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In vitro evaluation of fungicides and biopesticides against pathogens of pea diseases

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Abstract

***In vitro* evaluation of fungicides against *Sclerotinia sclerotiorum*, *Ascochyta pisi* and *Fusarium oxysporum* f.sp. *pisi* revealed that the fungicides FR2, mancozeb-75, carbendazim, Uthane M-45, Indofil M-45 Safal, Ridomil MZ and Companion resulted in maximum inhibition (99.78%) of mycelial growth of *S. sclerotiorum* at 0.1 and 0.5% whereas Carbendadazim, Indofil M-45 and Bavistin were the most effective giving complete inhibition (100%) in the mycelial growth of *Fusarium oxysporum*, f. sp. *pisi*, at both the concentrations. Against *Ascochyta pisi*, carbendazim, Uthane M-45, Indofil M-45, Safal Z-78, Ridomil MZ and Companion exhibited maximum inhibition of mycelial growth (99.78%). Among the five Neem based biopesticides, Wanis @ 0.1 and 0.5% was most effective against *F. oxysporum* f. sp. *pisi*, and inhibited the growth by 71.29 % and 80.29 % and *F. solani* f. sp. *pisi* by 86.28 and 91.57 % respectively.**

Introduction

Garden pea (*Pisum sativum* L.) is an important vegetable crop of India. In Himachal Pradesh, it is especially grown as off season vegetable. However it is subjected to many diseases but white rot (*Sclerotinia sclerotiorum*), root rot / wilt complex (*Fusarium oxysporum*, f sp. *pisi*, *F. solani* f. sp. *pisi*) and Ascochyta blight (*Ascochyta pisi*) are serious diseases causing heavy losses to growers especially root rot/ wilt disease complex (Kapoor *et al.* 2005). White rot has been reported to cause 2 to 40 per cent losses (Singh *et al.* 2002). Ascochyta blight may cause yield losses up to 40 per cent but in blight phase alone it may go up to 60 per cent (Bretag *et al.* 1995, Tivoli *et al.* 1996). Yield losses due to pea root rot complex have been estimated at more than 70 per cent in years when disease is severe (Hwang *et al.* 1991, Tu, 1991).The use of fungicides is one of the methods for combating the diseases and growers are still relying upon on them. However, due to some adverse effects on the environment and ecosystem, their usage is being discouraged. The possibility of use of biopesticides therefore, has been exploited against a number of diseases including white rot of pea (Kapil and Kapoor, 2005). Hence there is a need for evaluation of biopesticides against the pathogens of pea root rot complex.

Material and Methods

Eight fungicides viz; Carbendazim, Uthane M-45 (mancozeb), Indofil M-45 (mancozeb), FR1 (mancozeb) and FR2 (mancozeb) Mancozeb -75 , Companion (carbendazim 12% + mancozeb 63%), Indofil Z-78 (zineb), with standard check Bavistin 50 WP (carbendazim) were evaluated at two concentrations i.e. 0.1 and 0.5 per cent against *Fusarium oxysporum* f.sp. *pisi* . Two additional fungicides viz., Safal (carbendazim 12%+ mancozeb 63%) and Ridomil MZ (metalaxyl 8% + mancozeb 64%) were also evaluated along with the already tested fungicides against *S. sclerotiorum* and *A. pisi* at same two concentrations. Five neem based biopesticides viz., Wanis, Spictaf, Neemgold (M/S Southern Petrochemical Industries Corporation Ltd. Chennai-600116), Achook (M/S Godrej Agro Ltd. Sachin , Surat Gujarat) and Neem Azal (M/S EID Parry's India Ltd., Chennai - 600116), were evaluated at two concentrations (0.1 and 0.5 per cent) against *F. oxysporum* f.sp. *pisi* and *F.solani* f.sp. *pisi*. All these fungicides and biopesticides were evaluated by using poisoned food technique (Dhingra and Sinclair, 1994).

Results and Discussion

Fungicides i.e., Carbendazim, Bavistin, and Indofil M-45, showed maximum inhibition of mycelial

growth (100 %) of *F. oxysporum* f.sp. *pisi* at 0.1 and FR1, FR2 and Companion at 0.5% (Table1). Indofil Z-78 was least effective. Fungicides FR2, Mancozeb-75, Carbendazim, Uthane M-45, Indofil M-45, Safal, Ridomil MZ and Companion showed maximum inhibition of mycelial growth (99.78 %) of *S. sclerotiorum* and *A. pisi* at 0.1 and 0.5 per cent (Table 2).

