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# Management of Fungal Foliar Diseases of Blackgram

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**ABSTRACT**

A field experiment was conducted at Agricultural College farm, Bapatla during late *rabi*, 2016-17 to study the efficacy of eight fungicides on fungal foliar diseases of blackgram and on yield parameters. Foliar spray with Azoxystrobin @ 0.05% was found superior in reducing the Corynespora leaf spot (53.52% PDI) and Cercospora leaf spot (36.66% PDI). Foliar spray of trifloxystrobin + tebuconazole @ 0.05% combination found superior in reducing the powdery mildew (PDI-0%). Highest seed yield (9.33 q/ha), lowest discoloured seed (17%) and lowest shrivelled seed (4.67%) were recorded by foliar spray with Azoxystrobin @ 0.05%.

**Key words**: *Cercospora leaf spot, Corynespora leaf spot, fungicides,Powdery mildew.*

Black gram is one of the most important cultivated pulse crops of the 'Vigna' group. The crop is cultivated in all the seasons throughout India. The food values of *urdbean* lie in its high and easily digestible protein and low flatulence contents. It contains 24% protein, 60% carbohydrates, 1.3% fat and is the richest source of phosphoric acid among pulses (5-6% richer than others). Out of different constraints, fungal diseases mainly leaf spots caused by *Corynespora cassicola* (Wei, 1950; Mallaiah *et al.,*1981), *Cercospora canascens* (Munjal *et al.,* 1960; Pandey *et al*., 2009) and powdery mildew caused by *Erysiphe polygoni* (Butler, 1918; Singh *et al*., 2010) are important yield constraints in blackgram cultivation. Fungal foliar diseases cause yield loss up to 50% or more in blackgram (Singh *et al*., 2010). It is the efficacy of different fungicides imperative to control the diseases economically, hence the experiment was conducted to evaluate the popular fungicides against fungal diseases of blackgram.

## MATERIAL AND METHODS

The experiment was conducted during late *rabi* 2016-17 at the Agricultural College Farm, Bapatla, Guntur district, Andhra Pradesh, under field conditions in randomized block design to determine the efficacy of fungicides on fungal foliar diseases of blackgram. The variety LBG 752 was sown with common spacing of 30cm x 10cm and each treatment was replicated thrice. The treatments comprised of eight fungicides, *viz.,* T1-Trifloxystrobin 25% WG + Tebuconazole 50% WG @ 0.05%, T2 - Tebuconazole 25 EC @ 0.1%, T3 - Propiconazole 25 EC @ 0.1%, T4 - Chlorothalonil 75 WP @ 0.15%, T5 - Dinocap 48 EC @ 0.1%, T6-Carbendazim 50 WP @ 0.1%, T7 - Hexaconazole 5 EC @ 0.2%, T8 - Azoxystrobin 23 SC @ 0.05%.

Recommended dose of nitrogen and phosphorus at 20:50 kg $ha^{-1}$ was applied in the form of urea and single super phosphate as basal dose. Spraying was done twice from the occurrence of disease at two weeks interval. Weeding and inter cultivation activities were carried out regularly and irrigation was given whenever necessary.

Per cent Disease Index for Corynespora leaf spot and Cercospora leaf spot were calculated based on the standard 1-9 point scale and for powdery mildew based on the standard 0-5 point scale (Alice and Nadarajan., 2007) (Table 1 and 2).

### Collection of Experimental Data

### Disease Severity

Severity of fungal foliar diseases *viz.*, Corynespora leaf spot, Cercospora leaf spot and Powdery mildew was recorded in each treatment plot at weekly interval from the time of first

occurrence of the disease. Data was collected first and second week after first spray and one week after second spray and PDI was calculated.

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

**Growth and yield parameters**

Observations were recorded at harvesting stage on growth and yield contributing parameters like 100 seed weight, per cent discoloured seed, per cent shrivelled seed and Seed yield per plot (kg $ha^{-1}$) from each treatment plot at harvesting stage.

## RESULTS AND DISCUSSION

One week after first spray dinocap @ 0.1% showed lowest PDI of 18.53%. two weeks after first spray propiconazole @ 0.1% showed lowest PDI of 33.11%. At one week after second spray, azoxystrobin 23 SC @ 0.05% has significantly controlled Corynespora leaf spot (53.52% PDI) followed by tebuconazole 25 EC @ 0.1% (59.23% PDI) which was on par with chlorothalonil 75 WP @ 0.15% (60.44% PDI) (Table 3). Jones (1974) recommended application of chlorothalonil (2.4 l/ha) for the effective management of Corynespora leaf spot on cucumber.

