

## Alternaria Leaf Spot of Blackgram and its Management

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### ABSTRACT

Field experiments were carried out during *kharif* and *rabi* 2018-19 at Regional Agricultural Research Station, Lam, Guntur, for the management of *Alternaria* leaf spot caused by *Alternaria alternata* (Fr.) Keissler of blackgram. A total of ten treatments were imposed in the form of seed treatment (ST), foliar spray (FS) and in combination with both seed treatment and foliar spray (ST + FS). All the chemicals evaluated were found to be superior over check in terms of reducing disease severity and increasing seed yield in both the seasons. The lowest PDI with maximum seed yield during *kharif* and *rabi* were recorded in the plots where seed treatment with mancozeb (@ 0.25%) followed by two sprays of trifloxystrobin + tebuconazole (@ 0.05%) was done.

**Keywords:** *Alternaria leaf spot, foliar spray, fungicides, management, PDI, seed treatment and yield.*

Black gram (*Vigna mungo* L. Hepper) is one of the premium pulse crop amongst all pulses. Blackgram contains the perfect combination of all nutrients that includes proteins (25-26%), carbohydrates (60%), fat (1.5%), minerals, aminoacids and vitamins. The dry seeds are the richest source of phosphoric acid among the pulses (5-6% richer than others). Since it serves as a cheap source of protein (25-26%) for the poor, it is rightly called as the "poor man's meat". It is an ancient and well-known leguminous crop cultivated in Asia due to its nutritional quality and the suitability to cropping system.

Blackgram being a short duration crop can be grown in all seasons *viz.*, *kharif*, *rabi* and summer throughout India. Major constraints in economic crop production that they inflict heavy yield losses are diseases. Like other crops, blackgram suffers from many diseases caused by biotic (fungi, bacteria, viruses) and also abiotic stresses. Out of which fungal diseases cause up to 50% or more yield losses in

blackgram (Singh *et al.*, 2010). Of late, *Alternaria* leaf spot and blight in blackgram has become endemic and is appearing in severe form. *Alternaria* being a low sugar fungus, most prominent symptoms are produced at flowering stage on older leaves (Ramakrishna *et al.*, 1971). Most characteristic symptoms are small, circular, dark lesions, often surrounded by yellow halo that expand into concentric rings called target board symptoms (Ferrin, 2010). Extended leaf wetness for 3-4 days cause serious loss as the spots become larger and coalesce with each other (Mayee, 1992). The fungus is being reported as internally borne as well as externally on the seed, seed treatment with fungicides may protect the seeds from seed borne infections and improve seed germination. Spraying of fungicides at appropriate intervals reduces the probability of airborne infection.

### MATERIAL AND METHODS

The trail was laid out in Randomized Block Design (RBD) with ten treatments each of three

replications using LBG 752 variety of blackgram during *kharif* and *rabi* 2018-19 at Regional Agricultural Research Station, Lam, Guntur. Sowing was done in 5 x 4 m plots with 30 x 10 cm spacing. The chemicals used in this study, *viz.*, thiophanate methyl @ 0.10%, mancozeb @ 0.25% were imposed as seed treatment alone, hexaconazole @ 0.20%, trifloxystrobin + tebuconazole @ 0.05%, azoxystrobin @ 0.05%, urea @ 2.0%, KNO<sub>3</sub> @ 2.0% were imposed as foliar spray alone and other two combination treatments (ST and FS) *viz.*, mancozeb @ 0.25% and trifloxystrobin + tebuconazole @ 0.05% (FS), and thiophanate methyl @ 0.10% (ST) and hexaconazole @ 0.20% (FS). Two sprays were given first at the time of initial disease symptom appearance and later at fifteen days after first spray. The final observations were recorded fifteen days after second spray. Per cent Disease Index (PDI) for Alternaria leaf spot was calculated based on the standard 1-9 point scale (Alice and Nadarajan, 2007) (Table 1).

