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EVALUATION OF EFFICACY OF FUNGICIDES AGAINST PURPLE BLOTCH OF ONION IN FIELD CONDITIONS

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ABSTRACT

Present investigation was carried out to evaluate efficacy of fungicides against purple blotch of onion. Experiment was carried out at Department of Plant Pathology, B. A. College of Agriculture, Anand Agricultural University, Anand, Gujarat during *rabi*, 2023-24. The result revealed that among all the treatment, azoxystrobin 11% + tebuconazole 18.3% SC was very effective against purple blotch of onion with minimum PDI which was at par with tebuconazole 50% + trifloxystrobin 25% WG. The later treatment was also found at par with the treatments of azoxystrobin 18.2% + difenoconazole 11.4% SC as well as picoxystrobin 7.05% + propiconazole 11.7% SC. The significantly highest bulb yield was recorded in azoxystrobin 11% + tebuconazole 18.3% SC, which was at par with the treatment of tebuconazole 50% + trifloxystrobin 25%. However, the untreated check recorded the lowest bulb yield.

Key words : Onion, Purple blotch, Fungicides.

Introduction

Onion (*Allium cepa* L.) is the most important vegetable in worldwide. The family Alliaceae includes the genus Allium, which includes onions (Cramer, 2000). Chromosome number of onion is 2n = 16. Due to its highly prized flavour, scent and distinct taste as well as the therapeutic qualities of its flavour components, onions are known as the “Queen of Kitchen” (Griffiths *et al*., 2002). India is the second largest onion-growing country in the world after China. In India, total onion growing area is 1.53 Mha and production is 24.21 million tonnes with 15.70 MT/ha productivity (Indiastat, 2023). In Gujarat, total onion growing area is 0.08 Mha and production is 2.10 million tonnes with 25.67 MT/ha productivity (DOH, Gujarat, 2022). In India, 29 fungal, 3 viral and 4 bacterial pathogens were recorded by Gupta *et al*. (1994) in onion. Among the all diseases, purple blotch caused by *Alternaria porri* is most destructive disease in most of the onion growing regions of the world.

Under these favourable conditions, the purple blotch symptoms on onion first appear on leaves as a tiny (2-3 mm in diameter) water-soaked lesions that quickly develop with white center. These lesions get enlarge, coalesce, become zonate and turn brown to purple that extend upwards and downwards. The older leaves are more susceptible than younger leaves. This disease reduces the photosynthetic activity of leaves, growth of the plant, ultimately reducing the bulb size and seed yield (Verma and Sharma, 1999). The disease is comparatively more aggressive during *kharif* seasons than *rabi* seasons and causing 2.5 to 97.0 per cent yield loss (Sahoo *et al*., 2020). Keeping in view the economic importance of onion and yield losses caused by purple blotch the experiment was undertaken to evaluate efficacy of fungicides against purple blotch of onion under field conditions.

Materials and Methods

The field experiment was conducted in *rabi*, 2023-24 using the variety Agri-Found Light Red Onion at

Research farm, Dept. of Plant Pathology, B. A. College of Agriculture, Anand Agricultural University, Anand. The experiment was laid out in Randomized Block Design (RBD) with three replications. A plot size of 3.0 × 2.0 m was maintained for each plot with the spacing of 15.0 ×10.0 cm. All the recommended agronomical practices were followed during experimentation. The first foliar spray of the respective treatments was given at the appearance of the disease and second spray was given after 15 days of the first spray.

The disease intensity was recorded before one day of each spray. Five plants were randomly selected from each plot to record the disease intensity. These selected plants were graded using a 0-5 disease rating scale given in Table 1 (Sharma, 1986). Bulb yield was recorded plot wise at the time of harvesting.

The per cent disease intensity (PDI) was calculated by using the formula given by Wheeler (1969).

$$PDI = \frac{\text{Sum of all individual disease ratings}}{\text{Total no. of plants observation} \times \text{Maximum rating}} \times 100$$

Table 1 : Disease rating scale for purple blotch of onion.

Grade	Per cent leaf area infected
0	No visible symptoms
1	A few spots towards the tip covering less than 10 per cent of leaf area
2	Several dark purplish brown patches covering less than 20 per cent of leaf area
3	Several patches with paler outer zone covering up to 40 per cent of leaf area
4	Long streak covering up to 75 per cent of leaf area or breaking of leaves from center
5	Complete drying of the leaves or breaking of the leaves from base

The per cent disease control was calculated by using following formula.

$$\text{Disease control} = \frac{\text{PDI in control} - \text{PDI in treatment}}{\text{PDI in control}} \times 100$$

Statistical analysis

The data on per cent disease intensity and yield were analyzed statistically using analysis of variance (ANOVA). PDI data were transformed using arcsine transformation.

Results and Discussion

The study was undertaken to evaluate different fungicides against purple blotch of onion under field conditions. The data presented in Tables 3 and 4 and depicted in Plate 1.

