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# Antagonistic Potentiality of *Trichoderma* Isolates on Soil Borne Fungal Plant Pathogens

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**Keywords**

*Trichoderma* spp., Mycelial growth inhibition, *Fusarium oxysporum* f. sp. *vasinfectum*, *Rhizoctonia solani*, *Sclerotium rolfsii*, *Phytophthora capsici*

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**A B S T R A C T**

In the present investigation, twenty-two *Trichoderma* isolates collected from different sources, along with one commercial isolate (*Trichoderma viride*) were screened for the antagonistic efficacy against soil borne plant pathogens *viz.*, *Fusarium oxysporum* f. sp. *vasinfectum*, *Rhizoctonia solani*, *Sclerotium rolfsii*, and *Phytophthora capsici.* The result indicated that all twenty-two *Trichoderma* isolates effectively inhibited the mycelia growth at varied levels. Highest mycelial growth inhibition of *F. oxysporum* f. sp. *Vasinfectum* was recorded by RKd-Cu (97.44%) which was obtained from rhizosphere of cucumber. PSV and RMy-B isolates showed 100 per cent mycelial growth inhibition of *R. solani*, which was obtained from paddy straw and soil rhizosphere of banana crop respectively. RSr-Sc showed highest mycelial growth inhibition of two pathogens: *S. rolfsii* (95.19%) and *P. capsici* (96.25%). Whereas, the commercial isolate recorded growth inhibition of 72.59% (*F.oxysporum* f. sp. *vasinfectum)*, 72.33% (*R.solani*), 72.48% (*S.rolfsii)* and 81.08% (*P.capsici),* which was significantly low compared to other isolates. Least Per cent of growth inhibition were recorded with RMl-T (72.59%), RKd-HG (72.22%), RD-A (66.70%) and RMy-SC (75.83%) against *F. oxysporum* f. sp. *vasinfectum*, *R. solani*, *S. rolfsii* and *P. capsici* respectively. Thus, from this study it can be concluded that effective isolates obtained from different geographical location have the better antagonistic activity than the commercial isolate against the soil borne fungal plant pathogens.

## Introduction

Plant diseases caused by pathogenic fungi play a major role in the decrease of food production in agriculture, which often result in significant yield loss. In particular, soil-borne pathogens cause important losses, fungi being the most aggressive. The distribution of several phytopathogenic fungi, such as *Fusarium*, *Rhizoctonia*, *Sclerotium* and *Phytophthora* has spread during the last few years due to changes introduced in farming with detrimental effects on crops of economic importance (Asad *et al.*, 2014). Soil borne plant pathogens can be a major limitation to yield and quality in crops. These pathogens are predominantly challenging because they often survive in soil for many years and each

crop may be susceptible to several species of pathogen. They are often difficult to control by single management practice. So, by employing the combination of physical, chemical and biological methods as IPM practice helps to control different crop diseases (Pal and Gardener, 2006). The use of chemicals is very expensive and tedious method in controlling plant diseases and also leads to higher phytotoxicity and environmental pollution (Kucuk *et al.,* 2004; Pal *et al.,* 2006). Excessive use of fungicides may lead to deposition of toxic compounds which will be hazardous to humans and environment and also build-up the evolution of new races of resistance pathogens (Houssien *et al.,* 2010). In demand to tackle these problems, the substitute method of crop disease control is the usage of biological control agents.

Biological control agents (BCA's) are cost-effective and ecofriendly in nature and also having higher compatible with other methods of disease management techniques in IDM. Among the different soil microflora, *Trichoderma* spp. is a common saprophytic filamentous fungus which is seen in rhizospheric soil of different agricultural and horticultural crops. It acts as biocontrol agent against various plant pathogens *viz*., *Fusarium*, *Phytophthora*, *Rhizoctonia*, *Sclerotium* etc., which causes several diseases in mono and dicotyledonous crop plants (Galarza *et al.,* 2015). They are nonpathogenic microorganisms that not only provide protection against fungal diseases additionally, they promote high yields in crops (Ezziyyani *et al.,* 2004). This is achieved through its traits *viz*., production of antifungal metabolites, hydrolytic enzymes, and their mycoparasitic behavior, as well as the production of other substances that will helps in the enhancement of plant growth (Mesa *et al.,* 2008). Apart from soil rhizosphere, *Trichoderma* can also be isolated from other sources *viz*., manures, paddy straw, coir pith, sawdust, etc. Because, *Trichoderma* is one of the widespread saprophytic fungi present as ubiquitous colonizers of cellulosic materials, often found in decaying plant material of different crops and it have the efficient antagonistic activity against different soil borne fungal plant pathogens, in the present investigation, the antagonist activity of the novel isolates of *Trichoderma* spp. against soil borne fungal plant pathogens *viz*., *Fusarium oxysporum* f. sp. *vasinfectum*, *Rhizoctonia solani*, *Sclerotium rolfsii*, *Phytophthora capsici* were evaluated.

