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Management of *Leveillula taurica* causing powdery mildew of cluster bean using different fungicides

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Abstract

Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.) is one of the most important legume crops grown in India. Powdery mildew caused by *Leveillula taurica* is one of the major constraints in the production of cluster bean. In order to find out the efficacy of various fungicides against *Leveillula taurica* experiment was carried out under *in vivo* condition during *Kharif*, 2013. Out of nine fungicides tested, propiconazole (0.025 %) was the most effective fungicides with 16.42 per cent mean disease intensity. The second effective treatment was wettable sulphur (0.2 %) with 22.42 per cent mean disease intensity, which was statistically at par with hexaconazole, difenoconazole and dinocap with mean disease intensity of 22.86, 22.97 and 25.30 per cent, respectively. Sulphur dust and picoxystrobin were found moderately effective with 28.71 and 28.82 per cent disease intensity, respectively. Per cent disease control ranged from 55.91 to 74.88. Maximum disease control of 74.88 per cent was observed in the treatment of propiconazole followed by treatment wettable sulphur by 65.69 per cent as compared to control. Minimum disease control was found in the treatment of picoxystrobin with disease control of 55.91 per cent.

Keywords: *Leveillula taurica*, *in vivo*, powdery mildew, fungicides and cluster bean

Introduction

Cluster bean (*Cyamopsis tetragonoloba* (L.) Taub.) is an important drought resistant leguminous crop that has been grown in India since ancient times. In India, Rajasthan, Gujarat, Haryana, Uttar Pradesh and Punjab are known to be the leading states for cultivation of cluster bean.

The cluster bean crop is affected by various biotic and abiotic stresses causing considerable yield losses. Among biotic stresses, the damage caused by plant diseases is one of the major constraints. It is affected by a number of diseases caused by fungi, nematodes, virus and phytoplasma. Fungal diseases like anthracnose, angular leaf spot, root rot, rust and charcoal rot *etc.* Among these, powdery mildew of cluster bean caused by *Leveillula taurica* is an important disease. The weather conditions during December and January are most congenial for outbreak of powdery mildew, which has become a limiting factor for successful cultivation of cluster bean. It has also been observed in moderate to severe forms in fields of Junagadh district of Gujarat state. It is a routine practice for farmers to spray fungicides onward from one month crop age to maturity, particularly for powdery mildew control. Fungicidal applications are also mandatory for powdery mildew management after its initiation. Hence looking to importance of this disease and need of present era, efficacy of various fungicides was tested in field condition against powdery mildew pathogens.

Materials and Methods

A field trial was conducted at the Department of Plant Pathology, JAU, Junagadh to study efficacy of various fungicides for controlling powdery mildew disease of cluster bean caused by *L. taurica* during *kharif* season of 2013-14. The details of different treatments are given in Table 1.

First spray was given on initiation of disease and remaining two sprays of fungicides were carried out at 20 day interval. Control was maintained by water spraying (500 lit/ha) and without spraying of any fungicides. Observations on disease intensity were recorded from ten plants randomly selected from each treatment after seven days of last spray using 0-5 scale given by Rathore and Rathore (1995) [1].

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Each plant was evaluated for its disease reaction by scoring the disease intensity on top, middle and lower leaves following a 0-5 scale, where 0=0 (Healthy leaves), 1= 1-20 %, 2=21-40 %, 3=41-60 %, 4=61-80 % and 5= 81-100 % leaf area.

