

Original Research Article

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Evaluation of Fungicides, Botanical and Organic Amendments for Management of Chilli Powdery Mildew caused by *Leveillula taurica* (Lev.) Arn

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ABSTRACT

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Powdery mildew of chilli caused by *Leveillula taurica* is one of the devastating diseases of chilli. The present studies were aimed of evaluation of promising fungicides, botanical and organic amendments for the management of powdery mildew of chilli under field conditions during *khari*f2018. Among the eight treatments, combination of Propiconazole 0.1% + Neem oil 5% was found most effective for the management of powdery mildew with minimum per cent disease index (PDI) 14.73% and maximum 78.95 per cent disease control (PEDC) with maximum fresh chilli fruit yield of (40.66 q/ha) in epiphytotic condition followed by Myclobutanil 0.1% + Neem oil 5% (17.53 PDI) with 74.91 PEDC, with fruit yield of (36.29 q/ha) was recorded over untreated control. The aim of present study was to find out an innovative and environmentally safe strategy for the control of powdery mildew in chilli by integrating of chemical fungicides, Botanicals and organic amendments. The developed integrated disease management is a package that would lower the disease incidence and increase the yield

Introduction

Chilli (*Capsicum annum* L. and *C. fruitcense*) is an important commercial horticulture crop and grown for the domestic market and export purpose. It is believed to be originated from South America during 15th Century (Pickersgill, 1997). During this century Portuguese introduced chilli crop to India from Brazil. The major chilli producer and exporter countries in the world are China, India, Mexico, Morocco, Pakistan, Thailand

and Turkey (Lakshmi et al., 2014). India is the world's largest consumer, producer and exporter of chilli and contributes about 25 percent of total world production (Chandra Nayaka et al., 2009) with the 4 per cent share of total export in the world (Gutpa and Naik, 2005). Chilli suffers from many diseases caused by fungi, bacteria, viruses and nematodes. Among the fungal diseases, powdery mildew, leaf spot and anthracnose or fruit rot are the most prevalent ones (Khodke et al., 2009). The powdery mildew caused by

Leveillula taurica (Lev.) 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 plant (Mathur *et al.*, 1972; Sivaprakasam *et al.*, 1976; Gohokar and Peshney, 1981). In India, powdery mildew of chilli occurs in endemic form on a severe scale and has become a major constraint to chilli production (Singh and Lodha, 1985).

Many systemic and non-systemic fungicides were reported to manage the powdery mildew of capsicum. The information on the efficacy of new fungicides against powdery mildew of capsicum is insufficient. By considering the seriousness of disease and the economic damage/exorbitant losses caused by the disease, the present investigation was carried out by using integrated management approach using new molecule fungicides, botanicals and organic amendments for their efficacy to suppress powdery mildew of chilli under field condition.

Materials and Methods

The experiment was conducted at Agronomy farm of Rajasthan College of Agriculture, MPUAT, Udaipur. The experiment was laid out to comprises 8 treatments for their efficacy over control *viz.*, Foliar spray of Propiconazole 25% EC(0.1%), Myclobutanil 10% WP (0.1%), Neem oil (5%), Panchgavya (10%), Propiconazole 25% EC (0.1%) + Neem oil (5%), Neem oil (5%) + Panchgavya (10%), Myclobutanil 10% WP (0.1%) + Neem oil (5%) and untreated control. The chilli hybrid variety 'PusaJwala' was raised in nursery and after 25days seedling were transplanted in 1.8x2.25 m² size plots at 60x45 cm distance having three replications in randomized block design (RBD).Powdery mildew is an obligate pathogen and it was appearing in severe condition in this region

during *kharif* season year after year on susceptible chilli cultivar 'PusaJwala' and there was no need to develop disease by means of other methods.

The calculated quantities of different treatments (fungicides, botanicals and organic amendments) were suspended in water and applied thrice as foliar spray at 15 days' intervals from the initiation of powdery mildew symptoms. The observation of disease development and disease severity was recorded on a standard 0-5 disease rating scale (Tajider *et al.*, 1994). After 15 days of each spray per cent disease index was calculated by the formula given by Mc Kinney (1923) and Wheeler (1969).

$$\text{Per cent disease index} = \frac{\text{Sum of all numerical rating}}{\text{No. of plants} \times \text{Maximum rating}} \times 100$$

The per cent efficacy of disease control (PEDC) was calculated by using following formula.