**Table 1. Disease scale for Alternaria leaf spot (1-9 scale)**

Grade	Description
1	Free from disease
2	Traces to pin head size spots on leaves
3	Spots slightly larger than pin heads
4	Spots occupying 2-5 % leaf area
5	Spots occupying 5-10 % leaf area
6	Spots occupying 10-25 % leaf area
7	Spots occupying 25-50 % leaf area
8	Spots occupying 50-75 % leaf area
9	Spots occupying more than 75 % leaf area

The Per cent Disease Index (PDI) was calculated by the following formula given by Wheeler (1969).

$$\text{PDI} = \frac{\text{Sum of all the numerical ratings}}{\text{No. of observations} \times \text{Max.disease grade}} \times 100$$

## RESULTS AND DISCUSSION

The results indicated that all chemicals evaluated had significantly reduced the Alternaria leaf spot disease in both the seasons *i.e.*, *kharif* and *rabi*. Minimum PDI (27.10 in *kharif* and 24.14 in *rabi*) was recorded in combination treatment where presowing seed treatment with mancozeb @ 0.25% was done followed by two sprays of trifloxystrobin + tebuconazole @ 0.05% with the highest disease over control (60.75 % in *kharif* and 62.27 % in *rabi*) it was on par with treatments where trifloxystrobin + tebuconazole (FS) @ 0.05% (29.77% PDI in *kharif* and 25.47% in *rabi*), azoxystrobin (FS) @ 0.05% (30.21% PDI in *kharif* and 27.70% PDI in *rabi*) alone and in treatment where seed treatment with thiophanate methyl @ 0.10% followed by two foliar sprays with hexaconazole @ 0.20% were implemented (32.00% PDI in *kharif* and 30.36% PDI in *rabi*) (Table 2 and 3). These treatments were found superior over rest of the treatments. Das (2015) reported that out of six different fungicides trifloxystrobin 25% + tebuconazole 50% (0.05%) controlled the disease with the lowest disease severity. Sidlauskiene *et al.* (2003) reported that Azoxystrobin to be very effective in controlling Alternaria leaf spot disease up to 80%.

Maximum PDI during both seasons were recorded in the plots where seeds were treated with thiophanate methyl (ST) @ 0.10% alone (52.47% PDI in *kharif* and 48.29% PDI in *rabi*) with the lowest decrease over control (24.02 % in *kharif* and 24.53 % in *rabi*) and it was found to be on a parity with mancozeb (ST) @ 0.25% alone (42.21% PDI in *kharif* and 47.11% PDI in *rabi*). It was also found that two mineral nutrient treatments *viz.*, urea (FS) @ 2.0% (39.70% PDI in *kharif* and 36.41% PDI in *rabi*) and KNO<sub>3</sub> (FS) @ 2.0% (42.66% PDI in *kharif* and 39.48% PDI in *rabi*) were also found to be

**Table 2. Effect of chemicals on blackgram Alternaria leaf spot disease severity during *kharif* 2018-19**

S.No.	Treatments	Conc. (%)	PDI *		Decrease over control (%)		Yield (q ha <sup>-1</sup> *)	Increase over control (%)	BCR
			After I spray	After II spray	After I spray	After II spray			
1	Thiophanate methyl 70% WP (ST)	0.1	55.7 (48.25)	52.47 (46.40) <sup>e</sup>	13.15	24.02	6.55 <sup>e</sup>	5.13	1.03
2	Mancozeb 75% WP (ST)	0.25	49.77 (44.84)	47.11 (43.13) <sup>de</sup>	22.4	31.78	6.83 <sup>e</sup>	9.63	1.18
3	Hexaconazole 5% EC (FS)	0.2	37.03 (37.45)	33.63 (35.42) <sup>ab</sup>	42.26	51.3	8.66 <sup>d</sup>	39.00	1.75
4	Trifloxystrobin+ Tebuconazole 75% WG (FS)	0.05	33.03 (35.03)	29.77 (33.04) <sup>a</sup>	48.5	56.89	11.16ab	79.13	2.50
5	Azoxystrobin 23% SC (FS)	0.05	35.4 (36.49)	30.21 (33.31) <sup>a</sup>	44.8	56.25	10.16 <sup>bc</sup>	63.08	2.00
6	Urea (FS)	2	42.22 (40.16)	39.7 (39.03) <sup>bc</sup>	34.17	42.51	7.30 <sup>e</sup>	17.17	1.35
7	KNO <sub>3</sub> (FS)	2	44.59 (41.86)	42.66 (40.75) <sup>cd</sup>	30.48	38.22	7.08 <sup>e</sup>	13.64	1.12
8	Thiophanate methyl 70% WP (ST) & Hexaconazole 5% EC (FS)	0.10 & 0.20	36.73 (37.28)	32 (34.41) <sup>a</sup>	42.73	53.66	9.25 <sup>cd</sup>	48.47	1.81
9	Mancozeb 75% WP (ST) & Trifloxystrobin+Tebuconazole	0.25 & 0.05	31.7 (34.35)	27.1 (31.34) <sup>a</sup>	50.57	60.75	12.06 <sup>a</sup>	93.57	2.73
10	Unsprayed Check	-	64.14 (53.20)	69.06 (56.21) <sup>f</sup>	-	-	6.23 <sup>e</sup>	-	1.02
			1.623	1.375			0.38		
			4.822	4.088			1.15		
			6.874	6.063			7.88		

