Ecofarming
e-Magazine for Agriculture and Allied Sciences
http://www.rdagriculture.in
e-ISSN: 2583-0791
Ecofarming Vol. 02(04): 188-192, 2022

Biological Plant Protection Agent: *Trichoderma viridae*

Akash Singh* and S.N. Rahul

Department of Plant Pathology
Acharya Narendra Deva University of Agriculture & Technology
Kumarganj, Ayodhya (224229), India

*Email: akashsngh197@gmail.com

Received: **August 12, 2022;** ***Revised:*** **August 14, 2022** ***Accepted:*** **August 17, 2022**

Introduction

Today, one of the most important areas of plant pathology study worldwide is the biological control of soil-borne plant infections by species of *Trichoderma* (Mukhopadhyay, 1987). In all soils, where they are naturally present and most common, the fungus genus *Trichoderma* of the family Hypocreaceae can be found. Most soil-borne illnesses are controlled by culturable fungi, which are also very effective. Plantation crops are among the crops that are commercially significant. This genus has numerous species that can be identified. As adaptive, non-virulent plant symbionts. This is about the capacity of several *Trichoderma* species to produce. Several plant species have mutualistic endophytic interactions. Christiaan

provided an explanation of the genus. It was first referred to as producing green mould by *Hendrik Persoon* in 1794.

Trichoderma species are known to grow and function in soil using a wide range of carbon and nitrogen sources. The use of pesticides has become a necessary component of modern agriculture. The biological equilibrium in soil is typically disturbed and altered by the application of pesticides. In root, soil, and foliar habitats, *Trichoderma* spp. is very interacting. The rate of growth, survival, or illnesses brought on by pathogens by many mechanisms, such as competition, antibiosis, and mycoparasitism. Enzyme secretion and hyphal interactions (Mannina and Segrc, 1997).

Classification

Kingdom	Fungi
Division	Ascomycota
Class	Sordariomycetes
Order	Hypocreales
Family	Hypocreaceae
Genus	*Trichoderma*
Species	*viridae*

Trichoderma sp. also exhibits the qualities listed below:

1. Initially translucent colonies on media like cornmeal dextrose agar (CMD) or white colonies on richer media like potato dextrose agar (PDA). Conidia normally form, and mycelium is not readily seen on CMD. Within a week, in tufts that are compact or loose, and are coloured green, yellow, or less frequently, white (fig.1). Yellow pigment may be released into the agar.
2. Conidiophores are extremely branching, making them challenging to describe or quantify. They can be loosely tufted or compactly tufted, frequently formed in separate concentric rings, or they can be carried along the sparse aerial hyphae (fig.2). Latitudinally side branches that may or may not be coupled are produced by conidiophore main branches.
3. The farthest branches from the tip and frequently the phialides that arise directly from the main axis close to the tip. The branches may split again, with the secondary branches that are closest to the main axis being the longest and frequently paired secondary branches. All primary and secondary branches begin at a 90° angle or close to it with relation to the primary axis. The normal pair of branches on *Trichoderma* sp. conidiophores acquires an aspect of a pyramid.
4. Phialides can be cylindrical or almost subglobose, but they usually have an expanded centre. Phialides can be penicillate in various ways or kept in whorls at an angle of 90 degrees to the other whorl members (gliocladium-like).
5. Conidia have the appearance of being carried in smooth, clear drops of green or yellow liquid.
6. Some species that also produce the usual *Trichoderma* pustules give rise to synanamorphs. The single conidiophores that are verticillately branched and bear conidia in a drop of

clear green liquid at the tip of each phialide are characteristics of synanamorphs.

7. All species have the potential to produce chlamydospores, although not all species do so within 10 days on CMD at 20° C. Chlamydospores can form inside hyphal cells and are typically unicellular subglobose, terminating short hyphae. Some species of chlamydospores are multicellular (e.g., *T. stromaticum*).
8. Species of the ascomycete genus Hypocrea that are teleomorphs of *Trichoderma* sp. The development of fleshy stromata in hues of light or dark brown, yellow, or orange is what distinguishes them. Typically, the stroma is limited in size and discoidal to pulvinate in shape. However, the stromata of some species are effused, occasionally covering large areas. The perithecia are totally submerged. The ascus looks to contain 16 ascospores even though ascospores are actually bicellular but disarticulate into 16 part-ascospores at the septum early in development. Hyaline or green, and generally spinulose, ascospores.

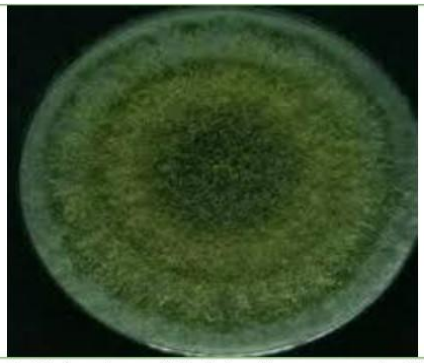

Fig.1: Colonies of *Trichoderma* sp. in PDA

Fig.2: Microscopic Image of hyphae of *Trichoderma* sp.

Biocontrol Agent

Trichoderma strains have been created as biocontrol agents for plant diseases caused by fungi. Antibiosis, parasitism, promoting host-plant resistance, and competition are a few of the different ways. The species *T. asperellum*, *T. harzianum*, *T. viride*, and *T. hamatum* are the source of the majority of biocontrol agents. The biocontrol agent often develops on the root surface of its natural habitat, which has an impact on root disease specifically but can also be useful against foliar diseases.

