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Management of powdery mildew of mustard incited by *Erysiphe cruciferarum* through novel combined formulations of fungicides

Astha Sharma, Shailesh Godika, Pinki Sharma and Kiran

Abstract

Indian mustard [*Brassica juncea* (L.) Czern & Coss] is an important oilseed crop. Powdery mildew of mustard incited by *Erysiphe cruciferarum* (Opiz ex Junell) is the most important disease that causes a maximum reduction in yield and quality of mustard seed. A field experiment was carried out to know the effect of different fungicides against powdery mildew of mustard during *Rabi* season. Among the seven treatments, Tebuconazole 50 % + Trifloxystrobin 25% WG (0.1%), was observed highly superior over other fungicides and recorded a minimum of 8.33 per cent disease intensity (PDI) by decreasing 85.37 per cent disease intensity and maximum 13.62 q/ha yield. Myclobutanil (0.1%) was observed second best and recorded 12.73 per cent disease intensity and yield 12.32 q/ha.

Keywords: Mustard, *Erysiphe cruciferarum*, Fungicides

Introduction

Mustard [*Brassica juncea* (L.) Czern & Coss] is an important oilseed crop. It belongs to family *Cruciferae* (*Brassicaceae*). India is the one of leading oilseed producing country in the world accounting for 11.2% of the world's rapeseed and mustard production and ranks third in the world next to China and Canada. Mustard is the second most important oilseed crop after groundnut, contributing nearly 30% of the total oilseed production in India. Indian contribution in global rapeseed and mustard production is 9.34 million tones with an area of 6.23 million hectares and average yield of 1499 kg/ha (Anonymous, 2018-19) [1].

In Rajasthan, rapeseed and mustard occupies a prime place amongst all the oilseed crops grown. It occupies 2.37 million hectares area, 4.08 million tones production and 1720 kg/ha average yield (Anonymous, 2018-19) [1]. Mustard is hardy crop which grown in arid conditions of Rajasthan, characterized by sandy and loamy sand soils, scanty rainfall (400-600mm), thermal oscillations (5-35 °C) and low relative humidity. Some important fungal diseases which have been reported to cause huge economic losses worldwide to the crop are like powdery mildew (*Erysiphe cruciferarum* (Opiz ex L. Junell), downy mildew (*Hyaloperonospora parasitica* (pers.) constant), alternaria blight (*Alternaria alternata*, *Alternaria brassicae* (Berk.) sacc), white rust (*Albugo candida* (Pers.) kuntze), club root (*Plasmiodiophora brassicae* (Wor.), seedling blight /damping off (*Rhizoctonia solani*, *Fusarium* spp., *Pythium* spp.), sclerotinia stem rot (*Sclerotinia sclerotiorum* (Lib.) de bary.), black leg (*Leptosphaeria maculans*), root rot complex and foot rot (*Rhizoctonia solani*, *Fusarium* spp., *Pythium* spp.), fusarium wilt (*Fusarium oxysporum* f.sp. *conglutians*) (Kolte and Mehta *et al.* 2005) [8]. Among these powdery mildew incited by *Erysiphe cruciferarum* is the most important disease that causes maximum reduction in yield and quality of mustard. In india, powdery mildew disease affects yield losses from 10-90 per cent with reduction in 6.47 per cent oil content have been estimated from different Brassicas (PD Meena, 2018) [7].

The disease has attained the economic status in the Rajasthan state. By considering the seriousness of disease and the economic damage/exorbitant losses caused by the disease, the present investigation was carried out by using different fungicides for its efficacy against powdery mildew disease of mustard under filed condition.

Materials and Methods

The field experiment was conducted during *Rabi* 2020-21 at Department of Plant Pathology S.K.N. College of Agriculture, Jobner, Sri Karan Narendra Agriculture University, Jobner, Jaipur (Rajasthan). Jobner is situated at latitude 26°5' N, longitude of 75°20' E and altitude of

200 meters above MSL (mean sea level). The region falls under semi-arid eastern plain (Agro Climatic Zone- III A) of Rajasthan. The experiment was laid out in Randomized Block Design (RBD) with three replications and seven treatment with control. Sowing was done in the last week of November using local susceptible (Varuna) cultivar of mustard using a 30×10 cm and with plot size of 2×1 m. The recommended package of practices was followed for the trial.

