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Efficacy of *Trichoderma longibrachiatum* isolates against soil borne pathogens

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Abstract
Genus *Trichoderma* contain many species that are of great economic importance because of ability to suppress pathogens and enhance their biocontrol capabilities against soil borne pathogen. Nine isolates of *T. longibrachiatum* were obtained from rhizosphere soil of different districts of Vidarbha region. There was variability in colony growth, colony colour, reverse pigmentation, conidial shape and size, phialides etc. *T. longibrachiatum* isolates were evaluated for antagonism using dual culture technique and all isolates were found significant in controlling per cent growth inhibition of soil borne pathogens *S. rolfsii*, *R. bataticola* and *F. udum.* Growth inhibition was also recorded due to volatile substance produced by the isolates. Among the isolates TL-4 (Buldhana) and TL-9 (Yeotma) were found more effective against tested soil borne pathogens.

Keywords: *Trichoderma longibrachiatum*, Soil Borne Pathogens, antagonism

Introduction
Trichoderma spp. is antagonistic to other fungi and have shown promise as biological control agents for several soil-borne diseases (Papavizas, 1985; Jenson and Wolffhechel, 1995) [6]. *Trichoderma spp.* Like *T. harzianum, T. viride and T. virens* are the most widely used for biological control. They are reported effective in controlling root rots /wilt complexes and foliar diseases in several crops and are reported to inhibit a number of soil borne fungi like *Rhizoctonia*, *Pythium*, *Sclerotinia*, *Sclerotium*, *Fusarium spp.*, *Macrophomina* etc. and recently root knot nematode, *Meloidogyne spp*. Several potentially useful strains of *Trichoderma* for the biological control are difficult to distinguish from otherstrains found in the field. So there is a need to find ways to monitor these strains when applied to the natural pathosystem. There is significant interest in finding more efficient mycoparasitic fungi especially within *Trichoderma spp*., which differ considerably with respect to their biocontrol effectiveness. Javaid *et al.* (2014) [2] carried out *in vitro* bioassays to evaluate antagonistic behavior of seven species of *Trichoderma* against two highly problematic soil-borne plant pathogenic fungi viz. *Fusarium oxysporum f. sp. lycopersici* and *Macrophomina phaseolina*. T. harzianum showed the highest inhibition (65%) in growth of M. phaseolina followed by T. aureoviridi (60%).

Objective
- To test the efficacy of *Trichoderma longibrachiatum* isolates against Soil Borne Pathogens

Material and methods
T. longibrachiatum was isolated from the soil samples collected from different districts of Vidarbha region Maharashtra India by using *Trichoderma* specific media. Pure cultures of different soil borne plant pathogens viz. *F. udum, R. bataticola, S. rolfsii* for testing efficacy of *T. longibrachiatum* was collected from Department of Plant Pathology, Dr. P.D.K.V, Akola. Antagonistic activity of *Trichoderma longibrachiatum* was assayed against *Rhizoctonia bataticola, Sclerotium rolfsii* and *Fusarium udum* by using dual culture technique. Percent growth inhibitions of test pathogens were calculated as described by Vincent *et al.,* (1927) [8].

Results
The data presented in Table 1 and fig. 1, revealed that the maximum per cent growth inhibition (86.22%) of *Sclerotium rolfsii* was recorded by the isolate TL-2 (Amravati) The next best isolate was TL-4 (Buldhana) which showed 75.92 % inhibition. The least per cent inhibition was observed in TL-7 (Gondia) i.e. 56.77. The per cent growth inhibition of *Rhizoctonia bataticola* was maximum i.e. 68.63% by TL-8 (Washim) isolate and least

