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Comparison of native *Trichoderma* isolates on important soil-borne pathogens

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ABSTRACT

Native isolate, *T. harzianum* (THCh 1) was found to be the most efficient isolate as it showed maximum antagonism than rest of the isolates tested against *Fusarium oxysporum* f.sp. *ciceri*, *F. solani*, *F. oxysporum* f.sp. *vasinfectum*, *F. moniliformae* and *Macrophomina phaseolina*. The same isolate was further proved its better potentiality when compared with other existing isolates *viz*., *T. viride* (SKN 1), *T. viride* (PDBC, Bangalore), *T. viride* (ARI, Pune), *T. harzianum* (ARI, Pune), *T. harzianum* (Junagadh), *T. harzianum* (PDBC, Bangalore) and *T. koningii* (SKN 1).

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INTRODUCTION

The drawbacks of chemicals are well known in scientific and farming community. Hence, the farmers have started for eco-friendly plant disease management (EPDM) or biological based Integrated Disease Management (BIDM). *Trichoderma* proved worldwide accepted technology for the biological control of plant diseases particularly for seed and soil borne diseases. No work has been done on comparison of native strains of *Trichoderma* isolates from South Gujarat region. Hence, the present research paper focused on the efficacy of the native strains against most important soil-borne pathogens.

MATERIALS AND METHODS

Present research work was carried out at the laboratory of Department of Plant Pathology, N.M. College of Agriculture, NAU, Navsari during the year 2007. All the isolates of *Trichoderma viz*., *T. viride* (2 isolates), *T. harzianum* (1 isolate), *T. atroviride* (1 isolate) and *T. fasciculatum* (2 isolates) were used for study of antagonism against six important soil-borne pathogens *viz*., *Fusarium oxysporum* f.sp. *ciceri* (Chickpea wilt), *Fusarium moniliformae* (Sugarcane wilt), *Fusarium solani* (Gladiolus wilt), *Fusarium oxysporum* f.sp. *vasinfectum* (Cotton wilt), *Sclerotium rolfsii* (Groundnut stem rot) and *Macrophomina phaseolina* (Chickpea root rot) by employing dual culture technique (Morton and Straube, 1955).

Methodology and observations of the experiment was given below:

- Sterilized PDA i.e. 20 ml was poured aseptically in sterilized Petri plates of 90 mm diameter.
- Mycelial discs (5 mm) of 7 days old actively growing culture of the bioagents and the test pathogens were cut separately with the help of sterilized cork borer and placed on solidified PDA approximately 4 cm away from each other.
- The experiment was repeated thrice along with their controls where test pathogen and *Trichoderma* isolates were subjected alone for growth comparison.
- All the inoculated plates were incubated at room temperature (27 ± 2^0C).
- The radial growth of test pathogens in treated and control plates were recorded after 5 days of incubation and the per cent inhibition of mycelial growth of the pathogens was calculated by using formula of Bliss (1934) i.e. I = (C-T/C) x 100 where, I = Inhibition per cent, C = Colony diameter in control plate and T = Colony diameter in treated plate.
- Further, the efficacy of *T. harzianum* was compared with the cultures of different existing available *Trichoderma* spp. *viz*., *T. viride* (SKN 1), *T. koningii* (SKN 1), *T. viride* (PDBC, Bangalore), *T. harzianum* (Junagadh isolate), *T. viride* (ARI, Pune) by employing dual culture technique (Morton and Straube, 1955) against *F*. oxysporum f.sp. *ciceri* and observations of inhibition were taken as mentioned above formulae.

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RESULTS AND DISCUSSION

Table-1: Overall result of antagonism by native *Trichoderma* isolates

Sr. No.	Isolates	Per cent inhibition of mycelial growth (PIMG)						Avg. PIMG
		F.oxysporum f.sp. *ciceri*	*F.moniliformae*	*F.solani*	*F.oxysporum* f.sp. *vasinfectum*	*S.rolfsii*	*M.phaseolina*	
1	TFC 1	69.69	56.12	92.42	89.18	55.32	63.33	71.01
2	TFC 2	92.42	61.22	84.34	89.86	49.74	58.90	72.74
3	TVS 1	92.42	59.18	92.42	89.86	42.13	52.78	71.46
4	TVS 2	92.42	48.46	92.42	89.86	39.08	55.56	69.63
5	ThCh 1	92.42	66.84	92.42	89.18	55.32	65.00	76.86
6	ThCh 1	92.42	57.14	84.34	33.78	50.25	47.78	60.95

TFC 1 & TFC 2: *T. fasciculatum* ; TVS 1 & TVS 2: *T. viride*; ThCh 1: *T. harzianum* ; TACh 1: *T. atroviride*

