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In vitro efficacy of fungicides against *Fusarium oxysporum* f. sp. *cumini* causing wilt of cumin

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Abstract
A laboratory experiment was conducted to find out efficacy of different fungicides against *Fusarium oxysporum* f. sp. *cumini* causing wilt of cumin using poisoned food technique. Among different fungicides tried, significantly the maximum mycelial growth inhibition (99.98 per cent) of *F. oxysporum* f. sp. *cumini* was recorded in the treatment of carbendazim 25% + mancozeb 50% WS. The next effective fungicide found was carbendazim 50% WP with mean mycelial growth inhibition of 85.70 per cent. Whereas, copper oxychloride 50% WP found the least effective fungicide with mean mycelial growth inhibition of 43.06 per cent.

Keywords: Cumin, *F. oxysporum* f. sp. *cumini*, fungicides, cumin wilt

Introduction
Cumin is an important *rabi* spice crop of Saurashtra and North Gujarat regions. The crop is known to affect by soil borne fungal pathogen *Fusarium oxysporum* f. sp. *cumini* causing wilt disease. The yield losses of 7.0 to 30.6 per cent has been noticed in Gujarat (Dange *et al.*, 1992) [4] due to this disease. Some districts of Rajasthan reported yield losses up to 35 per cent in cumin (Vyas and Mathur, 2002) [10]. The fungus is widely distributed soil inhabitant known to be phylogenetically diverse. The disease manifests at any crop growth stage, right from the seedling stage and continues up to maturity of the crop. But the severity of wilt increases with the plant age. The affected plant shows characteristic drooping of the leaves, branches and drying. The split open root exhibited brownish coloured vascular bundles. Certain fungicides are found effective for inhibiting the mycelial growth of the pathogen under laboratory condition. The present study was carried out to evaluate efficacy of different fungicides against *Fusarium* wilt pathogen of cumin under laboratory condition.

Materials and Methods
Isolation and purification of pathogen
The typical wilt affected cumin plants were collected from different parts of Saurashtra and Ghed area of Gujarat and brought to the laboratory. Isolation of the fungus was made by tissue isolation technique on potato dextrose agar (PDA) and incubated at 28±2° C. The resulting fungal culture was purified aseptically by hyphal tip method. The purified culture was used for evaluation of different fungicides under laboratory condition.

In vitro evaluation of different fungicides against test pathogen
An experiment was laid out to evaluate efficacy of different fungicides with three repetitions in completely randomized design using four systemic fungicides *viz*, carbendazim 50%WP, kresoxim methyl 44.3% SC, propiconazole 25% EC and validamycin 3% SL with four concentrations (50, 100, 250 and 500 ppm); three non-systemic fungicides *viz*, captan 50% WP, chlorothalonil 75% WP and copper oxychloride 50% WP with four concentrations (500, 1000, 1500 and 2000 ppm) and three ready-mix fungicides *viz*, carbendazim 25% + mancozeb 50% WS, carboxin 37.5% + thiram 37.5% SD and tebuconazole 50% + trifloxystrobin 25% WG with four concentrations (100, 250, 500 and 1000 ppm) against cumin wilt pathogen under laboratory condition.
Mycelial growth inhibition activities of different fungicides were tested against *F. oxysporum* f. sp. *cumini in vitro* by employing poisoned food technique of Bagchi and Das (1968) [1] using potato dextrose agar (PDA) as a germinating medium. Appropriate quantity of each fungicides

required were incorporated into autoclaved PDA medium before solidification and then medium were poured into sterilized Petri plates (90 mm dia.) in equal quantity (20 ml per Petri plate) to form a uniform layer.

An actively growing mycelial bit of 4 mm diameter was transferred aseptically in inverted position over the solidified PDA medium containing Petri plates in the centre. The Petri plates were incubated at 28±2 ºC till control plate attains full growth and observations were recorded on linear mycelial growth in treated and control plates. Inoculated Petri plates containing PDA medium without fungicides was served as control. Per cent inhibition of the growth of the fungus over the control was calculated by using the following formula (Vincent, 1947) [9].

