

Management of *Cercospora* leaf spot disease of Urdbean (*Vigna mungo* L. Hepper)

Abstract

This study, which examines the management of *Cercospora* leaf spot disease in Urdbean, contributes to the benefit of agriculture by preventing the occurrence of plant diseases. The purpose of this study was to look into how various fungicides affected the management of *Cercospora* leaf spot in Urdbean. During the *Kharif* season of 2023, the study was conducted at the Rainfed Organic Agriculture Research Farm Narayan Bagh, which is part of the Department of Plant Pathology at the Institute of Agricultural Sciences, Bundelkhand University, Jhansi (Uttar Pradesh). The experiment was laid out in a randomized block design (RBD) with three replications. Fungicides were foliar applied after the initiation of the disease. Results showed that among the tested treatments, including the control, carbendazim 50% WP @ 0.10 g/L (86.77%), followed by *Trichoderma harzianum* 1% WP @ 10 g/L (18.33%), propineb 70% WP @ 0.15 % (19.53%), propiconazole 25% WP @ 0.10 g/L (20.43%), *Trichoderma* + *Pseudomonas* @ 0.10 g/L (22.27 %), chlorothalonil 75% WP @ 0.15 % (23.60%), mancozeb 75% WP @ 0.20 % (24.50%), and *Pseudomonas fluorescens* 1% WP @ 10 g/L (33.27 %), they were significantly superior over control.

Key words: *Cercospora* leaf spot, bioagents and fungicides, urdbean and management

INTRODUCTION

Black gram (*Vigna mungo* L. Hepper) commonly known as Urdbean, mash, and black maple is an annual, semi-erect to spreading herb belonging to the family Fabaceae and is grown as a *Kharif* crop in tropical and subtropical countries. A 100 g of Urdbean seeds contains the following nutrients: protein (24%), fat (1.4%), carbohydrate (59.6%), phosphorus (385 mg), calcium (154 mg), iron (9.1 mg), beta-carotene (38 mg), thiamine (0.4 mg), riboflavin (0.37 mg), and niacin (2 mg). Diseases that result in quantitative and qualitative yield losses threaten to undermine the sustainability of black gram cultivation.

Urdbean originated in India (De Candolle, 1886). "It is an important pulse crop of the Indian subcontinent, cultivated almost throughout the country in all three seasons, occupying an area of about 4.6 million hectares with an average annual production of 24.5 lakh tons. It holds an important position after chickpea in India. India occupies an area of 463.3 thousand hectares with a production of 277.6 thousand tons and a productivity of 59.9 mt/ha". (Anonymous, 2022).

"The major diseases, viz., anthracnose (*Colletotrichum lindemuthianum*), bacterial leaf blight (*Xanthomonas phaseoli*), *cercospora* leaf spot (*Cercospora canescens*), corynesporaleafspot (*Corynespora cassiicola*), powdery mildew (*Erysiphe polygoni*), root rot, web blight (*Rhizoctonia solani*), and stem canker (*Macrophomina phaseolina*) are reported in this crop. Among these *Cercospora* leaf spots, anthracnose, web blight, and powdery mildew cause heavy losses to the crop" (Agarwal *et al.*, 2019).

"The symptoms of *C. canescens* on *V. catjang* are brown leaf spots, later on, grey to dirty white, sub-circular to irregular and confluent, 5–10 mm wide, fruiting amphigenous, sometimes present on leaf, stem, cotyledons, and drying pod in effuse black to grey patches observed

(Vasudeva, 1963). Depending on the temperature and humidity, the disease appears 30–40 days after planting and spreads rapidly in susceptible varieties, causing premature defoliation and a reduction in the size of pods and grains” (Grewal et al., 1980). “The fungus produced definite spots on leaves, which were first brown, later turned grey to dirty grey with a narrow reddish-brown margin, subcircular to irregular, and 5–10 mm wide” (Jamadar, 1988). “*Cercospora spp.* produce a perylenequinone toxin called cercosporin, which is non-selective and affects bacteria, plants, fungi and animals unless these produce protective antioxidants such as carotenoids” (Daub and Ehrenshaft, 2000).

“*Cercospora* leaf spot was first known to occur in Delhi, India and is prevalent in all parts of the humid tropical areas of India, Bangladesh, Indonesia, Malaysia, Philippines, Taiwan as well as Thailand. It becomes severe in the wet season causing 0.0 % to 100.0 per cent yield loss” (Amin and Singh, 1987; Iqbal et al., 1995; Munjal et al., 1960). The present study conducted to evaluate the efficacy of fungicides against *Cercospora* leaf spot disease for effective management.

