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Evaluation of newer fungicide against Alternaria blight of *Bt.* cotton under natural field condition

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ABSTRACT
A field experiment was conducted during kharif 2018 at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in order to estimate the disease severity and losses in yield due to Alternaria leaf blight disease on cotton and to find out a suitable fungicide in controlling the disease at field level.Among the tested fungicides In vivo conditions Hexaconazole and Propiconazole are the effective fungicide which controlled per cent diseases intensity by 57.80 and 54.39. The fungicide mancozeb and pyraclosterbin is less effective as it reduce per cent disease intensity only 21.91 and 32.20 respectively. The highest yield of 1536.76 kg ha^{-1} was recorded with highest benefit cost ratio of 2.04 of hexaconazole, propiconazole (1484.10 kg ha^{-1}) followed by tebuconazole (1453.87kg ha^{-1}) and carbendazim + mancozeb (1291.63 kg ha^{-1}).
Keywords: *Alternaria, hexaconazole, yield, cotton, fungicides*

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INTRODUCTION

Cotton is one of the most important crop of India. It is also called as white gold. It provides the basic raw material (cotton fiber) to cotton textile industry. Cotton in India provides direct livelihood to 6 million farmers and about 40 -50 million people are employed in cotton trade and its processing. India is the largest cotton growing country in the world with in area around country 10.5 M ha and shares in global cotton exports around 25%.During the year 2017-18, Gujarat, Maharashtra and Telangana were the major cotton growing states covering around 71% (86.4 lakh hectare) in area under cotton cultivation and 65% (246 lakh bales) of cotton production in India (1). The crop suffers from many fungal diseases, of which foliar diseases take a heavy roll and among the diseases, Alternaria leaf spot causes yield losses up to 26 per cent (3). Alternaria blight *(A. macrospora*) has been reported to cause about 20-30 per cent losses in seed cotton yield (8). (9) reported significant reduction in yield and quality of cotton due to Alternaria stem blight and Leaf spot of cotton in West Texas. In past, this disease did not receive much attention and importance because of cultivation of *G. herbacium* and *G arborium*. Present investigation was carried out to evaluate the efficacy of different newer fungicides as foliar spray along with untreated control under natural field conditions, against Alternaria leaf blight of cotton during kharif 2018.

MATERIAL AND METHODS

In vivo evaluation of fungicides

A field experiment was conducted during kharif 2018 at Cotton Research Unit, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola in order to estimate the disease severity and losses in yield due to Alternaria leaf blight disease on cotton and to find out a suitable fungicide in controlling the disease at field level.

Percent diseases intensity

Five plants were selected randomly in each plot and observation on severity of the disease on the foliage (using 0-4 scale) was recorded under different treatments one day before each spray and 15 days after the final spray. The cotton yield in each treatment was recorded and the data were statistically analyzed.

Experimental details

1.	Location	Cotton Research Unit, Dr. PDKV, Akola
2.	Soil type	Black cotton soil
3.	Design	Randomized Block Design
4.	Plot size	3.60 x 2.40 meters
5.	Row spacing	60 × 60 cm
6.	Variety	Bhakti Bt
7.	Treatments	9
8.	Replications	Three
9.	Date of sowing	05-07-2018
10.	Fertilizer dose	100:50:50 NPK kg/ha

All other cultural and pest management practices were imposed as recommended in package of practices. The first spray of each treatment was initiated as soon as the first symptom of leaf spot was seen in the field and repeated at an interval of 30 days. The chemical treatments were applied as sprays to run off at thirty days intervals with first, second and third chemical sprays were given at 30, 60 and 90 DAS, respectively. Seven days after last spraying, PDI was recorded in all the treatments and calculated the disease reduction in treatment plots over control and increased the yield in the chemical imposed plots over control plots.

Statistical analysis

Data, so obtained were subjected to statistical analysis (6). All the experiments were conducted as per the statistical design in RBD, with required replications and treatments. The data interpreted and conclusions were drawn.

