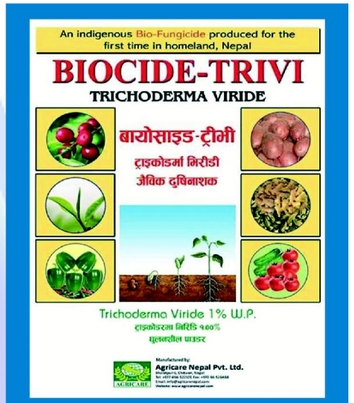

Fig: *Trichoderma produced locally in Nepal*

Nursery treatment: Drench nursery beds with 5 gm of Trichoderma formulation per liter of water. Or, Apply 10 - 25 g of Trichoderma powder per 100 m2 of nursery bed. Application of neem cake and FYM before treatment increases the efficacy.

Cutting and seedling root dip: Mix 10g of Trichoderma powder along with 100g of well rotten FYM per litre of water and dip the cuttings and seedlings for 10 minutes before planting.

Soil treatment: Apply 5 Kg of *Trichoderma* powder per ha after turning of sun hemp or dhaincha into the soil for green manuring Or Mix 1kg of *Trichoderma* formulation in 100kg of farmyard manure and cover it for 7 days with polythene. Sprinkle the heap with water intermittently. Turn the mixture in every 3-4 days interval and then broadcast in the field.

Plant Treatment: Drench the soil near stem region with 10g *Trichoderma* powder mixed in a litre of water

Trichoderma formulations: Several commercial formulations are currently available in the name of *Tricho-Star, Sanjibani,Guard, Niprot, Biocide-Trivi* and *Bioderma.*


Fig: *Trichoderma parasitizing harmful fungi*

Biocontrol mechanisms of Trichoderma

- Trichoderma colonizes plants root systems and reduces growth, survival or infections caused by pathogens by different mechanisms like competition, antibiosis, mycopararsitism, hyphal interactions and enzyme secretion.
- It decomposes and absorbs the organic material in which it grows. It competes and grows rapidly on substrates.
- It provides plant with systemic resistance against pathogens by releasing compounds that activate the plant defense mechanisms.

Precautions

- Don't use chemical fungicide after application of Trichoderma for 4-5 days.
- Don't use Trichoderma in dry soil. Moisture is an essential factor for its growth and survivability.
- Don't put the treated seeds in direct sun rays.
- Don't keep the treated FYM for longer duration.
- Harmful parasite of mushrooms
- It does not grow well in alkaline conditions (pH>8)

Compatibility

- Compatible with organic manure, biofertilizers like *Rhizobium, Azospirillum, Mycorrhizae, Azotobacter, Bacillus Subtilis* and *Phosphobacteria, Gliocladium virens, Pseudomonas fluorescens*
- Trichoderma can be applied to seeds treated with Metalaxyl or Captan, Carboxin, Carbendazium but not Mercurials.

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Trichoderma: An antagonistic Fungus

Introduction

Trichoderma spp. are free living fungi that are common in soil and root ecosystems. They are highly interactive in root, soil and foliar environments. They produce or release a variety of compounds that induce localized or systemic resistance in plants. Trichoderma strains have long been recognized as biological agents, for the control of plant disease and for their ability to increase root growth and development, crop productivity, resistance to abiotic stresses, and uptake and use of nutrients. *Trichoderma harzianum*, *T.viride* and *T.hamatum*. are commonly used species in biological control.


Fig: Morphology of *Trichoderma harzianum*

- ✓ Serves as the roots shield against harmful fungi such as *Fusarium, Phytopthora*.
- ✓ Increased root growth, resulting in higher crop yield
- ✓ Induces plants' resistance against biotic and abiotic stresses
- ✓ Facilitates the uptake and use of nutrients.
- ✓ Environmental friendly and cost effective
- ✓ Majority of Trichoderma strains are compatible with agro-chemicals.
- ✓ Reduces the use chemical fungicides

Benefits of Trichoderma


Fig: Root Development without (left) and with (right) *Trichoderma*

- ❖ **Disease Control:**
  Used for disease control in
  a) chilli, tomato, brinjal against *damping off*,
  b) cotton, tomato, brinjal against *wilting diseases* and c) ginger, turmeric, onion against *rhizome rot*.
- ❖ **Plant Growth Promoter:**
  Trichoderma strains solubilizes phosphates and micronutrients which accelerates the rate of plant growth and development; production of more robust roots.
- ❖ **Biochemical elicitors or disease resistance:**
  Trichoderma strains induce resistance in plants through production of ethylene, hypersensitive responses and other defense related reactions in plant cultivates.
- ❖ **Bioremediation:**
  It helps in bioremediation of soil that are contaminated with pesticides. They degrade a wide range of insecticides: organochlorines, organophosphates and carbonates.

Method of application

Seed treatment: Mix 10g of Trichoderma formulation per litre of cow dung slurry for treatment of 1kg of seed before sowing, particularly for cereals, pulses and oilseeds.