

# Field evaluation of fungicides against powdery mildew of chilli (*Capsicum annuum* L.)

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## ABSTRACT :

The experiment was conducted on powdery mildew of Chilli (*Capsicum annuum* L.) caused by *Leveillulla taurica* to know the effective management strategy. The pooled data revealed that there was significant effect of the treatments in reducing the disease. However, plants sprayed with Difenconazole (0.5g/L) as a second spray 15 days after the Chlorothalonil (2/L) was found to be effective in the management of powdery mildew, where in the PDI of 11.85 as against to control plot and also supported the higher yield of 13.4 t/ha in contrast to 9 t/ha in untreated control plots.

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## INTRODUCTION

Chilli (*Capsicum annuum* L.) is an vegetable cum spice crop. India is a major contributor for production and consumption of this crop. Presently crop is regularly suffering from virus, bacterial and fungal diseases. Among fungal disease powdery mildew is the major pathogen in all over the world (Smith, 2000). The casual agent of powdery mildew is *Leveillulla taurica* (Lev.) Arn. is one of the major threat that causes significant crop loss upto 24 per cent (Gohokar and Peshney, 1981).

To manage this crop many efforts are made earlier with systematic and contact fungicides. However, the new generation chemical combinations and its effects on disease management is still explored. Hence, the present study was undertaken by considering the severity of the disease in the dry tracks of the Karnataka.

## MATERIAL AND METHODS

Field experiment on evaluation of fungicides against powdery mildew was conducted at ARS, Pavagada, UAS, Bangalore in two seasons during *Kharif* 2014 and 2015. The experiment was laid out in Randomized Complete Block Design with three replication and 12 different treatments (Table A). The seeds of chilli variety Ballapur local has sown in plastic trays and proper nutrition was given. Thirty to thirty five days old seedlings were planted at a spacing of 60 X 45 cm in plot size of 5.0X 3.0 mt with the recommended intercultural operations.

Treatment were imposed immediately after the appearance of the disease symptom. Similarly 2<sup>nd</sup> spray with recommended concentration was sprayed after 30

Sr. No.	Treatments	Concentra- tions (g or ml/L)	PDI						Per cent disease over control	Yield (t/ha)
			15 days after first spray	15 days after second spray	30 days after second spray	60 days after second spray	90 days after second spray	100 days after second spray		
1.	Sulphur 80 % WP (Sultaf)	3.0	22.62 (4.81) <sup>g</sup>	23.5 (4.90) <sup>c</sup>	32.5 (5.74) <sup>de</sup>	43 (6.60) <sup>g</sup>	48 (6.96) <sup>g</sup>	48.5 (7.00) <sup>h</sup>	9.83 (3.21) <sup>g</sup>	9.9 (3.22) <sup>k</sup>
2.	Chlorothalonil 78.12 % WP (Kavach)	2.0	22.2 (4.76) <sup>fg</sup>	21.5 (4.69) <sup>bc</sup>	29.85 (5.51) <sup>cd</sup>	41.5 (6.48) <sup>fg</sup>	43.35 (6.62) <sup>f</sup>	43.5 (6.63) <sup>ghi</sup>	18.72 (4.38) <sup>g</sup>	10.45 (3.31) <sup>j</sup>
3.	Carbendazim (50 % WP) (Bavistin)	1.0	20.65 (4.60) <sup>ef</sup>	22 (4.74) <sup>bc</sup>	28.5 (5.39) <sup>cde</sup>	36.85 (6.11) <sup>ef</sup>	40 (6.36) <sup>ef</sup>	40 (6.36) <sup>fg</sup>	25.5 (5.11) <sup>if</sup>	10.9 (3.38) <sup>h</sup>
4.	Mycobutanil 10 % WP (Index)	1.0	18.85 (4.40) <sup>de</sup>	14.85 (3.92) <sup>b</sup>	26 (5.15) <sup>cd</sup>	28.7 (5.40) <sup>cd</sup>	31 (5.61) <sup>d</sup>	33 (5.79) <sup>de</sup>	38.6 (6.26) <sup>def</sup>	11.2 (3.42) <sup>g</sup>
5.	Difenconazole (Score)	0.5	19 (4.42) <sup>de</sup>	14 (3.81) <sup>b</sup>	26.5 (5.20) <sup>cd</sup>	29.5 (5.48) <sup>cde</sup>	31.5 (5.66) <sup>d</sup>	32.5 (5.74) <sup>de</sup>	39.4 (6.32) <sup>cde</sup>	11.3 (3.35) <sup>f</sup>
6.	Sulphur (1 <sup>st</sup> spray) Carbendazim (2 <sup>nd</sup> spray)	3 and 1 g, respectively	20.5 (4.58) <sup>ef</sup>	23.5 (4.90) <sup>bc</sup>	28.35 (5.37) <sup>cd</sup>	33.5 (5.83) <sup>d</sup>	37 (6.12) <sup>e</sup>	37.5 (6.16) <sup>ef</sup>	30.6 (5.56) <sup>e</sup>	10.7 (3.44) <sup>i</sup>
7.	Sulphur (1 <sup>st</sup> spray) Mycobutanil (2 <sup>nd</sup> spray)	3 and 1 g, respectively	16 (4.06) <sup>bc</sup>	18.3 (4.34) <sup>b</sup>	20.5 (4.58) <sup>bc</sup>	23.5 (4.90) <sup>b</sup>	26.35 (5.18) <sup>c</sup>	27.5 (5.29) <sup>c</sup>	49 (7.04) <sup>bc</sup>	11.8 (3.51) <sup>d</sup>
8.	Sulphur (1 <sup>st</sup> spray) Difenconazole (2 <sup>nd</sup> spray)	3 and 0.5 g, respectively	15.15 (3.96) <sup>b</sup>	17.7 (4.27) <sup>b</sup>	20.85 (4.62) <sup>bc</sup>	21.85 (4.73) <sup>b</sup>	22.35 (4.78) <sup>b</sup>	23 (4.85) <sup>bc</sup>	57.52 (7.62) <sup>b</sup>	12.2 (3.56) <sup>e</sup>
9.	Chlorothalonil (1 <sup>st</sup> spray) Carbendazim (2 <sup>nd</sup> spray)	2 and 1 g, respectively	17.65 (4.26) <sup>cd</sup>	16 (4.06) <sup>b</sup>	25.5 (5.10) <sup>cd</sup>	28.5 (5.39) <sup>c</sup>	31 (5.61) <sup>d</sup>	32 (5.70) <sup>de</sup>	40.28 (6.39) <sup>cd</sup>	11.5 (3.46) <sup>e</sup>
10.	Chlorothalonil (1 <sup>st</sup> spray) Mycobutanil (2 <sup>nd</sup> spray)	2 and 1 g, respectively	13 (3.67) <sup>a</sup>	11.15 (3.41) <sup>a</sup>	12.35 (3.58) <sup>ab</sup>	14.35 (3.85) <sup>a</sup>	16.85 (4.17) <sup>a</sup>	17.5 (4.24) <sup>ab</sup>	67.64 (8.25) <sup>a</sup>	12.7 (3.63) <sup>b</sup>
11.	Chlorothalonil (1 <sup>st</sup> spray) Difenconazole (2 <sup>nd</sup> spray)	2 and 0.5 g, respectively	11.85 (3.51) <sup>a</sup>	7.5 (2.83) <sup>a</sup>	9.85 (3.22) <sup>a</sup>	12 (4.54) <sup>a</sup>	13.5 (3.74) <sup>a</sup>	14 (3.81) <sup>a</sup>	73.86 (8.62) <sup>a</sup>	13.4 (3.73) <sup>a</sup>
12.	Control		27.7 (5.31) <sup>h</sup>	30.35 (5.55) <sup>d</sup>	40.2 (6.38) <sup>e</sup>	47.35 (6.92) <sup>h</sup>	49.65 (7.08) <sup>g</sup>	53.85 (7.37) <sup>i</sup>	0 (0.71) <sup>h</sup>	9 (3.08) <sup>l</sup>
	S.E.±		1.61	3.11	4.25	2.26	1.69	2.65	4.4	-
	C.D. (P=0.05)		3.52	6.85	9.35	4.97	3.73	5.84	9.6	-
	C.D. (P=0.01)		4.94	9.68	13.2	7.02	5.26	8.24	13.6	-
	CV		8.62	13.59	16.67	7.56	5.21	7.91	11.71	-

