soil Application

Soil being as the repertoire of both beneficial and pathogenic microbes, delivering of PGPR strains to soil will increase the population dynamics of augmented bacterial antagonists and thereby would suppress the establishment of pathogenic microbes onto the infection court.

Dose 1-2 kg per acre

Trichoderma harzianum

Seed treatment : 10g of talc formulation or 10 ml liquid formulation /kg seed of all the crops

Soil treatment:

2kg talc formulation/2 litre liquid formulation

+ 90 kg FYM

+ 10 kg neem cake

incubate for 7-10 days and can be used for one acre

Nursery beds

Protrays

 Please take care of BCA they will take care your crops!

Thank You