Research Paper :

Integrated biological management of chickpea wilt caused by *Fuasrium axysporum* f. sp. ciceri

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SUMMARY

Two isolates each of *Trichoderma viride* and *T. harzianum* and one of *Gliocladiun virens* and *Bacillus subtilis* were used against *F. axysporum* f.sp. *ciceri,* Bio-agent tested *in vitro* by dual culture method, were found antagonistic to *F. axysporum* f.sp. *ciceri.* A maximum growth of inhibition of *F. axysporum* f.sp. *ciceri,* (44.8%) was reported by *T. varide*-1 (PDBCTv 23) followed by *T. varide*-2 (Gulbarga strain Tv) (39.8%), whereas *G. virens* was found least effective. Wilt incidence was also high in control (20.7, 26.7 and 35.3%) at 30, 45 and 60 days. *T. viride*-1 (PDBCT v 23) recorded only 4.9, 9.2 and 12.0% wilt incidence at 30, 45 and 60 days, respectively and was also found to be superior to all other treatments.

Key words : Biological control, *Fusarium axysporum f.sp. ciceri, Trichoderma viride,T. harzianum*, Chickpea, Wilt

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Chickpea (*Cicer arietinum* L.) commonly known as channa or gram is one of the most important pulse crops in the Indian sub-continent. Wilt incited by *Fusarium axysporum* f.sp. *ciceri* is an important constraint in higher production of chickpea in Vindhyan Plateau Zone of Madhya Pradesh. In general resistant varieties, cultural practices and chemical fungicides are advocated for management of the disease but application of chemical fungicides proved short term measures as chemicals were reported to induce new strains of pathogen and also had environmental hazards on the other hands, for disease resistance, would constitute a medium term strategy due to the presence of several races (2, 3 and 5) of the pathogen. Various species of *Trichoderma* and *Gliocladium* had been studied for their bio-control ability against plant disease caused by *Fusarium* spp. (Lewis and Papavizas, 1980: Papavizas, 1985 : Selvarajan and Jeyarajan, 1996), therefore, integrated biological management to keep the disease below economic injury level as long term measure. In this context, the present study was planned for the integrated management of chickpea wilt by the use of biotic agent.

MATERIALS AND METHODS

The pathogen was insolated from infected roots of chickpea, collected from 23, locations of Vindhyan Plateau Zone, by routine method on P.D.A. Soil samples collected from rhizosphere of healthy chickpea plants just adjacent to wilted ones and also from wilt sick plants were used for isolation of micro organisms by using Trichoderma selective medium Method (Elad and Chet, 1983).

The antagonistic activity of micro organisms towards pathogen was tested on PDA medium in petriplate under sterilized conditions. Five mm disc of antiagonists were placed at four corners of petriplates in such a way that they were approximately 4.5 cm away from each other. The inculated plates were placed in an incubator at 27 ± 01^{0}C for seven days after, radial growth of *F. axysporum* f.sp. *ciceri* was measured in(mm).

F. axysporum f.sp. *ciceri* was multiplied on sand maize meal medium (9:1) and fungal biocontrol agent were multiplied on wheat bran sand medium(1:9). *F. axysporum* f.sp. *Ciceri* and antagonists were added in quantities (1:1) in 15 cm plastic pots filled with sterilized soil. Surface sterilized seed of chickpea (JG 62) with 0.1% mercuric chloride for 2 minute, were sown in each pot. Observation on wilt incidence was recorded at 30, 45and 60 days after sowing.

RESULTS AND DISCUSSION

Antagonistic potential of different biocontrol agent was noted in dual culture (Table 1). Bioassay test with these biocontrol agent revealed maximum zone of inhibition in case of *B. subtilis* followed by *T. viride*-2, *T.*

Table 1 : Antagonistic activity of fungal isolates against *Fusarism oxysporum* f. sp *ciceri*

Sr. No.	Anatogonists	Zone of Inhibition (mm)	Growth in control (m.m.)	Growth in treatment (m.m.)	Percent growth inhibition
1.	*Trichoderma viride – 1*	3.60	44.00	25.27	44.80
2.	*T. Viride – 2*	4.50	44.00	26.50	39.87
3.	*T. harzianum*	3.60	44.00	30.00	31.80
4.	*T. viride – 3*	3.30	44.00	32.90	25.20
5.	*Gliocladium virens*	2.60	44.00	33.57	23.70
6.	*Bacillus subtilis*	8.00	44.00	29.67	32.6
7.	Control	0.00	44.00	-	0.0