## Materials and Methods

The present experiments were conducted in the Department of Plant Pathology, College of Agriculture, V.C. Farm, Mandya, UAS, Bangalore.

### Collection, isolation and purification

Six different sources *viz*., soil rhizosphere, manures, coirpith, paddy straw, sawdust were collected from different places *viz.*,Mandya, K. M. Doddi, Malavalli, Mysore, K. R. Pete, Srirangapatna, Chamrajanagar, Davanagere, Hassan and Tumkur from different cropsby random sampling method. Isolation of different isolates was made by serial dilution technique, along with one commercial isolate (*T. viride*) (Table 1). Identification of pathogens was done based on cultural, morphological characteristics under research microscope. The culture was purified by repeated hyphal tip transfers and were maintained in PDA slants for further use.

### Screening of Trichoderma isolates against plant pathogens

Dual culture technique was used to conduct the antagonistic test. Per cent inhibition was

calculated in relation to mycelial growth in the control plate using the formula given by Vincent (1947).

$$\text{Inhibition (\%)} = \frac{C - T}{C} \times 100$$

Where, I = Per cent inhibition of growth
C = Mycelial growth in control plate
T = Mycelial growth in test plate

## Results and Discussion

All the isolates of *Trichoderma* spp. inhibited the mycelial growth of all the four soil-borne fungal plant pathogens significantly over the control and also showed higher per cent inhibition of pathogen than the commercial isolate (*T. viride*) (Table 2).

The results revealed that, out of twenty-two *Trichoderma* isolates maximum inhibition of mycelial growth of *F. oxysporum* f. sp. *vasinfectum* was recorded by RKd-Cu isolate (97.44 %) followed by RMy-SC isolate (97.41 %) which was significantly superior over the control. These two isolates were obtained from rhizosphere of cucumber and sugarcane crop respectively. Least per cent inhibition of (72.59 %) was recorded in RMl-T isolate obtained from soil rhizosphere of tomato crop, which was on par with the commercial isolate (*T. viride*: 72.59 %) (Table 2, Fig. 1 and Plate 1).

Data presented in Table 2 showed that100 per cent mycelium growth inhibition of *R. solani* was recorded in PSV isolate obtained from paddy straw and RMy-B isolate from soil rhizosphere of banana crop followed by RKd-Cu isolate from rhizosphere of cucumber crop which is significantly high (98.81 %) over the control. Further, the isolate RKd-HG obtained from soil rhizosphere of horse gram exhibited least mycelial growth inhibition of 72.22 per cent followed by GMV (75.00 %) and RMd-C (75.19 %). However, the commercial isolate recorded least inhibition per cent of 72.23 compared to all the other isolates except RKd-HG isolate (Table 2, Fig. 1, Plate 2).

RSr-SC isolate obtained from the rhizosphere of sugarcane had shown significantly maximum percent inhibition of mycelial growth (95.19%) of *S. rolfsii*, followed by PSV isolate (94.44 %), GMV (93.07 %), RCh-S (92.96 %) and RMd-C (92.22 %). Whereas, RD-A isolate showed minimum percent inhibition of mycelial growth (66.7 %) which were isolated from soil rhizosphere of arecanut crop followed by RMl-T (68.56 %), RMl-P (69.67 %) and commercial isolate (*T. viride*) (72.48 %).Thus, apart from RD-A (66.7 %), RMl-T (68.56%) and RMl-P (69.67 %), other eighteen Trichoderma isolates found to be superior than the commercial isolate (Table 2, Fig. 1 and plate 3).

All the *Trichoderma* isolates were found tobe significantly effective over control in inhibiting the mycelial growth of *P. capsica* (Table 2). Among them RSr-SC isolated from rhizosphere of sugarcane exhibited highest mycelial growth inhibition (96.25 %) of the pathogen followed by RMy-B (95.38 %), RD-A (95 %) and RMl-T (93.75 %). Thus, nineteen isolates were found to be superior than the commercial isolate (*T. viride*) (81.08%). RMy-SC isolated from soil rhizosphere of sugarcane exhibited least inhibition of pathogen (75.83 %) followed by RMy-P (76.67 %) (Table 2, Fig. 1 and plate 4).

The above results are in accordance with Raut and Hamade (2016), wherein they reported highest antifungal activity of *Trichoderma* spp. like RLS19 (68.89 %) against *F. oxysporum* f. sp. *Vasinfectum* followed by RLS52 (62.22 %), RLS53 (60.00%), RLS72 (57.78 %), and RLS101 (57.78 %) which were isolated from soil rhizosphere.