RESULTS AND DISCUSSION

Evaluation of newer fungicide against Alternaria blight of *Bt.* cotton under natural field condition

This study was conducted to evaluate the efficacy of different newer fungicides as foliar spray along with untreated control under natural field conditions, against Alternaria leaf blight of cotton during kharif 2018 and the results are presented in the Table 1 and 2.

Table: 1 Efficacy of different fungicide treatments on Alternaria blight intensity of *Bt.* cotton under field conditions

Treatment No.	Fungicides	Conc.%	Before spraying	30 days after spraying	
			Percent desease intensity* at 30 DAS	Percent disease intensity* at 60 DAS	Percent disease control
T1	Mancozeb	0.25	7.33 (15.68)	19.70 (26.32)	17.57
T2	Carbendazim 12% + Mancozeb 63%	0.20	7.47 (15.85)*	14.67 (22.50)	38.61
T3	Propiconazole	0.10	6.05 (14.20)	11.33 (19.65)	52.59
T4	Tebuconazole	0.10	7.03 (15.37)	13.57 (21.61)	43.22
T5	Pyraclosterbin	0.10	7.33 (15.69)	17.00 (24.34)	28.87
T6	Hexaconazole	0.10	7.37 (15.74)	10.67 (19.05)	55.35
T7	Tebuconazole 50%+Trifloxystrobin25%	0.10	6.76 (15.05)	14.37 (22.26)	39.87
T8	Trifloxystrobin	0.10	6.70 (14.99)	16.33 (23.82)	31.67
T9	Control	-	6.33 (14.55)	23.90 (29.25)	00.00
	'F, test	-	Non-Sig.	Sig.	-
	SE(m)±	-	0.46	0.60	-
	CD@5%	-	1.41	1.82	-

*Mean of three replications. DAS - Days after Sowing

*Figures in parentheses indicate angular transformed values.

The results revealed that Hexaconazole recorded significantly lower per cent disease intensity (15.33) which was on par with Propiconazole (16.57). The next best treatment was Tebuconazole (18.35 PDI) and Pyraclostrobin (24.63 PDI) followed by Tebuconazole 50% + Trifloxystrobin 25% (19.00 PDI) and Carbendazim 12% + Mancozeb 63% (19.33 PDI). Maximum percent disease intensity was noticed in untreated check (36.33) followed by Mancozeb (28.37).

Table 2: Effect of different fungicide treatments on Alternaria blight Intensity of *Bt*. cotton under field conditions.

Tr. No.	Fungicides	Conc. %	60 days after spraying		90 days after spraying	
			% disease intensity at 90 DAS	% disease control	% disease intensity* at 120 DAS	% disease control
T1	Mancozeb	0.25	24.90 (29.92)*	8.89	28.37 (32.18)	21.91
T2	Carbendazim12% +Mancozeb 63%	0.20	17.73 (24.90)	35.12	19.33 (26.07)	46.79
T3	Propiconazole	0.10	14.43 (22.29)	47.20	16.57 (24.01)	54.39
T4	Tebuconazole	0.10	16.57 (23.99)	39.37	18.35 (25.35)	49.49
T5	Pyraclosterbin	0.10	21.33 (27.44)	21.95	24.63 (29.74)	32.20
T6	Hexaconazole	0.10	13.90 (21.87)	49.14	15.33 (23.04)	57.80
T7	Tebuconazole 50%+Trifloxystrobin25%	0.10	17.67 (24.84)	35.34	19.00 (25.83)	47.70
T8	Trifloxystrobin	0.10	19.40 (26.12)	29.01	21.33 (27.48)	41.28
T9	Control	-	27.33 (31.48)	00.00	36.33 (37.06)	00.00
	'F, test	-	Sig	-	Sig.	-
	SE(m)±	-	0.95	-	0.57	-
	CD@5%	-	2.86	-	1.74	-

*Mean of three replications. DAS - Days after Sowing

* Figures in parentheses indicates angular transformed values

Out of different treatments carried out, the highest per cent decrease over control was shown by Hexaconazole (57.80) followed by Propiconazole (54.39), Tebuconazole (49.49.), Pyraclostrobin (32.20), Tebuconazole 50% + Trifloxystrobin 25% (47.70), Carbendazim 12% + Mancozeb 63% (46.79), Trifloxystrobin (41.28), Pyraclostrobin and least per cent decrease over control was shown by Mancozeb (21.91).