All the foliar sprays (treatments) were given as per their doses. The first spray of fungicides was done after first appearance of disease. The same concentration was followed for second sprays at 15 days after interval. The severity of powdery mildew was examining 20 leaves from 10 randomly selected plants in each treatment by using 0-5 disease rating scale (McKinney (1923) ^[6] and per cent disease intensity (PDI) was calculated by using formula (Wheeler, 1969) ^[10].

$$\text{PDI \%} = \frac{\text{Sum of individual rating} \times 100}{\text{Total No. of leaves observed} \times \text{Maximum disease grade}}$$

The per cent disease control (PDC) over control was calculated as

$$\text{PDC over control} = \frac{\text{PDI in control} - \text{PDI in treatment}}{\text{PDI in control}} \times 100$$

The seed yields were recorded after harvesting the crop at maturity and the weight of crops at every plot separately for calculate the yield per hectare.

Fungicides with following details were used under field conditions

S. No.	Common name	Trade name	Dose (%)
1	Tebuconazole 50% + Trifloxystrobin 25% WG	Nativo 75 WG	0.1
2	Metiram 55% + Pyraclostrobin 5% WG	Cabrio top 60% WP	0.1
3	Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l SC	Merivon	0.1
4	Myclobutanil	Index	0.05
5	Azoxystrobin 23% SC	Amistar	0.1
6	Triadimefon	Bayleton 25 WP	0.1
7	Control	-	-

Result and Discussion

The result of the experiment is presented in Table 1 & Fig. 1. It was very clear that all the treatments reduced the disease significantly compared to the unsprayed control plant. The efficacy of various fungicides were evaluated for management of powdery mildew of mustard by spraying twice at 45 and 75 days after sowing under field conditions.

Per cent disease intensity revealed that all the fungicides were significantly effective in reducing the powdery mildew disease intensity over control (56.97 per cent). Among all treatments Tebuconazole 50% + Trifloxystrobin 25% WG was found most effective against powdery mildew which was

significantly superior over other treatments. The minimum 8.33 per cent disease intensity was recorded with application of tebuconazole 50% + trifloxystrobin 25% WG by decreasing 85.37 per cent disease intensity. However, Myclobutanil was second best and recorded 12.73 per cent disease intensity by decreasing 77.65 per cent disease intensity. Azoxystrobin 23% SC, Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l SC and triadimefon were observed statistically at par with 16.2, 16.86 and 18.43 per cent disease intensity. Among the fungicides maximum 26.2 per cent disease intensity was recorded in the treatment of metiram 55% + pyraclostrobin 250 g/l.

Analysis of yield data of mustard was found statistically significant over control. Result showed that maximum 13.62 q/ha yield was recorded in tebuconazole 50% + trifloxystrobin 25% WG with increasing 65.85 per cent yield followed by Myclobutanil 12.32 q/ha yield with increasing 50.03 per cent yield. Azoxystrobin 23% SC, fluxapyroxad 250g/l + pyraclostrobin 250 g/l SC and triadimefon recorded 11.60 q/ha, 11.39 q/ha and 11.20 q/ha yield respectively. Minimum 8.21 q/ha yield was recorded in control.

Amin *et al.* (2018) ^[2] determine the effectiveness of Nativo (Tebuconazole 50% + Trifloxystrobin 25%) against powdery mildew disease of cumin. Eight treatments including in different concentration of Nativo (Tebuconazole 50% + Trifloxystrobin 25%), Trifloxystrobin, Tebuconazole and Azoxystrobin were compared with untreated control. Two year results revealed that Nativo (Tebuconazole 50% + Trifloxystrobin 25% WG) formulation @ 350 g/ha were found effective against powdery mildew (*Erysiphe polygoni*) disease of cumin with higher seed yield. Daunde A. T. *et al.* (2018) ^[4] reported the powdery mildew of chilli incited by *Leveillula taurica* is one of the most serious diseases of chilli. Field experiment was carried out to know the effect of different fungicides against powdery mildew of chilli during Kharif season. Among the nine treatments, propiconazole (0.1%) proved to be best for the management of powdery mildew (9.01%) with minimum per cent disease index (PDI), which was superior over all other treatments with maximum fruit yield of 36.13 q/ha which is followed by myclobutanil (@ 0.1%) with the PDI of 13.24 powdery mildew with fruit yield of 34.56 q/ha. Muhammad Nasir *et al.* (2017) reported the results achieved with Nativo 75% WDG (Tebuconazole + Trifloxystrobin) which control powdery mildew disease of mango by 90.19%. It was followed by Cabrio Top 60% WDG (Metiram + Pyraclostrobin) which reduced incidence of powdery mildew disease by 88.04%. Dabbas and prakash (2012) ^[3] reported that three foliar spray of bayleton at 10 days interval from initiation of the pea powdery mildew disease (0.25%) gave minimum disease intensity and maximum grain yield.