When tested against Corynespora leaf sopt one week after first spray azoxystrobin @ 0.05% showed lowest PDI of 18.14%. Two weeks after first spray chlorothalonil @ 0.15% showed lowest PDI (25.13%). One week after second spray, carbendazim 50 WP @ 0.1% recorded least PDI of 33.75%. Hexaconazole 5 EC @ 0.2%, azoxystrobin 23 SC @ 0.05% and tebuconazole 25 EC @ 0.1% were on par with each other and recorded 36.48%, 36.66% and 36.68% respectively (Table 4). Bhat *et al.* (2015) reported that application of carbendazim (0.05%) at first appearance of disease followed by another spray with hexaconazole (0.2%) against Cercospora leaf spot of greengram which ensured significant reduction in pod infection, leaf spot intensity and resulted in higher yield.

All the chemicals were significantly effective in reducing the Powdery mildew disease on blackgram over control. In trifloxystrobin 25% WG + tebuconazole 50% WG @ 0.05% at one week after first spray there was no occurence of disease (Table 5). Khunti *et al*. (2005) evaluated the efficacy of ten different fungicides against powdery mildew and they reported that all the triazole fungicides performed better as compared to conventional fungicides and the minimum disease intensity and highest yield was registered with the application of hexaconazole closely followed by penconazole

The highest seed yield (9.33 q/ha), test weight (6.40 g), lowest per cent discoloured (17%), per cent lowest shriveled seed (4.67%) and highest B:C ratio (1.72) were obtained with azoxystrobin 23 SC @ 0.05%.(Table 6 and 7).

## CONLUSION

Azoxystrobin (0.05%) and carbendazim (0.1%) were found effective in controlling the Corynespora leaf spot and Cercospora leaf spot respectively. Trifloxystrobin + tebuconazole @ 0.05% showed 100% control and the triazole fungicides were found effective in controlling the powdery mildew of blackgram.

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

| Grade | Percentage infection | Reaction |
|---|---|---|
| 1 | No infection on leaves | Resistant (R) |
| 2 | 0.1% to 5% infection on the leaf surface | Moderately resistant (MR) |
| 3 | 5.1% to 10% infection on the leaf surface | Moderately resistant (MR) |
| 4 | 10.1% to 15% infection on the leaf surface | Moderately susceptible MS) |
| 5 | 15.1% to 30% infection on the leaf surface | Moderately susceptible (MS) |
| 6 | 30.1% to 40% infection on the leaf surface | Susceptible (S) |
| 7 | 40.1% to 50% infection on the leaf surface | Highly susceptible (HS) |
| 8 | 50.1% to 75% infection on the leaf surface | Highly susceptible (HS) |
| 9 | Above 75% infection on the leaf surface | Highly susceptible (HS) |

**Table 2. Disease rating scale for Powdery mildew (0-5 scale)**

| Grade | Description | Reaction |
|---|---|---|
| 0 | Plants free from infection | Free (F) |
| 1 | Plants showing traces to 10% infection on leaves, stem free from disease | Resistant (HR) |
| 2 | Slight infection with thin coating of powdery growth on leaves covering 10.1 - 25% area. Slight infection on stem, pods visually free | Moderately resistant (MR) |
| 3 | Dense powdery coating covering 25.1 to 50% leaf area. Moderate infection on stem, slight infection pods | Moderately susceptible (MS) |
| 4 | Dense powdery coating covering 50.1 to 75% leaf area, stem heavily infected, on pods moderate infection. Infected portion turns greyish | Susceptible (S) |
| 5 | Severe infection with dense powdery growth covering more than 75% area of the whole plant including pods, plants resulting in premature defoliation and drying. | Highly Susceptible (HS) |

**Table 3. Effect of fungicides on blackgram Corynespora leaf spot during *rabi*, 2016-17**

| S.No | Treatment | Percent Disease Index (PDI) | | | Mean | Percent reduction over control |
|---|---|---|---|---|---|---|
| | | one week after first spraying | two weeks after first spraying | one week after second spraying | | |
| T1 | Trifloxystrobin 25% WG + Tebuconazole 50% WG @ 0.05% | 21.45 (27.57) | 42.24 (40.50) | 71.90 (57.98) | 45.20 (42.02) | 26.74 |
| T2 | Tebuconazole 25 EC @ 0.1% | 26.71 (31.08) | 46.38 (42.90) | 59.23 (50.30) | 44.11 (41.44) | 28.50 |
| T3 | Propiconazole 25 EC @ 0.1% | 25.89 (30.55) | 33.11 (35.08) | 72.28 (58.22) | 43.76 (41.30) | 29.07 |
| T4 | Chlorothalonil 75 WP @ 0.15% | 20.04 (26.57) | 38.10 (38.09) | 60.44 (51.01) | 39.53 (38.56) | 35.93 |
| T5 | Dinocap 48 EC @ 0.1% | 18.53 (25.49) | 46.15 (42.77) | 78.92 (62.66) | 47.87 (43.63) | 22.41 |
| T6 | Carbendazim 50 WP @ 0.1% | 19.55 (26.23) | 48.44 (44.09) | 66.28 (54.49) | 44.76 (41.60) | 27.45 |
| T7 | Hexaconazole 5 EC @ 0.2% | 20.26 (26.74) | 44.30 (41.71) | 74.81 (59.88) | 46.46 (42.77) | 24.70 |
| T8 | Azoxystrobin 23 SC @ 0.05% | 19.74 (26.34) | 34.00 (35.65) | 53.52 (47.00) | 35.75 (36.34) | 42.05 |
| T9 | Untreated control (Check) | 35.23 (36.39) | 61.82 (51.82) | 88.05 (69.76) | 61.70 (52.65) | |
| | SEm± | 0.70 | 1.16 | 0.52 | 2.11 | |
| | CD (P@ 0.05) | 2.12 | 3.48 | 1.58 | 6.31 | |
| | CV (%) | 4.30 | 4.86 | 1.61 | 8.63 | |

