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National Academy of Agricultural Science (NAAS) Rating : 3.03

In vitro evaluation of fungicides against spore germination of *Leveillula taurica* causing powdery mildew in guar

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ABSTRACT: *The experiment on invitro evaluation of fungicides were taken in order to know their efficacy before taking into the field. Among the seven systemic fungicides propiconazole followed by penconazole showed the maximum inhibition of spore germination and least in carbendazim at 0.2 percent concentration. With respect to non systemic fungicides wettable sulphur showed the maximum inhibition of spore germination at 0.3 percent concentration.*

Key words*: Guar, fungicides, Leveillula taurica, powdery mildew*

INTRODUCTION

Guar (*Cyamopsis tetragonoloba*) crop is an annual plant, which can grow in extremely drought resistant conditions and can thrive in semiarid regions where most plants perish. The guar has a large endosperm, which contains significant amounts of guar gum, which is the primary marketable product of the plant. Guar is used as cattle feed and green manure and can be eaten as a green bean. India leads the list of the major guar producing countries of the world contributing to around 75 to 80 per cent in the world's total production by producing 7.5 lakh to 10 lakh tonnes.

The productivity of guar crop has been very low because it is highly susceptible to the diseases. It includes the diseases caused by fungi, bacteria and viruses, among the fungal diseases alternaria blight (*Alternaria cucumerina* var. *cyamopsidis*), powdery mildew (*Leveillula taurica*), bacterial blight (*Xanthomonas axanopodis* pv *cyamopsidis*) among bacteria and virus diseases like green sterile disease and top necrosis are important and cause economic losses [1].

Among the foliar diseases, powdery mildew caused by *Leveillula taurica* is an important disease causing an yield loss of 50-55 per cent. The disease manifests mainly on leaves and pods. Severely affected plants are defoliated and weakened by premature drying and death of infected leaves. The incidence of powdery mildew is more observed in the regions where crop season is prolonged. Warm temperature (33 ^{0}C or above), high humidity (more than 80 per cent) and bright sunshine are congenial conditions for disease development.

MATERIALS AND METHODS

In the absence of resistant cultivars, use of chemicals to control the disease is an age old practice. Availability of new chemicals necessitates evaluation of fungicides under *in vitro* conditions to know their efficacy, and initiate spray schedule in field conditions.

Present study involves the efficacy of seven systemic fungicides and five non systemic fungicides**.** Seven systemic fungicides at three concentrations (0.05, 0.075 and 0.1%) and Five non-systemic fungicides were tested at 0.1, 0.2 and 0.3 per cent concentrations were tested against *L. taurica* by spore germination technique. Required double strength concentrations were prepared by dissolving known quantity of fungicide in sterile distilled water separately under aseptic conditions. The conidial suspension was prepared separately in sterile distilled water and adjusted to 4 x 10^3 conidia/ ml. Then a drop of a spore suspension was mixed with one drop of fungicidal solution in a cavity slide to achieve the

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required concentration. In each treatment three replications were maintained. Slides were then incubated at room temperature (27 ± 1^{0}C) for 24 hour. The observation on spore germination was recorded 24 hour after incubation under microscope at 40x magnification. A control treatment was maintained with sterile water. Per cent inhibition of conidial germination was calculated by the following formula [2].

$$\text{Per cent inhibition of spore germination} = \frac{C-T}{C} \times 100$$

Where;

C = Germination of conidia in control

T = Germination of conidia in treatment

RESULTS AND DISCUSSION

Further, the data were statistically analysed and results are presented in Table (1 and 2). The results clearly indicated that effect fungicicides on the spore germination was significant.

