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Evaluation of fungicides as seed tratment against coriander wilt disease caused by *Fusarium oxysporum* f.sp. *corianderii*

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ABSTRACT

Among all the tested fungicides, complete inhibition of the fungal growth *i.e.* 100.00 per cent was recorded with Bavistin (carbendazim) at 200 ppm and 500 ppm the tested concentrations. The next best fungicides in order of fungal growth inhibition were Carbendazim + Mancozeb (companion), Topsin-M (thiophanate methyl), Vitavax (carboxin + thiram) and Benomyl (benlate) which inhibited the fungal growth by Carbendazim was found significantly superior at 200 and 500 ppm with (100%) inhibition of mycelial growth followed by Companion and Topsin- M at 500 ppm and with (100%). Seed treatment with Bavistin (carbendazim) resulted in lowest wilt incidence (10.39%) result showed that increase with seed yield 1011.15 kg/ha was recorded in Carbendazim followed by companion that showed wilt incidence of 12.22 per cent. Both these fungicides were found to be statistically at par with each other. Next effective seed dresser were Topsin-M and Vitavax that showed wilt incidence of 14.33 and 21.55 per cent, respectively. These fungicides were found to be at par with best fungicides. Seed treatment with Benomy were found to be least effective which showed wilt incidence of 24.15 per cent and decrease with seed yield 617.90 kg/ha was recorded both the years.

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INTRODUCTION

Coriander occupied prime place amongst the seed spices grown in northern India particularly in Rajasthan and Gujarat. In India, it occupies 543.20 thousand hectares area with annual production 523.90 thousand tonnes. The average productivity of coriander seed is 964 kg/ha (Anonymous, 2013-14). Disease can also be a serious problem in coriander crop. The main diseases are noted *Fusarium oxysporum* causes coriander wilt (Narula and Joshi,1963 and Srivastava, 1972). The disease well as soil borne and the pathogen has been found to survive on root surface in the form of macroconidia and chlamydospores (Mathur and Mathur, 1970). Its seed transmission has also been demonstrated (Singh *et al.*, 1972). The mycelium of the pathogen has

been observed in the embryo of cumin seed (Champawat, 1986).

MATERIAL AND METHODS

In vitro evaluation of fungicides against *F. oxysporum* f. sp. *corianderii* :

To study the efficacy of five fungicides against cumin wilt pathogen (*F. Oxysporum* f. sp. *corianderii*) *in vitro* (Table 1). "Poisoned Food Technique" (Nene and Thapliyal, 1979) was employed. Systemic fungicides were tested at 100,200 and 500 ppm, A 4 mm disc was cut aseptically from ten days old culture of the pathogen and was placed in center of each PDA poured Petri plate and these inoculated plates were incubated at 27 ± 1°C. After seven days of incubation, diameter of fungal growth was measured in each case, by averaging two diameter of fungal colony at right angle to one another and the per cent inhibition was calculated by using the following formula (Bliss, 1934):

$$I = \frac{C - T}{C} \times 100$$

where,

I = Per cent growth inhibition

C = Colony diameter in control (mm)

T = Colony diameter in treatment (mm).

In vivo evaluation of fungicides as seed treatment against cumin wilt disease :

With a view to know the efficacy of fungicides against under *in vivo* conditions, these fungicides were applied through seed treatment. The experiments were conducted during winter season of 2013-14 and 2014-15 at Agronomy farm, SKN College of Agriculture, Jobner in Randomized Block Design (RBD) with four replaction. Seeds of coriander variety RCr-435 were treated with different fungicides 2 g/kg seed in 100 ml Erlenmeyer flask and shaken thoroughly to give a uniform coating of respective chemicals and then air dried at room temperature. Chemical treated as well as untreated seeds were sown separately in plots containing *Fusarium* inoculated soil. The coriander seeds were sown in each plot. Each treatment was replicated four. The plots were irrigated on alternate day with uniform amount of water. Observations on disease incidence were recorded periodically upto 90 days after sowing.

