

Trichoderma: an integrated pest management tool with potential for use in conservation agriculture

R. Muniappan, Director, IPM CRSP, OIRED, Virginia Tech, Blacksburg, VA 24060
 Poster prepared by M. "Amado" Ohland of the IPM CRSP Management Entity

Challenge: The costs of commercially-available chemical farm inputs to control fungal diseases in vegetable crops is high, but farmers in developing countries have to pay them to avoid crop losses.

Opportunity: There is a low-cost, environmentally-friendly way to reduce the use of chemical fungicide to combat a range of fungal diseases.

Trichoderma sp. is a beneficial fungus, an avirulent plant symbiont that occurs naturally in all agricultural and forest soils and root ecosystems. It is highly competitive and displays antagonism against other pathogenic fungi. It has been successfully cultivated for use as a biofungicide to control fungal diseases of plants.

Trichoderma harzianum, *T. viride* and *T. hamatum* are common species used in biological control.

What It Can Be Used For

Trichoderma is used to protect the following crops from a range of different diseases:

- Cacao
- Citrus
- Cucurbits
- Durian
- Eggplant
- Langsat
- Legumes
- Oil Palm
- Oilseed Crops
- Okra
- Onion
- Pepper
- Tomato
- Vanilla

Used against:

- *Fusarium* wilt and *Pythium* rot
- Clubroot of broccoli
- *Fusarium* wilt of watermelon
- *Anthraxnose* bulb rot, damping off, and pink rot of onion



Trichoderma treated and untreated broccoli in the Philippines



Trichoderma compost production in Bangladesh



Compost being sieved for inoculation with *Trichoderma* in Bangladesh

How It Operates

Trichoderma colonizes plants' root systems and protects them from several soil-borne pathogens. It decomposes and absorbs the organic material in which it grows.

- It attacks other fungi in the plant's root system by coiling its tentacle-like mycelia around them, penetrating their hyphal strands, and consuming their insides.
- It can grow rapidly on many different substrates and can out-compete other organisms for space and food within the plant root system, starving out the harmful organisms.
- It can provide a plant with systemic resistance against pathogens by releasing compounds that activate the plant defense mechanisms.

In these ways, *Trichoderma* serves as the roots' shield against harmful fungi. It is beneficial in other ways as well:

- Seed treatment with *Trichoderma* can protect the seedlings from pathogenic fungi.
- Root colonization by *Trichoderma* enhances plant root growth and nutrient and water uptake, therefore, increasing their resistance to drought and increasing their crop productivity.

This versatility is part of what makes *Trichoderma* such a powerful tool for the agriculturalist.



Control - No seed treatment



Seed treatment with *Trichoderma* + *Pseudomonas* @ 10 g/kg of seeds

Benefits

- Inexpensive to purchase
- Easy and inexpensive to produce
- Potential source of income
- Environmentally-friendly
- Reduces the need for harsh, expensive chemical fungicides
- Does not leave a chemical residue
- Reduces crop loss; increases yields
- Usable on many crops
- Usable against many pathogenic fungi



Dr. Aunu Rauf, Entomologist at Bogor Agricultural University in Indonesia, holding a commercial package of *Trichoderma*

Where It Is Produced or In Use

Scientists are using *Trichoderma* to combat a range of fungal diseases that affect crops from India to Honduras.

- In **India** several Universities and private companies produce and sell *Trichoderma* to farmers. For example, Tamil Nadu Agricultural University has been so successful selling the biofungicide, they were able to build a new plant pathology building.
- In **India**: used against *Fusarium* wilt and *Pythium* rot.
- In **India** and **the Philippines**: sprayed on seedlings as a treatment.
- In **Bangladesh** and **Indonesia**: mixed with compost and applied in the field.
- In **Indonesia**: used against clubroot in broccoli. It has also been tested on diseases of tomato and pepper.
- In the **Philippines**: tested in several sites; used to combat *anthracnose* bulb rot, damping off, and pink rot of onions.
- In **Honduras**: used on watermelon for the control of *Fusarium* wilt.



Trichoderma propagating machine at TNAU, India

Trichoderma has been a godsend in treating fungal diseases in developing countries. It is easy to produce, and in addition to helping farmers regain their livelihood, it has created a new source of income. Investigate whether the use of *Trichoderma* is right for your conservation agriculture project.