Sundarmoorthy and Balabaskar (2013) also recorded *T. harzianum* (ANR-1) isolate showing high per cent inhibition of mycelial growth (60 %) and lowest occurrence of disease incidence in *in vitro* and *in vivo* conditions. Chrianjeevi *et al.,* (2018) reported that *Trichoderma* isolates *viz*., ET-1 and RT-4 to exhibit highest antagonistic potentiality against *R. solani* under *in vitro* condition (68.50 % and 66.20 % respectively). Asad *et al.,* (2013) recorded that few *Trichoderma* spp. showing highest mycelial growth inhibition ranged from 74.4 to 67.8 per cent due to soluble metabolites and few other *Trichoderma* spp. showing mycelial growth inhibition ranging from 15.3 to 10.6 per cent due to volatile metabolites.

**Table.1** List of *Trichoderma* isolates collected from different sources from different places

| Sl. No. | Source | Isolate code | Isolate name | Place of collection |
|---|---|---|---|---|
| **1** | Sheep manure | SMV | Sheep manure V C Farm | V. C. Farm |
| **2** | Goat manure | GMV | Goat manure V C Farm | V. C. Farm |
| **3** | Paddy straw | PSV | Paddy straw V C Farm | V. C. Farm |
| **4** | Saw dust | SDKd | Sawdust K M Doddi | K. M. Doddi |
| **5** | Coir pith | CPV | Coir pith V C Farm | K. M. Doddi |
| **6** | Soil rhizosphere | RMy-B | Rhizosphere Mysore- Banana | Mysore |
| **7** | Soil rhizosphere | RMy-P | Rhizosphere Mysore- Paddy | Mysore |
| **8** | Soil rhizosphere | RMy-SC | Rhizosphere Mysore- Sugarcane | Mysore |
| **9** | Soil rhizosphere | RMd-C | Rhizosphere Mandya- Castor | Mandya |
| **10** | Soil rhizosphere | RMd-SC | Rhizosphere Mandya-Sugarcane | Mandya |
| **11** | Soil rhizosphere | RKp-CP | Rhizosphere K R Pete- Cowpea | K. R. Pete |
| **12** | Soil rhizosphere | RSr-SC | Rhizosphere Srirangapatna-Sugarcane | Srirangapatna |
| **13** | Soil rhizosphere | RCh-S | Rhizosphere Chamrajanagar-Sorghum | Chamrajanagar |
| **14** | Soil rhizosphere | RD-A | Rhizosphere Davangere-Arecanut | Davangere |
| **15** | Soil rhizosphere | RH_Co | Rhizosphere Hassan- Coconut | Hassan |
| **16** | Soil rhizosphere | RT-FM | Rhizosphere Tumkur- Fodder Maize | Tumkur |
| **17** | Soil rhizosphere | RKd-Cu | Rhizosphere K M Doddi-Cucumber | K. M. Doddi |
| **18** | Soil rhizosphere | RKd-HG | Rhizosphere K M Doddi-Horsegram | K. M. Doddi |
| **19** | Soil rhizosphere | RMl-O | Rhizosphere Malavalli- Onion | Malavalli |
| **20** | Soil rhizosphere | RMl-P | Rhizosphere Malavalli- Paddy | Malavalli |
| **21** | Soil rhizosphere | RMl-T | Rhizosphere Malavalli- Tomato | Malavalli |
| **22** | Commercial isolate | *T. viride* | Mandya Commercial isolate | Mandya |

**Table.2** Antagonistic activity of the effective isolates from different sources against four soil borne fungal plant pathogens