MATERIALS AND METHODS

A field experiment was conducted to evaluate the efficacy of different bioagents and fungicides against the *Cercospora* leaf spot disease of Urdbean under field conditions at Rainfed Organic Agriculture Research Farm Narayan Bagh, Institute of Agricultural Science, Bundelkhand University, Jhansi (UP). Urdbean variety HD-2250 was sown and trials were laid out in a randomized block design with 9 treatments and 3 replications. Recommended agronomic practices were followed for raising the crop. The total number of plants was recorded at the time of thinning i.e., fifteen days after sowing, while the number of green leaf spot-infected plants was recorded at 30 and 45 days after sowing and then the green leaf spot incidence per cent was calculated with the help of the following formula:

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants}} \times 100$$

$$\text{Per cent disease control} = \frac{C-T}{C} \times 100$$

Where,

I = Per cent inhibition of fungal growth.

C = Per cent disease incidence of control plots

T = Per cent disease incidence in treated plots

RESULTS AND DISCUSSION

All the bioagents and fungicides tested against *Cercospora* leaf spot on per cent disease index and disease reduction in field conditions. The efficacy of bio-agents and fungicides as foliar spray were evaluated in field condition to find out the effectiveness of all treatments at 30 and 45 days of sowing.

At 30 days after sowing

Per cent Disease index

The result indicated that the minimum disease index was found in carbendazim 50% WP @ 0.10 g/L (14.30%), followed by *Trichoderma harzianum* 1% WP @ 10 g/L (16.40%), propineb 70% WP @ 0.15 % (17.37%), propiconazole 25% WP @ 0.10 g/L (17.73%), *Trichoderma + Pseudomonas* % WP @ 0.10 g/L (20.27%), mancozeb 75% WP @ 0.20 % (21.47 %), chlorothalonil 75% WP @ 0.15 % (22.40%), *Pseudomonas fluorescens* 1% WP @ 10 g/L (31.37%) and control (79.43%). *Trichoderma harzianum* 1% WP, *Pseudomonas fluorescens* 1% WP, *Trichoderma + Pseudomonas*, Mancozeb 75% WP (M Guard 45), Carbendazim 50% WP (Bavistin), Propiconazole 25% WP and Propineb 70% WP were found at par with each other (Table 1).

Disease Reduction

The results indicated that maximum disease control was found in carbendazim 50% WP @ 0.10 g/L (93.44%), followed by propineb 70% WP @ 0.15 % (89.04%), propiconazole 25% WP @ 0.10 g/L (88.52%), *Trichoderma + Pseudomonas* @ 0.10 g/L (84.88%), mancozeb 75% WP @ 0.20 % (83.16%), chlorothalonil 75% WP @ 0.15 % (81.82%), *Trichoderma harzianum* @ 10 g/L (79.35%), *Pseudomonas fluorescens* @ 10 g/L (68.95%) and control (81.82%). *Trichoderma harzianum* 1% WP, *Pseudomonas fluorescens* 1% WP, *Trichoderma + Pseudomonas*, Mancozeb 75% WP (M Guard 45), Carbendazim 50% WP (Bavistin), Propiconazole 25% WP and Propineb 70% WP were found at par with each other (Table 1).

At 45 days after sowing

Disease incidence

The result indicated that the minimum disease index was found in carbendazim 50% WP @ 0.10 g/L (86.77%), followed by *Trichoderma harzianum* 1% WP @ 10 g/L (18.33%), propineb 70% WP @ 0.15 % (19.53%), propiconazole 25% WP @ 0.10 g/L (20.43%), *Trichoderma + Pseudomonas* @ 0.10 g/L (22.27%), chlorothalonil 75% WP @ 0.15 % (23.60%), mancozeb 75% WP @ 0.20 % (24.50%), *Pseudomonas fluorescens* 1% WP @ 10 g/L (33.27%) and control (84.50%). *Trichoderma harzianum* 1% WP, *Pseudomonas fluorescens* 1% WP, *Trichoderma + Pseudomonas*, Mancozeb 75% WP (M Guard 45), Carbendazim 50% WP (Bavistin), Propiconazole 25% WP, and Propineb 70% WP were found at par with each other (Table 1).

Disease Reduction

The results indicated that maximum disease control was found in carbendazim 50% WP @ 0.10 g/L (86.77%), followed by chlorothalonil 75% WP @ 0.15 % (84.40%), propineb 70% WP @ 0.15 % (82.87%), propiconazole 25% WP @ 0.10 g/L (81.72%), *Trichoderma + Pseudomonas* @ 0.10 g/L (79.38%), *Trichoderma harzianum* @ 10 g/L (78.31%), *Pseudomonas fluorescens* @ 10 g/L (65.34%) and control (84.40%). *Trichoderma harzianum* 1% WP, *Pseudomonas fluorescens* 1% WP, *Trichoderma + Pseudomonas*, Mancozeb 75% WP (M Guard 45), Carbendazim 50% WP (Bavistin), Propiconazole 25% WP and Propineb 70% WP were found at par with each other (Table 2). Several researchers reported the effectiveness of compounds against *Cercospora* leaf spot disease in black gram and green gram (Khunti et al.,

2005; Kavyashree et al., 2017; Tiawri Smita et al., 2021). Kavyashree et al. (2017) evaluated the efficacy of different fungicides against *Cercospora* leaf spot infecting mungbean.

