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Research Article

BIO-CONTROL POTENTIAL OF NATIVE STRAINS OF *Trichoderma* AGAINST *Rhizoctonia bataticola* CAUSING DRY ROOT ROT OF CHICKPEA

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Abstract- Seven *Trichoderma* strains were isolated from chickpea rhizosphere and root endophytic region by using serial dilution technique and purified by single hyphal tip method. Isolated *Trichoderma* strains were evaluated by using dual culture method. Out of the ten isolates tested against *Rhizoctonia bataticola*, T-6 showed highest inhibition percentage (67.32 %) followed by T7 (63.61%), T-3 (59.72 %) and T-5 (57.50 %), while the least inhibition was shown by T-1 (45.56%).

Keywords- *Trichoderma, Rhizoctonia bataticola,* mycelium growth, Inhibition percentage.

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Introduction

Chickpea (Cicer arietinum L.) is the premier pulse crop grown in more than 50 countries, originated in south west Asia and is cultivated from ancient times both in Asia and European countries. In India, chickpea is grown in an area of 10.22 million hectares with a production of 9.53 million tonnes and productivity of 967 kg/ha. Madhya Pradesh, Chhattisgarh, Rajasthan, Maharashtra, Uttar Pradesh, Andhra Pradesh and Karnataka together contribute 95.71% of production and 90% of area in the country [1]. *Rhizoctonia bataticola* (Taub.) Butler is a nectrotropic fungus caused Dry root rot of chickpea which is emerging as a serious threat to the chickpea production worldwide [2]. Among the several constraints affecting the productivity of chickpea, 10-35 percent loss in yields are due to wilt and dry root rot diseases [3]. Among them, dry root rot caused by *R. bataticola* is becoming severe in most of the chickpea growing regions of Madhya Pradesh. Effective and practical chemical control is not feasible. Biological control appears to be the only solution for long-term sustainability and effective management of soil borne diseases. *Trichoderma* spp. are among the most studied fungal Biocontrol agents and commercially marketed as biopesticides, biofertilizers and soil amendments [4,5,6].

Materials and methods

Isolation of native strains of *Trichoderma*

Random samples were taken from about 15-20 cm depth by means of a soil auger. The samples were placed into clean polythene bags. The sampling of the rhizosphere soil was done separately. For rhizosphere analysis, only the soil adhering to the root system was used. The soil samples were taken about 5-10 cm away from the root. The composite samples were, mixed thoroughly and screened through 2 mm sieve [7].

Fifty-four soil samples were collected from rhizosphere of 5 crops and from seven districts of west Madhya Pradesh for the isolation of *Trichoderma* spp. Samples was brought to laboratory and stored at 4°C until used. Five-fold serial dilutions of each soil samples was prepared in sterilized distilled water by using serial dilution method and 0.5 ml diluted sample was poured on the surface of *Trichoderma* specific medium (TSM) [8]. Plates were incubated at 28 ± 2°C for 96 hrs. Isolated *Trichoderma* spp was evaluated by dual culture method [9].

Dual culture technique

To test the efficacy of antagonistic fungus, twenty ml of sterilized melted PDA was plated in Petri plates and allowed to solidify. Mycelial discs measuring five mm diameter from seven days old cultures of both fungal antagonist and the test pathogen were placed at equidistant on sterile Petri plate containing PDA medium. The petri plates with pathogen inoculated at one end alone, served as control. The petri plates were placed in incubator at 25 ± 2°C. Each treatment was replicated four time. Growth of *Trichodema* and *R. bataticola* were measured after recording full growth of the *R. bataticola* in control plate. Percent inhibition of mycelial growth of *R. bataticola* was calculated by the following formula:

$$I = \frac{C - T}{C} \times 100$$

Where,
I = Percent inhibition in growth of test pathogen
C = Radial growth (mm) in control
T = Radial growth (mm) in treatment.