First spray

The result revealed that before spray the disease index ranged from 5.19 to 8.00 per cent and the difference was non-significant. After fifteen days of first spray, among the all treatments, azoxystrobin 11% + tebuconazole 18.3% SC was found very effective against purple blotch of onion with minimum (9.25%) per cent disease index followed by tebuconazole 50% + trifloxystrobin 25% WG (10.59% PDI), azoxystrobin 18.2% + difenoconazole 11.4% SC (11.80% PDI) and picoxystrobin 7.05% + propiconazole 11.7% SC (12.00% PDI), which were at par with each other. The highest (29.22%) per cent disease index was observed in the untreated check.

Second spray

The data indicated that after fifteen days of second spray, lowest per cent disease index found in plots treated with azoxystrobin 11% + tebuconazole 18.3% SC (10.59% PDI) which was statically at par with tebuconazole 50% + trifloxystrobin 25% WG (13.28%

Table 2 : Treatment details.

Tr. no.	Treatments	a. i. g/ha	Conc.(%)	Dosage/ 10 litre of water (mL/g)
T_1	Azoxystrobin 18.2% + Difenoconazole 11.4% SC	150	0.03	10.0
T_2	Azoxystrobin 11% + Tebuconazole 18.3% SC	225	0.045	15.0
T_3	Boscalid 25.2% + Pyraclostrobin 12.8% WG	190	0.038	10.0
T_4	Carbendazim 12% + Mancozeb 63% WP	375	0.075	10.0
T_5	Fluopyram 17.7% + Tebuconazole 17.7% SC	200	0.04	11.0
T_6	Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l SC	100	0.02	4.0
T_7	Kresoxim – methyl 15% + Chlorothalonil 56% WG	710	0.142	20.0
T_8	Metiram 55% + Pyraclostrobin 5% WG	1000	0.20	33.0
T_9	Picoxystrobin 7.05% + Propiconazole 11.7% SC	200	0.04	21.0
T_{10}	Tebuconazole 50% + Trifloxystrobin 25% WG	375	0.075	10.0
T_{11}	Control	—	—	—

Table 3 : Effect of fungicides on purple blotch of onion under field conditions (*Rabi*, 2023-24).

Tr. no.	Treatments	Disease intensity (%)				Disease reduction over control (%)
		Before spray	After 1st spray	After 2nd spray	Pooled over sprays	
T_1	Azoxystrobin 18.2% + Difenoconazole 11.4% SC	16.43(8.00)	20.09^{a}(11.80)	24.57^{ab}(17.29)	22.33^{b} (14.44)	61.42
T_2	Azoxystrobin 11% + Tebuconazole 18.3% SC	14.80(6.53)	17.71^{a}(9.25)	18.99^{a} (10.59)	18.35^{a} (9.91)	73.51
T_3	Boscalid 25.2% + Pyraclostrobin 12.8% WG	16.43(8.00)	27.42^{bc} (21.21)	32.72^{de}(29.22)	30.07^{cd} (25.11)	32.90
T_4	Carbendazim 12% + Mancozeb 63% WP	14.80(6.53)	25.57^{b}(18.63)	30.92^{cd}(26.40)	28.25^{c} (22.40)	40.12
T_5	Fluopyram 17.7% + Tebuconazole 17.7% SC	14.80(6.53)	28.29^{bc} (22.46)	34.42^{de} (31.95)	31.36^{cd} (27.08)	27.62
T_6	Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l SC	16.43(8.00)	30.21^{bc} (25.32)	35.21^{de}(33.24)	32.71^{d} (29.20)	21.95
T_7	Kresoxim – methyl 15% + Chlorothalonil 56% WG	16.43(8.00)	30.12^{bc}(25.18)	37.58^{ef}(37.19)	33.85^{d} (31.03)	17.07
T_8	Metiram 55% + Pyraclostrobin 5% WG	16.43(8.00)	31.08^{bc}(26.65)	33.62^{de}(30.66)	32.35^{d} (28.63)	23.48
T_9	Picoxystrobin 7.05% + Propiconazole 11.7% SC	13.17(5.19)	20.27^{a}(12.00)	25.57^{bc}(18.63)	22.92^{b} (15.17)	59.47
T_{10}	Tebuconazole 50% + Trifloxystrobin 25% WG	16.43(8.00)	18.99^{a}(10.59)	21.37^{ab}(13.28)	20.18^{ab} (11.90)	68.20
T_{11}	Control (Untreated check)	14.80(6.53)	32.72^{c}(29.22)	42.69^{f}(45.97)	37.71^{e} (37.41)	-
S.Em.±	**Treatment (T)**	1.15	1.70	1.98	1.31	-
	Spray (S)	-	-	-	0.56	-
	T×S	-	-	-	1.84	-
	C.D. at 5%	NS	Sig.	Sig.	Sig.	-
	C.V. (%)	12.85	11.48	11.17	11.34	-

Note: 1) Treatment means with the letter/letters in common are not significant by Duncan's new multiple range test (DNMRT) at a 5% level of significance. 2) Figures in the parentheses are retransformed values while those outsides are arcsine transformed value.