Table 1. *In vitro* evaluation of fungicides against *Fusarium oxysporum* f. sp. *pisi*

Treatment	Per cent inhibition at concentration	
	0.1	0.5
Carbendazim	100.00 (90)	100.00 (90)
Uthane M-45	52.45 (46.38)	59.73 (50.59)
Indofil M-45	100. 00(90)	100.00 (90)
Mancozeb -75	11.68 (19.91)	67.78 (55.37)
Companion	93.50 (75.23)	100 .00(90)
Indofil Z-78	0. 02 (1.81)	45.45 (42.36)
FR1	14.82 (22.63)	100.00 (90)
FR2	17.90 (25.03)	100.00 (90)
Bavistin	100.00 (90)	100.00 (90)
Control	-	-
CD (P =0.05)	2.38	5.05

Figures in parentheses are angular transformed values

Table 2. *In vitro* evaluation of fungicides against *Sclerotinia sclerotiorum* and *Ascochyta pisi*

Treatment	*S. sclerotiorum*		*A. pisi*	
	Per cent inhibition at conc.		Per cent inhibition at conc.	
	0.1	0.5	0.1	0.5
FR1	27.60 (31.56)	37.49 (37.72)	61.60 (51.69)	75.20 (60.15)
FR2	99.78 (87.28)	99.78 (87.28)	68.80 (56.10)	85.60 (67.86)
Mancozeb-75	99.78 (87.28)	99.78 (87.28)	60.00 (50.76)	70.40 (57.09)
Carbendazim	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)
Uthane M-45	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)
Indofil M-45	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)
Safal	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)
Ridomil MZ	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)
Companion	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)	99.78 (87.28)
Control	—	—	—	—
CD (P =0.05)	2.44	1.31	2.56	3.23

Figures in parentheses are arc sine transformed values

Several fungicides viz; benomyl, chlorothalonil, thiophanate methyl, iprodione and dicloran have been documented to be effective against *S. sclerotiorum* (Tu, 1997). Kraft and Papavizas (1983) reported pea seed treatment with metalaxyl significantly reduced the population of *F.solani* f.sp. *pi*si and *Pythium ultimum* in resistant variety.

Out of five, Neem based biopesticides evaluated against *F oxysporum*, f.sp. *pisi* and *F.solani* f.sp. *pisi* under *in vitro* conditions, revealed that Wanis @ 0.1 and 0.5% was most effective against both the pathogens. It inhibited the mycelial growth of *F. oxysporum* f. sp. *pisi*, by 71.29, 80.29 and *F. solani* f. sp. *pisi* by 86.28 and 91.57 per cent at 0.1 and 0.5% respectively (Table 3). Neem Azal was the least effective biopesticide in inhibiting mycelial growth of *F. oxysporum* f.sp. *pisi*.

Neem derivatives have been reported to act as insecticides, nematicides, fungicides etc. (Shanker and Parmar, 1999). Kak (2000) reported good control of *F. oxysporum, F. solani, R. solani* and *S. sclerotiorum* which attack many crops including pea and potato. Kapil and Kapoor (2005) also found Wanis as the most effective in inhibiting mycelial growth and sclerotial germination of *S. sclerotiorum*.

Table 3. *In vitro* evaluation of biopesticides against *Fusarium oxysporum* f. sp. *pisi* and *F. solani* f.sp. *pisi*

Treatment	*F. oxysporum* f. sp. *pisi*		*F. solani* f. sp. *pisi*	
	Per cent inhibition at conc.		Per cent inhibition at conc.	
	0.1	0.5	0.1	0.5
Wanis	71.29 (57.54)	80.29 (63.58)	86.28 (68.19)	91.57 (73.05)
Spictaf	46.64 (43.05)	60.55 (51.06)	50.94 (45.52)	60.02 (50.77)
Neemgold	47.33 (43.45)	62.70 (52.36)	50.35 (45.17)	61.22 (51.47)
Achook	55.09 (47.87)	71.87 (57.92)	46.95 (43.22)	46.43 (42.43)
Neem Azal	28.16 (32.01)	48.79 (44.25)	27.55 (31.63)	42.87 (40.86)
Control	—	—	—	—
CD (P=0.05)	2.59	4.59	3.68	5.94

Figures in parentheses are arc sine transformed values.

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