inhibition 51.54 % was recorded in TL-4 (Buldhana) isolate. In case of F*usarium udum* the maximum inhibition was recorded by TL-6 (Gadchiroli) i.e. 87.77 % where as 62.42 % growth inhibition was observed by Tl-1 (Akola) isolate. (Plate no. 1, 2, and 3) Prameela Devi *et al* 2012) [7] also assessed *T. virens* (Tv) and *T. harzianum* (Th) for their Mycoparasitic effect on soil borne plant pathogens, *Rhizoctonia solani, Fusarium udum, F. solani, Sclerotium rolfsii and Macrophomina phaseolina* and found same result. The data are presented in fig 2; per cent growth inhibition of tested pathogens was recorded at 12 DAI due to volatile substance produced by *Trichoderma longibrachiatum*. TL-4 (Buldhana), isolate recorded maximum 33.36% and 45.78% growth inhibition of *Sclerotium rolfsii* and *F. udum* respectively whereas TL-9 (Yeotmal) inhibited *Rhizoctonia bataticola up to* 59.88%. (Plate no. 4, 5 and 6) (Amin *et al*. 2010) [1] tested six isolates of *Trichoderma spp*. for their ability to produce volatile metabolites against several fungal plant pathogens viz., *Fusarium oxysporum* (causing Chilli wilt), *Rhizoctonia solani* (causing sheath blight of rice), *and Sclerotium rolfsii* (causing collar rot of tomato). Studies indicated that *T. viride* (Tv-1) was most effective in reducing the mycelial growth of *F. oxysporum* (41.88%), whereas, in case of *R. solani T. viride* (Tv-2) accounted for maximum reduction in mycelial growth (30.58%) against *Sclerotium rolfsii*, *T. viride* (Tv-1) was most effective antagonist producing volatile metabolites, thereby inhibiting the mycelial growth by 40.68. The present results are in conformity with the findings of Amin *et al*.

These findings showed similarity with the observations made by Kumar and Sharma (2016) [3] evaluation of *Trichoderma spp*. against *Sclerotium* where Th3 exhibited 90% inhibition followed by Th10 and Th30. The isolate TvNir had maximum impact of 85% against the target fungi, followed by Tv2, TvChen and Tv4.

The same work was done by Jana and Mandal (2017) tested eleven isolates of *Trichoderma spp.* to find out their antagonistic potential and nature of colony interaction against test pathogen, *S. rolfsii. T. harzianum* isolate T3 produced highest inhibition of 71.67%, while *T. viride* isolate T10 showed an inhibition of 67.23.

Table 1: Antagonism of *Trichoderma* isolates against soil borne fungal pathogen (percent growth inhibition) at 7 DAI

S. No.	Isolates	Mean Radial Growth (mm) of *Sclerotium Rolfsii*	PGI (%)	Mean Radial Growth (mm) of *Rhizoctonia bataticola*	PGI (%)	Mean Radial Growth (mm) of *Fusarium udam*	PGI (%)
1.	TL-1 (Akola)	35.18	60.91	35.28	60.80	32.02	62.42
2.	TL-2 (Amravati)	12.40	86.22	31.66	64.82	39.62	87.45
3.	TL-3 (Bhanadara)	37.18	58.68	29.13	67.63	11.41	87.32
4.	TL-4 (Buldhana)	21.67	75.92	42.61	51.54	25.89	71.23
5.	TL-5 (Chandrapur)	33.00	63.33	33.00	63.33	23.23	74.18
6.	TL-6 (Gadchiroli)	22.78	74.68	43.27	51.92	11.00	87.77
7.	TL-7 (Gondia)	38.90	56.77	37.17	58.70	12.45	86.66
8.	TL-8 (Washim)	34.65	61.50	28.23	68.63	34.32	87.72
9.	TL-9 (Yeotmal)	29.99	66.67	32.53	63.85	30.67	65.92
	Control	90	-	90	-	90.00	-
	F test	Sig	-	Sig	-	Sig	-
	S.E (M)±	0.49	-	0.36	-	0.19	-
	C.D. at (p= 0.01)	1.45	-	1.07	-	0.56	-

