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RESEARCH ARTICLE

Efficacy of fungicides and plant extracts against Fusarium wilt in fenugreek

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ABSTRACT

Four fungicides and five plant extracts were evaluated *in vitro* for their efficacy in enhancing the seed germination and seedling vigour and in reducing pre-and post-emergence mortality by seed treating method against seed borne *Fusarium oxysporum* Schlecht, causing wilt in fenugreek. Seed treatment with Bavistin @ 1.5g / kg seed and Neem leaf extract @ 5 ml/ 10g seed significantly enhanced seed germination, seedling vigour by preventing pre-and post-emergence mortality over control.

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INTRODUCTION

Fenugreek (*Trigonella foenum-graecum*), an annual legume native to the Mediterranean region, locally known as *Methi*, is cultivated not only as a leafy vegetable but also for medicinal purposes (Som and Maity, 1993). It is cultivated in countries like India, Argentina, Egypt, Southern France, Morocco and Lebanon. Green methi is a good source of iron (Fe) as well as other minerals for human beings (Chhibba *et al*., 2000). Diseases are the major constraints to the production of fenugreek. Among the diseases, wilt caused by *Fusarium oxysporum* Schlecht is serious threat and its frequency varies between 40 and 60 per cent. Young plants are more susceptible than older ones. At seedling stage, the recorded rot incidence was 50–75 per cent. The use of chemicals for managing the disease is expensive and often leads to environmental pollution, development of fungicide resistant strains of the pathogens and upset of the biological equilibrium in soil (Singh, 1984). In the latest ecosystem approach on integrated pest management, biological control has become the basic component. To alleviate these ill effects, introduction of environmentally safe long lasting and ecofriendly bioagents are highly essential in the present and future plant disease management strategies. Therefore, the present study was taken up in this area to develop an eco-friendly disease management strategy in fenugreek.

MATERIALS AND METHODS

Leaf extracts of each plant (neem, aak, tulsi, ardu and garlic 5 ml/10 g) leaves and cloves were prepared separately by washing the leaves, chopping and grinding them in a pastle and mortar with the addition of cold water at the ratio of 1 : 2 (1 part of leaf : 2 parts of water). The extracts were squeezed through cotton wool and used immediately (Alice, 1984). Seeds were soaked for 30 minutes (Jacob and Sivaprakasam, 1994). In case of fungicides, aparently healthy surface sterilized seeds of fenugreek were artificially inoculated with 10 days-old culture of *Fasarium oxysporum*. Inoculated seeds were treated with four fungicides (Bavistin, (1.5g/kg), Captan, (2.5g/kg), Raxil (1.5g/kg) and Thiraum (2.5g/kg). The treated seeds were placed on moistened blotting papers in Petridishes at the rate of 20 seeds per Petridish with 4 replications for each treatment. Inoculated untreated seeds served as control. After 15 days

of incubation at 22±1°C with 12 hours of light alternating with 12 hours of dark period, the observations were recorded on seed germination, pre-and post-emergence mortality and root and shoot length. Vigour index was calculated by the following formula as suggested by Abdul Baksi and Anderson (1973):

Vigour index = germination (%) x [root length + shoot length]

RESULTS AND DISCUSSION

The plant leaf extract showed fungicidal/ fungistatic property against seed borne *Fusarium oxysporum* and indicated that seed treated with leaf extracts of all the plants tested gave significantly higher per cent of seed germination rangeing from 55.50 to 75.00 per cent in comparison to control (65.00%). Maximum per cent seed germination (75.00%), pre- and post-emergence mortality (0.0%) and vigour index (450.00%) was observed in seed treated with leaf extract of Neem followed by garlic and tulsi with moderately seed germination (70.50% and 59.20%) pre-and post-emergence mortality (12.50%, 4.50% and 14.00%, 3.25%) and vigour index (387.75% and 309.75%), respectively. While it was minimum in control (Table 1). Several plant extracts have been reported to increase the seed germination and vigour index by reducing the pre-and post-emergence mortality in several crops including fenugreek (Bagri *et al*., 2004; Yadav, 2008).