| Sl. No. | *Trichoderma* isolates | Mean radial growth of pathogen (mm) | | | | Percent inhibition | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | *F. oxysporum* f. sp. *vasinfectum* | *R.solani* | *S.rolfsii* | *P.capsici* | *F. oxysporum* f. sp. *vasinfectum* | *R.solani* | *S.rolfsii* | *P.capsici* |
| **1** | T1: SMV | 13.33 (1.37) | 11.67 (1.33) | 14.73 (1.39) | 13.27 (1.37) | 85.19 (1.98) | 87.04 (1.99) | 83.63 (1.97) | 83.42 (1.97) |
| **2** | T2: GMV | 20.67 (1.49) | 22.50 (1.51) | 5.67 (1.19) | 12.67 (1.35) | 77.04 (1.94) | 75.00 (1.93) | 93.70 (2.02) | 84.17 (1.97) |
| **3** | T3: PSV | 4.80 (1.17) | 0.00 (1.00) | 5.00 (1.18) | 11.07 (1.32) | 94.67 (2.02) | 100.00 (2.04) | 94.44 (2.02) | 86.17 (1.98) |
| **4** | T4: SDKd | 5.67 (1.19) | 8.07 (1.26) | 24.00 (1.53 | 14.40 (1.39) | 93.70 (2.02) | 91.04 (2.00) | 73.33 (1.92) | 82.00 (1.96) |
| **5** | T5: CPV | 14.67 (1.39) | 6.07 (1.21) | 20.67 (1.49) | 11.07 (1.32) | 93.70 (2.02) | 93.26 (2.01) | 77.04 (1.94) | 86.17 (1.98) |
| **6** | T6: RMy-B | 2.57 (1.09) | 0.00 (1.00) | 11.67 (1.33) | 3.70 (1.13) | 97.15 (2.03) | 100.00 (2.04) | 87.04 (1.99) | 95.38 (2.02) |
| **7** | T7: RMy-P | 3.17 (1.11) | 1.67 (1.06) | 19.67 (1.47) | 18.67 (1.45) | 96.48 (2.03) | 98.15 (2.03) | 78.15 (1.95) | 76.67 (1.94) |
| **8** | T8: RMy-SC | 2.33 (1.09) | 14.67 (1.39) | 15.00 (1.40) | 19.33 (1.47) | 97.41 (2.03) | 83.70 (1.97) | 83.33 (1.97) | 75.83 (1.93) |
| **9** | T9: RMd-C | 19.33 (1.46) | 22.33 (1.51) | 20.00 (1.48) | 15.00 (1.40) | 78.52 (1.95) | 75.19 (1.93) | 77.78 (1.94) | 81.25 (1.96) |
| **10** | T10: RMd-SC | 5.83 (1.18) | 19.67 (1.47) | 7.00 (1.23) | 15.00 (1.40) | 93.52 (2.01) | 78.15 (1.95) | 92.22 (2.01) | 81.25 (1.96) |
| **11** | T11: RKp-CP | 22.57 (1.51) | 7.67 (1.24) | 22.67 (1.51) | 10.33 (1.31) | 74.93 (1.93) | 91.48 (2.01) | 74.81 (1.93) | 87.08 (1.99) |
| **12** | T12: RSr-SC | 6.33 (1.19) | 1.67 (1.06) | 4.33 (1.16) | 3.00 (1.11) | 92.96 (2.01) | 98.15 (2.03) | 95.19 (2.02) | 96.25 (2.03) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **13** | T13: RCh-S | 19.00 (1.46) | 2.67 (1.10) | 6.33 (1.19) | 9.00 (1.28) | 78.89 (1.95) | 97.04 (2.03) | 92.96 (2.01) | 88.75 (1.99) |
| **14** | T14: RD-A | 11.00 (1.32) | 12.53 (1.35) | 29.97 (1.60) | 4.00 (1.13) | 87.78 (1.99) | 86.07 (1.98) | 66.70 (1.88) | 95.00 (2.02) |
| **15** | T15: RH-Co | 21.57 (1.50) | 21.67 (1.50) | 19.00 (1.46) | 8.00 (1.25) | 76.04 (1.93) | 75.93 (1.93) | 78.89 (1.95) | 90.00 (2.00) |
| **16** | T16: RT-FM | 9.33 (1.29) | 16.67 (1.42) | 18.33 (1.41) | 13.33 (1.37) | 89.63 (2.00) | 81.48 (1.96) | 79.63 (1.95) | 83.33 (1.97) |
| **17** | T17: RKd-Cu | 2.30 (1.09) | 1.07 (1.04) | 16.33 (1.42) | 12.47 (1.35) | 97.44 (2.03) | 98.81 (2.04) | 81.85 (1.96) | 84.42 (1.97) |
| **18** | T18: RKd-HG | 20.80 (1.49) | 25.00 (1.54) | 16.33 (1.42) | 14.67 (1.39) | 76.898 (1.94) | 72.22 (1.91) | 81.85 (1.96) | 81.67 (1.96) |
| **19** | T19: RMl-O | 20.23 (1.48) | 21.57 (1.50) | 13.33 (1.37) | 6.67 (1.20) | 77.52 (1.94) | 76.04 (1.93) | 85.19 (1.98) | 91.67 (2.01) |
| **20** | T20:RMl-P | 14.33 (1.39) | 19.33 (1.46) | 27.30 (1.57) | 13.93 (1.38) | 84.07 (1.97) | 78.52 (1.95) | 69.67 (1.90) | 82.58 (1.97) |
| **21** | T21: RMl-T | 24.67 (1.54) | 17.67 (1.44) | 28.30 (1.58) | 5.00 (1.18) | 72.59 (1.92) | 80.37 (1.96) | 68.56 (1.90) | 93.75 (2.02) |
| **22** | T22: *T.viride* | 24.67 (1.54) | 24.90 (1.54) | 24.77 (1.54) | 15.13 (1.40 | 72.59 (1.92) | 72.33 (1.92) | 72.48 (1.92) | 81.08 (1.96) |
| **23** | T23: Control | 90.00 (2.00) | 90.00 (2.00) | 90.00 (2.00) | 80.00 (1.95) | 0.00 (1.00) | 0.00 (1.00) | 0.00 (1.00) | 0.00 (1.00) |
| | **F** | ** | ** | ** | ** | ** | ** | ** | ** |
| | **SEm (±)** | **0.03** | **0.03** | **0.04** | **0.03** | **0.01** | **0.01** | **0.01** | **0.01** |
| | **CD @ 1%** | **0.12** | **0.12** | **0.15** | **0.12** | **0.03** | **0.03** | **0.05** | **0.03** |

