

Review Article

***Trichoderma* sp : An amended compost and biopesticide used as organic substrates over soil borne fungal diseases of Kota district (Rajasthan)**

Abstract – *Trichoderma* sp. are used as an amended compost organic material .It was isolated from the soil samples of selected fields to obtain a pure culture of *Trichoderma* . *Trichoderma* is used in biotechnology and microbiology labs , as it is a fresh and pure culture of *Trichoderma* sp. In a lab, *Trichoderma* species can be isolated and multiplied on a growth medium without contamination for compost preparation . The aim of this study was detecting organic substrates of *Trichoderma* spp. for their antagonistic ability, for this purpose six major agricultural fields of Kota district are selected and tricho-compost was applied over diseased vegetable crops to study the antagonistic effects of *Trichoderma* sp.

Key Words – *Trichoderma* , pure culture ,antagonistic , tricho - compost, isolation

Introduction - Soil - borne fungi are microscopic living cells which grow as minute , thin and long thread-like structures i.e hyphae . A group of hyphae is called mycelium. The mycelium absorbs all essential nutrients of the plants . Common examples of soil borne fungi are *Pythium* ,*Fusarium*, *Phytophthora*, *Rhizoctonia* etc. These fungi enter into the plants through haustorium and indirectly harm the living cells of the plants by making them weak, nutrient deficient , and finally death .

The harmful effect of Soil – borne fungi can be controlled by using fungicides and various chemicals , as it is the simplest and quick method applied by farmers for better yield. A huge quantity of chemicals are used to reduce the disease incidence of which is not only detrimental to the environment but are also hazardous to the human health .

There is a need so these harmful chemical control could be minimized or to be replaced by eco- friendly substances over soil – borne fungal diseases (Lockwood,1990).

Now a days , *Trichoderma* sp. are used as an amended compost material .It worked as biopesticides which protects the plants from harmful fungal diseases. *Trichoderma* sp. are natural competitors against a wide range of harmful fungi; it is added to compost material which work as an antifungal agent to protect crops in the field. *Trichoderma* is a genus of beneficial fungus present in nature. have been used as bio-control agents against plant pathogens (Harman, 2000).

The systematic position of *Trichoderma* is Division - Ascomycota, Subdivision - Pezizomycotina, Class - Sordariomycetes, Order - Hypocreales, Family – Hypocreaceae. *Trichoderma* is known from 1920 for its capability to function as biocontrol agents (BCA) against plant pathogens (Samuels, 1996).

Trichoderma show the multiple interactions with vegetable crop plants like tomato , brinjal, cucurbits , okra etc and soil borne fungal pathogens such as *Pythium* ,*Fusarium*, *Phytophthora*, *Rhizoctonia* etc. (Woo et al., 2006).*Trichoderma* is cultured in biotechnical lab, where a specific *Trichoderma* species can be isolated and multiplied on a growth medium without contamination as a biological control agent.

Materials and Methods –

- a) **Collection of Soil Samples** - Soil samples were collected from different agricultural fields of Kota district for the isolation of *Trichoderma* spp. (Table 1). These samples are needed to be isolated from the soil to obtain a pure culture of *Trichoderma*.

Table 1. Agricultural fields of Kota district for the isolation of *Trichoderma* spp

S.No.	Name of Vegetable Crop	Place of Collection	Disease percentage
1.	Tomato	Girdharpura	26.5%
2.	Okra	Nanta	32.7%
3.	Brinjal	Manpura	18.8%
4.	Bottle gourd	Arjunpura	42.4%
5.	Bitter Gourd	Arjunpura	37.8%
6.	Beans	Badgaon	26.4%

b) **Isolation of Soil Samples** –Soil Samples were brought to laboratory and stored at 5°C until used. Soil -serial dilutions of each preserved samples were prepared in sterilized distilled water. A wide range of media are used for isolation of different groups of fungi that influence the vegetative growth and colony morphology. The mediums used is Nutrient media i.e. Potato Dextrose Agar (extract from 250g of potato boiled and filtered, dextrose 20g, agar 15g and distilled water 1000ml) and Serial Dilution Plate Method (Waksman,1922). The pH of the medium was maintained at 5.5 being optimal for the growth and sporulation in a majority of fungi.