In the present study, among seven systemic fungicides tested, maximum inhibition of conidial germination at 0.05, 0.1 and 0.2 per cent concentration

Table 1
Effect of systemic fungicides on per cent inhibition of conidial germination of *Leveillula taurica*

Sl. No.	*Fungicide*	*Per cent inhibition at different concentrations*			
		0.05	*0.1*	*0.2*	*Mean*
1.	Carbendazim	80.27	91.68	98.20	90.65
		(63.63)*	(73.43)	(82.29)	(73.14)
2.	Hexaconazole	91.24	97.09	100.00	96.11
		(73.05)	(80.57)	(90.00)	(81.21)
3.	Difenconazole	96.38	98.00	98.10	97.49
		(79.03)	(81.87)	(88.12)	(83.30)
4.	Propiconazole	99.38	100.00	100.00	99.79
		(86.77)	(90.00)	(90.00)	(88.92)
5.	Penconazole	96.61	100.00	100.00	98.87
		(79.81)	(90.00)	(90.00)	(86.60)
6.	Myclobutanil	95.08	99.21	100.00	98.09
		(77.36)	(84.96)	(90.00)	(84.11)
7.	Triadimefon	94.58	98.09	100.00	97.55
		(76.05)	(82.06)	(90.00)	(83.85)
	Mean	**93.36**	**97.72**	**99.94**	**97.02**
		(75.01)	**(81.30)**	**(88.60)**	**(80.06)**
		S.Em±		CD at 1 %	CV
Fungicides (F)		0.83		3.19	3.02
Concentration(C)		0.54		2.09	
F x C		1.44		5.28	

Table 2
Effect of non systemic fungicides on per cent inhibition of conidial germination of *Leveillula taurica*

Sl. No.	*Fungicide*	*Per cent inhibition at different concentrations*			
		0.1	*0.2*	*0.3*	*Mean*
1.	Mancozeb	86.67*	91.67	92.61	90.31
		(68.59)	(72.26)	(74.27)	(71.70)
2.	Wettable sulphur	86.76	93.26	94.09	91.37
		(68.66)	(74.59)	(76.05)	(73.22)
3.	Chlorothalonil	75.91	81.36	90.37	82.54
		(60.61)	(64.43)	(71.94)	(65.66)
4.	Copper oxychloride	36.97	48.15	54.27	46.46
		(37.45)	(43.94)	(47.45)	(42.95)
5.	Zineb	35.58	60.00	70.34	55.30
		(36.61)	(50.77)	(57.01)	(48.13)
	Mean	**64.37**	**74.88**	**80.33**	**73.19**
		(54.38)	**(61.27)**	**(65.34)**	**(60.33)**
		S.Em±		CD at 1 %	CV
Fungicides (F)		0.38		1.51	0.12
Concentration(C)		0.30		1.17	
F x C		0.67		2.62	

*Figures in parentheses are arc sine transformed values

was recorded in propiconazole. Further, propiconazole and penconazole fungicides at 0.1 per cent concentration were found to inhibit the conidial germination completely. At 0.2 per cent concentration all the fungicides were found to inhibit the conidial germination completely except carbendazim. However, triazole fungicides propiconazole, penconazole, difenconazole, hexaconazole and triadimefon were found to be best fungicides in reducing conidial germination. Among the five non systemic fungicides, maximum inhibition of conidial germination was observed in wettable sulphur at all the three tested concentrations (0.1, 0.2 and 0.3 per cent) which was followed by mancozeb and chlorothalonil. Least conidial inhibition was observed in copper oxychloride and zineb at all the concentrations.

The results are in agreement with several workers [3] reported that penconazole and difenconazole at 0.1 per cent were effective in reducing conidial inhibition of green gram powdery mildew, propiconazole at 0.1 per cent concentration was found to be effective in reducing conidial germination of pea powdery mildew [4]. The efficacy of triazole fungicides may be attributed to their interference with the biosynthesis of fungal sterols and inhibit ergosterol biosynthesis, but ergosterol is essential in the cell wall of many fungi. [5] reported kerathane and wettable sulphur as effective in complete inhibition of conidial germination at 0.3 per cent against grape powdery mildew.

Since, the present study results are based on *invitro* experiments, testing of these fungicides under field conditions is necessary before their recommendations.

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