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

Where,

I = Per cent inhibition of growth of test pathogen

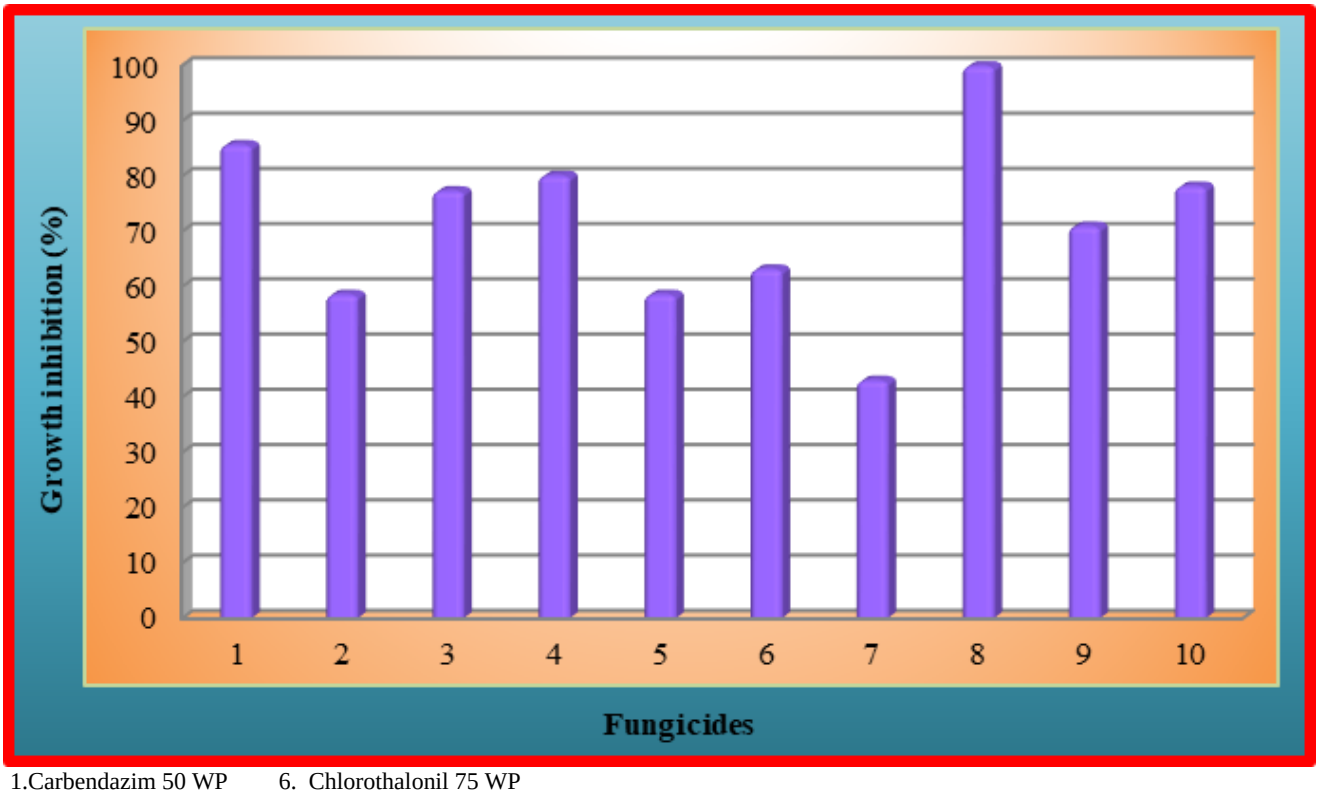
C = Radial growth (mm) in control plate

T = Radial growth (mm) in treated plate

Results and Discussion

The perusal of data (Table 1) revealed that all the fungicides at all concentrations reduced mycelial growth of *F. oxysporum* f. sp. *cumini in vitro.* It is evident from the data presented in Table 1 and Fig. 1 that significantly the maximum mycelial growth inhibition (99.98 per cent) of *F. oxysporum* f. sp. *cumini* was recorded in the treatment of carbendazim 25% + mancozeb 50% WS. The next effective fungicide found was carbendazim 50% WP with mean mycelial growth inhibition of 85.70 per cent. The fungicide validamycin 3% SL found moderately effective in inhibiting the mean mycelial growth of the pathogen (80.14 per cent). Tebuconazole 50% + trifloxystrobin 25% WG on the other hand exhibited 78.20 per cent mean mycelial growth inhibition of the pathogen but it was remained statistically at par with propiconazole 25 EC with 77.36 per cent mean mycelial growth inhibition. Whereas, copper oxychloride 50% WP found the least effective fungicide with mean mycelial growth inhibition of 43.06 per cent.

The present findings are in close conformity with the similar type of results reported by Champawat (1990) [3], Gangopadhyay *et al*. (2009) [5] and Bardia and Rai (2007) [2] during their *in vitro* study. They revealed maximum inhibition of mycelial growth of *F. oxysporum* f. sp. *cumini* using carbendazim and thiophanate-methyl even at lowest concentration. Similarly, Raheja and Patel (2011) [7] reported complete inhibition of fungal growth in ready mix fungicide carbendazim+mancozeb and carbendazim against cumin wilt *in vitro.* Taskeen *et al*. (2011) [8] also found mancozeb as the most effective in reducing mycelia growth of the fungi followed by captan and zineb using poisoned food technique under laboratory condition among non-systemic fungicides. Jat and Ahir (2017) [6] also found complete inhibition of the fungal growth with carbendazim. While, carbendazim+mancozeb, thiophanate methyl, vitavax and benomyl have also inhibited the fungal growth significantly.



