

Trichoderma viride: Morphology, Mass Production, Different Types of Formulations

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Trichoderma viride is a species of fungi widely recognized for its beneficial role in agriculture and plant health. It belongs to the genus *Trichoderma*, which comprises fast-growing, opportunistic, and filamentous fungi found in soil and root ecosystems. Due to its antagonistic activity against a wide range of plant pathogens, *T. viride* is extensively used as a biocontrol agent in sustainable farming practices.



Morphology and Habitat

Trichoderma viride typically appears as greenish colonies with rapid growth on nutrient media. It thrives in soil, decaying wood, and plant debris and establishes itself in the rhizosphere (root zone) of plants, forming symbiotic relationships.

Mass Production Techniques of *Trichoderma viride*

Trichoderma viride is a beneficial fungus widely used as a biocontrol agent. For large-scale agricultural application, it needs to be mass-produced under controlled conditions. The production process involves the selection of suitable substrates, sterilization, inoculation, incubation, and formulation into carrier-based or liquid forms.

1. Substrate Selection

The choice of substrate significantly affects the growth and sporulation of *T. viride*. Common substrates include:

- **Solid Substrates:**
 - * **Wheat bran**
 - * **Rice bran**
 - * **Maize powder**
 - * **Jaggery and wheat flour mix**
 - * **Saw dust (optional for structural support)**

Liquid Media (for spore suspension or liquid formulations):

- * **Molasses yeast medium**
- * **Potato Dextrose Broth (PDB)**
- * **Sucrose-based media**

2. Mother Culture Preparation

- Obtain a pure culture of *T. viride* from a certified lab.
- Inoculate on Potato Dextrose Agar (PDA) slants and incubate at 25–28°C for 7–10 days.
- Maintain slants under refrigeration for long-term use.

3. Inoculum Production

- Use the mother culture to inoculate liquid media (e.g., PDB or molasses yeast extract) in 250–500 mL flasks.
- Incubate on a rotary shaker (150–200 rpm) at 25–28°C for 5–7 days to produce a high-density spore suspension.

4. Mass Multiplication (Solid State Fermentation)

Materials Needed:

- Wheat bran/rice bran (sterilized)
- Plastic trays or fermentation chambers
- Inoculum from step 3

Steps:

1. Substrate Preparation:

- * Mix wheat bran with water (or jaggery solution) to about 40–50% moisture content.
- * Adjust pH to around 6.5–7.0.
- * Sterilize the substrate by autoclaving at 121°C for 30–45 minutes.

2. Inoculation:

- * After cooling, inoculate the sterile substrate with 5–10% of *T. viride* inoculum.

3. Incubation:

- * Spread in trays and incubate at 25–30°C for 7–10 days.
- * Turn the material every 2 days to allow aeration and uniform growth.

4. Harvesting:

- * When the substrate is fully colonized (greenish mycelial growth), it's ready for formulation.

5. Formulation and Packaging

Carrier-Based Formulation:

- **Mix colonized substrate** with sterile talc powder (or another inert carrier) in a ratio of 1:2 or 1:3.
- Add 1% carboxymethyl cellulose (CMC) as a binder.
- Final moisture content should be less than 20%.
- Pack in polythene bags and store in a cool, dry place (shelf-life: 4–6 months).

Liquid Formulation:

- Filter the fungal suspension from liquid media.
 - Mix with sterile liquid carriers (e.g., glycerol, mineral oils).
 - Add suitable preservatives (e.g., sorbitol, CMC) and bottle in sterile containers.

6. Quality Control Parameters

- **Spore count:** Minimum 1×10^7 CFU/g for solid formulations or 1×10^8 CFU/mL for liquid.
- **Purity:** Should be free from pathogenic contaminants.
- **pH:** Around 6.5–7.5.
- **Viability:** Maintains >70% viability up to 6 months under proper storage.

7. Safety and Hygiene

- Maintain sterile conditions to avoid contamination.
- Personnel should wear protective clothing and gloves.
- Equipment and surfaces must be disinfected regularly.

Conclusion

Trichoderma viride is a beneficial soil-dwelling fungus with significant ecological and agricultural importance. It is known for its rapid growth, strong adaptability, and ability to suppress plant pathogens through mechanisms such as mycoparasitism, enzyme production, and antibiotic secretion. This fungus plays a crucial role in biological control, enhancing plant health and productivity by:

- Competing with harmful microbes,
- Promoting root growth and nutrient uptake,

- Inducing systemic resistance in host plants.

Its resilience to a wide range of environmental conditions (temperature, pH, moisture, nutrient availability) and its non-toxic, eco-friendly nature make it an ideal agent for sustainable agriculture.

In summary, *Trichoderma viride* is a powerful bioagent that supports eco-friendly pest management and soil health, making it a valuable tool for integrated crop protection and environmental sustainability.

References

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