*Figures in parentheses are arcsine transformed values

**Table 4. Effect of fungicides on blackgram Cercospora leaf spot during *rabi*, 2016-17**

| S.No | Treatment | Percent Disease Index (PDI) | | | Mean | Percent reduction over control |
|---|---|---|---|---|---|---|
| | | one week after first spraying | two weeks after first spraying | one week after second spraying | | |
| T1 | Trifloxystrobin 25% WG +Tebuconazole 50% WG @ 0.05% | 19.20 (25.96) | 28.39 (32.18) | 70.20 (56.89) | 39.26 (38.35) | 26.95 |
| T2 | Tebuconazole 25 EC @ 0.1% | 18.78 (25.66) | 41.60 (40.15) | 36.68 (37.26) | 32.35 (34.36) | 39.81 |
| T3 | Propiconazole 25 EC @ 0.1% | 19.02 (25.85) | 29.06 (32.60) | 63.70 (52.93) | 37.26 (37.13) | 30.67 |
| T4 | Chlorothalonil 75 WP @ 0.15% | 19.84 (26.42) | 25.13 (30.06) | 42.19 (40.49) | 29.05 (32.34) | 45.95 |
| T5 | Dinocap 48 EC @ 0.1% | 19.42 (26.14) | 40.76 (39.65) | 62.04 (51.95) | 40.74 (39.25) | 24.20 |
| T6 | Carbendazim 50 WP @ 0.1% | 19.64 (26.28) | 40.54 (39.53) | 33.75 (35.50) | 31.31 (33.87) | 41.74 |
| T7 | Hexaconazole 5 EC @ 0.2% | 18.41 (25.40) | 28.63 (32.33) | 36.48 (37.14) | 27.84 (31.62) | 48.20 |
| T8 | Azoxystrobin 23 SC @ 0.05% | 18.14 (25.19) | 32.54 (34.77) | 36.66 (37.24) | 29.11 (32.40) | 45.84 |
| T9 | Untreated control (Check) | 22.13 (28.04) | 49.60 (44.75) | 89.53 (71.11) | 53.75 (47.96) | |
| | SEm± | 0.38 | 0.59 | 0.48 | 3.99 | |
| | CD (P @ 0.05) | 1.16 | 1.78 | 1.44 | 11.95 | |
| | CV (%) | 2.57 | 2.84 | 1.78 | 18.99 | |

*Figures in parentheses are arcsine transformed values

**Table 5. Effect of fungicides on blackgram Powdery mildew during *rabi*, 2016-17**

| S.No | Treatment | Percent Disease Index (PDI) | | | Mean | Percent reduction over control |
|---|---|---|---|---|---|---|
| | | One week after first spraying | Two weeks after first spraying | One week after second spraying | | |
| T1 | Trifloxystrobin 25% WG +Tebuconazole 50% WG @ 0.05% | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 0.00 (0.00) | 100 |
| T2 | Tebuconazole 25 EC @ 0.1% | 9.28 (17.67) | 11.12 (19.45) | 8.54 (16.96) | 9.65 (18.06) | 78.39 |
| T3 | Propiconazole 25 EC @ 0.1% | 4.88 (12.74) | 7.46 (15.82) | 5.48 (13.49) | 5.94 (14.04) | 86.70 |
| T4 | Chlorothalonil 75 WP @ 0.15% | 10.62 (19.01) | 11.62 (19.91) | 10.53 (18.93) | 10.92 (19.29) | 75.55 |
| T5 | Dinocap 48 EC @ 0.1% | 9.95 (18.37) | 12.36 (20.55) | 9.99 (18.41) | 10.77 (19.12) | 75.88 |
| T6 | Carbendazim 50 WP @ 0.1% | 10.82 (19.19) | 13.66 (21.67) | 11.17 (19.51) | 11.88 (20.13) | 73.40 |
| T7 | Hexaconazole 5 EC @ 0.2% | 2.17 (8.46) | 7.05 (15.34) | 7.08 (15.42) | 5.43 (13.09) | 87.84 |
| T8 | Azoxystrobin 23 SC @ 0.05% | 9.15 (17.58) | 17.71 (24.88) | 18.71 (25.62) | 15.19 (22.07) | 65.99 |
| T9 | Untreated control (Check) | 17.73 (24.88) | 40.28 (39.38) | 76.00 (60.69) | 44.67 (41.64) | |
| | SEm± | 0.51 | 0.49 | 0.56 | 3.46 | |
| | CD (P@ 0.05) | 1.55 | 1.47 | 1.68 | 10.38 | |
| | CV (%) | 5.85 | 4.33 | 4.64 | 32.12 | |