Seed germination was enhanced by Bavistin (Carbendazim) seed treatment (92.20%) which was found significantly superior to other fungicides used. Thiram (91.00%) and Raxil (Tebuconazol) (90.32%) were next in superiorily in improving germination and were found at par in their fungicidal efficacy followed by captan (88.00%). In case of preventing pre emergence mortality, Bavistin (0.59%) was found significantly superior than other fungicides. Thiram (1.20%) ranked second followed by Raxil (1.92%) and Captan (2.20%). In reducing post-emergence mortality, Bavistin (0.00%) was found significantly superior than other fungicides. Raxil (1.50%) and Thiram (1.70%) were ranked second followed by Captan (3.20%). Seed vigour index was increased by seed treatment with Bavistin (746.82), Thiram (733.46) and Raxil (660.00). All the fungicides were found to be significantly superior over control (Table 2). Among all the seed dressing fungicides tested, Bavistin (Carbendazim) and Thiram were found to be the most effective against *Fusarium oxysporum in vitro* conditions. Bavistin gave highest percentage of seed germination and minimum pre-and post-emergence mortality with less number of seedlings showing symptoms followed by Thiram, Raxil, and Captan. Bavistin and Thiram have been reported to be best seed dressers against seed-borne *Fusarium*

Table 1: Effect of seed treatment with plant extracts against *Fusarium oxysporum* on seed germination, pre- and post-emergence mortality and vigour index (*in vitro*)

Sr. No.	Treatments	Plant part used	Dose	Germination %	Per cent mortality		Root length (cm)*	Shoot length (cm)*	Vigour index
					Pre-emergence	Post-emergence			
1.	Neem (*Azadirachta indica*)	Leaves	5.0	75.00	0.00	0.00	3.20	2.80	450.00
			ml/10 g	(60.00)	(0.00)	(0.00)			
2.	Garlic (*Allium sativum*)	Leaves	5.0	70.50	12.50	4.50	3.00	2.50	387.75
			ml/10 g	(57.10)	(20.70)	(12.25)			
3.	Tulsi (*Ocimum sanctum*)	Leaves	5.0	59.00	14.00	3.25	2.65	2.60	309.75
			ml/10 g	(50.18)	(30.97)	(30.31)			
4.	Ardu (*Ailianthus excelsa*)	Leaves	5.0	69.20	10.23	4.75	2.50	2.25	328.70
			ml/10 g	(56.29)	(18.63)	(12.52)			
5.	Aak (*Calotropis procera*)	Cloves	5.0	55.50	16.50	2.00	2.50	2.80	294.15
			ml/10 g	(48.16)	(23.97)	(8.13)			
6.	Control (artificially treated	-	-	65.00	20.50	18.40	2.15	2.10	276.25
	seed)			(53.73)	(26.92)	(25.46)			
	S.E.±			0.87	0.31	0.18	0.04	0.03	5.80
	C.D. at 5%			2.57	0.91	0.54	0.13	0.09	17.17

* Average based on emerged seedlings

Figures given in parentheses are angular transformed values

Table 2 : Effect of fungicidal seed treatment against *Fusarium oxysporum* on seed germination, pre and post emergence mortality and vigour index (*in vitro*)

Sr. No.	Treatments	Dose (g)	Germination %	Per cent mortality		Root length (cm)*	Shoot length (cm)*	Vigour index
				Pre- emergence	Post-emergence			
1.	Bavistin	1.5	92.20	0.59	0.00	4.20	3.90	746.82
			(73.78)	(4.05)	(0.00)			
2.	Captan	2.5	88.00	2.20	3.20	3.80	3.70	660.00
			(69.73)	(8.53)	(10.31)			
3.	Raxil	1.5	90.32	1.92	1.50	4.00	3.90	729.31
			(71.85)	(7.92)	(7.04)			
4.	Thiram	2.5	91.00	1.20	1.70	3.96	4.10	733.46
			(72.54)	(6.29)	(7.49)			
5.	Control (artificially	-	65.66	20.55	25.40	2.10	2.10	275.77
	treated seed)		(54.09)	(26.92)	(25.40)			
	SEm±		1.23	0.18	0.16	0.09	0.06	10.42
	C.D. at 5%		3.70	0.54	0.49	0.28	0.17	31.30

* Average based on emerged seedlings Figures given in parentheses are angular transformed values

oxysporum of fenugreek by Champawat and Sharma (2007), Singh *et al*. (2006), Rahman *et al*. (2005).

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