The present results are close agreement with the results of (5) and (7) who reported that difenconazole, tebuconazole, hexaconazole and propiconazole suppressed Alternaria leaf spot (*A.macrospora)* to a significant extent as compared to untreated plots and differences in yield of per cent increase were significant in treated than the untreated plots.

Effect of fungicides on yield of *Bt*. cotton and percent increase yield over control

The seed cotton yield was significantly superior in all the treatments as compared to untreated check. Maximum yield was recorded in Hexaconazole (1536.76 kg ha^{-1}) followed by Propiconazole (1484.10 kg ha^{-1}), Tebuconazole (1453.87 kg ha^{-1}), Tebuconazole 50% + Trifloxystrobin 25% (1355.96 kg ha^{-1}), Carbendazim 12% + Mancozeb 63% (1291.63), Trifloxystrobin (1254.33 kg ha^{-1}), Pyraclostrobin (1163.63 kg ha^{-1}) whereas, least quantity of yield was recorded in Mancozeb (1078.13 kg ha^{-1}). The cost benefit ratio has been worked out for all treatments. The highest total returns was obtained in Hexaconazole (2.04) followed by Propiconazole (1.70), Tebuconazole (1.61). Whereas, the lowest total returns was obtained in Tebuconazole 50% + Trifloxystrobin 25% (1.05).

Table 3: Efficacy of fungicides against Alternaria leaf blight of *Bt.*cotton

Treatments no.	Fungicides	Conc.%	Seed cotton Yield Kg/ha	% increased seed cotton yield over control	B:C ratio
T1	Mancozeb	0.25	1078.13	32.44	1.46
T2	Carbendazim12% +Mancozeb 63%	0.20	1291.63	58.67	1.47
T3	Propiconazole	0.10	1484.10	82.32	1.70
T4	Tebuconazole	0.10	1453.87	78.60	1.61
T5	Pyraclosterbin	0.10	1163.63	42.95	1.08
T6	Hexaconazole	0.10	1536.76	88.79	2.04
T7	Tebuconazole 50%+Trifloxystrobin25%	0.10	1355.96	66.57	1.05
T8	Trifloxystrobin	0.10	1254.33	54.09	1.26
T9	Control	-	814	0.00	1.22
	'F, test	-	-	Sig.	
	SE(m)±	-	-	40.39	
	CD@5%	-	-	121.59	

*Mean of three replications. DAS - Days after Sowing

These result are consistent with those of other scientist (3) and (4) who reported that tebuconazole and propiconazole effective in controlling foliar diseases of cotton and recorded highest cotton yield. Similarly (2) also obtained a reduction in Alternaria leaf spot severity by 39.15% and increase in yield by 16.7 q/ha^{-1} with five sprays of propiconazole 0.1% at 15 days interval between 35 and 95 DAS.

CONCLUSIONS

The salient features of the present investigation are as under *In vivo*, fungicides hexaconazole and propiconazole are the effective fungicide which controlled per cent diseases intensity by 57.80 and 54.39. The fungicide mancozeb and pyraclosterbin is less effective as it reduce per cent disease intensity only 21.91 and 32.20 respectively. The highest yield of 1536.76 kg ha-1 was recorded with highest benefit cost ratio of 2.04 of hexaconazole, propiconazole (1484.10 kg ha^{-1}) followed by tebuconazole (1453.87kg ha^{-1}) and carbendazim + mancozeb (1291.63 kg ha^{-1}).

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