*Figures in parentheses are arcsine transformed values

**Table 6. Effect of funcigides on seed parameters in blackgram during *rabi* 2016-17**

| S. No. | Treatment | Seed yield per plot (q/ha) | % increase over control | Test weight (q/ha) | % increase over control | % discoloured seed | % dicrease reduction over control | % shrivelled seed | % dicrease reduction over control |
|---|---|---|---|---|---|---|---|---|---|
| T1 | Trifloxystrobin 25% WG + | 6.88 | 21.55 | 6.04 | 7.86 | 23.33 | 10.27 | 11.67 | 25.53 |
| T2 | Tebuconazole 25 EC @ 0.1% | 9.03 | 59.54 | 6.19 | 10.54 | 18.67 | 28.19 | 6.00 | 61.71 |
| T3 | Propiconazole 25 EC @ 0.1% | 7.55 | 33.39 | 6.02 | 7.50 | 22.00 | 15.38 | 12.33 | 21.31 |
| T4 | Chlorothalonil 75 WP @ 0.15% | 8.29 | 46.47 | 6.16 | 10.00 | 20.00 | 23.08 | 11.00 | 29.80 |
| T5 | Dinocap 48 EC @ 0.1% | 6.51 | 15.02 | 6.07 | 8.39 | 24.67 | 5.12 | 14.33 | 8.55 |
| T6 | Carbendazim 50 WP @ 0.1% | 8.44 | 49.12 | 6.18 | 10.36 | 21.33 | 17.96 | 11.33 | 27.70 |
| T7 | Hexaconazole 5 EC @ 0.2% | 8.74 | 54.42 | 6.32 | 12.86 | 18.33 | 29.50 | 5.67 | 63.82 |
| T8 | Azoxystrobin 23 SC @ 0.05% | 9.33 | 64.84 | 6.40 | 14.29 | 17.00 | 34.62 | 4.67 | 70.20 |
| T9 | Untreated control (Check) | 5.66 | - | 5.60 | - | 26.00 | - | 15.67 | - |
| | SEm± | 0.36 | | 0.094 | | 0.59 | | 0.53 | |
| | CD (P @ 0.05) | 1.09 | | 0.28 | | 1.76 | | 1.58 | |
| | CV (%) | 3.89 | | 1.134 | | 3.70 | | 4.96 | |

**Table 7. Chemical control economics on funagal foliar diseases infected blackgram during *rabi* 2016-17**

| Treatments | Cost of Cultivation (Rs/ha) | Yield (q/ha) | Gross returns (Rs/ha) | Net returns (Rs/ha) | B:C Ratio |
|---|---|---|---|---|---|
| T1: Trifloxystrobin 25% WG + Tebuconazole 50% WG @ 0.05% | 18688 | 6.88 | 36464 | 17776 | 0.95 |
| T2: Tebuconazole 25 EC @ 0.1% | 17688 | 9.03 | 47859 | 30171 | 1.71 |
| T3: Propiconazole 25 EC @ 0.1% | 17447 | 7.55 | 40015 | 22568 | 1.29 |
| T4: Chlorothalonil 75 WP @ 0.15% | 17583 | 8.29 | 43937 | 26354 | 1.50 |
| T5: Dinocap 48 EC @ 0.1% | 20083 | 6.82 | 36146 | 16063 | 0.80 |
| T6: Carbendazim 50 WP @ 0.1% | 17084 | 8.44 | 44732 | 27648 | 1.62 |
| T7: Hexaconazole 5 EC @ 0.2% | 17308 | 8.74 | 46322 | 29014 | 1.68 |
| T8: Azoxystrobin 23 SC @ 0.05% | 18163 | 9.33 | 49449 | 31286 | 1.72 |
| T9: Untreated control (Check) | 16788 | 5.66 | 29998 | 13210 | 0.79 |

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