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CHEMICAL MANAGEMENT OF FOLIAR FUNGAL DISEASES OF BLACKGRAM (*Vigna mungo* (L.) Hepper) IN KARNATAKA

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Abstract: In the present study fungicides such as Tebuconazole (250 EC) @ 1 ml /l, Tebuconazole + Trifloxystrobin @ 0.5 g /l, Propiconazole (25 EC)@ 1 ml /l and Hexaconazole 5 EC) @1 ml /l were evaluated for their bio-efficacy against cercospora leaf spot, anthracnose and powdery mildew of blackgram. Seed treatment with *Trichoderma* 10 g/kg followed by foliar spray of above chemicals and seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray of above chemicals were evaluated as individual treatments. Among the treatments, seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l was found to be the most effective in managing the cercospora leaf spot, anthracnose and powdery mildew of blackgram with PDI of 4.85, 11.07 and 6.72 respectively. Untreated control recorded the maximum PDI of 30.20, 65.50 and 51.40 for the above diseases respectively. Highest seed yield of 8.79 q/ha was observed with seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l with maximum B: C ratio of 2.29. Thus, seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l found to be best for the management of multiple foliar fungal diseases such as cercospora leaf spot, anthracnose and powdery mildew of blackgram.

Keywords: Blackgram, Powdery mildew, Anthracnose and Fungicides.

INTRODUCTION

Black gram (*Vigna mungo* (L.) Hepper) is one of the most important pulse crops of Fabaceae. It is an ancient and well known leguminous crop of Asia, due to its nutritional quality and the suitability to cropping system. Rich in easily digestible protein (24%), contains vitamin B1 (0.42 mg), B2 (0.37), Niacin (2.0 mg), iron (8.7 mg), calcium (185 mg), P (345 mg) and Fat (1.2%) per 100 g dry seed. It is consumed as dhal in South Asia and consumed as food products like fried snacks, desserts and bean sprouts. The lower productivity of black gram is mainly attributed to low genetic yield potentiality, indeterminate growth habit, canopy architecture, low partitioning efficiency, cultivation in marginal land and due to biotic and abiotic stresses. Among biotic stresses powdery mildew, cercospora leaf spot, anthracnose are the major fungal foliar diseases of black gram in our location.

Powdery mildew caused by *Erysiphe polygoni* DC is considered as a major one. The loss inflicted is proportional to the disease intensity and varies considerably depending on the stage of plant growth. The disease has world-wide importance, occurring wherever it is grown, particularly in the Indian sub-continent and southeast-Asian countries (Butler, 1918). In India the disease is

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present in almost all states of the country and becomes severe in dry season causing 9.0- 50.0 per cent yield loss (Pandey *et al*., 2009). Powdery mildew of urdbean causes both qualitative and quantitative loss of grains. The reduction in photosynthetic activity and physiological changes are considerable, which lead to potential reduction in yield (40-90%) depending on stage and time at which the disease appears. However, disease intensity depends upon the cultivar, growing period and environmental conditions.

Symptoms of *Cercospora canescens* on *Vigna radiata* produced definite spots on leaves, which are at first brown, later turning grey or dirty grey with narrow reddish brown margin on both the surfaces (Munjal *et al*., 1960). The causal organism *Cercospora canescens* is a shy sporulating pathogen (Jamadar, 1988) and is soil and air borne in nature. Although the disease has became very severe now-a-days, not much work is carried out on leaf spot disease of greengram. In view, of this, there is a need for systematic work which includes survey for knowing the disease severity.

The diseases can be managed by spraying fungicides. Many systemic and non-systemic fungicides are reported for the management of multiple foliar fungal diseases such as cercospora leaf spot, anthracnose and powdery mildew of blackgram. The information on the efficacy of different new fungicides and combi products against cercospora leaf spot, anthracnose and powdery mildew of blackgram is insufficient. Hence there is a need to evaluate new fungicides against cercospora leaf spot, anthracnose and powdery mildew of blackgram. Hence, the present investigation was undertaken with the objective to evaluate the efficacy of new fungicides against cercospora leaf spot, anthracnose and powdery mildew of blackgram.

MATERIALS AND METHODS

The present investigation was carried out at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad (Karnataka) during *kharif* 2018-19 and 2019-20. Commercial fungicides Tebuconazole (250 EC) @ 1 ml /l, Tebuconazole + Trifloxystrobin @ 0.5 g /l, Propiconazole (25 EC)@ 1 ml /l and Hexaconazole 5 EC) @1 ml /l were evaluated for their bio-efficacy against cercospora leaf spot, anthracnose and powdery mildew of blackgram. Seed treatment with *Trichoderma* 10 g/kg followed by foliar spray of above chemicals and seed treatment with Carbendazim (50 WP) 2g/ kg followed by foliar spray of above chemicals were evaluated as individual treatments in the present study. The field experiment was laid out in Randomized Block Design with 9 treatments and three replications. Blackgram variety 'DBGV 5' was sown at 30 cm x 10cm spacing. Recommended dose of fertilizers was. Thinning and gap filling operations were carried out ten days after sowing to maintain uniform plant population. First spraying was done immediately on appearance of powdery mildew disease and subsequent second spray was given at an interval of 15 days. The plot without fungicidal spray was treated as untreated control plot.