Soil samples are diluted up to 38 times in distilled water which is used as inoculum in a sterilized Potato Dextrose Agar (PDA) medium that allow the fungi to grow as organic substrate. From the fungi colonies in PDA growth medium, *Trichoderma* is isolated after identification by counting spores and conidia appears in petriplates. Now about 0.5 ml diluted sample was poured on the surface of *Trichoderma* Specific Medium (TSM) (Elad et al. 1982). Plates were incubated at $28 \pm 2^{\circ}\text{C}$ for 3 days in BOD. The purified isolates were preserved at 5°C and used for preparation of tricho- compost.

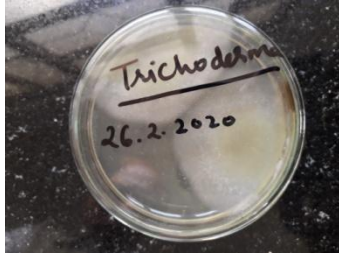


Figure 1 : *Trichoderma* spp. observed in petriplate incubated at $28 \pm 2^\circ\text{C}$

c) Preparation of Tricho-compost – Tricho – compost is combination of *Trichoderma* inoculum and composting material found in our surrounding. Following materials are used for preparation of Trico- compost .

Materials used for making Tricho - compost -

- Wood chips
- cow dung (rich in nitrogen, with a carbon & nitrogen ratio (C:N) of 8)
- Twigs , dry leaves
- Poultry manure
- Sawdust (Source of carbon)
- Vegetable matter
- Crop residues
- Wood ashes.
- Newspapers etc

Now *Trichoderma* inoculum mixed with 0.5 kg of compost (mix up of above listed material) with 2 litre of water . All these ingredients are well mixed together and then placed in the compost bin. Carefully note that the compost and inoculum was mixed up properly before being placed in the compost bin. The compost bin is kept covered for 30 days at a cool place with temperature $25-32^\circ\text{C}$, so all materials get mixed up and fermented easily. After 30 days , Tricho- compost is ready to applied as a manure in fields. It should be applied at a rate of 2 to 2.5 tons/hectare to the crop field for better results.



Figure 2 : Use of *Trichoderma* as tricho- compost material

Results and Discussion – *Trichoderma*, is a beneficial fungi, as it worked over many plant pathogenic fungi. It worked as antagonistic fungi over soil borne fungal diseases. The identification of the fungal species is based on morphological characteristics of the colony and microscopic examinations (Diba et al., 2007) . Morphological observations were recorded from cultures grown on PDA plates. The Mycelium discs are 5 mm in thickness . Petri plates containing PDA media and incubated at $28 \pm 2^{\circ}\text{C}$ for one week in BOD. The radius of fungal colonial was measured about 22 mm in thickness. Some characters i.e. colony appearance , presence of pigments, green conidia, odour are also seen and recorded for further references.

Conclusion-

Tricho-compost works as a natural antifungal agent against harmful fungi which are mostly responsible for soil borne disease like *Fusarium sp* , *Rhizoctonia sp* , *Sclerotium sp* , *Phytophthora sp* , *Pythium sp* , *Sclerotonia sp* etc. *Trichoderma sp*. are used in the composting process .Tricho-compost work as growth promoter in many vegetable plants (Celar & Valic, 2005) . Tricho-compost is primarily used as a soil amendment (Hudson & Berman ,1994). It improves soil structure, helpful in maintaining soil pH, improves water holding capacity etc.

Amending the soil with tricho-compost as a source of organic matter can be viewed as both a problem-solving activity and as part of ecosystem management. Hence , *Trichoderma sp* are considered safer for the environment and use of tricho-compost as a biological control methods works as a boon and new strategy for disease management and it is environment friendly too.

References –

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