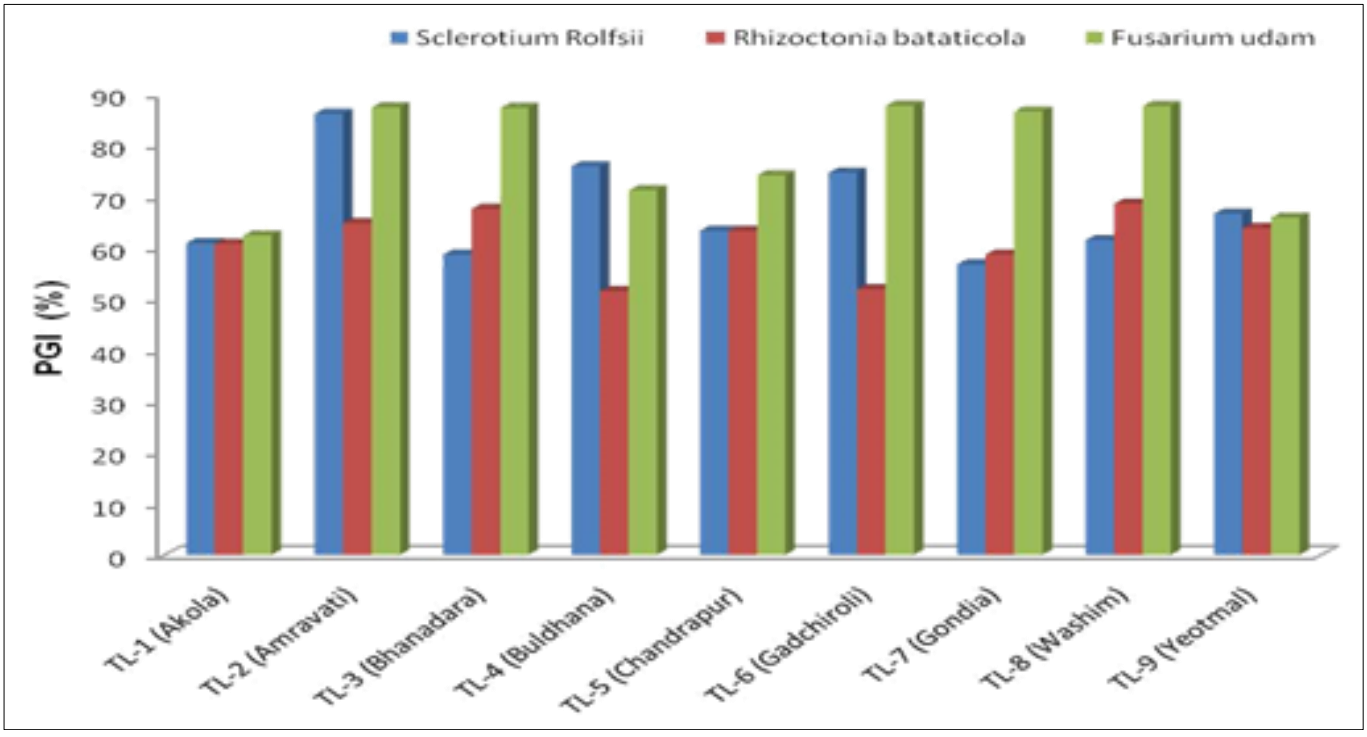

Fig 1: Antagonistic of *Trichoderma* isolates against soil born fungal pathogens

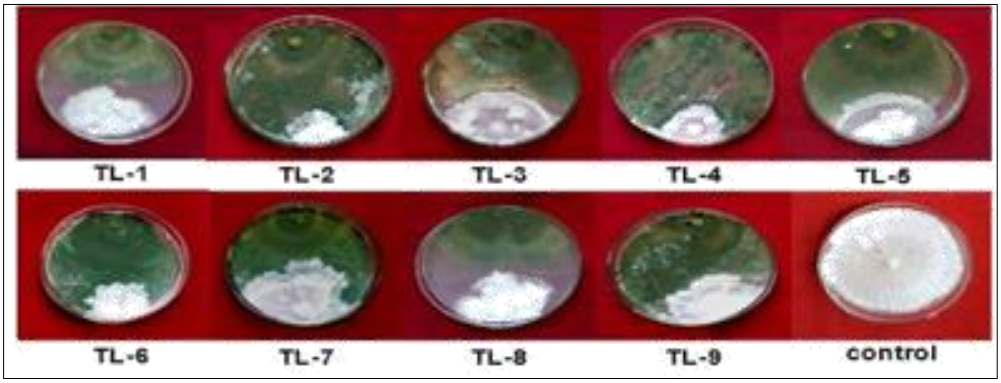