RESULTS AND DISCUSSION

The findings of the present study as well as relevant discussion have been presented under the following heads:

In vitro evaluation of fungicides against *F. oxysporum* f. sp. *corianderii* :

In vitro efficacy of five fungicides *viz.*, Carbendazim, Carboxin + Thiram, Benomyl, Thiophanate methyl and Companion was tested at 100, 200, 500 ppm concentration against inhibition of mycelial growth of *Fusarium oxysporum*. The data presented in reveals that all the fungicides significantly inhibited the mycelial growth of *Fusarium oxysporum* as compared to check. Carbendazim was found significantly superior at 200 and 500 ppm with (100%) inhibition of mycelial growth followed by Companion and Topsin- M at 500 ppm and with (100%). As the concentration of fungicides increased, the inhibition of mycelial growth was also increased and maximum inhibition was observed at 500 ppm concentration. Fungicides and concentration interaction was also significant. Benomyl was least

Table 1 : *In vitro* efficacy of fungicides against *F. oxysporum* f.sp. *corianderii*

Fungicides	Per cent inhibition of mycelial growth* concentration (ppm)			Mean
	100	200	500	
Carbendazim	95.40 (77.62)	100.00 (90.00)	100.00 (90.00)	98.47
Carboxin + Thiram	80.42 (63.74)	84.91 (67.14)	100.00 (90.00)	88.44
Benomyl	72.10 (58.12)	74.29 (59.53)	85.50 (68.32)	77.29
Thiophanate methyl	84.12 (66.52)	91.90 (73.46)	100.00 (90.00)	92.00
Carbendazim + Mancozeb	86.00 (68.03)	96.30 (78.91)	100.00 (90.00)	94.10
Check	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00
S.E.±	0.87	0.86	0.97	
C.D. (P=0.05)	2.63	2.59	2.92	

* Average of four replications Figures given in parenthesis are angular transformed values

effective. The results presented in Table 1 reveal that all fungicides at different concentrations (100, 200 and 500 were also found inhibitory to fungal growth.

***In vivo* evaluation of fungicides as seed dresser against coriander wilt disease :**

Efficacy of five fungicides as seed dresser was tested at recommended dose 2 g/kg seed against wilt of coriander. Carbendazim was found significantly superior with (80.06%) disease control followed by Companion with (76.54%) disease control. Benomyl was least effective. It can be concluded that Carbendazim as seed dresser was most effective in controlling wilt of Coriander caused by *Fusarium oxysporum.* Two years pooled data on per cent disease incidence (Table 2) revealed that all the fungicides were significantly effective in reducing the wilt disease incidence over control (52.07 %). The minimum 10.39 per cent disease incidence was recorded with the application of Carbendazim by decreasing 80.06 per cent disease incidence. However, Companion was second best and recorded 12.22 per cent disease incidence by decreasing 76.54 per cent disease incidence. Thiophanate methyl and Carboxin + Thiram were found moderately effective where, 14.33 per cent, and 21.55 per cent, respectively disease incidence was recorded. Among the fungicides maximum 24.15 per cent disease incidence was recorded in the treatment of Benomyl, respectively. Mean analysis of two year seed yield data of coriander was found statistically significant over control. Result showed that maximum 1011.15 kg/ha seed yield was recorded in Carbendazim with increasing 187.61 per cent seed yield followed by Companion recorded 956.85 kg/ha seed yield with increasing 107.54 per cent seed yield. Carboxin + Thiram and Thiophanate methyl recorded 729.65 kg/ha and 686.65 kg/ha seed yield. Minimum 351.58 kg/ha seed yield was recorded in control. Among the five fungicides, Carbendazim, was observed highly superior over other fungicides and recorded minimum 10.39 per cent disease incidence by decreasing 70.94 per cent disease incidence and maximum 1085.15kg/ha seed yield. Companion was observed second best and recorded 12.22 per cent disease incidence and 976.85kg/ha seed yield. Kala *et al*. (2013) evaluated against *F. oxysporum* under in field condition disease incidence was minimum in Carbendazim seed treatment followed by carboxin+thiram.