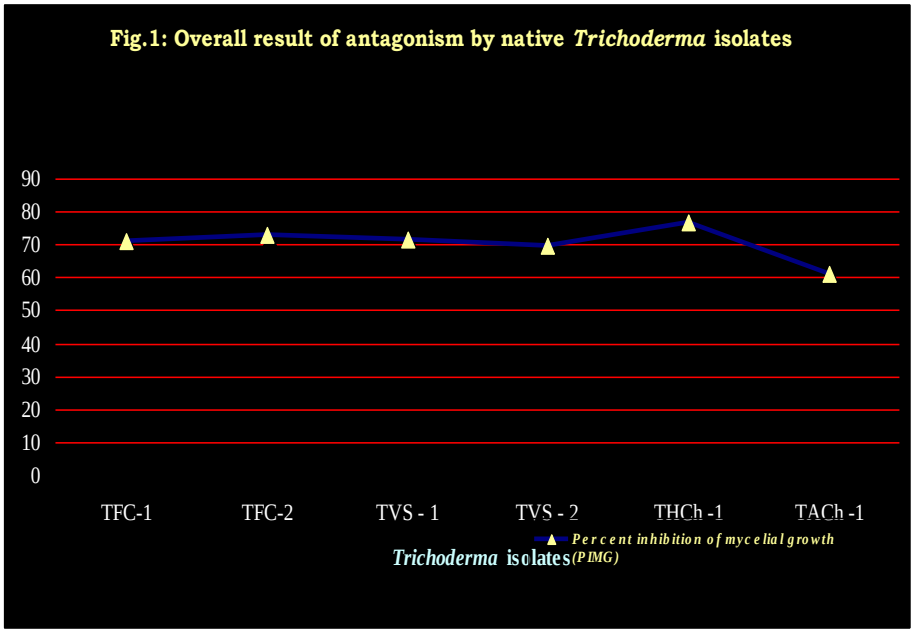

Fig.1: Overall result of antagonism by native *Trichoderma* isolates

Overall experimental results (Table 1 & Fig. 1) clearly indicated that all the isolates proved effective against the all the pathogens tested. Maximum inhibitory effect of all the isolates was found against *F. oxysporum* f.sp. *ciceri* and *F. solani* followed by *F. oxysporum* f.sp. *vasinfectum* and *F. moniliformae*. It was comparatively less against *M. phaseolina*, in general. The results of isolate wise efficacy showed that isolate ThCh 1 (*T. harzianum*) was found comparatively superior with an average mycelial growth inhibition of 76.86 per cent as compared to the rest. This was followed by TFC 2 (72.74%), TVS 1 (71.46%), TFC 1 (71.01%), TVS 2 (69.63%) and TACh 1 (60.96%). The variation of different isolates in their efficacy against the fungal pathogens might be due to different levels of secondary metabolites produced by different isolates. The results of the present study also indicated that the effect of biocontrol

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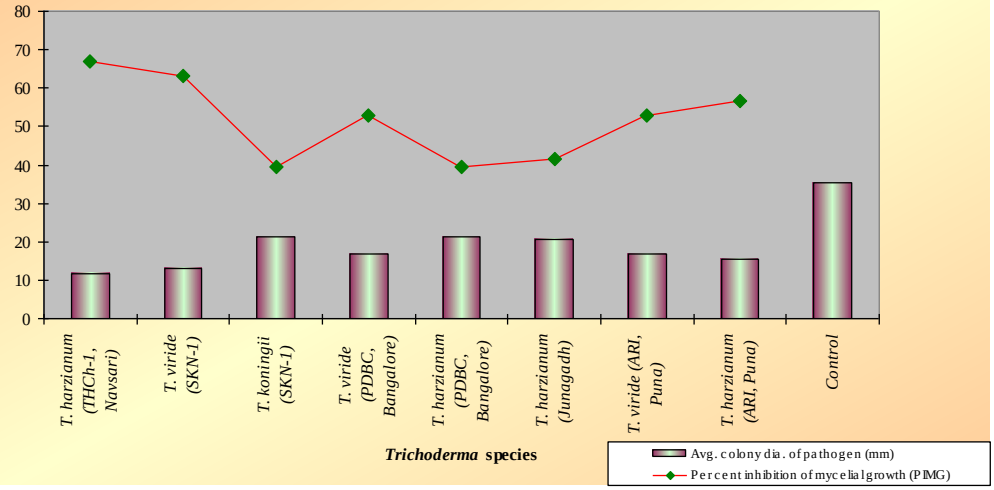
agents may be specific and hence more study on this aspect is required. The present results are in agreement with the earlier results obtained by Gurha (2001), Pan and Bhagat (2007) and Vishwanath *et al.* (2008).