Plate 1: Antagonism of *Trichoderma longibrachiatum* against *Sclerotium rolfsii*

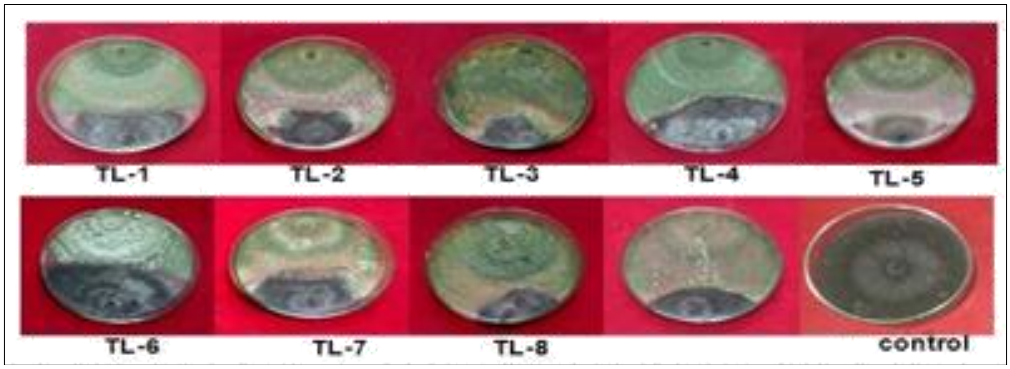

Plate 2: Antagonism of *Trichoderma longibrachiatum* against *Rhizoctonia bataticola*