Mailem *et al*. (2015) was found Carbendazim (0.1%) and Tebuconazole (0.1%) were found superior in completely inhibiting *Fusarium oxysporum* f.sp. ciceri at recommednded dosages. Raheja and Patel (2011), reported that under *in vivo*, seed treatment with Carbendazim resulted in highest seed germination and lowest cumin wilt incidence followed by Sixer. Singh *et al*. (2005), the seeds treated with Bavistin gave higher percentage of seed germination (94%) and minimum pre- and post-emergence mortality (0.66 and 0.10%) with less number of seedlings showing symptoms. Singh (2009) observed that two fungicides Carbendazim (0.1%) and Mancozeb (0.25%) at 45 DAS was found effective for control of coriander wilt and also increase seed yield. Bansal (2003) tested Carbendazim, Mancozeb, Captan, Thiram and Topsin M at 0.2 per cent concentration against *F. oxysporum* inducing fenugreek wilt under pot conditions. Carbendazim was found significantly effective followed by Mancozeb. Rana *et al*. (2005) reported that carbendazim was most effective in

Table 2 : Effect of seed treatment with fungicides on wilt disease incidence and seed yield of coriander under field condition

Fungicides	Dose (g/kg seed)	Per cent disease incidence*			Decrease in PDI over control (%)	Yield(kg/ha)*			Increase in yield over control (%)
		2013-14	2014-15	Pooled		2013-14	2014-15	Pooled	
Carbendazim	2.0	11.55 (19.87)	9.22 (17.68)	10.39 (18.80)	80.06	1002.30	1020.00	1011.15	187.61
Carboxin + Thiram	2.0	22.80 (28.52)	20.30 (26.78)	21.55 (27.66)	58.61	672.40	700.90	686.65	95.31
Benomyl	2.0	24.70 (29.80)	23.60 (29.06)	24.15 (29.43)	53.62	607.50	628.30	617.90	75.75
Thiophanate methyl	2.0	16.22 (23.75)	12.44 (20.65)	14.33 (22.24)	72.48	716.20	743.10	729.65	107.54
Carbendazim + Mancozeb	2.0	13.25 (21.35)	11.18 (19.53)	12.22 (20.46)	76.54	917.20	996.50	956.85	172.16
Control		53.40 (46.95)	50.74 (45.42)	52.07 (46.19)		335.25	367.90	351.58	
S.E.±		0.67	0.69	0.74		24.13	27.58	22.01	
C.D. (P=0.05)		2.01	2.08	2.23		72.72	83.13	66.34	
C.V. (%)		5.63	6.50	6.60		6.81	7.43	6.07	

*Average of four replications, Figures in parentheses are angular transformed values

increasing seed germination, seedling stand and reducing the wilt incidence in okra. They also reported that among the other seed treatments with fungicides SAAF (carbendazim + mancozeb) was found to be significantly superior over mancozeb and thiram. Champawat (1990) reported that among the 10 fungicide tested under *in vitro* and *in vivo* against the cumin wilt pathogen, Bavistin (carbendazim) and RH 893 (thiophanate methyl) were the most effective in inhibiting the growth of pathogen under *in vitro* and in increasing the seed germination and seedling vigour under *in vivo*. Agnihotri and Sharma (1987) have reported carbendazim and thiram as best seed dressers against *F. oxysporum* f. sp. *cumini*. The present findings are in corroboration with the above mentioned earlier findings. Thus, it can be concluded from the above study that among the five tested fungicides Bavistin and Sixer can be promisingly used as seed dresser in managing the coriander wilt disease and increasing theseed yield.

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