The severity of the powdery mildew was recorded during both the seasons using 0-5 scale and severity of **cecospora leaf spot and anthracnose were recorded using** 0**-9 scale** (Mayee and Datar, 1986) and per cent disease Index (PDI) was calculated.

(a) Disease severity ofpowdery mildew: 0**-5 scale** will be used for scoring the disease.

0= No infection
1= 0.1 to 10 % leaf area is infected
2= 10.1 to 25.0 % leaf area is infected
3= 25.1 to 50.0 % leaf area is infected
4= 50.1 to 75.0 % leaf area is infected
5= 75.1 to 100.0 % leaf area is infected

b) **Disease severity of cecospora leaf spot and anthracnose:** 0**-9 scale** will be used for scoring the disease.

0 = No symptoms on leaf
1 = Few small necrotic spots covering 1% or less of the leaf area
3= Few small necrotic spots covering 1-5% of the leaf area
5= Spots coalescing, covering 6-20% of the leaf area
7= Spots enlarging, coalescing to cover 21-50% of the leaf area
9= Spots enlarging, coalescing to cover ≥51 % of the leaf area

$$Percent\ disease\ index(PDI) = \frac{Sum\ of\ the\ individual\ disease\ ratings}{Number\ of\ leaves\ observed \times Maximum\ disease\ grade} \times 100$$

The yield was recorded from each plot and computed to yield kg/ha, gross returns, net returns and benefit cost ratio were also calculated according to standard procedures. The data were subjected to statistical analysis after using transformations such as arc sine transformation for Per cent Disease Index.

RESULTS AND DISCUSSION

Disease severity (PDI): Pooled data of experiments conducted at MARS, UAS, Dharwad for two years during 2018-19 and 2019-20 *Kharif* revealed that, all the chemicals were found effective in reducing the severity of the diseases (Table. 1)and their by increasing the blackgram yield. Among the treatments, seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l was found to be the most effective in managing the cercospora leaf spot, anthracnose and powdery mildew of blackgram with PDI of 4.85, 11.07 and 6.72 respectively and which was followed by Seed treatment with T*richoderma* 10 g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l which recorded PDI of 7.61, 12.75 and 9.90 respectively. Untreated control recorded the maximum PDI of 30.20, 65.50 and 51.40 for the above diseases respectively. The results are in agreement with several workers who reported powdery mildew management in various crops through fungicides (Begum, 1989, Upadhyay and Gupta, 1994, Kapoor and Sugha, 1995, Malani *et al*., 1998, Naik and Nagaraja, 2000, Moshe 2001, Saxena and Moly Saxena, 2002, Gupta and Amit Kumar 2008, Divyjyothi, 2012 Channaveeresh , 2013 and Ashwini *et al*., 2016 . Madhuri and Karunasagar, 2020. Similarly, the efficacy of different fungicides and botanicals was studied under field condition against green gram anthracnose and found that among different treatment, the least disease incidence was observed in propiconazole followed by hexaconazole and carbendazim. But, in case of botanicals, the least disease incidence was noticed in azadirachtin (Laxman, 2006).

Triazole fungicides interfere with the biosynthesis of fungal sterols and inhibit ergosterol biosynthesis (Rawal, 1993). Ergosterol is essential to the structure of cell wall and its absence causes irreparable damage to the cell wall thus fungus dies. Apart from this also interfere in conidia and haustoria formation. These changes in a sterol content and saturation of the polar fatty acids leading to alterations in membrane fluidity and behaviour of membrane bound enzymes (Nene and Thapliyal, 1993).

Seed yield and Net returns

Highest seed yield of 8.79 q/ha was observed with seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l with maximum B: C ratio of 2.29 and followed by Seed treatment with T*richoderma* 10 g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l (8.12 q/ha) with B: C ratio of 2.12 when compared to least seed yield of 4.61 q/ha in untreated control with least B:C of 1.34 (Table. 2).

COCLUSION

Seed treatment with Carbendazim (50 WP) 2g/kg followed by foliar spray with Tebuconazole + Trifloxystrobin @ 0.5 g /l found to be best for the management of multiple foliar fungal diseases such as cercospora leaf spot, anthracnose and powdery mildew of blackgram with maximum net returns and B: C ratio.