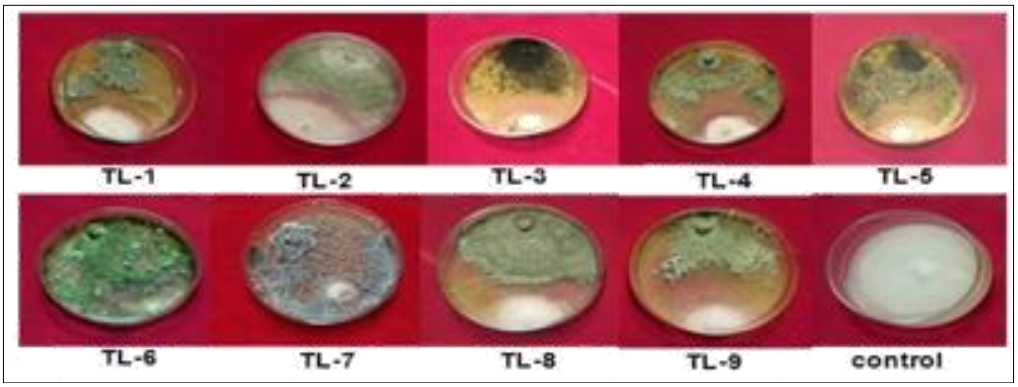

Plate 3: Antagonism of *Trichoderma longibrachiatum* against *Fusarium udam*

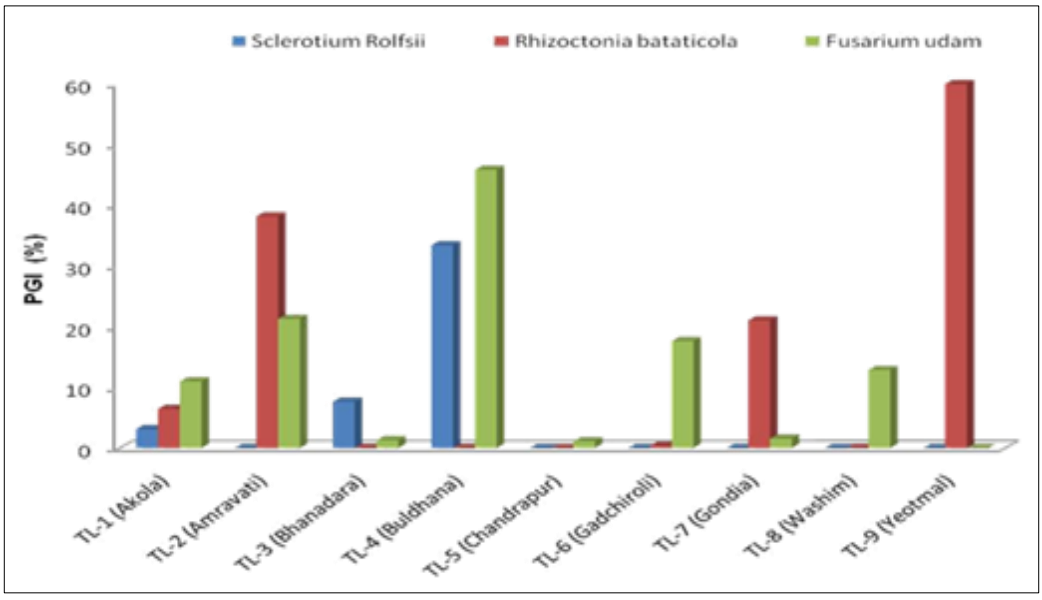

Fig 2: Efficacy of volatile compounds produced by *T. longibrachiatum* against *Sclerotium rolfsii, Rhizoctonia bataticola and Fusarium udum*

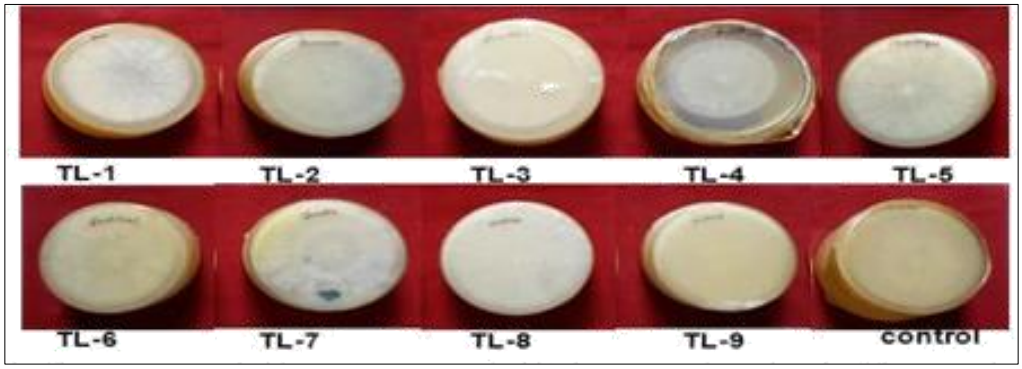

Plate 4: Efficacy volatile substance of *Trichoderma longibrachiatum* against *Sclerotium rolfsii*

