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Efficacy of bioagent and different root extracts for supression of chickpea wilt *in vitro*

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In an attempt to study the effect of different root extract and bioagent against *Fusarium oxysporum* f.sp.*ciceri* in laboratory, least radial mycelial growth and maximum inhibition was recorded in sorghum root extract medium (28.00 mm and 54.34%), respectively, however, it was at par with groundnut root extract medium (30.00 mm and 51.08%) as compared to control (61.33 mm). In dual culture technique the growth of *Fusarium oxysporum* f.sp.*ciceri* was restricted by *Trichoderma viride* (56.16%) followed by *Trichoderma harzianum* (50.57%). *Trichoderma* lignorum gave minimum zone of inhibition (40.45%).

Key words : *Fusarium oxysporum* f.sp.*ciceri, Trichoderma* spp.,Root extract, Inhibition.

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is a native of Asian plant species grown as a pulse crop throughout tropical and subtropical Asia. Though India is a home of pulses yet they are to be imported from foreign countries because of low production and is mostly stagnant. There are various reasons for low yield of chickpea. Amongst them diseases play an vital role in reducing the yield. More than seventy pathogens have been reported on chickpea. *Fusarium oxysporum* f.sp. *ciceri*, *Rhizoctonia bataticola* and stunt are important (Zote and Dhutraj, 1996). Wilt (*Fusarium oxysporum* f.sp. *ciceri*) of chickpea is a major disease of almost worldwide distribution with wide spread host range inflicting considerable yield losses, (Nene *et al.,* 1996). Many of the workers reported the yield losses up to 10 per cent due to chickpea wilt,(Mathur *et al.*,1960; Singh and Dahiya,1973; Jani *et al.*,1999). Successful management of the disease by a single mean including fungicides seems to be a difficult proposition, warranting new management approach. Fungal antagonist (*Trichoderma* spp.) have exhibited promising control of soil/seed borne pathogens causing wilts, root rot in chickpea and other pulses (Mukhopadhyay, 1987; Kaur and Mukhopadhyay, 1993). Most of the workers also studied the antagonism *in vitro* by using bioagents (Moon *et al.*, 1988; Xu *et al.*, 1993) and by using root extracts of various crops (Satyaprasad and Rama Rao, 1983; Sahana *et al.*, 1987). Hence keeping in view, the present study was undertaken to study the efficacy of different means in suppression of chickpea wilt.

MATERIALS AND METHODS

Chickpea plants from Pulses Research Unit, Dr. Panjabrao Desh Mukh Krishi Vidyapeeth, Akola showing wilting symptoms *i.e.*, drooping of leaves and defoliating were gently uprooted and brought to the laboratory. The disease samples were subjected to isolation on Potato Dextrose Agar (PDA) medium. On the basis of morphological and cultural characteristics, the pathogen was identified as *Fusarium oxysporum* f.sp. *ciceri*. By frequent sub-culturing, the pathogen was purified and maintained on PDA.

Pure cultures of *Trichoderma* spp. were obtained from Agro-Product Development Research Centre (APDRC), Dr. P.D.K.V., Akola (M.S.). Autoclaved PDA was poured in 90 mm diameter Petriplates and allowed to solidify. Seven days old culture disc of 5 mm diameter of *Trichoderma* spp. were placed on four sides of plates and 6 mm disc of each *Fusarium oxysporum* f. sp. *ciceri*, was placed in centre of plates. This combination was replicated three times. The plates were incubated at room temperature. Observations on colony diameter of *Fusarium oxysporum* f. sp. *ciceri* hyperparasite growth of *Trichoderma* spp. and zone of inhibition between *Trichoderma* and *Fusarium* were recorded at 24 hrs. interval. Colony diameter was recorded in two marked directions passing through the centre of colony and means were worked out and per cent inhibition was calculated.

The work of effect of different crop root extract *Fusarium oxysporum* f. sp. *ciceri* was undertaken to study the influence of root extract of soybean, sunflower, udid, sorghum, groundnut and mung on the growth formation of *Fusarium oxysporum* f. sp. *ciceri*, a wilt of chickpea.