Table 1: Fungicides tested *in vivo* during *kharif*, 2013

Sr. No.	Fungicides	Concentrations (%)
1.	Hexaconazole 5% EC	0.005
2.	Difenoconazole 25% EC	0.025
3.	Propiconazole 25% EC	0.025
4.	Picoxystrobin 25% EC	0.025
5.	Dinocap 48% EC	0.048
6.	Wettable Sulphur 80% WP	0.2
7.	Sulphur Dust	25 kg/ha
8.	Control (Water spray)	500 lit/ha
9.	Control	

Per cent disease intensity (PDI) was calculated by using the following formula:

$$PDI = \frac{\text{Sum of total rating}}{\text{Total plants observed}} \times \frac{100}{\text{Maximum disease rating}}$$

The per cent disease control and the percentage deviation in seed yield were calculated with the help of the following formula (Mathur *et al.*, 1971) [2].

$$PDC (\%) = \frac{PDI \text{ in check} - PDI \text{ in treatment}}{PDI \text{ in check}} \times 100$$

Table 2: Effect of different fungicides against powdery mildew of cluster bean *in vivo* during *kharif*, 2013

Sr. No.	Fungicides	Concentrations (%)	Per cent disease intensity*	Disease control (%)
1.	Hexaconazole 5% EC	0.005	22.86 (28.57)*	65.02
2.	Difenoconazole 25% EC	0.025	22.97 (28.64)	64.85
3.	Propiconazole 25% EC	0.025	16.42 (23.90)	74.88
4.	Picoxystrobin 25% EC	0.025	28.82 (32.47)	55.91
5.	Dinocap 48% EC	0.048	25.30 (30.20)	61.29
6.	Wettable Sulphur 80% WP	0.2	22.42 (28.27)	65.69
7.	Sulphur Dust	25 kg/ha	28.71 (32.40)	56.08
8.	Control (Water spray)	500 lit/ha	56.89 (48.96)	12.96
9.	Control		65.37 (53.95)	-
	S. Em. ±		1.85	
	CD at 5%		5.55	
	CV %		9.39	

*Figures in parentheses show angular transformed values.

Conclusion

Based on present investigation, it can be concluded that clusterbean plants are susceptible to *Leveillula taurica*. Generally the cool and dry weather favour the disease. However, it is found in severe form in summer season showed diversity of pathogen to grow and survive in hot weather also. The pathogen is air borne in nature and wide host range provides shelter for survival. Hence, its elimination from nature is problematic and challenging. Though, in present investigation it was tried to minimize the loss incurred due to pathogen using fungicides *in vivo*.

The triazole group of fungicides especially propiconazole and hexaconazole were effective in field condition and reduced the losses in yield up to 28.20 per cent. The conventional fungicide, wettable sulphur also proved to be the best for management of disease.

Results and Discussion

Effect of fungicides on powdery mildew of cluster bean

Data presented in Table 2 that all fungicides tested reduced the disease intensity significantly as compared to the control. The propiconazole (0.025 %) was the most effective fungicides with 16.42 per cent mean disease intensity. The second effective treatment was wettable sulphur (0.2 %) with 22.42 per cent mean disease intensity, which was statistically at par with hexaconazole, difenoconazole and dinocap with mean disease intensity of 22.86, 22.97 and 25.30 per cent, respectively. Sulphur dust and picoxystrobin were found moderately effective with 28.71 and 28.82 per cent disease intensity, respectively.

Per cent disease control ranged from 55.91 to 74.88. Maximum disease control of 74.88 per cent was observed in the treatment of propiconazole followed by treatment wettable sulphur by 65.69 per cent as compared to control. Minimum disease control was found in the treatment of picoxystrobin with disease control of 55.91 per cent.

The water spray control and no spray control recorded the maximum per cent disease intensity 56.89 and 65.37 per cent, respectively.

The findings of present investigation were in favor of work done by Fiori *et al.*, (1996) [3]. They noticed that the new triazole compounds *viz.*, propiconazole, hexaconazole, penconazole and triadimefon gave good control against *L. taurica* f. sp. cynare causing powdery mildew of artichoke. Similarly, Nagaraja and Naik (1998) [4] evaluated the relative efficacy of various fungicides for the control of powdery mildew of pea by imposing three sprays at 15 days interval. All three triazoles *viz.*, propiconazole (0.1%), penconazole (0.1%) and difenoconazole (0.1%) exhibited promising activity against powdery mildew.

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