Conclusion

The study highlights the efficacy of fungicides against *Cercospora* leaf spot disease for effective management. *Cercospora* leaf spot was first known to occur in Delhi, India and is prevalent in all parts of the humid tropical areas of India. It becomes severe in the wet season causing 0.0 % to 100.0 per cent yield loss.

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Table:1 Effects of bioagent and fungicides against *Cercospora* leaf spot on per cent disease index and disease reduction under field condition at 30 and 45 days after sowing.

Symbol	Treatment	Dose	30 Days		45 Days	
			PDI	PDC	PDI	PDC
T ₁	<i>Trichoderma harzianum</i> 1 % WP	10 g/L	16.40	79.35	18.33	78.31
T ₂	<i>Pseudomonas fluorescens</i> 1 % WP	10 g/L	31.37	68.95	33.27	65.34
T ₃	<i>Trichoderma + Pseudomonas</i>	10 g/L	20.27	84.88	22.27	79.38
T ₄	Mancozeb 75 % WP (M Guard 45)	0.20%	21.47	83.16	24.50	76.53
T ₅	Carbendazim 50 % WP (Bavistin)	0.10%	14.30	93.44	16.47	86.77
T ₆	Propiconazole 25 % WP	0.10%	17.73	88.52	20.43	81.72
T ₇	Propineb 70 % WP	0.15%	17.37	89.04	19.53	82.87
T ₈	Chlorothalonil 75 % WP (Kavach)	0.15%	22.40	81.82	23.60	84.40
T ₉	Control	-	79.43	-	84.50	-
	S. Em±	-	0.06	-	0.07	-
	CD	-	0.18	-	0.20	-

Figure given in parenthesis are transformed value

*PDI= Percent disease incidence, *PDC= Percent disease control.

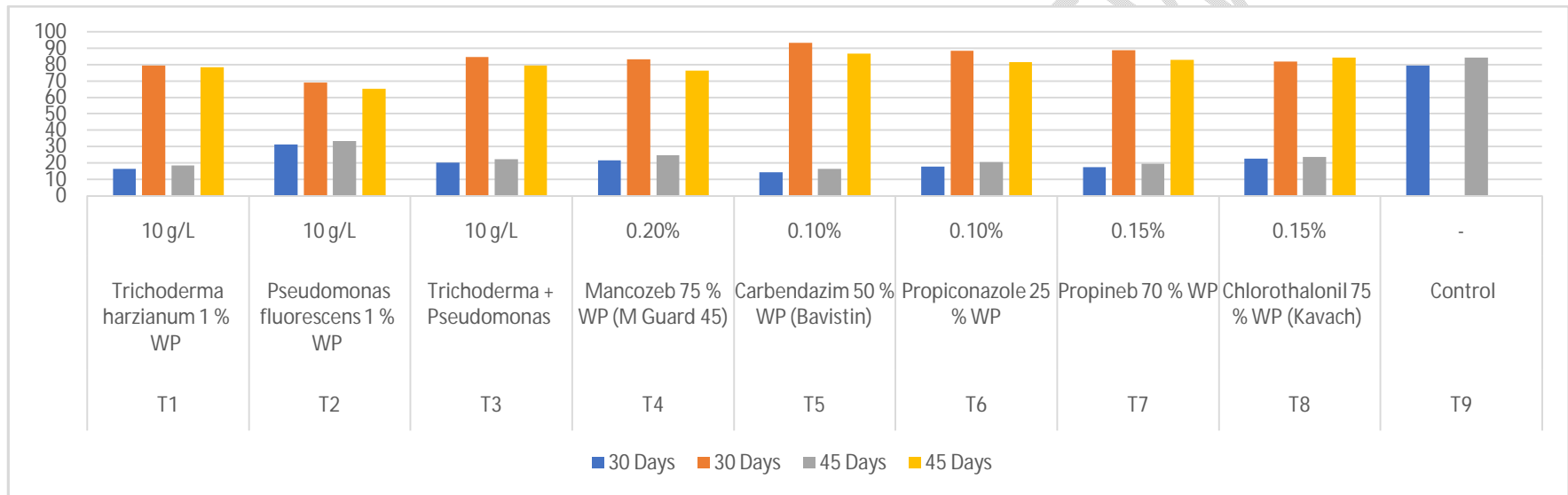


Fig.:1 Effects of bioagent and fungicides against *Cercospora* leaf spot on per cent disease index and disease reduction under field condition at 30 and 45 days after sowing.