PDI) and azoxystrobin 18.2% + difenoconazole 11.4% SC (17.29% PDI). The highest (45.97%) per cent disease index was observed in untreated check.

Pooled over sprays

Pooled over sprays data revealed that among the all treatments, azoxystrobin 11% + tebuconazole 18.3% SC was recorded very effective against purple blotch of onion with minimum (9.91%) per cent disease index and maximum disease control (73.51%), which was at par with tebuconazole 50% + trifloxystrobin 25% WG (11.90% PDI and 68.20% disease control). The later treatments were also found at par with treatments of azoxystrobin 18.2% + difenoconazole 11.4% SC (14.44% PDI and 61.42% disease control) as well as picoxystrobin 7.05% + propiconazole 11.7% SC (15.17% PDI and 59.47% disease control). The treatments of carbendazim 12% + mancozeb 63% WP, boscalid 25.2% + pyraclostrobin 12.8% WG and fluopyram 17.7% + tebuconazole 17.7% SC were recorded with 22.40 per cent, 25.11 per cent and 27.08 per cent PDI and 40.12 per cent, 32.90 per cent and 27.62 per cent disease control, respectively and found mediocre and at par with each other. The later two treatments were also found at par with the treatments of metiram 55% + pyraclostrobin 5% WG (28.63% PDI and 23.48% disease control), fluxapyroxad 250 g/l + pyraclostrobin 250 g/l SC (27.08% PDI and 27.62% disease control) and kresoxim-methyl 15% + chlorothalonil 56% WG (31.03% PDI and 17.07% disease control) which were least effective against purple blotch of onion.

The significantly highest bulb yield (428.95 q/ha) with maximum

Table 3 : Effect of fungicides on bulb yield of onion.

Tr. no.	Treatments	Onion bulb yield(q/ha)	Yield increase over control (%)
T_1	Azoxystrobin 18.2% + Difenoconazole 11.4% SC	318.34^{b}	45.58
T_2	Azoxystrobin 11% + Tebuconazole 18.3% SC	428.95^{a}	60.36
T_3	Boscalid 25.2% + Pyraclostrobin 12.8% WG	216.23^{cd}	21.36
T_4	Carbendazim 12% + Mancozeb 63% WP	258.34^{c}	34.18
T_5	Fluopyram 17.7% + Tebuconazole 17.7% SC	224.62^{cd}	24.29
T_6	Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l SC	219.00^{cd}	20.35
T_7	Kresoxim – methyl 15% + Chlorothalonil 56% WG	213.50^{d}	22.35
T_8	Metiram 55% + Pyraclostrobin 5% WG	222.06^{cd}	23.42
T_9	Picoxystrobin 7.05% + Propiconazole 11.7% SC	312.28^{b}	45.55
T_{10}	Tebuconazole 50% + Trifloxystrobin 25% WG	402.95^{a}	57.80
T_{11}	Control (Untreated check)	170.06^{e}	-
	S.Em. ±	13.54	-
	C.D. at 5%	Sig.	-
	C.V. (%)	8.64	-

Note: Treatment means with the letter/letters in common are not significant by Duncan's new multiple range test (DNMRT) at a 5% level of significance

T_2: Azoxystrobin 18.2% + Tebuconazole 18.3% SC

T_{11}: Control (Untreated check)

Plate 1 : Efficacy of fungicides against purple blotch of onion in field conditions.

yield increase over control (60.36%) was recorded in plots sprayed with azoxystrobin 11% + tebuconazole 18.3% SC which was at par with the treatment of tebuconazole 50% + trifloxystrobin 25% WG (402.95 q/ha bulb yield, 57.80% yield increase over control). The next best treatment was azoxystrobin 18.2% + difenoconazole 11.4% SC which recorded 318.34 q/ha bulb yield with 45.58 per cent yield increase over control and it at par with treatment of picoxystrobin 7.05% + propiconazole 11.7% SC (312.28 q/ha bulb yield, 45.55% yield increase over control). However, the untreated check recorded the lowest bulb yield of 170.06 q/ha (Table 4).

Similar findings have been reported by previous researchers such as Savitha and Ajithkumar (2016), Ruth and Naik (2016) and Chandan *et al*. (2023), they also found the foliar application of azoxystrobin 11% + tebuconazole 18.3% SC to be highly effective against purple blotch in onions.

Likewise, Aujla *et al*. (2013), Veeraghanti *et al*. (2017) and Ruth (2017) reported trifloxystrobin 25% + tebuconazole 50% WG as the most effective treatment against this disease.

Ruth and Naik (2016) noted that the highest bulb yield was achieved with azoxystrobin 11% + tebuconazole 18.3% SC treatment, while Yadav *et al*. (2017) reported the highest fresh bulb yield with trifloxystrobin 25% + tebuconazole 50% WG treatment.

Conclusion

The present investigations revealed that foliar spray with azoxystrobin 11% + tebuconazole 18.3% SC at 0.045% (15 mL/10 litre of water), first spray at initiation of disease and subsequent spray after 15 days was found most effective against purple blotch of onion, as it recorded the least disease intensity with the highest bulb yield.

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