Table 2 : Effect of antagonists on seeding emergence wilt incidence of chickpea

Sr. No.	Anatogonists	Seedling emergence (%)	Wilt incidence (DAS)		
			30	45	60
1.	*Trichoderma viride – 1*	87.20	4.90	9.2	12.044.80
2.	*T. Viride – 2*	88.10	6.70	10.3	13.3
3.	*T. harzianum*	83.60	8.60	14.3	17.3
4.	*T. viride – 3*	80.80	7.90	12.6	15.8
5.	*Gliocladium virens*	76.40	11.80	16.9	25.7
6.	*Bacillus subtilis*	78.20	14.60	20.2	22.8
7.	Control	70.50	20.70	26.7	35.5
S.E. ±		2.27	0.87	0.80	1.27
C.D. (P=0.05)		7.01	2.68	2.46	3.92

harzianum-1, *T. harzianum*-2, *T.viride*-1 and *Gliocladium virnes*. The maximum (44.80%) growth of *F. axysporum* f.sp. *ciceri* was inhibited by *T. viride* - 1 followed by *T. viride* - 2, (39.87%), *B. subtilis* (32.60%), *T. harzianum* - 1 (31.80%), *T. harzianum* - 2 (25.20%) and *Gliocladium virnes* (23.70%), respectively. The results are in agreement with Sivan and Chet (1989) and Singh *et al*. (2002), where *Trichoderma* spp. were found to be highly antagonistic to *F. axysporum* f.sp. *ciceri.*

The result of the experiment on the seedling emergence and disease incidence at different stage of the crop growth. *T. viride*-2 resulted better seeding emergence (88.1%) followed by *T. viride*-1 (87.2%). (Table 2). The seeding emergence was significantly high in all treatments as compared to control. The disease incidence was very low in *T. viride*-1 with incidence of 4.9, 9.2 and 12.0% at 30,45 and 60 days after sowing as compared to control (20.70, 26.70 and 35.3%). These observations were in conformity with the finding of Kaur and Mukhopadhyay (1992), Parsed, *et al.* (2002) and Singh *et al.* (2002). Where as *T. viride*-1 treatment held promise – integrated management of Fusarium wilt in chickpea.

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REFERENCES

Elad, Y. and Chet, I. (1983). Improved selective media for isolation of *Trichoderma* spp. or *Fusarium* spp. *Phythoparasitica,* **11**:55-58.

Kaur, N.P. and Mukhopadhyay, A.N. (1992). Iintegrated control of chickpea wilt complex by *Trichoderma* and chemical method in India. *Tropical Pest Mgmt*., **38**: 372-375.

Lewis, J.A. and Papavizas G.C. (1980). Integrated control of Rhizoctonia fruit rot of cucumber. *Phytopathology,* **70**: 85-89.

Papavizas, G.C. (1985). Trichoderma and Gliocladium; Biology, ecology and potential for biocontrol. *Ann. Rev. Phytopathol*., **23**: 23-54.

Prasad, R.D., Rangeshwaran, R., Anuroop, C.P. and Rashmi, H.J.(2002). Biological control of wilt and root rot of chickpea under field conditions. *Ann. Pl. Protec. Sci.,* **10**(1): 72-75.

Selvarajan, R. and Jeyarajan, R. (1996). Inhibition of chickpea root rot pathogens, *Fusarium solani* and *Macrophomina phaseolina* by antagonists. *Indian J. Mycol & Pl. Pathol*., **26**: 248-251.

Singh, S.K., Singh, R.H. and Dutta, S. (2002). Integrated management of pigeonpea wilt by biotic agent and bio-pesticides. *Ann. Pl. Protec. Sci*., **10**(2): 323-326.

Sivan, A. and Chet, I. (1989). The possible role of competition between *Trichoderma harzianum* and *Fusarium oxysporum* on rhizosphere colonization. *Phytopathology*, **79**: 198-203.

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