** Significant at 1 % level; Figures in parenthesis are logarithmic transferred value

**Fig.1** Growth inhibition of soil borne fungal plant pathogens by novel isolates of *Trichoderma* spp.

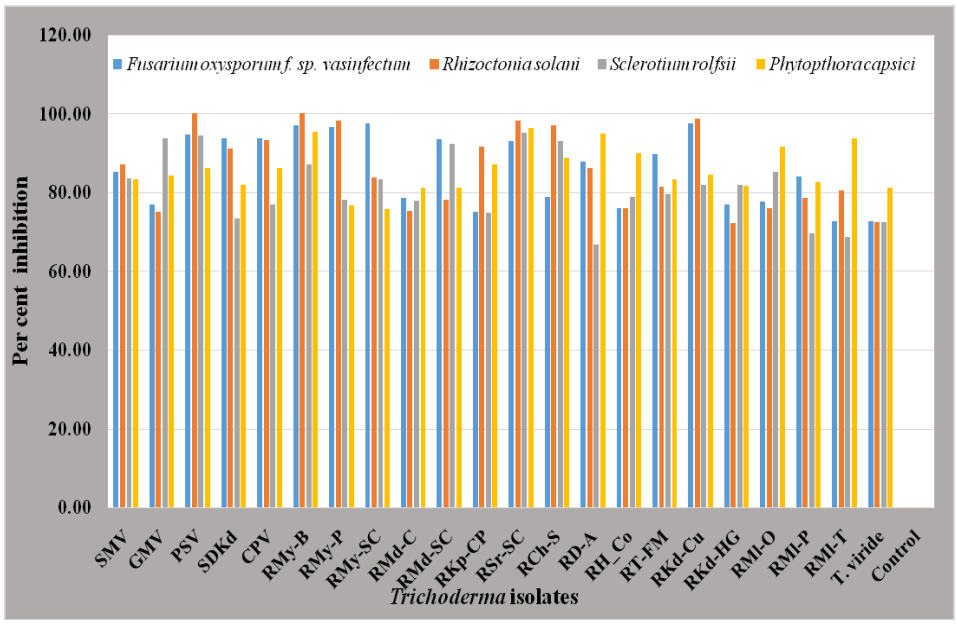
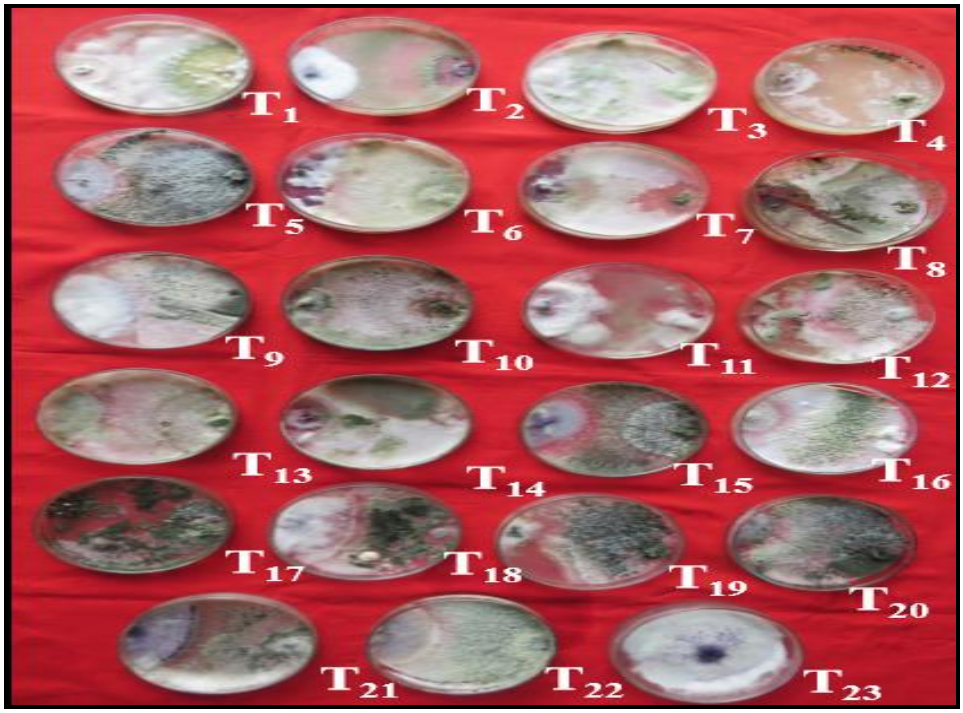
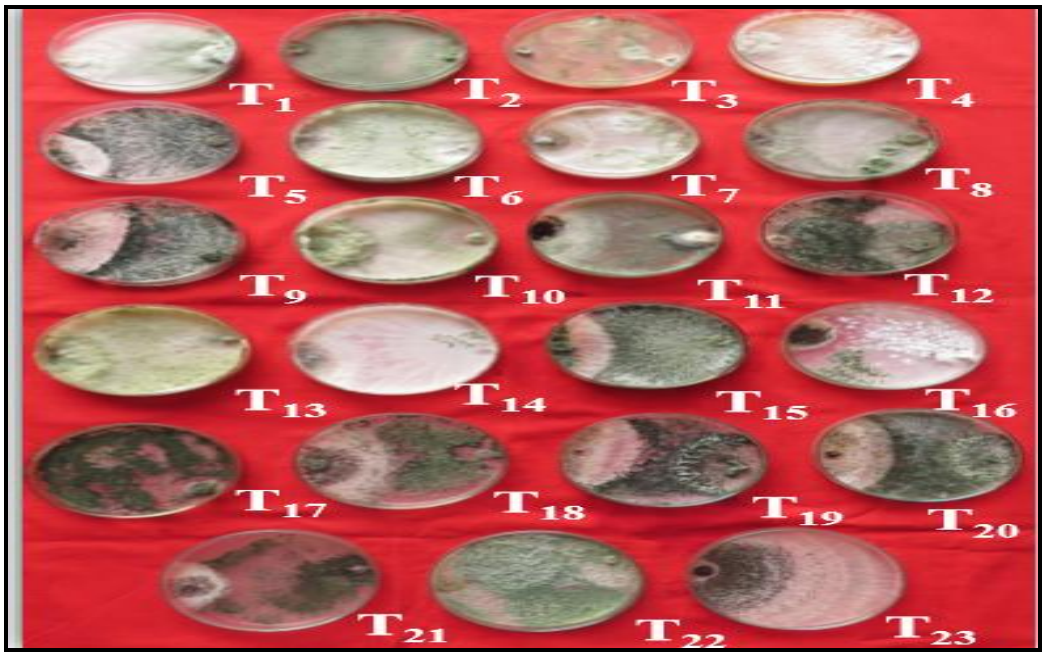



