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Bio-efficacy studies of new fungicides against powdery mildew of chilli under field condition

Ashish Shrivastava and Preeti Chouhan

Abstract
Powdery mildew of chilli is incited by *Leveillula taurica* is one of the most important diseases of chilli. The present experiment was conducted at College of Agriculture Ganjbasoda during the *Rabi* season of 2017-18 to evaluate the efficacy of new fungicides against powdery mildew of chilli. A variant with no application of fungicides was used to control. All fungicidal treatments reduced the disease severity as compared to the untreated control with increased yield. Application of Pyriofenone 180SC (700 ml/ha) significantly reduced the disease and recorded the highest yield (138.86 q/ ha)) followed by Pyriofenone 180 Sc (600 ml/ha) with yield135.45 q/ha. The overall results revealed that Pyriofenone 180 Sc at both the concentration (700 ml and 600 ml/ha) effectively reduced the disease severity and increased the yield as compared to untreated control.

Keywords: Chilli, powdery mildew, *Leveillula taurica*, percentage disease Index (PDI), disease severity index and pyriofenone

Introduction
Chilli (*Capsicum annum L*) belongs to the family Solonaceae is one of the major vegetables and spice crops grown in the country. Its cultivation became popular in 17th century being fit to chilli both tropical as well as sub tropical conditions. It's popular and highly remunerative, annual herbaceous vegetable crop. In India, Andhra Pradesh is the leading producer of chilli followed by Karnataka, Telangana, Madhya Pradesh, Maharashtra and Tamil Nadu. In India. chilli is cultivated over an area of 1.75 lakh hectares and production of about 19.83 lakh tones (Anonymous, 2015) [1] which account for 25% of the world production. Chilli suffers from many diseases caused by fungi, bacteria, virus and nematodes. Among the fungal diseases powdery mildew, leaf spot and anthracnose or fruit rot are the most prevalence ones (khodke *et al.* 2009) [9]. The powdery mildew is caused by (*Leveillula taurica* (*Lav*.) Arn. is a major constraint in chilli production in India causing heavy yield loss ranging from 14 to 30% due to severe defoliation and reduction in photosynthesis, size and number of fruits per plants. (Mathur *et al.* 1972; Sivaprakasam *et al.* 1976; Gohekar and peshney 1981) [11, 13, 7]. Older plant and lower leaves are the first to show evidence of powdery mildew infection (Curtis *et al*, 2004) [4]. Correct amount of dosage and right time of application for the control of powdery mildew disease. Most of the new fungicides are effective and single site in mode of action. The present investigation was carried out to the study the bio-efficacy of new fungicide against powdery mildew of chilli.

Materials and methods
The field experiment on bio-efficacy of fungicides was conducted at the Research Farm, of College of Agriculture, Ganjbasoda (Vidisha) during the *Rabi* season of 2017-18. Chilli seedlings were raised in a nursery bed and transplanted after 35 days old to the experimental field by following a spacing of 60 cm row spacing and plant spacing of 50 cm and with plot of size 5.0 m x 5.0 m. The experiment was laid out in randomized block design (RBD) with four replications and eight treatments. The agronomic package of practices such as nutriment, weed management, irrigation and pest management were followed as per the farmer's practices. All the foliar sprays (treatments) were given as per their doses. The first spray of fungicides was done after first appearance of disease with the help of hand operated knapsack sprayer. The same concentration was followed for second spray at 10 days interval and the unsprayed treatment served as control. 500 liter spray volume was used per hectare. The disease incidence and severity were recorded before the first spray and the subsequent observations after first spray and before second spray i.e., after every seven days and 10 days after last

applications. The severity of powdery mildew was scored at 7 days interval after each spray.

The disease severity of powdery mildew was recorded on 10 plants and 10 leaves on lower, middle and upper leaves by using 0-5 disease rating scale (as described by (Adinarayana *et al*. 2012) [2] and expressed as Percent Disease incidence (PDI) (Wheeler, 1969) [14].

Rating scale for assessment of powdery mildew

Severity Scale	Description of symptoms
0	No infection
1	10% of the area infected
2	10 to 25% of the area infected
3	25.1 to 50% of the area infected
4	50.1 to 75% of the area infected
5	:>75% of the area infected

The percent disease index of Powdery mildew of Chilli was calculated using the following formula

$$\frac{\text{Sum of the individual diseases grade}}{\text{Total number of leaves observed}} \times \frac{100}{\text{Maximum Disease grade}}$$

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

Statistical analysis

All the data related to diseases incidence and yield was statistically analyzed. As prescribed for randomized complete block design (RBD) (Snedecor and Cochran, 1980) [12]. The critical difference at 5% level of significance for each character were work out for comparing the significance among the treatments means.