\* means of three replications; Figures in parentheses are arc sine transformed values; ST: Seed treatment FS: Foliar spray

Table 3. Effect of chemicals on blackgram Alternaria leaf spot disease severity during *rabi* 2018-19

S. No.	Treatments	Conc. (%)	PDI *		Decrease over control (%)		Yield (q ha <sup>-1</sup> )*	Increase over control (%)	BCR
			After I spray	After II spray	After I spray	After II spray			
1	Thiophanate methyl 70% WP (ST)	0.1	49.62 (44.76)	48.29 (44.19) <sup>e</sup>	17.07	24.53	7.08 <sup>d</sup>	6.3	1.1
2	Mancozeb 75% WP (ST)	0.25	43.88 (41.46)	42.21 (40.50) <sup>de</sup>	26.67	34.03	7.28 <sup>d</sup>	9.3	1.22
3	Hexaconazole 5% EC (FS)	0.2	33.77 (35.50)	31.55 (33.95) <sup>bc</sup>	43.56	50.69	10.16 <sup>c</sup>	52.55	2.09
4	Trifloxystrobin + Tebuconazole 75% WG (FS)	0.05	28.14 (31.68)	25.47 (30.29) <sup>ab</sup>	52.97	60.19	12.08 <sup>ab</sup>	81.38	2.62
5	Azoxystrobin 23% SC (FS)	0.05	31.84 (34.33)	27.7 (31.74) <sup>ab</sup>	46.79	56.71	11.75 <sup>b</sup>	76.42	2.33
6	Urea (FS)	2	38.22 (38.16)	36.14 (36.94) <sup>cd</sup>	36.12	43.52	7.65 <sup>d</sup>	14.86	1.36
7	KNO <sub>3</sub> (FS)	2	41.25 (39.94)	39.48 (38.91) <sup>d</sup>	31.06	38.3	7.50 <sup>d</sup>	12.61	1.16
8	Thiophanate methyl 70% WP (ST) & Hexaconazole 5% EC (FS)	0.10 & 0.20	33.33 (35.23)	30.36 (33.19) <sup>abc</sup>	44.3	52.55	11.41 <sup>b</sup>	71.32	2.32
9	Mancozeb 75% WP (ST) & Trifloxystrobin+Tebuconazole 75% WG (FS)	0.25 & 0.05	27.4 (31.53)	24.14 (29.40) <sup>a</sup>	54.21	62.27	12.75 <sup>a</sup>	91.44	2.77
10	Unsprayed Check	-	59.84 (50.66)	63.99 (52.93) <sup>f</sup>	-	-	6.66 <sup>d</sup>	-	1.06
	SEm (±)		1.51	1.35			0.35		
	CD (P<0.05)		4.5	4.03			1.06		
	CV (%)		6.84	6.32			6.59		

\* means of three replications; Figures in parentheses are arc sine transformed values; ST: Seed treatment FS: Foliar spray

