

Role of *Trichoderma viride* in Disease management

Dr.I.Venkata Reddy¹ PN Siva Prasad ², Dr.K.AtchutaRaju³ and Dr.N.Rajasekhar⁴

¹ SMS (Crop Production), KVK, Garikapadu, NTR District, Andhra Pradesh

² Programme Coordinator, KVK, Garikapadu, NTR District, Andhra Pradesh, India

³ SMS (Extension), KVK, Garikapadu, NTR District, Andhra Pradesh, India

⁴ SMS (Plant protection), KVK, Garikapadu, NTR District, Andhra Pradesh, India

[DOI:10.5281/ScienceWorld.15610959](https://doi.org/10.5281/ScienceWorld.15610959)

Trichoderma viride is a versatile fungus with various applications in agriculture, environmental management, and biotechnology. Here are some of its key uses:

Trichoderma viride is a beneficial fungus widely used in Indian agriculture as a biocontrol agent, promoting plant growth, and improving soil health. It helps control soil-borne diseases, solubilizes phosphorus, and enhances nutrient uptake. *Trichoderma viride* is environmentally friendly and can be used on various crops, including vegetables, fruits, and cereals.

Agricultural Applications

1. **Biological Control Agent:** *Trichoderma viride* is used to control plant pathogens, such as fungi and nematodes, reducing the need for chemical pesticides.
2. **Soil Amendment:** - It improves soil health by promoting beneficial microbial communities, enhancing nutrient cycling, and increasing soil fertility.
3. **Seed Treatment:** -*Trichoderma viride* can be applied as a seed treatment to protect young plants from pathogens and promote healthy growth.
4. **Plant Growth Promotion:** - It can stimulate plant growth by producing plant growth-promoting substances and enhancing nutrient uptake.

Environmental Applications

1. **Bioremediation:** - *Trichoderma viride* can be used to clean up contaminated soil and water by degrading pollutants.
2. **Waste Management:** -It can be used to break down organic waste, reducing the need for landfills and minimizing environmental impact.

Biotechnological Applications

1. **Enzyme Production:** - *Trichoderma viride* is a source of various enzymes, such as cellulases and xylanases, which have industrial applications.
2. **Bioactive Compounds:** - It produces bioactive compounds with potential applications in medicine and agriculture.

Other Benefits

1. **Sustainable Agriculture:** - *Trichoderma viride* offers a sustainable alternative to chemical pesticides and fertilizers, reducing environmental impact.
2. **Increased Crop Yields:** - By controlling pathogens and promoting plant growth, *Trichoderma viride* can help increase crop yields and improve food security.

- **Disease Control:**

Trichoderma viride is effective against various fungal pathogens, including *Fusarium*, *Phytophthora*, and *Sclerotinia*. It can suppress plant diseases through competition, antibiosis (producing antifungal compounds), and inducing systemic resistance in plants.

- **Plant Growth Promotion:**

It promotes root growth and increases the uptake of nutrients, including phosphorus and micronutrients. This leads to enhanced plant vigor and overall growth.

- **Soil Health:**

It decomposes organic matter, releases essential nutrients, and solubilizes soil phosphorus, contributing to a healthier soil environment.

- **Biopesticide:**

Trichoderma viride can be used as a biopesticide, reducing the need for chemical pesticides and promoting sustainable agriculture.

- **Seed Treatment:**

Applying *Trichoderma viride* to seeds can improve germination and seedling emergence, as well as protect against soil-borne diseases.

- **Foliar Application:**

Trichoderma viride can be applied as a foliar spray to control foliar diseases caused by fungi and bacteria.

- **Applications in various crops:**

It is effective in controlling diseases in a wide range of crops, including vegetables, fruits, and other crops.

In summary, *Trichoderma viride* is a valuable tool in agriculture, offering a sustainable and effective solution for disease control, plant growth promotion, and soil health improvement.

Trichoderma, a beneficial fungus, can be used in agriculture to control soil-borne diseases, promote plant growth, and improve nutrient availability. It's applied through various methods, including seed treatment, seedling treatment, soil application, and foliar spray.

Mechanisms to Control Plant Diseases

Trichoderma species employ several mechanisms to control plant diseases, including mycoparasitism, antibiosis (production of antibiotics), competition for resources, and

induced systemic resistance in plants. They also play a role in plant growth promotion and nutrient availability.

1. Mycoparasitism:

- Trichoderma can directly attack and kill other fungi (pathogens) by secreting enzymes that break down the pathogen's cell walls.
- This process, known as mycoparasitism, involves recognition of the host, adhesion, coiling of the hyphae around the host, and penetration.
- Trichoderma then extracts nutrients from the pathogen's cell.

2. Antibiosis:

- Trichoderma produces various secondary metabolites, including antibiotics, that directly inhibit the growth of plant pathogens.
- These metabolites can interfere with the pathogen's metabolism, disrupt their cell structures, or block their ability to reproduce.

3. Competition:

- Trichoderma competes with plant pathogens for resources like nutrients, space, and even attachment sites on plant roots.
- By outcompeting pathogens, Trichoderma reduces their ability to grow and cause disease.

4. Induced Systemic Resistance (ISR):

- Trichoderma can stimulate the plant's own defense mechanisms, making it more resistant to disease.
- This is achieved by releasing signaling molecules that activate plant defense pathways.
- These pathways can produce antimicrobial substances or enhance the plant's ability to recognize and respond to pathogens.

5. Plant Growth Promotion:

- Trichoderma can enhance plant growth by improving root development, nutrient uptake, and even promoting the synthesis of plant growth hormones.
- This can lead to stronger, more robust plants that are better able to withstand disease and environmental stress.

6. Nutrient Solubilization:

- Trichoderma can make certain nutrients, like iron and manganese, more readily available to the plant.
- This is achieved through the production of siderophores, molecules that bind to insoluble iron and make it soluble.
- They can also solubilize phosphate in the soil, making it available for plant uptake.