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Management of Alternaria Blight Disease of Mustard through Nutrients and Fungicides

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A B S T R A C T

Alternaria blight of mustard caused by *Alternaria brassicicola* is one of the most wide spread and destructive disease of rapeseed-mustard. To manage the disease - nutrients and fungicides were tested against *Alternaria brassicicola*, causing Alternaria blight of mustard. Efficacy of five nutrients were tested through foliar spray. Out of five, potassium proved to be most effective against Alternaria blight followed by copper in reducing per cent disease intensity. Efficacy of five fungicides *viz.* (azoxystrobin+hexaconazole), carbendazim + mancozeb, mancozeb, propineb and copper oxychloride were tested in *in vitro* conditions by poisoned food technique showed that (azoxystrobin + hexaconazole) was found most effective in inhibiting mycelial growth of *Alternaria brassicicola* at 200 and 300 ppm concentration followed by mancozeb. Foliar application of (azoxystrobin + hexaconazole) (0.1%) was found effective in reducing disease intensity.

Introduction

Oilseed crops play an important role in agricultural economy of India. Oilseed Brassicas often called rapeseed-mustard placed in Brassicaceae family. Oilseed Brassicas are the third most important oil seed crop in terms of acreage and production after soybean and palm in the world and occupy second position after groundnut in India (Kumar and Chopra, 2014). Among rapeseed-mustard, Indian mustard is one of the most important which contribute about 85 per cent of total rapeseed-mustard produced in India (Kumar and Chauhan, 2005). Major Indian mustard growing states are Rajasthan, Madhya Pradesh, UP, Haryana, Punjab and Gujarat. It is also grown under some non-

traditional areas of South India including Karnataka, Tamilnadu and Andrapradesh. Indian contribution in global rapeseed-mustard production is 6.33 million tonnes with an area of 6.412 million hectares (Anonymous, 2017-18). In Rajasthan, rapeseed-mustard occupies a prime position amongst all the oilseed crops grown in state. Rajasthan ranks first both in area and production of rapeseed-mustard in the country. In Rajasthan, the mustard crop is mostly cultivated in Alwar, Bharatpur, Jaipur, Dholpur, Sawaimadhopur, Sriganganagar, Jhunjhunu and Sikar districts. It occupies 2.379 million hectares area with 3.588 million tonnes production (Anonymous, 2018-19).

The symptoms of *Alternaria* blight disease appears on leaves and stems of seedlings and adult plants and also in siliquae during the ripening stage. Dark spots on the leaves and siliquae reduce the photosynthetic capacity and induce immature ripening, which causes reduced amount of quality seed production in both vegetable and oleiferous Brassicas (Kumar *et al.*, 2014). Chadar *et al*. (2016) recorded 23.9 – 62.0 per cent disease intensity of leaf blight of mustard which occurred widely in Jhansi region of India.

Materials and Methods

Effect of nutrients on disease development

The experiment was carried out in earthen pots (30 cm dia.) with highly susceptible variety, Varuna (T-59) at SKN College of Agriculture, Jobner (Jaipur). All the experimental pots fertilized with the recommended dose of fertilizers. Five different treatments mentioned below including untreated control were applied in the form of chemical fertilizers. Nutrients were sprayed on plants at 40 days after sowing (DAS) while inoculation was done at 50 days after sowing. Per cent disease intensity was recorded 90 DAS.

Efficacy of fungicides (*In vitro)*

Efficacy of five systemic and non-systemic fungicides against growth of *Alternaria brassicicola* was tested by Poisoned Food Technique. Three different concentrations viz., 100, 200 and 300 ppm of each fungicide were tested. Weighted quantity of each fungicide was added in autoclaved PDA medium and mixed thoroughly. The poisoned medium was poured in sterilized Petri plates and allowed to solidify. Each plate was inoculated with 5mm disc of fungal culture and incubated at 25 ± 1^{0}C for seven days. The linear growth of the test fungus was recorded at 7^{th} day of incubation. A check was also maintained where fungicide was not added in the medium. Per cent inhibition of mycelial growth was calculated according to Vincent`s formula (1947).

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

Where, C=Diameter of the colony in control (Average of both diagonals)
T=Diameter of the colony in treatments (Average of both diagonals)

Efficacy of fungicides (*In vivo)*

Efficacy of fungicides against Alternaria blight of mustard was tested under cage house conditions. Mustard plants were raised in cage house of Department of Plant Pathology, S.K.N. College of Agriculture, Jobner. The experiment was carried out in earthen pots (30 cm dia.) with cultivar Varuna (T-59). Five fungicides were tested by foliar application at the time of disease initiation. Plants were inoculated by spraying with aqueous suspension of *Alternaria brassicicola* (2×10^3 spores/ml) at 40 DAS. PDI was recorded at 90 DAS. Per cent disease intensity (PDI) and per cent disease control (PDC) were calculated

using following formula suggested by Conn *et al.* (1990).

$$PDI = \frac{\text{Sum of rating of the leaves infected}}{\text{Number of leaves x maximum disease rating}} \times 100$$

$$PDC = \frac{\text{PDI in check} - \text{PDI in treatment}}{\text{PDI in check}} \times 100$$