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Table 1: Management of *Cercospora* leaf spot, anthracnose and powdery mildew of blackgram

Tr. No.	*Treatment details*	*CLS (PDI)*			*Anthracnose (PDI)*			*PM (PDI)*			*Yield q/ha*		
		2018	*2019*	*Pooled*	*2018*	*2019*	*Pooled*	*2018*	*2019*	*Pooled*	*2018*	*2019*	*Pooled*
1	Seed treatment with T*richoderma* 10 g/kg+ foliar spray of Tebuconazole (250 EC) @ 1 ml /l	13.98 (21.96)	10.77 (19.17)	12.38 (20.61)	17.83 (24.98)	20.04 (26.61)	18.94 (25.81)	14.57 (22.45)	13.48 (21.55)	14.03 (22.00)	7.45	5.58	6.51
2	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of of Tebuconazole 250 EC) @ 1ml /l	11.53 (19.86)	10.00 (18.44)	10.77 (19.16)	15.65 (23.28)	17.51 (24.75)	16.58 (24.04)	14.19 (22.14)	12.99 (21.14)	13.59 (21.64)	7.77	6.30	7.03
3	Seed treatment with T*richoderma* 10 g/kg+foliar spray of Tebuconazole + Trifloxystrobin @ 0.5 g /l	9.50 (17.96)	5.72 (13.84)	7.61 (16.02)	11.46 (19.78)	14.03 (22.01)	12.75 (20.93)	11.20 (19.53)	8.60 (17.06)	9.90 (18.35)	8.80	7.38	8.12
4	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of Tebuconazole + Trifloxystrobin @ 0.5 g /l	5.35 (13.38)	4.35 (12.04)	4.85 (12.72)	9.52 (17.96)	12.62 (20.82)	11.07 (19.44)	7.50 (15.84)	5.93 (14.1)	6.72 (15.03)	9.54	8.03	8.79
5	Seed treatment with T*richoderma* 10 g/kg+foliar spray of Propiconazole (25 EC)@ 1 ml /l	19.26 (26.05)	15.59 (23.27)	17.43 (24.69)	20.43 (26.88)	25.51 (30.35)	22.97 (28.65)	16.92 (24.29)	15.60 (23.27)	16.26 (23.79)	7.28	5.51	6.40
6	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of of Propiconazole (25 EC)@ 1 ml /l	15.58 (23.26)	14.45 (22.35)	15.01 (22.81)	18.58 (25.53)	22.60 (28.4)	20.59 (27)	15.17 (22.91)	14.09 (22.06)	14.63 (22.5)	7.62	6.21	6.92
7	Seed treatment with T*richoderma* 10 g/kg+foliar spray of Hexaconazole 5 EC) @1 ml /l	18.35 (25.37)	18.58 (25.54)	18.46 (25.46)	21.32 (27.51)	27.69 (31.77)	24.50 (29.69)	20.06 (26.61)	19.13 (25.95)	19.59 (26.29)	7.01	5.18	6.09
8	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of Hexaconazole (5 EC) @ 1 ml /l	18.70 (25.63)	17.06 (24.41)	17.88 (25.03)	22.56 (28.36)	26.17 (30.79)	24.37 (29.59)	17.69 (24.87)	17.23 (24.53)	17.46 (24.71)	7.49	6.13	6.81
9	Control	30.48 (33.53)	29.92 (33.18)	30.20 (33.35)	60.32 (51.02)	70.67 (57.24)	65.50 (54.05)	73.51 (59.14)	29.30 (32.79)	51.40 (45.83)	4.87	4.34	4.61
	S.Em ±	0.76	1.10	0.71	0.97	1.59	0.71	0.91	1.49	0.76	0.21	0.25	0.19
	CD at 5%	2.28	3.29	2.14	2.91	4.79	2.15	2.74	4.49	2.30	0.62	0.77	0.56
	CV	5.74	8.93	5.58	6.18	9.13	4.31	6.00	11.56	5.43	5.55	7.34	4.77

Table 2: Benefit Cost (B:C) ratio for management of *Cercospora* leaf spot, anthracnose and powdery mildew in blackgram

Tr. No.	*Treatment details*	*Yield q/ha pooled*	*Cost of cultivation (Rs/ha)*	*Gross returns (Rs/ha)*	*Net returns (Rs/ha)*	*B:C ratio*
1	Seed treatment with T*richoderma* 10 g/kg+ foliar spray of Tebuconazole (250 EC) @ 1 ml /l	6.51	24385	42325.83	17941	1.74
2	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of of Tebuconazole 250 EC) @ 1ml /l	7.03	24435	45705.83	21271	1.87
3	Seed treatment with T*richoderma* 10 g/kg+foliar spray of Tebuconazole + Trifloxystrobin @ 0.5 g /l	8.12	24865	52780.00	27915	2.12
4	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of of Tebuconazole + Trifloxystrobin @ 0.5 g /l	8.79	24915	57113.33	32198	2.29
5	Seed treatment with T*richoderma* 10 g/kg+foliar spray of Propiconazole (25 EC)@ 1 ml /l	6.40	23455	41567.50	18113	1.77
6	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of of Propiconazole (25 EC)@ 1 ml /l	6.92	23505	44969.17	21464	1.91
7	Seed treatment with T*richoderma* 10 g/kg+foliar spray of Hexaconazole 5 EC) @1 ml /l	6.09	22960	39606.67	16647	1.73
8	Seed treatment with Carbendazim (50 WP) 2g/kg +foliar spray of Hexaconazole (5 EC) @ 1 ml /l	6.81	23010	44275.83	21266	1.92
9	Control	4.61	22325	29943.33	7618	1.34
	S.Em ±	0.19				
	CD at 5%	0.56				
	CV	4.77				