**Plate.1** Antagonistic activity of different isolates of *Trichoderma* spp. against *Fusarium oxysporum* f. sp. *Vasinfectum*



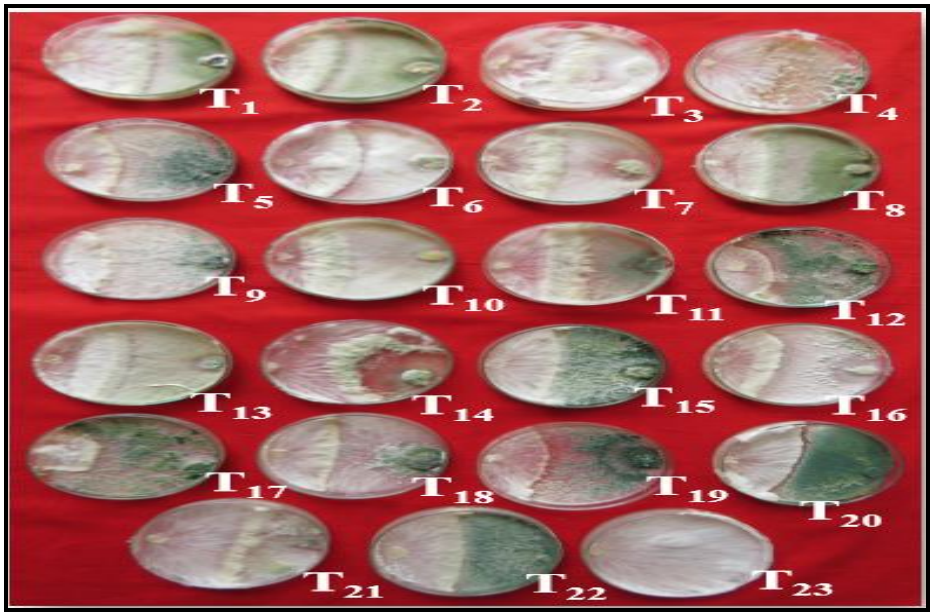

$T_1$: SMV, $T_2$: GMV, $T_3$: PSV, $T_4$: SDKd, $T_5$: CPV, $T_6$: RMy-B, $T_7$: RMy-P, $T_8$: RMy-SC, $T_9$: RMd-C, $T_{10}$: RMd-SC, $T_{11}$:RKp-CP, $T_{12}$: RSr-SC, $T_{13}$: RCh-S, $T_{14}$: RD-A, $T_{15}$: RH-Co, $T_{16}$: RT-FM,$T_{17}$: RKd-Cu, $T_{18}$: RKd-HG, $T_{19}$: RMl-O, $T_{20}$: RMl-P, $T_{21}$: RMl-T, $T_{22}$: commercial isolate (*T. viride*)