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

Results and Discussion

The result of the field experiment indicated that all the treatments significantly reduced the disease compared to the unsprayed control after each spray. Among eight treatments combination of (Propiconazole 0.1% + Neem oil 5%) was found most effective to suppress the powdery mildew of chilli at each spray. Powdery mildew intensity (PDI) during in this treatment continuously decreased (25.47; 16.93 and 14.73 per cent) with maximum percent disease control (53.11; 73.45 and 78.95 per cent) and highest yield 40.66 q/hac from the first to last spray which was significantly superior over all the treatments over control (Fig. 1; Table 1 and 2).

Table.1 Powdery mildew of chilli 0-5 disease rating scale (Tajider *et al.*, 1994)

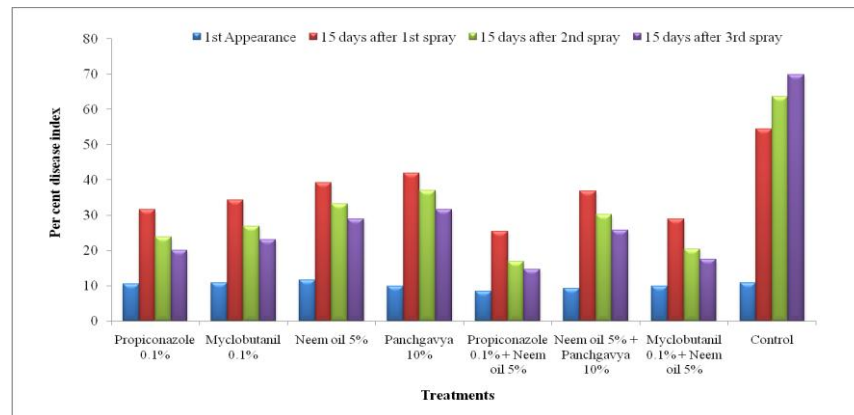
Score	Description
0	No infection
1	1–10% leaf area infected
2	10.1–15% leaf area infected
3	15.1–25% leaf area infected
4	25.1–50% leaf area infected
5	>50% of leaf area infected

Table.2 Evaluation of promising fungicides, botanical and organic amendments for suppression of powdery mildew of chilli under field condition

Tr. No.	Treatment	*PDI at 1st Appearance	PDI at 15 days after 1st spray	**PEDC	PDI at 15 days after 2nd spray	PEDC	PDI at 15 days after 3rd spray	PEDC	***Yield (Kg/plot)	***Yield (q/ha)
T ₁	Propiconazole 0.1%	10.53 (18.92)	31.60 (34.19)	41.88 (40.30)	23.80 (29.18)	62.58 (52.27)	20.07 (26.59)	71.24 (57.56)	1.34	33.00
T ₂	Myclobutanil 0.1%	10.93 (19.29)	34.40 (35.90)	36.75 (37.28)	26.80 (31.16)	57.80 (49.50)	23.00 (28.63)	67.06 (54.97)	1.22	30.04
T ₃	Neem oil 5%	11.60 (19.85)	39.20 (38.74)	27.80 (31.67)	33.27 (35.21)	47.62 (43.62)	28.87 (32.48)	58.68 (49.98)	1.00	24.61
T ₄	Panchgavya 10%	9.91 (18.34)	42.00 (40.38)	22.80 (28.44)	37.07 (37.48)	41.53 (40.07)	31.67 (34.22)	54.73 (47.70)	0.86	21.15
T ₅	Propiconazole 0.1% + Neem oil 5%	8.40 16.839	25.47 (30.29)	53.11 (46.77)	16.93 (24.25)	73.45 (58.98)	14.73 (22.50)	78.95 (62.72)	1.65	40.66
T ₆	Neem oil 5% + Panchgavya 10%	9.33 (17.76)	36.87 (37.36)	32.01 (34.29)	30.20 (33.32)	52.79 (46.58)	25.80 (30.50)	63.08 (52.57)	1.09	26.91
T ₇	Myclobutanil 0.1% + Neem oil 5%	9.87 (18.28)	28.93 (32.52)	46.72 (43.09)	20.40 (26.79)	67.79 (55.46)	17.53 (24.74)	74.91 (59.91)	1.47	36.29
T ₈	Control	10.80 (19.18)	54.53 (47.59)	0	63.60 (52.88)	0	69.87 (56.69)	0	0.65	16.13
	SEm±	0.534	0.629	1.048	0.822	1.144	0.773	0.980	0.024	0.589
	CD (P= 0.05)	1.634	1.927	3.211	2.517	3.505	2.366	3.002	0.073	1.805