Conclusion

Among six fungicides, tebuconazole 50% + trifloxystrobin 25% WG (@0.1%) recorded minimum 8.33 PDI with two sprays at 20 days interval. Second best was myclobutanil (@0.05) (12.73 PDI).

Table 1: Effect of fungicides on powdery mildew of disease of mustard under natural field conditions

Fungicides	Concentration (%)	Percent disease intensity*	Decrease in PDI over control (%)	Yield (q/ha)	Increase in yield over Control (%)
Tebuconazole 50% + Trifloxystrobin 25% WG	0.1	8.33 (16.76)	85.37	13.62	65.85
Metiram 55% + Pyraclostrobin 5% WG	0.1	26.2 (30.76)	54.01	10.15	23.54
Fluxapyroxad 250 g/l + Pyraclostrobin 250 g/l SC	0.1	16.86 (24.18)	70.39	11.39	38.67
Myclobutanil	0.05	12.73 (20.87)	77.65	12.32	50.03
Azoxystrobin 23% SC	0.1	16.2 (23.72)	71.56	11.60	41.23
Triademefon	0.1	18.43 (25.40)	67.64	11.20	36.36
Control	-	56.97 (48.99)		8.21	
S.Em.±		1.25		0.40	
CD (p=0.05)		3.85		1.23	
CV		7.95		6.19	

*Average of three replications.

Figure in parenthesis are angular transformed values

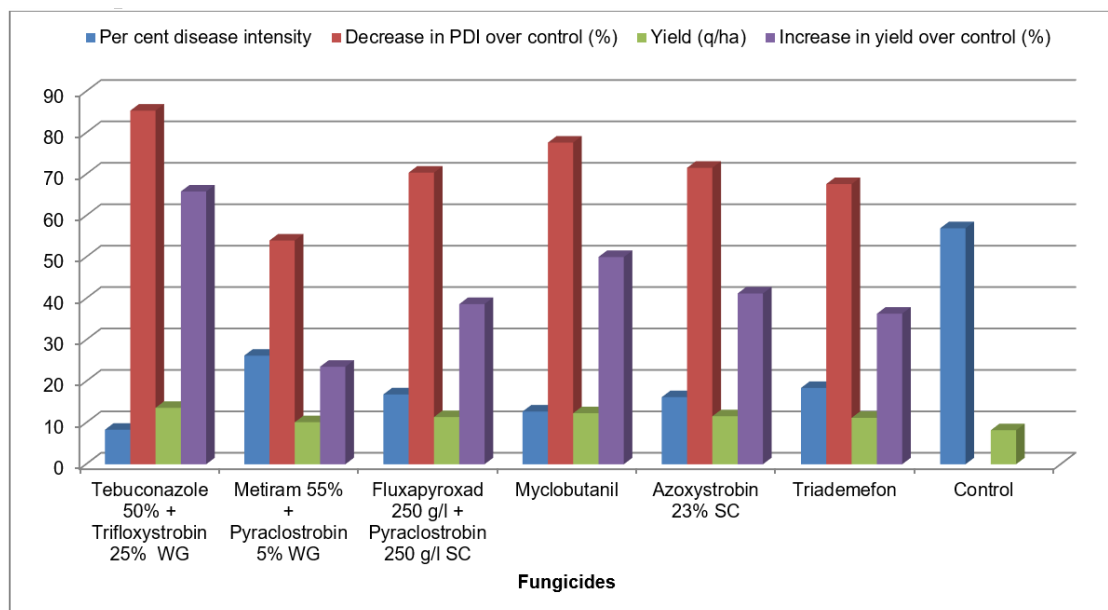


Fig 1: Effect of fungicides on powdery mildew of mustard under natural field condition.

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