**Plate.2** Antagonistic activity of different isolates of *Trichoderma* spp. against *Rhizoctonia solani*



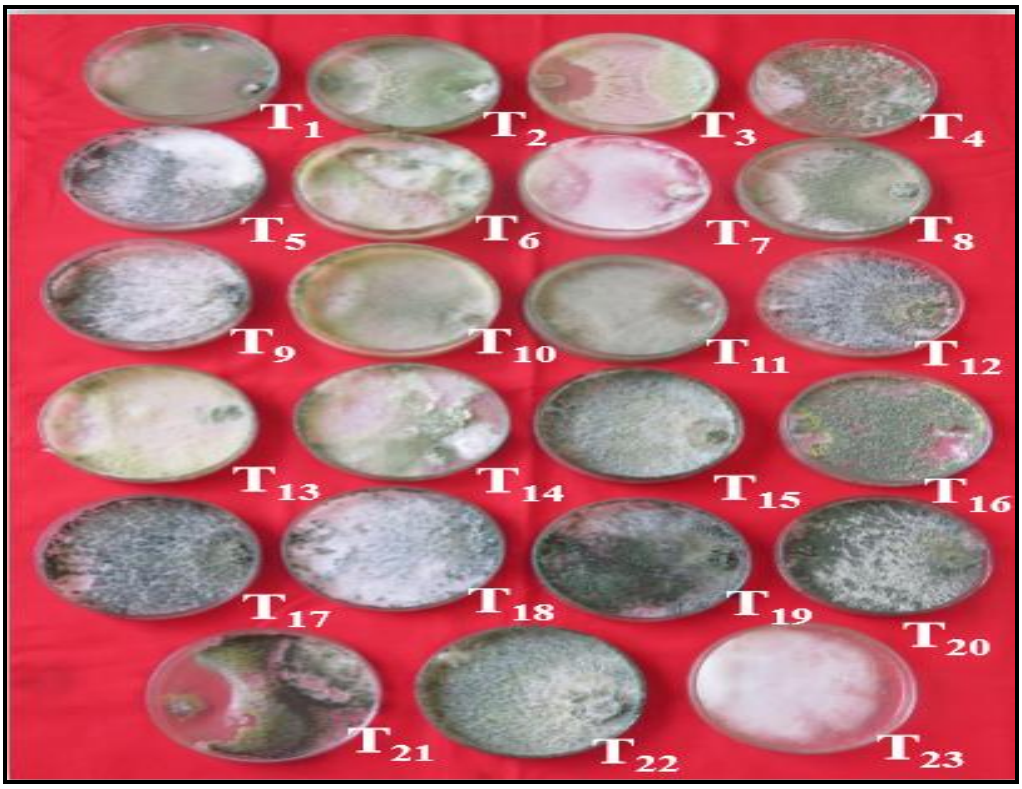

$T_1$: SMV, $T_2$: GMV, $T_3$: PSV, $T_4$: SDKd, $T_5$: CPV, $T_6$: RMy-B, $T_7$: RMy-P, $T_8$: RMy-SC, $T_9$: RMd-C, $T_{10}$: RMd-SC, $T_{11}$:RKp-CP, $T_{12}$: RSr-SC, $T_{13}$: RCh-S, $T_{14}$: RD-A, $T_{15}$: RH-Co, $T_{16}$: RT-FM,$T_{17}$: RKd-Cu, $T_{18}$: RKd-HG, $T_{19}$: RMl-O, $T_{20}$: RMl-P, $T_{21}$: RMl-T, $T_{22}$: commercial isolate (*T. viride*)

**Plate.3** Antagonistic activity of different isolates of *Trichoderma* spp. against *Sclerotium rolfsii*




$T_1$: SMV, $T_2$: GMV, $T_3$: PSV, $T_4$: SDKd, $T_5$: CPV, $T_6$: RMy-B, $T_7$: RMy-P, $T_8$: RMy-SC, $T_9$: RMd-C, $T_{10}$: RMd-SC, $T_{11}$:RKp-CP, $T_{12}$: RSr-SC, $T_{13}$: RCh-S, $T_{14}$: RD-A, $T_{15}$: RH-Co, $T_{16}$: RT-FM,$T_{17}$: RKd-Cu, $T_{18}$: RKd-HG, $T_{19}$: RMl-O, $T_{20}$: RMl-P, $T_{21}$: RMl-T, $T_{22}$: commercial isolate (*T. viride*)

**Plate.4** Antagonistic activity of different isolates of *Trichoderma* spp. against *Phytophthora capsici*




$T_1$: SMV, $T_2$: GMV, $T_3$: PSV, $T_4$: SDKd, $T_5$: CPV, $T_6$: RMy-B, $T_7$: RMy-P, $T_8$: RMy-SC, $T_9$: RMd-C, $T_{10}$:RMd-SC, $T_{11}$:RKp-CP, $T_{12}$: RSr-SC, $T_{13}$: RCh-S, $T_{14}$: RD-A, $T_{15}$: RH-Co, $T_{16}$: RT-FM,$T_{17}$: RKd-Cu, $T_{18}$: RKd-HG, $T_{19}$: RMl-O, $T_{20}$: RMl-P, $T_{21}$: RMl-T, $T_{22}$: commercial isolate (*T. viride*).