Results and discussion

The data on the disease severity index (%) powdery mildew were recorded periodically at ten days interval after the onset of disease powdery mildew, first and second spray. The data on disease severity showed that all fungicides significantly reduced the disease intensity significantly as compared to the control. The lowest DSI (%) 8.56 and 9.04%, respectively, was recorded after first and second spray in treatment T_4- Pyriofenone 180 SC (700 ml/ha) followed by treatment T 3 Pyriofenone 180 SC (600 ml/ ha). 8.78 and 9.44.%, respectively, and treatment T_2 Pyriofenone 180 SC (500 ml/ ha) 9.32 and 10.22%.

All the fungicides used as spray significantly controlled the powdery mildew disease (Table 1). All the concentrations of Pyriofenone 180 SC were effective in controlling powdery mildew disease. Lowest incidence of powdery mildew disease was in Pyriofenone 180 SC at the rate of 700 ml/ha as compared to control.

Minimum powdery mildew disease incidence (20.96 and 22.68%) were recorded first and second spray in Pyriofenone 180 SC at the rate of 700 ml/ha which was at par with Pyriofenone 180 SC at the rate of 600 ml/ha (22.42 and 24.56%) as compared to control (31.50 and 43.28%). These results are in conformity with the earlier reports of Felix-Gastelum *et al*. (2007) [5], Ganeshan *et al*. (2011) [6], Adinarayana *et al.* (2012) [2], Kumbhar and More (2013) [10]. Ahiladevi and prakasam (2013) [3] Islamet *et al*. (2015) [8].

The data presented in the table 1 indicated that all the treatments were effective against powdery mildew disease as compared to control. The maximum PDC (percent disease reeducation over control) of powdery mildew was in Pyriofenone 180 SC at the rate of 700 ml/ha spared plant as compared control.

Yield

The maximum green fruit yield (138.86 q/ ha) was observed in treatment Pyriofenone 180 SC at the rate of 700 ml/ha followed by treatment Pyriofenone 180 SC at the rate of 600 ml/ha) with 135.45 q/ha. Whereas the minimum green fruit yield (106.68 q/ha) was observed in T7 –Untreated control (Table 2). The maximum green fruit yield may be due to less disease severity and also plant responses to the chemical sprayed. A spray of fungicide with suitable concentration controlled the diseases.

Conclusions

Result of the present study showed that all fungicide significantly controlled the diseases as compared to the untreated control (Table-1and 2). From the present investigation, it was clearly indicated that maximum disease control and high green yield could be obtained from the spray with suitable concentration of fungicide Pyriofenone as compared to Azoxystrobin and Tebuconazole. The application of treatment T 4 – Pyriofenone 180 SC at the rate of 700 ml/ha was found significantly effective in controlling powdery mildew disease and Increased yield (138.95 Q./ha). According to these results, it can be suggested that treatment T 4 – Pyriofenone 180 SC (700 ml/ha) is more beneficial and effective controlling powdery mildew diseases.

Table 1: Effect of new fungicidal formulation foliar spray on powdery mildew of chilli

Treatments	Dosages	Disease severity index (%)			Disease incidence (%) (10days after each spray)			
		Pre-spray	After 1st spray	After 2nd spray	Pre-spray	After 1st spray	After 2nd spray	PDC
T_1 Pyriofenone 180 SC	400 ml	6.15	10.96	12.59	21.50	24.86	26.59	38.56
T_2 Pyriofenone 180 SC	500 ml	5.51	9.32	10.22	19.54	24.20	25.85	40.27
T_3 Pyriofenone 180 SC	600 ml	6.74	8. 78	9.44	20.24	22.42	24.56	43.25
T_4 Pyriofenone 180 SC	700 ml	6.71	8.56	9.04	18.59	20.96	22.77	46.59
T_5 – Azoxystrobin 23% SC	500 ml	6.91	12.29	17.44	21.94	25.42	27.34	36.87
T_6 – Tebuconazole25%WG	750g	6.75	10.27	10.72	22.31	27.12	32.45	25.16
T_7 – Untreated- (Control)	-----	5.65	14.07	19.32	23.44	31.50	44.56	--
SEm +	----	----	0.09	0.29	---	0.96	1.00	--
CD at 5%	-----	----	0.26	0.84	----	2.78	2.91	--

Table 2: Effect of new fungicidal formulation as foliar spray on fruit Yield of chilli

Treatments	Yield q/ha
T_1 Pyriofenone 180 SC (400ml/ha)	125.16
T_2 Pyriofenone 180 SC (500ml/ha)	132.56
T_3 Pyriofenone 180 SC (600ml/ha)	135.86
T_4 Pyriofenone 180 SC (700ml/ha)	138.95
T_5 – Azoxystrobin 23% SC(500ml/ha)	128.56
T_6 – Tebuconazole25%WG (750g/ha)	130.36
T_7 – Untreated- (Control)	106.68
SEm+	1.67
CD 5%	4.77

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