RESEARCH ARTICLE

TRICHODERMA VIRIDE CRUCIAL ROLE IN PLANT DEFENCE AND REPLACE THE CHEMICAL FUNGICIDE THAT HIGH HEALTH RISK TO FARMER LIFE

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Abstract

The plant-Trichoderma-pathogen triangle is a complex net of several techniques. Trichoderma spp. are avirulent opportunistic plant symbionts. In addition to being a hit plant Symbiotic organisms. Trichoderma spp. additionally behave as a low cost, powerful and ecofriendly biocontrol agent. They can set themselves up in numerous patho-systems, have minimum effect at the soil equilibrium and do now no longer impair beneficial organisms that make contributions to the manipulation of pathogens. This symbiotic affiliation in plant life results in the purchase of plant resistance to pathogens, improves developmental techniques and yields and promotes absorption of nutrient and fertilizer use efficiency. Among different biocontrol mechanisms, antibiosis, opposition and mycoparasitism are a number of the major capabilities through which microorganisms, including Thrichoderma, react to the presence of different aggressive pathogenic organisms, thereby stopping or obstructing their development. Stimulation of each system entails the biosynthesis of centered metabolites like plant increase regulators, enzymes, siderophores, antibiotics, etc. This evaluation summarizes the organic manipulate past time exerted by Trichoderma spp. and sheds mild light on the current development in pinpointing the ecological importance of Trichoderma on the biochemical and molecular stage inside the rhizosphere in addition to the blessings of symbiosis to the plant host in phrases of physiological and biochemical mechanisms. From an applicative factor of view, the proof furnished herein strongly helps the opportunity to use Trichoderma as a safe, ecofriendly and powerful biocontrol agent for one-of-a-kind crop species.

Introduction:

T. viride is a mold which produces spores asexually, by mitosis. It is the anamorph of Hypocrearufa, its teleomorph, which is the sexual reproductive stage of the fungus and produces a typical fungal fruiting body. The mycelium of T. viride can produce a variety of enzymes, including cellulases and chitinases which can degrade cellulose and chitin respectively. The mould can grow directly on wood, which is mostly composed of cellulose, and on fungi, the cell walls of which are mainly composed of chitin. It parasitizes the mycelia and fruiting bodies of other fungi, including cultivated mushrooms, and it has been called the "green mould disease of mushrooms". The affected mushrooms are distorted and unattractive in appearance and the crop is reduced. Trichoderma viride is the causal agent of green mold rot of onion. A strain of Trichoderma viride is a known cause of dieback of Pinus nigra seedlings.

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T. viride useful as a biological control against plant pathogenic fungi:
It has been shown to provide protection against such pathogens as Rhizoctonia, Pythium and even Armillaria.[2] It is found naturally in soil and is effective as a seed dressing in the control of seed and soil-borne diseases including Rhizoctonia solani, Macrophomina phaseolina and Fusarium species. When it is applied at the same time as the seed, it colonizes the seed surface and kills not only the pathogens present on the cuticle, but also provides protection against soil-borne pathogens.

A closely related species, Trichoderma reesei, is used in the creation of stonewashed jeans. The cellulase produced by the fungus partially degrade the cotton material in places, making it soft and causing the jeans to look as if they had been washed using stones.

| Scientific classification |
|---------------------------|
| Kingdom:                  | Fungi                        |
| Division:                 | Ascomycota                   |
| Class:                    | Sordariomycetes              |
| Order:                    | Hypocreales                  |
| Family:                   | Hypocreaceae                 |
| Genus:                    | Trichoderma                 |
| Species:                  | T. viride                    |

Trichoderma spp. are the most widely used fungal biocontrol agents against fungal diseases of pulses, grapes, cotton, onion, carrot, peas, plums, maize, apple, etc. Trichoderma spp. grow very fast and can produce polysaccharide-degrading enzymes, so it can be grown on a large number of substrates.

In agricultural products, Trichoderma spp. significantly suppress the growth of plant pathogenic microorganisms and regulate the rate of plant growth. Recent works have shown that common plant disease such as root rot disease, damping off, wilt, fruit rot and other plant diseases can be controlled by Trichoderma spp.
Trichoderma may suppress the growth of the pathogen population in the rhizosphere:
The Trichoderma may suppress the growth of the pathogen population in the rhizosphere through competition and thus reduce disease development. It produces antibiotics and toxins such as trichothecin and a sesquiterpene, Trichodermin, which have a direct effect on other organisms.

Largest group of fungal secondary metabolites:
Polketides is the largest group of fungal secondary metabolites. These originate from the repetitive connections of short chain fatty acids ex. acetate or propionate, by pathways very similar to those of fatty acid biosynthesis. Terpenes are the most abundant and widely distributed secondary metabolites in nature. Trichoderma spp. form volatile terpenes. These are grouped as monoterpenes, sesquiterpene, diterpene, triterpene and tetra-terpene. Mycoparasitism There are four stages in direct interaction between Trichoderma spp. and other fungi. These are:
1. Chemotropic growth - A chemical stimulus produced by the target fungus attracts the antagonist.
2. Specific recognition - Lectins present on cell surfaces of both pathogens and antagonist are responsible for this process.
3. Attachment and coiling of Trichoderma around its host.
4. Secretion of lytic enzymes.

