

## Trichoderma: An Eco-friendly Biocontrol Agent

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### Introduction

To fulfil the demand for food grain of increasing population was the main concern of our country. For surplus production and supply of food to feed the whole population of country is achieved by the green revolution. But inappropriate use of chemicals leads to several diseases and insect outbreaks as well as loss of soil and environmental health. Now *Trichoderma* came as an alternative to chemicals and pesticides. The application of *Trichoderma* to control disease is eco-friendly as well as affordable to the farmers. *Trichoderma* is a bio-pesticide fungus that has the ability to manage the disease as well as increase the plant growth.

### Importance of *Trichoderma*

1. Use as a biopesticide for plant disease control in different crops. (Herman et al. 2004)
2. *Trichoderma* species are economically important for their production of industrial enzymes (cellulases and hemicellulases), antibiotics, and their action as biocontrol agents against plant pathogen germs based on various mechanisms such as the production of antifungal metabolites, competition for space and nutrients, and mycoparasitism (Howenn, 2003).
3. *Trichoderma spp.* probably have significant, wide-scale use in the remediation of pollutants in soil and water. (Herman et al. 2006)
4. This also helps in organic production of crops under the strategy of integrated pest management (IPM). (Monte et al. 2003)
5. *Trichoderma* strain solubilises phosphate and micronutrients. The application of trichoderma strain with plants such as grasses increases the number of deep roots, thereby increasing the plant's ability to resist drought.

Species and strain	Plant	Pathogens	Evidence of effects	Time after application	Efficiency
<i>T.virens</i> G-6,G-6-5 and G-11	Cotton	<i>Rhizoctonia solani</i>	Protection of plants ;induction of fungitoxicTerpenoid phytoalexins	4 days	78% reduction in disease
<i>T.harzianum</i> T-39	Tomato, peper, tobacco	<i>B.cinerea</i>	Protection of leaf when t-39 present only on roots	7 days	25-100% reduction in gray- mold
<i>T.harzianum</i> T-22	Tomato	<i>Alternaria solani</i>	Protection of leaf when T-22 was present only on roots	3 months	Upto 80 % reduction in disease
<i>T.harzianum</i> T-22	Maize	<i>C.graminicola</i>	Protection of leaf when trichoderma present only on roots	14 days	45% reduction in disease
<i>T.harzianum</i> NF-9	Rice	<i>M.gricea</i> ; <i>X.oryzae</i> <i>pv.oryzae</i>	Protection of leafs when NF -9 present only on roots	14 days	30 – 50% reduction in disease

### Production of *Trichoderma*

For the production of *Trichoderma*, we needed *Trichoderma* culture, talc powder, and jowar grains as a raw materials. The amount of *Trichoderma* culture that is produced in the laboratory increases by using jowar grain as a growth substrate. For that dip, soak the jowar grain in a 2% sucrose solution for 6 hours and then release the extra water present in the jowar. Take 250 gm of grain in sterilised polythene and cover the mouth with a cotton plug. And then autoclave the polythene at 15 psi for 30 to 40 min, take out the polythene from the autoclave, and allow it to maintain its natural temperature. Take 5 ml. of *Trichoderma* culture using a pipette from a 2×10<sup>8</sup> cfu/ml concentration and put the culture in polythene. Then seal the polythene with tape and put in BOD incubator at 25°C for 15 days, grind the grain in fine texture and mix with the talc powder in ratio of 1:9. Now the *Trichoderma* is ready to pack for further application.

## Mode of Application

For successful disease control, delivery and establishment of *Trichoderma* on the site of action is very important. The most common methods of application of *Trichoderma* are seed treatment, seed biopriming, seedling treatment, and soil application. (Kumar et al. 2014)

### Seed treatment

Mix 10 g of *Trichoderma* formulation per litre of water for treatment of 1 kg of seed and put the treated seed in the shade for 4 to 6 hours before sowing, particularly for cereals, pulses, and oilseeds. Seed biopriming—treating seeds with a biocontrol agent and incubating them under warm and moist conditions until just prior to the emergence of the radical—is referred to as biopriming. Cutting and seedling treatments: Mix 10 gm of *Trichoderma* formulation with 1 litre of water and dip the cutting and seedling for 10 min. before planting.

### Soil Treatments

Mix 1 kg of *Trichoderma* formulation in 100 kg of farmyard manure and cover it for seven days with polythene. Turn the mixture in every 3 to 4 day interval and then broadcast in the field.

## Conclusion

In this decade, the use of chemicals for crop production has led to many side effects, such as chemical toxicity in soil, water, and air, and this causes many diseases. Now is the time to shift our modern agriculture towards sustainable agriculture. To achieve the aim of organic agriculture, *Trichoderma* will play a key role as an alternative for some pesticides and other chemicals. *Trichoderma*, with its several species, has a tremendous ability to manage disease in crop production.

## References

- Harman. G.E., Howell.C.R., Viterbo.A., Chet.I., Lorito.M.(2004). *Trichoderma* species - opportunistic avirulent plant symbionts. Microbiology volume 2.6.
- Harman.G.E.,(2006).Overview of mechanisms and uses of *Trichoderma* spp. Phytopathology.96;190-194.
- Kumar.S., Thakur.M., Rani.A.,(2014). *Trichoderma* :mass production, formulation, quality control,delivery and its scope in commercialization in India for the management of plant disease. African journal of agricultural research.Vol.9(53).
- Monte.E., Llobell.A.,(2003).*Trichoderma* in organic agriculture. Proceeding v world avocado congress.2.

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