Bangladesh J. Bot. **50**(2): 423-425, 2021 (June) **- Short communication**

EFFECTS OF *TRICHODERMA* SPECIES ON THE GROWTH OF *FUSARIUM VERTICILLIOIDES*

RAMESH KUMAR, SANJEEV KUMAR* AND BALKISHAN CHAUDHARY

Department of Plant Pathology, College of Agriculture, Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur-482004 (Madhya Pradesh), India

Keywords: Fusarium verticillioides, Trichoderma

Abstract

Six biocontrol treatments *viz., Trichoderma viride, Trichoderma virens, Trichoderma harzianum, T. harzianum + T. viride, T. harzianum + T. virens* and *T. viride + T. virens* were evaluated to test the antagonism against *Fusarium verticillioides* under *in vitro* conditions. The maximum growth inhibition (90.6%) was recorded in consortium of *T. harzianum + T. viride* in dual culture technique . The volatile and non volatile compounds from the consortium of *T. harzianum + T. viride* also found best and suppressed the mycelial growth of *F. verticillioides* to the tune of 83.90 and 84.61 %, respectively.

Multiple antagonistic microorganisms in combination are used to enhance the level and consistency of control of fungal pathogens by providing multiple mechanisms of action and also it is more stable to rhizosphere community and effective over a wide range of environmental conditions (Srivastava *et al*. 2010, Kushwaha *et al*. 2018). The aim of the present study was to evaluate the biocontrol activity of *Trichoderma* spp. against *Fusarium verticillioides.*

Three biocontrol agents in six combinations *viz., T. viride, T. virens, T. harzianum, T. harzianum + T. viride, T. harzianum + T. virens* and *T. viride + T. virens* were evaluated to test the antagonism against *Fusarium verticillioides* in the Department of Plant Pathology, Jawaharlal Nehru Krishi Vishwavidyalaya- Jabalpur (M.P.) during 2018-2019.

For screening of the antagonists *viz., T. viride, T. virens, T. harzianum, T. harzianum + T. viride, T. harzianum + T. virens* and *T. viride + T. virens* against *F. verticillioides,* dual culture technique developed by Morton and Straube (1955) was adopted. The effect of volatile and non volatile compounds from antagonists on radial growth of *F. verticillioides* was studied as per the method described by Dennis and Webster (1971a, b). The colony diameter was measured and per cent inhibition of radial growth of *F. verticillioides* was calculated according to Vincent (1947).

In dual culture, consortium treatment of *T. harzianum + T. viride* was found to be most effective with highest mycelial inhibition (90.60%) and poor sporulation of the test pathogen while in solo treatment, maximum inhibition of radial growth (70.0%) with fair sporulation was recorded in case of *T. viride* (Table 1).

The volatile and non volatile compounds of *T. harzianum + T. viride* also exhibited maximum growth inhibition of *F. verticillioides.* They inhibited the growth of the test pathogen to the tune of 83.9-and 84.61%, respectively after 96 hrs of incubation (Table 1). In solo treatment, maximum inhibition of radial growth (36.12%) was recorded in volatile compound of *T. harzianum* while the non volatile compound from *T. viride* showed 76.92% inhibition of the test pathogen at the concentration of 15 per cent. These results indicated that the use of

*Author for correspondence: <sanjeevcoa@gmail.com>.
DOI: https://doi.org/10.3329/bjb.v50i2.54101

Table 1. Effects of *Trichoderma* spp on the radial growth and sporulation of *Fusarium verticillioides*.

Treatment	Dual culture			Volatile compounds			Non volatile compounds (%)								
							5			10			15		
	Radial growth (mm)	Growth inhibition* (%)	Sporulation**	Radial growth (mm)	Growth inhibition* (%)	Sporulation	Radial growth (mm)	Growth inhibition* (%)	Sporulation**	Radial growth (mm)	Growth inhibition* (%)	Sporulation**	Radial growth (mm)	Growth inhibition* (%)	Sporulation**
T. harzianum + *T. viride*	4.7	90.6	++	10.5	83.90	+	15.0	76.92	+++	13.0	80.00	++	10.0	84.61	+
T. harzianum + *T. virens*	14.0	72.0	+	15.3	76.60	++	21.0	67.69	+++	18.0	72.30	++	14.0	78.46	+
T. viride + *T. virens*	8.7	82.6	+	12.1	81.50	++	23.0	64.61	+++	27.0	58.46	++	19.0	70.76	++
T. harzianum	18.0	64.0	++	41.9	36.12	+++	31.0	52.30	++++	25.0	61.53	++	22.0	66.15	++
T.viride	15.0	70.0	++	48.1	26.60	+++	22.0	66.15	++++	19.0	70.76	++	15.0	76.92	++
T. virens	31.4	37.2	+++	52.3	20.27	++++	34.0	47.69	++++	27.0	28.46	+++	24.0	67.07	++
Control (*F. verticillioides*)	50.0		++++	65.6		++++	65.0		++++	65.0		++++	65.0		++++
CD (0.05%)	2.28			2.18			3.00			2.67			2.56		

* Average of three replications, ** Excellent (++++), Good (+++), Fair (++), Poor (+) and - means not found.

Trichoderma spp. as consortium of compatible isolates enhanced the management compared with *Trichoderma* alone. Singh *et al.* (2013) and Singh and Singh (2014), also reported that the use of mixture of compatible *Trichoderma* isolates increased growth promoting activities and biocontrol potential as compared to single isolates. These findings are in agreement with the present findings.

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(Manuscript received on 1 May, 2019; revised on 21 May, 2020)