**Table 4. Effect of chemicals on blackgram Alternaria leaf spot severity and yield during 2018-19 (Pooled data)**

S.No.	Treatments	Conc. (%)	Percent Disease Index (PDI)*		Decrease over control(%)		Yield (q/ha)*	Increase over control (%)
			After I spray	After II spray	After I spray	After II spray		
1	Thiophanate methyl 70% WP (ST)	0.1	52.66 (46.50)	50.38 (45.20) <sup>f</sup>	15.05	24.26	6.81 <sup>ef</sup>	5.58
2	Mancozeb 75% WP (ST)	0.25	46.83 (43.16)	44.66 (41.91) <sup>e</sup>	24.45	32.86	7.18 <sup>ef</sup>	11.31
3	Hexaconazole 5% EC (FS)	0.2	35.40 (36.49)	32.59 (34.78) <sup>c</sup>	42.89	51	9.41 <sup>d</sup>	45.89
4	Trifloxystrobin+Tebuconazole 75% WG (FS)	0.05	30.58 (33.56)	27.62 (31.68) <sup>ab</sup>	50.66	58.47	11.62 <sup>ab</sup>	80.15
5	Azoxystrobin 23% SC (FS)	0.05	33.62 (35.42)	28.95 (32.49) <sup>abc</sup>	45.76	56.47	10.95 <sup>bc</sup>	69.76
6	Urea (FS)	2	40.22 (39.34)	37.91 (37.99) <sup>d</sup>	35.11	43	7.45 <sup>e</sup>	15.50
7	KNO <sub>3</sub> (FS)	2	42.92 (40.91)	41.07 (39.83) <sup>de</sup>	30.76	38.25	7.29 <sup>e</sup>	13.02
8	Thiophanate methyl 70% WP (ST) & Hexaconazole 5% EC (FS)	0.10 & 0.20	35.03 (36.27)	31.18 (33.88) <sup>bc</sup>	43.49	53.12	10.33 <sup>cd</sup>	60.15
9	Mancozeb 75% WP (ST) & Trifloxystrobin+Tebuconazole 75% WG (FS)	0.25 & 0.05	29.55 (32.90)	25.51 (30.31) <sup>a</sup>	52.33	61.65	12.40 <sup>a</sup>	92.24
10	Unsprayed Check	-	61.99 (51.92)	66.52 (54.63) <sup>g</sup>	-	-	6.45 <sup>f</sup>	-
			1.42	1.01			0.27	
			4.23	3.01			0.8	
			6.22	4.59			5.2	

\* means of three replications; Figures in parentheses are arc sine transformed values; ST: Seed treatment FS: Foliar spray

superior over control and also statistically on a par with each other.

The highest seed yield (12.06 q ha<sup>-1</sup> (*kharif*) and 12.75 q ha<sup>-1</sup> (*rabi*) and maximum B:C ratio (2.73 (*kharif*) and 2.77 (*rabi*) were obtained in combination treatment *i.e.*, seed treatment with mancozeb (0.25%) followed by two sprays of trifloxystrobin + tebuconazole (0.05%) with the highest increase over control (93.57 % in *kharif* 91.44 % in *rabi*).

Pooled data also indicates that the combination treatment *i.e.*, seed treatment with mancozeb @ 0.25% followed by two foliar sprays of trifloxystrobin + tebuconazole @ 0.05% was found to be effective with minimum PDI of 25.51% with the highest decrease over control (24.26%) which immediately was followed by two foliar sprays of trifloxystrobin + tebuconazole alone ( 27.62% PDI) (Table 4).

### CONCLUSION

The finding revealed that combination of seed treatment with mancozeb @ 0.25% followed by two sprays of trifloxystrobin + tebuconazole @ 0.05%, can be used for the management of the Alternaria leaf spot disease. Although it was on a par with trifloxystrobin + tebuconazole (@ 0.05%) foliar spray treatment in disease control and yield in both the seasons, the combination treatment resulted in marginal decrease in disease and increase in yield, which might be due to seed treatment with mancozeb @ 0.25%, given additional advantage by protecting seed not only from Alternaria leaf spot but also from other pre and post emergence rotting pathogens, resulting in marginal increase in plant stand.

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