Competition:
The antagonistic organism when applied to the field, it compete with the pathogen and other fungi for food. This competition leads to control of disease. Trichodermasp. are aggressive in nature and can even survive as chlamydospores and conidia in the absence of sufficient nutrients. Ecological concepts of exploitation, competition and interference, competition to inter-actions between fungal populations. Exploitation competition is depletion of a resource by any organism without directly limiting the resources for other organisms. In interference competition either chemicals or behavioural mechanisms by which one organism directly limits the activity of another organism.
a) Competition for necrotic tissue. Trichoderma sp. when applied to the aerial parts of plants viz. leaves known to control pathogens that invade the dead tissues as base and from this base they enter into the healthy tissues.

Botrytis spp. and Sclerotinia spp. are best controlled by this method. Trichoderma is reported to control Botrytis and Sclerotinia on Strawberry and Apple. Environmental factors play an important role in successful control of pathogen by this method. Trichoderma spp. when sprayed on grape flowers at the time of blossoming are able to colonize tissues as its senesces, thereby delaying colonisation by Botrytis, and later disease level in the fruit. He laid emphasis on the importance of timing of applications and importance of repeated applications of the antagonist during flowering. The most important spray according to him is during late flowering.

**Competition for plant exudates:**

Sometimes, the pathogen respond to the plant exudates is very rapid thereby causing disease. Damping off of cereals and vegetable seedling is initiated by the rapid response of the pathogen to the seed exudates. The response is so rapid, that within a short period. Sporangia in Pythium infested soil germinate and cause infection. Seeds treated with Trichoderma sp. Inhibits germination of sporangia. Trichoderma sp. compete for germination stimulants. Tharzictnum (T-35) is reported to control Fusarium oxysporum in the rhizosphere of cotton and melon by the method of nutrient competition. For this type of competition process, bio-control agents should be able to colonise or establish in the root zone first and utilize root exudates and other substrate/nutrients efficiently. Competition on wound sites. The most vulnerable site for pathogen attack is wound site in a plant. Bio-control agents when introduced to such sites can be very helpful in controlling a list of pathogens causing disease. Successfully controlled silver leaf pathogen (Chondrostereum purpureum) by using T. viride in spray or via pruning shears. Armillaria luteobubalina (a root pathogen) entry in the freshly cut stumps can be pre-vented by Trichoderma application.

Tharzictnum strain T3 is reported to colonize wound site in cucumber roots and the phenomena of control of Pythium is competition for nutrients discharged from wound. Integrated control According to the integrated approach in controlling plant diseases. Reduction of chemicals is advocated. As the wide range of chemicals use have long residual effects and the pathogens become resistant or develop resistance after a period of time, these (bio-control) when combine with other cultural methods of control can be of much use. Use of bio-control agents may result in improved disease control the low doses of fungicide combined with antagonist application can prove to be more effective as the pathogen initially gets weakened and then subjected subsequent attack by the antagonist. Two to three sprays with an antagonist and one spray of benzimidazole or dicarboximide fungicide is more effective than antagonists alone. Thus, it is concluded that Trichoderma is a very potential fungus for the control of many plant diseases, specially soil and seed borne diseases, and should be used to save our environment from pollution by hazardous chemicals which have long residual effect.

**Casual agent:**

Trichoderma viride is the causal agent of inexperienced mould rot of onion. A stress of Trichoderma viride is a acknowledged purpose of dieback of Pinus nigra seedlings.

**How do you operate Trichoderma viride?**

Soil treatment: Apply five Kg of Trichoderma powder according to hectar after turning of solar hemp or dhainch into the soil for inexperienced manuring. Or Mix 1kg of Trichoderma system in a hundred kg of farmyard manure and cowl it for 7 days with polythene. Sprinkle the heap with water intermittently.

**What is the significance of Trichoderma species?**

Trichoderma species promotes the boom of plant life and boundaries the boom of plant pathogens. Trichoderma species are powerful bio-fungicides, enzymatically degrading different fungi, generating anti-microbial compounds that kill pathogenic fungi, and outcompeting pathogenic fungi for area and nutrients.

**Conclusion:**

Trichoderma spp. is one of the regularly remoted fungal genera from soil and plant roots which have been appreciably studied for his or her huge metabolites with numerous applications (agricultural, industrial, health, etc.). In the sector of agriculture, Trichoderma are appropriate antimicrobial marketers in opposition to pathogenic bacteria, fungi, and yeast. Similarly, they play a critical function in enhancing the vegetative boom of vegetation and nutrient content.
material of soil via decomposition and biodegradation. It is a safe, cost-effective, and environmentally benign era to acquire a sustainable agriculture.

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