

# Trichoderma: An Effective Bioagent against Plant Pathogens

**Neha Chaudhary<sup>1\*</sup>, Dr. Pradeep Kumar Verma<sup>2</sup>, Shachi Tiwari<sup>1</sup> and Swarnima Tiwari<sup>1</sup>**

<sup>1</sup>Department of Botany Swami Vivekananda Subharti University Meerut (U.P.) India

<sup>2</sup>Assistant Professor Department of Agriculture,  
Swami Vivekananda Subharti University Meerut (U.P.) India

**Corresponding Author**

Neha Chaudhary

Email: dagarneha1993@gmail.com



**OPEN ACCESS**

**Keywords**

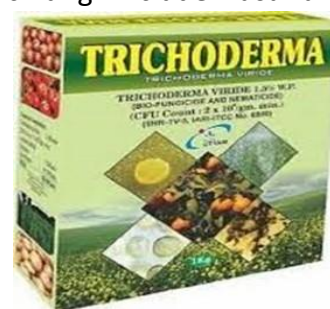
*Trichoderma*, Bioagent, Mass multiplication, Trichothecin and Trichodermin

*How to cite this article:*

Chaudhary, N., Verma, Dr. P. K., Tiwari, S. and Tiwari, S., 2024. *Trichoderma: An Effective Bioagent against Plant Pathogens*. *Vigyan Varta* 5(10): 156-159.

## ABSTRACT

*Trichoderma* has been used effectively against plant pathogenic fungi include *Fusarium*, *Phytophthora*, *Sclerotinia*, and other fungal pathogens. It produces antibiotics and poisons like trichothecin, sesquiterpene and *Trichodermin*. Which have direct effect of fungal pathogens and mass multiplication of *Trichoderma* in the Molasses Yeast Medium because it is provide good growth of fungal growth and multiplication. Its broth medium mix into 1:2 ratio with talc powder for commercial purpose. It is widely used for management of soil born of plant pathogens such as *Fusarium*, *Phytophthora*, *Sclerotinia* It produces antibiotics and poisons like trichothecin, sesquiterpene and Trichodermin.



## INTRODUCTION

This bioagent effective management the soil-borne plant diseases and its widely utilized. Since the 1920s, fungi belonging to the genus *Trichoderma* have been

recognised for their capacity to function as bio-control agents against plant diseases (Samuels 1996). p to 1969, when Rifai identified nine species, the notion that

Trichoderma was monotypic endured (Samuels, Gary J. et al., 2006). It has been used effectively against plant pathogenic fungi include *Fusarium*, *Phytophthora*, *Sclerotinia*, and other fungal pathogens. *Trichoderma* species is beneficial for a many types of field crop and vegetables such as cauliflower, cotton, tobacco, soybeans, sugarcane, brinjal, Bengal gramme, banana, tomato, chillies, potato, citrus, onion, coffee, tea, ginger, turmeric, pepper, betel vine, and cardamom. *Trichoderma* strains dissolve phosphates and micronutrients. The remote sensing is partially due to the sequential expression of pathogenesis related proteins, mostly chitinases, glucanases and proteases (Harman, Howell et al., 2004). Applying *Trichoderma* strains to plants increases the amount of deep roots, making them more drought-resistant. *Trichoderma* may compete with pathogens in the rhizosphere, reducing disease development. It produces antibiotics and poisons like *trichothecin*, *sesquiterpene* and *Trichodermin*.

**Subdivision:** In 1991, Bissett divided the genus into five sections, partly based on the aggregate species described by Rifai: *Pachybasium* (20 species), *Longibrachiatum* (21 species), *Trichoderma*, *Saturnisporum* (2 species), *Hypocreanum*

#### Characteristics of an ideal formulation

- i. These formulations should have increased shelf life.
- ii. These formulations should not be phytotoxic to the crop plants.
- iii. These formulations should tolerate adverse environmental conditions.

#### Material Required for Mass Multiplication

Preparation of Molasses Yeast Medium

#### Ingredient

- |                     |        |
|---------------------|--------|
| 1. Molasses:        | 30g    |
| 2. Yeast:           | 5g     |
| 3. Distilled water: | 1000ml |

#### Method of Preparation

#### Procedure

1. All ingredients (Molasses and Yeast) mixed in 1000ml of distilled water at boiling temperature.
2. This media dispensed 500ml conical flask and take care that not more than 2/3 part of flask is filled.
3. The conical flasks tightly plugged with non-absorbent cotton plugs were further wrapped butter by the rubber band.
4. The molasses yeast medium was sterilized in an autoclave at 121°C (1.1/cm pressure) for 20 min.
5. After the medium is cooled at room temperature. After cooling the media is inoculated with 9 mm discs of a 10 day old culture of *Trichoderma viride* and then incubated in BOD incubator for 10 days for fungal growth of mother culture.
6. Molasses yeast medium is prepared in fermentor and sterilized in autoclave at 121°C (1.1/cm pressure) for 20 min.
7. After that the molasses yeast medium is cooled and the mother culture is mix to the fermentor @ 1.5 litter / 50 litter of the molasses yeast medium and incubated at room temperature for 10 days.
8. Then the incubated broth media containing the fungal culture of *Trichoderma viride* used for commercial formulation preparation using carboxy methyl cellulose (CMC) talc powder.