Results and discussion

Recovery of *Trichoderma* spp. from soils of different districts of M.P. and rhizospheric zones of different crops

Fifty-four soil samples were collected from rhizosphere of five different and from seven districts of west M.P. Out of these seven strains of *Trichoderma* were isolated through serial dilution technique [Table-1]. The details of the districts and crop rhizospheres from which strains of *Trichoderma* isolated were given in detail in the [Table-1]. The result indicated that *Trichoderma* spp. could grow and survive in different crop rhizospheres and various types of soil conditions. This finding also

conform earlier by researchers who had described that members of genus *Trichoderma* are free-living fungi and are common in soil and root ecosystems [5]. Hence, for *Trichoderma* isolation, the dilution plating technique remains adequate, agreeing with the findings of Sivakumar, *et al*., (2000) and Kader, *et al*., (1999) [10,11]. Thakur and Norris, (1928) [12] isolated the *Trichoderma* in India from soils of Madras.

Table-1 *Recovery of Trichoderma spp. from soil of different districts of M.P. and rhizospheric zones of different crops.*

Trichoderma isolates	Place/	Crop
T-1	Khandwa	Cotton
T-2	Bharwani	Chilli
T-3	Dhar	Chickpea
T-4	Harda	Greengram
T-5	Indore	Chickpea
T-6	Khargone	Pigeonpea
T-7	Dewas	Chickpea

In vitro evaluation of efficacy of antagonistic mycoflora (*Trichoderma* spp.) against *R. bataticola* in dual culture technique

All the native strains of *Trichoderma* showed significant reduction in mycelial growth of *R. bataticola* compared to control. The data related to percent inhibition of mycelial growth of *R. bataticola* due to *Trichoderma* isolates are presented in [Table-2]. Among seven *Trichoderma* isolates, T-6 showed maximum inhibition of growth of *Rhizoctonia bataticola* (67.32 %) followed by T-7 (63.61%), T-3 (59.72 %) and T-5 (57.50 %) [Plate-1]. The least inhibition was shown by T-1 (45.56%) followed by T-4 and T-2. Statically, T-3 (59.72 %) and T-5 (57.50 %) were found at par with each other, while T-1 (45.56%) and T-4 found similar effect on mycelium inhibition of *Rhizoctonia bataticola.* Veena, *et al*., (2014) [13] testing potential of ten strains of *Trichoderma* spp. against *R. bataticola*. Out of the ten isolates tested against *Rhizoctonia bataticola*, *Trichoderma* isolate-7 showed highest inhibition percentage (83.33). These results were in agreement with Bandyopadhyay, et al., (2003) [14] who reported that strain of *Trichoderma* inhibited the growth of *R. bataticola* by 51.1 percent under *in vitro* conditions. Paul, *et al*., (2008) [15] reported that among 11 *Trichoderma* isolates tested, *T. harzianum* showed higher inhibiton of the growth of *R. solani* by 77 percent under *in vitro* conditions.

Table-2 *Mean of growth inhibition of Rhizoctonia bataticola by Trichoderma Strains*

Trichoderma isolates	Mycelium growth (mm) and percent mycelium inhibition	
	Growth (mm)	Inhibition percent
T-1	44.25	50.83 (45.48)*
T-2	40.75	54.72 (47.71)
T-3	36.25	59.72 (50.61)
T-4	42.50	52.78 (46.59)
T-5	38.25	57.50 (49.32)
T-6	29.50	67.22 (55.09)
T-7	32.75	63.61 (52.90)
Control	90.00	-
SEm ±		0.61
C.D. at 5 %		1.80