*Per cent disease index; ** Per cent efficacy of disease control; Mean of three replications; Figures given in parentheses are arcsine $\sqrt{\text{Per cent angular transformed values}}$. ***Figures in parentheses are angular transformed values

Fig.1 Per cent disease index of promising fungicides, botanicals and organic amendments against powdery mildew of chilli under field conditions



Similarly, followed by Myclobutanil 0.1% + Neem oil 5% was showed (28.93; 20.40 and 17.53 PDI) powdery mildew intensity and (46.72; 67.79 and 74.91 PEDC) per cent disease control with yield 36.29 q/hac after each spray respectively, followed by Propiconazole 0.1% was showed (31.60; 23.80 and 20.07 PDI) percent disease intensity and (41.88; 62.58, 71.24 PEDC) per cent disease control with yield 33.00 q/ hac after each spray followed by Myclobutanil 0.1% (34.40; 26.80 and 23.0 PDI) per cent disease intensity and (36.75; 57.80 and 67.06 PEDC) per cent disease control with yield 30.04 q/ hac after each spray, followed by Neem oil 5% + Panchgavya 10% (36.87; 30.20 and 25.80 PDI) per cent disease intensity and (32.01; 52.79 and 63.08 PEDC) per cent disease control with yield 26.91 q/hac after each spray followed by Neem oil 5 % (39.20; 33.27 and 28.87 PDI) per cent disease intensity and (27.80; 47.62 and 58.68 PEDC) per cent disease control with yield 24.61 q/hac after each spray, followed by Panchgavya 10% (42.00; 37.07 and 31.67 PDI) per cent disease intensity and (22.80; 41.53 and 54.73 PEDC) per cent disease control with yield 21.15 q/ hac after each spray, respectively. The maximum per cent disease index was observed in untreated control (54.53; 63.60 and 69.87 PDI) and 0

per cent disease control (PEDC) with 16.13 q/hac.

The similar results were recorded by Raju *et al.*, (2017) that the Propiconazole at 0.1% was found superior and highly effective with minimum PDI (9.64) and maximum yield (98.00 q/ha), against powdery mildew compare to Myclobutanil, Hexaconazole, Azoxystrobin and Wettablesulphurat (0.1%) concentration. He reported that rest fungicides viz., Myclobutanil (11.90), Tridemefon (13.03) and Hexaconazole (15.86) with yields (94.62, 92.33, and 92.15 q/ha) also found effective. The similar result also described by Daundeet al., 2018 that Propiconazole 0.1% was very effective to management of powdery mildew with (9.01 PDI) with 88.0 disease control and 36.13 q/ha yield followed by Myclobutanil 0.1% (13.24 PDI) with 82.36 and yield (34.56 q/ha).

In botanical Similar result described by Peshaman *et al.*, (2017) that neem recorded significantly lowest mean disease incidence (18.88%), followed by Garlic (18.99%) and Ghaneri (20.44%), Turmeric powder (21.55), Nirgudi (22.22%), Tulsi (22.74%), and Parthenium (23.06%) compared to control (51.33%).

In organic amendments similar results were described by Ashlesha and Paul (2014) that the Panchgavya (10%) was effective against anthracnose of chilli with disease severity (20.08%) and 70.46 per cent disease control, followed by Buttermilk (10%) disease severity (24.20%) with 64.39 per cent disease control and Vermiwash (10%) disease severity (24.84%) with 63.45 per cent disease control recorded.

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