Similar study was carried out by Rekha *et al.*, (2012), where they reported the isolates Tri-13 (*T. viride*) and Tri-29 (*T. viride*) to inhibit the growth of *S. rolfsii* through volatile metabolites compared to other tested isolates. Sarita *et al.*, (2018) studied the effect of *T. harzianum* and *T. viride* wherein they recorded high mycelial inhibition zone of the pathogen by these two species *Trichoderma* spp. (72.04% and 61.85% respectively). The parallel study was carried out by Mokhtari *et al.*, (2018), where they recorded that the biocontrol agent *T. afro-harzianum* (T8A4) showed maximum percentage inhibition of mycelial of *Phytophthracapsici* (84.7%). Similar results were also noticed by Raut *et al.*, (2017) who reported that *T. asperellum* T36 exhibited maximum inhibition of *P. parasitica* (81.2%) followed by *T. asperellum* T50 (79.6%) and *T. harzianum* T78 (77.7%). In the same way present results indicated that, all twenty-one isolates had varying levels of inhibition of *P. capsici*. And also, that the *Trichoderma* isolate RSr-SC had the highest growth of mycelium inhibition (96.25 %), these two isolates performed better antagonistic activity compared to the commercial isolate.

In conclusion twenty-two *Trichoderma* isolates collected from six different sources at different geographical locations were characterized on the basis of their morphological features and molecular techniques. Screening of the antagonistic potential of isolated *Trichoderma* isolates against soil borne fungal pathogens *viz*., *F. oxysporum* f. sp. *vasinfectum*, *R. solani*, *S. rolfsii*, *P. capsica*was done and the maximum inhibition of mycelial growth of *F. oxysporum* f. sp. *vasinfectum* was recorded by RKd-Cu isolate (97.44 %) obtained from cucumber, followed by RMy-SC isolate (97.41 %) from

rhizosphere of sugarcane crop which was significantly superior over the control. Furthermore, except RMl-Tisolate (72.59 %), remaining all twenty *Trichoderma* isolates exhibited higher growth inhibition of pathogen than the commercial isolate (*T. viride*) (72.59 %). PSV and RMy-B isolates showed 100 per cent mycelium growth inhibition of *R. solani*, which was obtained from paddy straw and soil rhizosphere of banana crop followed by RKd-Cu isolate (98.81 %) from rhizosphere of cucumber crop which is significantly high over the control. All *Trichoderma* isolates except RKd-HG (72.22 %) showed higher growth inhibition of pathogen than the commercial isolate (*T. viride*) (72.33 %).In case of *S. rolfsii*, RSr-SC isolate obtained from the rhizosphere of sugarcane, showed a significantly maximum percent inhibition of mycelial growth (95.19%) followed by PSV isolate (94.44 %), GMV (93.07 %), RCh-S (92.96 %) and RMd-C (92.22 %). Thus, twenty isolates were found to be superior than the commercial isolate (*T. viride*) (72.48 %).Similarly, RSr-SC isolate exhibited highest mycelial growth inhibition (96.25 %) of *P. capsica* followed by RMy-B (95.38 %), RD-A (95 %) and RMl-T (93.75 %). Thus, nineteen isolates were found to be superior than the commercial isolate (*T. viride*) (81.08%).

In accordance with the current study revealed that among the all *Trichoderma*isolates, few isolates showed least mycelial growth inhibition of *F. oxysporum* f. sp. *vasinfectum*, *R. solani*, *S. rolfsii* and *P. capsica:* RMl-T(72.59 %), RKd-HG (72.22%), RD-A (66.70%) and RMy-SC (75.83%) respectively.

As per present investing data revealed that the novel isolate RSr-Sc showed highest mycelial growth inhibition of two pathogens (*S. rolfsii*and *P. capsica)* over the control and also showed greater per cent inhibition than the commercial isolate (72.33% and 72.48%). And also, the isolate PSV obtained from paddy straw which is other the soil rhizosphere source showed 100 per cent mycelial growth inhibition of *R. solani* over the control.so, we can use the animal waste and other farm waste material as a source to isolate the effective *Trichoderma* isolates and used as antagonist on soil borne fungal plant pathogens. Apart from this, the current study showed that out of twenty one *Trichoderma* isolates collected from different geographical locations, around twenty isolates showed highest mycelial growth inhibition than the commercial isolate over different soilborne plant pathogens. Therefore, these isolates can be further subjected to field studies against these plant pathogens. The present findings in this study will also be beneficial for further research on characterization of potential biocontrol genes of effective *Trichoderma* isolates and their interaction with the plant pathogens.

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