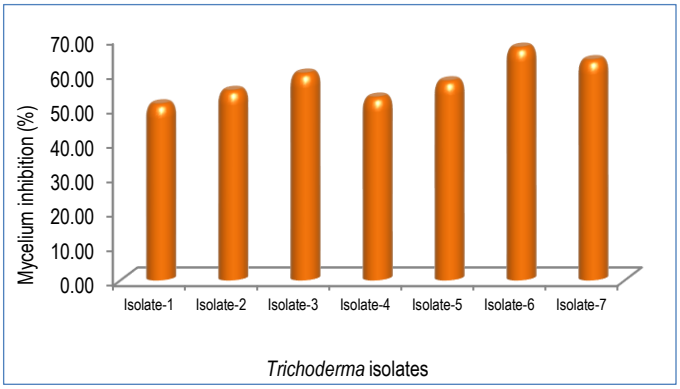

Fig-1 Mean of growth inhibition of Rhizoctonia bataticola by Trichoderma Strains

Kaushal, (2008) [16] reported that *T. harzianum* was effective in inhibiting the mycelial growth *of R. bataticola* the causal organism of chickpea dry root rot. Pan, (2009) [17] reported the antagonistic potential of *Trichoderma* isolates through production of volatile and non-volatile substances against *Macrophomina phaseolina.* Choudhary, *et al.,* (2010) [18] tested four bioagents *viz*, *T. viride, T.harzianum, Aspergillus versicolor* and *Bacillus firmus* for the control of dry root rot in mungbean. In dual cultures, *T. viride, T. harzianum* and *A. versicolor* were effective in inhibiting the growth of *M. phaseolina* to an extent of 61 to 65%.

Conclusion

It is concluded that out of seven strains of *Trichoderma*, T-6 was found best which was recorded maximum mycelium inhibition of *Rhizoctonia bataticola.*

Application of research: Disease Management through Bio-agents. Promote biological Disease management.

Research Category: Trichoderma, *Rhizoctonia bataticola*, Disease management

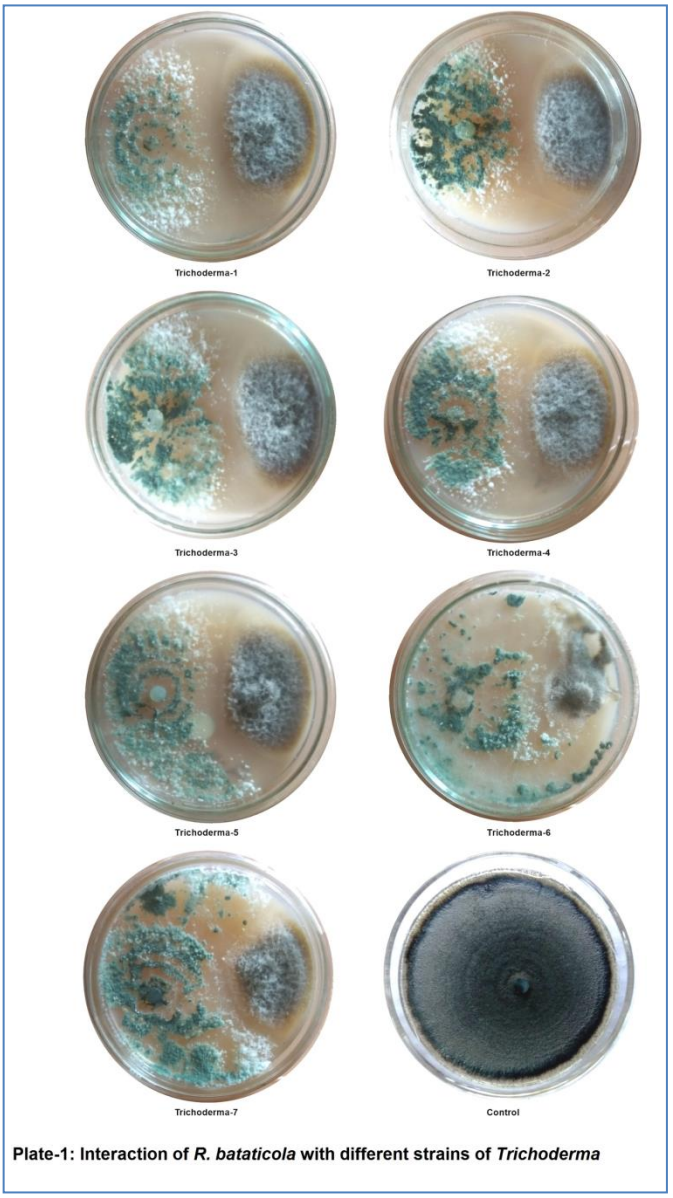

Plate-1: Interaction of *R. bataticola* with different strains of *Trichoderma*

Abbreviations:

°C: Degree centigrade
mm: millimetre
Spp.: Species

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Conflict of Interest: None declared

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