Trichoderma viridae, a biocontrol agent, multiplies on the surface of the seed after application and colonises the crop's seed or rhizosphere soil area. However, *Trichoderma viridae* also provides protection from soil-borne pathogens for the duration of the crop's life through mycoparasitism and antibiosis. It is a crucial weapon against diseases like root rot, seedling illnesses, charcoal rot, wilt, damping off, collar rot, etc. due to the efficient suppression of soil-borne diseases like Rhizoctonia *solani, Macrophomina Phaseolina* and *Fusarium* spp. *Trichoderma viridae* is also included. increases both productivity and fruit and vegetable quality. increase germination rate increased root and shoot length Nitrogen fixing is accelerated by soluble different insoluble forms of phosphates. Early in the crop's life, encourage healthy growth. Increase the production of dry matter

significantly.

Suitable Crops

To combat soil-borne diseases, *Trichoderma* sp. is applied to crops like cauliflower, cotton, tobacco, soybean, sugarcane, sugarbeet, eggplant, red gramme, banana, coconut, tomato, chillies, potato, citrus, onion, groundnut, peas, sunflower, brinjal, ginger, turmeric, pepper, betel vine, and cardamom, among others.

Application Techniques

1. Before sowing, treat the seeds by combining 6–10 g of *Trichoderma* powder per kg of seed.
2. For a nursery treatment, use 10 to 25 g of *Trichoderma* powder on a bed that is 100 m2. Neem cake and FYM application before therapy boosts effectiveness.
3. Cutting and seedling root dip: Prepare a solution of 10g of *Trichoderma* powder per litre of water and 100g of thoroughly rotted FYM. Dip the cuttings and seedlings for 10 minutes before to planting.
4. Apply 5 kg of *Trichoderma* powder per hectare as a soil treatment after incorporating sun hemp or dhaicha into the soil for green manuring. Or Combine 1 kg of the *Trichoderma* formulation with 100 kg of farmyard manure, then cover the mixture with polythene for 7 days. Sprinkle water on the pile in spots. Every three to four days, turn the mixture in and then spread it out in the field.
5. Plant Treatment: Soak the soil near the stem in a solution of 10g *Trichoderma* powder to 1 litre of water.

Trichoderma Products

There are significant commercial formulations under the names Sanjibani, Guard, Niprot, and Bioderma. In these formulations, 1 g of carrier material holds 3x106 cfu. For the creation of powder formulations, talc is employed as a carrier.

Advantages

Trichoderma viridae has some advantages, including:

1. Effective against infections transmitted by seeds by destroying the pathogen on the seed surface.
2. By removing pathogens from the rhizosphere zone, it protects seeds and plants.
3. *Trichoderma* formulation application is safer for the environment and encourages organic farming.
4. Simple to use and safer for people and other helpful organisms.
5. It can be used in conjunction with the use of other biopesticides or biofertilizers.
6. *Trichoderma viridae* grow quickly in soil and can overcome lingering issues.
7. It offers disease defence throughout the crop cycle.
8. Less expensive than managing plant diseases with chemicals.
9. It also encourages plant development through a number of processes.
10. *Trichoderma* sp. are also employed in the development of pesticides and other biological agents used to limit the spread of other fungi and harmful organisms in agriculture due to their potential to attack and destroy other

forms of fungi as well as different other organisms like bacteria.

11. The *trichoderma* fungus, which breakdown organic matter, are vital for the nitrogen and carbon cycles in addition to providing plants with readily available nutrients (biomass) (important for plant development).

Precautions

1. Wait 4-5 days before using a chemical fungicide after applying *trichoderma.*
2. Avoid applying *trichoderma* on dry soil. Moisture is crucial for its ability to grow and endure.
3. Avoid placing the treated seeds in the direct sun.
4. Avoid keeping the treated FYM for too long.

Compatibility

1. *Trichoderma* can grow in organic manure *Trichoderma* can grow in biofertilizers like *Rhizobium*, *Azospirillum*, *Bacillus subtilis*, and Phosphobacteria.
2. *Trichoderma* can be used on seeds that have received a *metalaxyl* or thiram treatment, but not mercurials. It can be combined as a tank mix with chemical fungicides.
3. *Trichoderma viridae* exhibits compatibility with certain insecticides (Mancozeb, Imidacloprid). *Anitha* et al. (2001) conducted a laboratory screening of carboxin and *metalaxyl* against bacterial and fungal antagonists and discovered that neither substance inhibited the growth of *Trichoderma viridae*.

Reference

1. *Trichoderma*; from Wikipedia, the free encyclopedia.
2. Krishnan, S., Gautam, R.J., Singh, P.K. and Kaari, M. july (2016) *Trichoderma viridae.* DOI: 10.13140/RG.2.1.1569.9449
3. Vasundara, P., Rangaswamy, V. and Johnson, M. (2015) Compatability Studies with fungicides, insecticides and their combinations on *Trichoderma viridae* in invitro conditions. International Journal of Scientific & Engineering Research.6(2), ISSN 2229-5518
4. Singh, R.K. (2010) *Trichoderma*: A bio-control agent for management soil borne diseases. Agropedia.
5. Nur A. ZinNoor A. Badaluddin (2020) Biological functions of *Trichoderma* spp. for agriculture applications.