1.Carbendazim 50 WP
2.Kresoxim methyl 44.3 SC
3.Propiconazole 25 EC
4.Validamycin 3 SL
5.Captan 50 WP
6. Chlorothalonil 75 WP
7. Copper oxychloride 50 WP
8. Carbendazim 25% + mancozeb 50% WS
9. Carboxin 37.5% + thiram 37.5% SD
10.Tebuconazole 50% + trifloxystrobin 25% WG

Fig 1: *In vitro* evaluation of different fungicides against *F. oxysporum* f. sp. cumini

Table 1: *In vitro* evaluation of different fungicides against *F. oxysporum* f. sp. *Cumini*

Sr. No.	Fungicides	Concentration (ppm)	Mycelial growth inhibition (%)	Mean inhibition (%)
1.	Carbendazim 50 WP	50	66.39 (83.90)*	67.83 (85.70)
		100	67.24 (85.00)	
		250	68.14 (86.12)	
		500	69.53 (87.77)	
2.	Kresoxim methyl 44.3 SC	50	43.41 (47.22)	50.05 (58.61)
		100	45.96 (51.67)	
		250	54.74 (66.67)	
		500	56.10 (68.88)	
3.	Propiconazole 25 EC	50	58.20 (72.22)	61.69 (77.36)
		100	60.01 (75.00)	
		250	62.65 (78.89)	
		500	65.91 (83.33)	
4.	Validamycin 3 SL	50	57.84 (71.67)	63.70 (80.14)
		100	64.25 (81.11)	
		250	65.07 (82.23)	
		500	67.66 (85.55)	
5.	Captan 50 WP	500	46.60 (52.78)	50.06 (58.62)
		1000	47.23 (53.89)	
		1500	48.20 (55.57)	
		2000	58.20 (72.23)	
6.	Chlorothalonil 75 WP	500	48.20 (55.57)	52.71 (63.20)
		1000	50.78 (60.02)	
		1500	54.74 (66.67)	
		2000	57.14 (70.55)	
7.	Copper oxychloride 50 WP	500	33.56 (30.57)	40.92 (43.06)
		1000	36.94 (36.12)	
		1500	45.00 (50.00)	
		2000	48.19 (55.55)	
8.	Carbendazim 25% + Mancozeb 50% WS	100	89.19 (99.98)	89.19 (99.98)
		250	89.19 (99.98)	
		500	89.19 (99.98)	
		1000	89.19 (99.98)	
9.	Carboxin 37.5% + Thiram 37.5% SD	100	49.48 (57.79)	57.64 (70.97)
		250	56.44 (69.44)	
		500	60.01 (75.00)	
		1000	64.65 (81.67)	
10.	Tebuconazole 50% + Trifloxystrobin 25% WG	100	60.01 (75.00)	62.19 (78.20)
		250	61.88 (77.78)	
		500	63.05 (79.45)	
		1000	63.83 (80.55)	
	S. Em.±	0.40		
	C.D. at 5%	1.13		
	C.V.%	1.17		

* Data outside the parenthesis are arcsine transformed whereas inside are re-transformed values

References

1. Bagchi BN, Das CR. Studies on biological spectrum and sensitivity of some fungicides. Indian Phytopath. 1968; 21:394-400.
2. Bardia PK, Rai PK. *In vitro* and field evaluation of biocontrol agents and fungicides against wilt of cumin caused by *Fusarium oxysporum* f. sp. *cumini*. J Spices Arom. Cr. 2007; 16(2):88-92.
3. Champawat RS. Efficacy of fungicides against *Fusarium oxysporum* f. sp. *cumini*. J Phytol. Res. 1990; 3(1-2):133-136.
4. Dange SRS, Pandey RL, Savalia RL. Diseases of cumin and their management - A review. Agric. Rev. Karnal. 1992; 13:219-224.
5. Gangopadhyay S, Gopal R, Godara SL. Effect of fungicides and antagonists on *Fusarium* wilt of cumin. J Mycol. Pl. Pathol. 2009; 39(2):331-334.
6. Jat MK, Ahir RR. Management of coriander wilt through plant extracts and source of resistance. J Pharma. Phytochem. 2017; 6(4):1032-1035.
7. Raheja S, Patel RL. Evaluation of different fungicides as seed dressers against cumin wilt disease caused by *Fusarium oxysporum* f. sp. *cumini*. Pl. Dis. Res. 2011; 26(1):20-25.
8. Taskeen-Un-Nisa, Wani AH, Bhat MY, Pala SA, Mir RA. *In vitro* inhibitory effect of fungicides and botanicals on mycelial growth and spore germination of *Fusarium oxysporum*. J Biopest. 2011; 4(1):53-56.
9. Vincent JM. Distortion of fungal hyphae in presence of certain inhibitors. Nature. 1947; 159:850.
10. Vyas RK, Mathur K. Distribution of *Trichoderma* spp. in cumin rhizosphere and their potential in suppression of wilt. Indian Phytopath. 2002; 55(4):451-457.