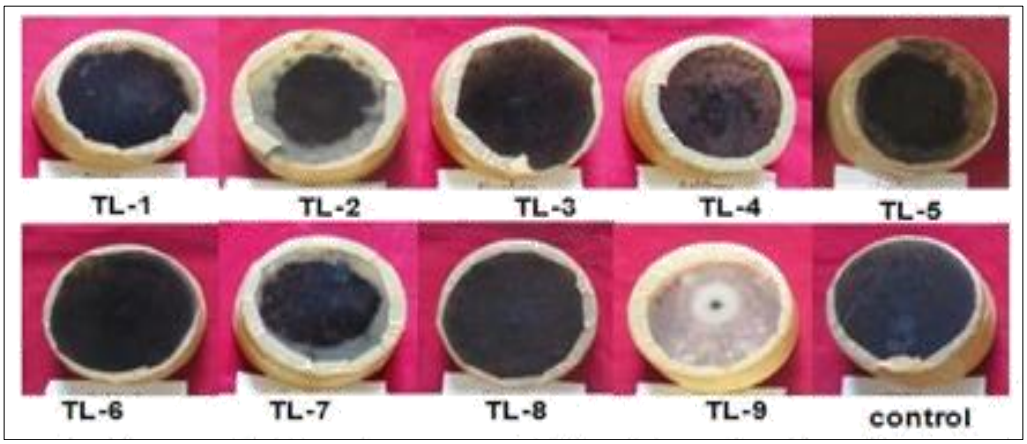

Plate 5: Efficacy volatile substance of *Trichoderma longibrachiatum* against *Rhizoctonia bataticola*

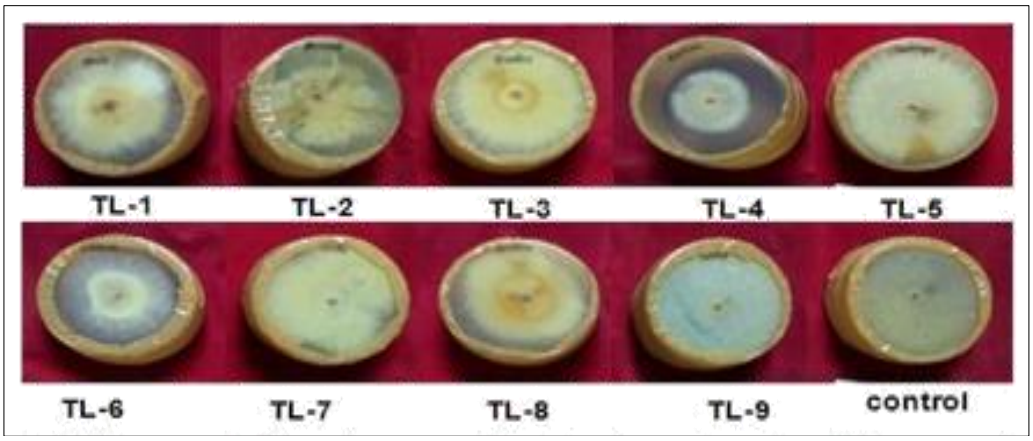

Plate 6: Efficacy volatile substance of *Trichoderma longibrachiatum* against *Rhizoctonia bataticola*

Conclusions

Nine *T. longibrachiatum* isolates were evaluated for antagonistic efficacy against three pathogens and the maximum per cent growth inhibition (86.22%) of *Sclerotium rolfsii* was observed by the isolate TL-2 (Amravati) and the least per cent inhibition was observed in TL-7 (Gondia) i.e. 56.77. The per cent growth inhibition of *Rhizoctonia bataticola* was maximum i.e. 68.63% by TL-8 (Washim) isolate and least inhibition 51.54 % was recorded in TL-4 (Buldhana) isolate. In case of F*usarium udum* the maximum inhibition was recorded by TL-6 (Gadchiroli) i.e. 87.77 % where as 62.42 % growth inhibition was observed by Tl-1(Akola) isolate. Growth inhibition of *Sclerotium rolfsii*, *Rhizoctonia bataticola* and *F. udum* were recorded at 12 DAI due to volatile substance produced by *T. longibrachiatum*. TL-4 (Buldhana), isolate recorded maximum 33.36% and 45.78% growth inhibition of *Sclerotium rolfsii* and *F. udum* respectively whereas TL-9 (Yeotmal) inhibited *Rhizoctonia bataticola* up to 59.88%.

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