9. The fungal biomass of *Trichoderma viride* is taken out of the fermentor and combined with talc at 1:2 ratios.
10. The mixture is air dried in shade and mixed with carboxy methyl cellulose (CMC) @ 5 g / kg the product.
11. It is packed in polythene bags and should be used within 4 months.

### Benefits of *Trichoderma viride*

1. It decomposes raw organic farm waste.
2. Solubilizes the soil phosphorus.
3. *Trichoderma* enhance the plant growth and development and maintains the soil ecosystem.
4. It providing resistance to drought and disease.

### Mechanism of *Trichoderma*

- **Mycoparasitism-** *Trichoderma* attacks other fungi by secreting metabolites that cause them to coil and penetrate.
- **Antibiosis-** *Trichoderma* produces low molecular weight antibiotics and other secondary metabolites that inhibit pathogen growth.
- **Competition-** *Trichoderma* competes with other fungal pathogens for space, nutrients, and attachment sites.
- **Induced plant defense mechanisms-** *Trichoderma* can induce plant defense mechanisms, such as the production of enzymes and defensive metabolites.
- **Stimulation of plant growth-** *Trichoderma* can promote plant growth by producing phytohormones and the 1-aminocyclopropane-1-carboxylate (ACC) deaminase enzyme.

- **Induced resistance-** *Trichoderma* releases elicitors from the plant host and the infecting microorganism that induce local or systemic resistance in the plant.
- **Cell wall degrading enzymes-** *Trichoderma* produces enzymes that degrade the cell walls of pathogens.
- **Improved root system-** *Trichoderma* improves the root system by forming more root hairs, which helps the plant absorb more water and nutrients.
- **Increased nutrient availability-** *Trichoderma* makes certain nutrients, like iron and manganese, available for the plant to absorb.

### Method of Application

**1. Seed treatment:** *Trichoderma* used as seeds treatment to seed protect in the soil from soil-borne plant pathogens and improve germination of seed.

### Method

- Prepare slurry by mixing *Trichoderma* spores or *Trichoderma* commercial formulation product with the water.
- Cover over the seeds with the slurry before planting of the nursery or sowing.
- Keep the seeds to dry in the shade before sowing the seed in the soil.

**2. Soil application:** The *Trichoderma* species colonize in the rhizosphere of plants and destruct the soil-borne plant pathogens.

### Method

- Mixing of the *Trichoderma* spores or powder with compost or farmyard manure (f @ of 1 to 2 kg per acre).
- Application of mixture in the soil around the root area of plant or during land preparation.

- *Trichoderma* mixed with the soil for potting or transplantation of the plants.

**3. Foliar sprayer:** This method uses to protect leaves from foliar pathogens of plant and enhance plant health.

#### Method

- Prepare a suspension of *Trichoderma* spores in the clean water @ 5-10 grams'/ liter water.
- Spray this solution of *trichoderma* on the foliage surface of plant by using a sprayer.
- Repeat the process of application at regular intervals as required.

**4. Root dip:** This method used to protect young plants or seedling and transplants from root diseases.

#### Method

- Prepare a suspension of the *Trichoderma* in clean water @10 grams' / liter water.
- Dip the seedling roots or transplants in this *Trichoderma* solution for a few minutes then planting.

**5. Soil drench:** This method used to treat localized areas of the soil for planting of seedling.

#### Method

- Prepare a suspension of *Trichoderma* spores in the clean water.
- Pour the solution of the *Trichoderma* directly near or base of the plants or over the soil.

**6. Composting:** This method used to enhance the quality of compost by accelerating decomposition and suppressing pathogens.

#### Method

- Mix *Trichoderma* culture with organic manure or compost materials.
- Allow the compost to mature, during which the *Trichoderma* will grow in the organic matter.

**7. Pellet or Granule Form:** This method uses to ensure a slow release of *Trichoderma* in the soil over time.

#### Method

- Use *Trichoderma* formulated as pellets or granules.
- Apply these directly in the soil or mix them with other granular fertilizers during planting.

#### Trade name of *Trichoderma viride*

It is available in the market of India as different trade name such as Sanjeevni, Multiplex Nisraga and Trichofort etc.

#### REFERENCES

- Samuels, G. J. (1996). *Trichoderma*: a review of biology and systematics of the genus. *Mycological research*, 100(8), 923-935.
- Harman, G. E., Howell, C. R., Viterbo, A., Chet, I., & Lorito, M. (2004). *Trichoderma* species—opportunistic, avirulent plant symbionts. *Nature reviews microbiology*, 2(1), 43-56.
- Rifai, M. A. (1969). A revision of the genus *Trichoderma*.
- Bissett, J. (1991). A revision of the genus *Trichoderma*. III. Section *Pachybasium*. *Canadian journal of botany*, 69(11), 2373-2417.
- Samuels, G. J. (2006). *Trichoderma*: systematics, the sexual state, and ecology. *Phytopathology*, 96(2), 195-206.