Table-2: Comparison of existing available *Trichoderma* isolates with *T. harzianum* (ThCh 1) through antagonism (Test pathogen: *F. oxysporum* f. sp. *ciceri*)

Sr. No.	Isolates	*Avg. colony dia. of pathogen (mm)	Per cent inhibition of mycelial growth (PIMG)
1	*T. harzianum* (ThCh 1, Navsari)	11.66	66.99
2	*T. viride* (SKN-1)	13.00	63.20
3	*T. koningii* (SKN-1)	21.33	39.62
4	*T. viride* (PDBC, Bangalore)	16.66	52.83
5	*T. harzianum* (PDBC, Bangalore)	21.33	39.62
6	*T. harzianum* (Junagadh)	20.66	41.50
7	*T. viride* (ARI, Puna)	16.66	52.83
8	*T. harzianum* (ARI, Puna)	15.33	56.60
9	Control	35.33	
S.E.M.±		1.09	
C.D.@5%		3.33	
C.V.%		1.10	

*** Average of three repetitions**

Fig.2: Comparison of existing available *Trichoderma* isolates through antagonism (Test pathogen: *F. oxysporum* f. sp. *ciceri*)



Further, the most efficient native isolate i.e. ThCh 1 was compared with other existing isolates obtained from the different laboratories and the results revealed that maximum mycelial growth inhibition was 66.99 per cent recorded in ThCh 1 followed by 63.20 per cent in *T. viride*-SKN-1 isolate. *T. harzianum*-ARI, Pune, *T. viride*-PDBC, Bangalore and *T. viride*-ARI, Pune produced 56.60, 52.83, 52.83 per cent mycelial growth inhibition, respectively and also proved as good bioagents. *T. harzianum*-Junagadh, *T. harzianum*-PDBC, Bangalore and *T.*

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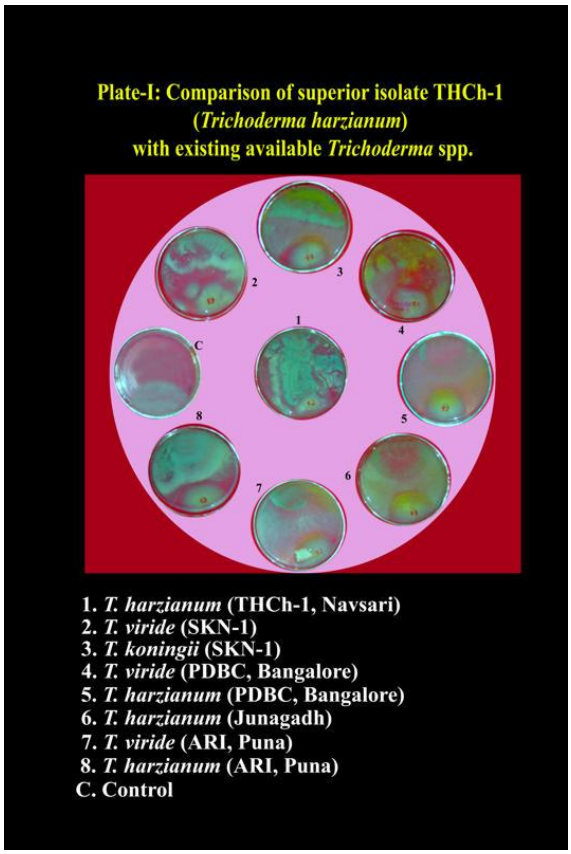
koningii-SKN-1 produced 39.62 to 41.50 per cent mycelial growth inhibition and proved comparatively less effective (Table 2, Fig. 2 & Plate-I). The results revealed that the isolates were varying through antagonism in efficacy against *F. oxysporum* f.sp. *ciceri*. The native strain *T. harzianum* (ThCh 1) isolated here showed higher antagonism as compared to the other available isolates tested. This shows variability of efficacy of isolates and hence, the selection of better native strain will be more useful for production and promotion biological control.



SUMMARY AND CONCLUSION

All the isolates proved effective against all the pathogens tested. Maximum inhibitory effect of all the isolates of *Trichoderma* was found against *F. oxysporum* f.sp. *ciceri* and *F. solani* followed by *F. oxysporum* f.sp. *vasinfectum* and *F. moniliformae*. It was comparatively less effective against *M. phaseolina*, in general. The results of isolate wise efficacy showed that isolate *T. harzianum* (ThCh 1) was found comparatively superior with an average mycelial growth inhibition of 76.86 per cent as compared to the rest. This was followed by *T. fasciculatum*-TFC 2 (72.74%), *T. viride*-TVS 1 (71.46%), *T.* fasciculatum-TFC 1 (71.01%), *T. viride*-TVS 2 (69.63%) and *T. atroviride*-TACh 1(60.96%). *T. harzianum* (ThCh 1) was also compared with the existing available *Trichoderma* spp. collected from the different laboratories and again it showed highest antagonism and with maximum potentiality with 66.99 per cent inhibition of mycelial growth of *F. oxysporum* f.sp. *ciceri*.

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