Results and Discussion

Effect of nutrients on blight

Foliar application of nutrients gave promising results (Table 1) in minimizing per cent disease intensity at 90 days after sowing (DAS) and all were significantly superior over control. At 90 days after sowing (DAS), minimum disease intensity was observed with K (40.75 %) followed by Cu (43.75%), Zn (48.25%), B (53.28%), Fe (52.51%) over control (57.51%). Foliar application of nutrients were found effective in minimizing disease intensity. Among these, K and Cu were found highly effective in reducing disease severity which is also in accordance with the findings of Kumar *et al.* (2014) who reported the positive effect of micronutrients in reducing disease caused by *Alternaria brassicicola.*

Effect of fungicides on blight

Efficacy of five fungicides each at three concentrations viz., 100, 200 and 300 ppm were tested *in vitro* by Poisoned Food Technique against *Alternaria brassicicola*. The data recorded on per cent growth inhibition are presented in (Table2). Among five fungicides, azoxystrobin + hexaconazole was found most effective in inhibiting mycelial growth (94.00, 100 and 100%) of *Alternaria brassicicola* at 100, 200 and 300 ppm, respectively followed by mancozeb (72.02, 72.77 and 89.80%) over control. Fungicides, carbendazim + mancozeb (60.16, 62.88 and 72.22%), copper oxychloride (56.76, 61.11 and 66.67%) and propineb (35.35, 44.44 and 50.00%) were found least effective in inhibiting mycelial growth over control.

Table.1 Effect of different nutrients on Alternaria leaf blight of mustard (foliar application)

S.No	Nutrients	Concentration (%)	Per cent disease intensity	Percent disease control
1	Copper sulphate	0.5	43.75	25.23
			(41.41)	
2	Zinc sulphate	0.5	48.25	17.54
			(44.00)	
3	Borax	0.5	53.28	8.94
			(46.88)	
4	Ferrous sulphate	0.5	52.51	10.25
			(46.44)	
5	Potasiumsulphate	0.5	40.75	30.35
			(39.67)	
6	Control	-	57.51	0.00
			(49.90)	
	SEm±		0.89	
	CD (p = 0.05)		2.73	

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

Table.2: Efficacy of fungicides against mycelial growth of *Alternaria brassicicola* by Poisoned Food Technique on 7th day of incubation at 25 ± 1^{0}C

S.No.	Fungicide	Per cent growth inhibition at various concentration*			Mean
		100 ppm	200 ppm	300 ppm	
1	Mancozeb	72.02	72.77	89.80	78.20
		(58.06)	(58.55)	(71.37)	(62.16)
2	Propineb	35.35	44.44	50.00	43.26
		(36.48)	(41.81)	(45.00)	(41.13)
3	Copper oxychloride	56.76	61.11	66.67	61.51
		(48.89)	(51.42)	(54.74)	(51.66)
4	Carbendazim+ Mancozeb	60.16	62.88	72.22	65.09
		(50.86)	(52.46)	(58.19)	(53.78)
5	Azoxystrobin+Hexaconazole	94.00	100.00	100.00	98.00
		(75.82)	(90.00)	(90.00)	(81.87)
6	Control	0.00	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)
	Mean	53.05	56.87	63.12	
		(46.75)	(48.95)	(52.60)	
		SEm±	CD (p = 0.05)		
	Fungicide (F)	2.00	5.54		
	Concentration (C)	1.61	4.44		
	F x C	2.78	7.70		

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

Table.3 Efficacy of fungicides against Alternaria blight of mustard (*in vivo*)

S. No	Fungicide	Concentration (%)	Per cent disease intensity	Percent disease control
1	Mancozeb	0.25	12.40	78.81
			(20.62)	
2	Copper oxychloride	0.1	17.50	70.09
			(24.73)	
3	Propineb	0.25	23.00	60.69
			(28.66)	
4	Carbendazim+ Mancozeb	0.2	14.80	74.71
			(22.63	
5	Azoxystrobin+ Hexaconazol	0.1	9.00	84.62
			(17.46)	
6	Control		58.51	-
			(49.90)	
	SEm±		1.43	
	CD (p = 0.05)		4.39	

*Average of five replications, PDI= 90 DAS
Figures given in parentheses are angular transformed values

Data presented in (Table 3) shows that all fungicides under study were significantly superior over control. Azoxystrobin + hexaconazole was found most effective in reducing per cent disease intensity (84.62%) followed by mancozeb (78.81%), carbendazim + mancozeb (74.71%) and copper oxychloride (70.09%). Propineb was least effective in reducing per cent disease intensity (60.69%).All the fungicides were found effective in reducing the per cent disease intensity over control. All the fungicides were found significantly superior over check in controlling the disease. Our results are in accordance with the findings of Kumar *et al*. (2018) foliar spray with mancozeb (0.2%) at 45 DAS followed by hexaconazole (0.05%) at 60 DAS was found most effective in controlling Alternaria leaf blight severity up to 78.0 per cent and Alternaria pod blight severity up to 56.5 per cent and increased seed yield upto 29.9 per cent as compared to untreated control. Singh and Singh (2007) have also reported that foliar spray of mancozeb was found effective in reducing the disease severity followed by Bavistin and Blitox-50.

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