About 20 per cent host material *i.e.* root of above mentioned crops was used for preparation of extract agar medium. Each sterile plate was poured with 20 ml of respective root extract agar medium. After solidification duplicate plates of each medium were inoculated with a bit of mycelial growth of *Fusarium oxysporum* f. sp. *ciceri* from potato-dextrose agar (PDA) medium. Plates of PDA served as control. Observations on growth of *Fusarium oxysporum* f. sp. *ciceri* was recorded after seven days incubation at 28°C.

RESULTS AND DISCUSSION

The antagonistic effect of bioagents against *Fusarium oxysporum* f. sp. *ciceri* was assessed by zone inhibition technique *in vitro*. The results from Table 1 revealed that the growth of *Fusarium oxysporum* f. sp. *ciceri* was restricted upto 56.16 per cent by *T. viride* at 7 days followed by *T. harzianum* (50.57 %). *T. lignorum* yielded minimum zone of inhibition *i.e.* 40.45 per cent. The inhibitory effect was probably due to competition or antibiosis. Various workers like Moon *et al.* (1988) found that *T. harzianum* and *T. viride* were highly antagonistic to *Fusarium oxysporum* spp. in dual culture and inhibited mycelial growth. Xu *et al.* (1993) reported that isolates of *Trichoderma* spp. inhibited hyphal growth of *Fusarium oxysporum in vitro*. Kanase (2003) who observed antagonistic action of bio-agents *viz.*, *T. viride*, *T. harzianum*, *T. koningii* and *T. lignorum* with control against *F. oxysporuum*. Highest per cent inhibition was recorded in *T. viride* followed by *T. harzianum* at 7 days. Similar results were also reported by Jha and Singh (1997).

From Table 2 it was revealed that the effect of different crop root extract on *F. oxysporum* f. sp. *ciceri* was significant. Highest growth of fungus *i.e. Fusarium oxysporum* f. sp. *ciceri* was recorded on PDA culture medium (control). All the root extracts used as medium for growth of *Fusarium* were recorded significantly less growth over normal medium (PDA). Least radial mycelial growth (28.00mm) and maximum inhibition (54.34%) was recorded in sorghum root extract medium however, it was at par with groundnut root extract. The present findings clearly indicated the presence of some fungitoxic principles in root exudates which allow limited germination and hyphal growth. Similar results were obtained by Satyaprasad and Rama Rao (1983) who reported that root exudates stimulated the mycelial growth, conidial and chlamydospore germination of *Fusarium oxysporum* f. sp. *ciceri*. Sahana *et al.* (1987) also observed differential effects of root exudates from chickpea cultivar on vascular wilt pathogen *Fusarium oxysporum* f. sp. *ciceri*. These findings are also in conformity with the results reported by Schroth and Snyder (1961), Boyd *et al.* (1973), Kolte and Shinde (1973) and Singh *et al.* (1989).

Table 1 : Efficiency of different *Trichoderma* spp. against *Fusarium oxysporum* f. sp. *ciceri in vitro*

Sr. No.	Treatments	Mean colony diameter (mm)	Per cent growth inhibition
1.	*T. koningii*	15.00	49.42
2.	*T. harzianum*	14.66	50.57
3.	*T. viride*	13.00	56.16
4.	*T. lignorum*	17.66	40.45
5.	Control	29.66	-

Table 2 : Effect of different crop root extracts on *F. oxysporum* f. sp. *ciceri* (Colony diameter after 7 days in mm)

Sr. No.	Treatments	Mean colony diameter (mm)	Per cent growth inhibition
T_1	Sorghum	28.00	54.34
T_2	Groundnut	30.00	51.08
T_3	Soybean	34.00	44.56
T_4	Sunflower	32.00	47.82
T_5	Mung	33.66	45.11
T_6	Udid	32.66	46.75
T_7	Control	61.33	-
	F' test	Sig.	
	S.E. ±	1.17	
	C.D. (P=0.01)	3.29	

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