days of the first spray. The un sprayed plot is treated as control plot. The disease severity of powdery mildew was recorded regularly and tabulated for 30 days using 0-9 scale given by Mayee and Datar, 1986 and PDI was calculated as per the standard procedure. PDI was calculated by using formula:

$$PDI = \frac{\text{Sum of the individual disease ratings}}{\text{Total number of leaves observed}} \times \frac{100}{\text{Maximum disease grade}}$$

## RESULTS AND DISCUSSION

The pooled results from two season trails (Table 1) revealed that, all the treatments were significantly

superior over untreated control however, the plots treated with Difenconazole (0.5g/L) and Myclobutanil (1g/L) were found effective with PDI of 19 and 18.85, respectively during 15 days after first spray and they were significantly superior over control plots.

However, treatment T<sub>11</sub> comprising of spray of Difenconazole (0.5g/L) as a second spray 15 days after the Chlorothalonil (2/L) was found to be effective in the management of powdery mildew, where in the PDI of 11.85 followed by T<sub>10</sub> treatment in which second spray with Myclobutanil (1g/L) 15 days after Chlorothalonil (2g/L) as first spray with PDI of 13.0 as against in

untreated control plots, where in PDI of 27.7. Similar trend was maintained upto 100 days after second spray.

The treatment T<sub>11</sub> was found effective even at 100 days after second spray with a PDI of 14 followed by treatment 10 (PDI of 17.5). In contrast to untreated control plots wherein PDI of 49.65. the results were supported by the effective management of powdery mildew of chilli using azoxystrobin 25 per cent SC (Ahiladevi and Prakasam, 2013 and 2014) and Reuveni, 2001.

Similar trend was also observed in both the seasons

data (Table 1 and 2) where in the per cent disease reduction over control was also maximum in T<sub>11</sub> and T<sub>10</sub> treated plants with 76.93 and 68.68, respectively during 2015. Whereas 70.80 and 66.6, respectively during 2016. Similarly treatment T<sub>11</sub> was also supported for higher yield of green chilli (13.4t/ha), where as in control plot the yield was only 9.0 t/ha. Results are in comparison with results findings of Gohokar and Peshney, 1981; Sharmila *et al.*, 2004 and Akhileshwari *et al.*, 2012 while working with various crops.

Sr. No.	Treatments	Concentrations (g or ml/L)	PDI						Per cent disease over control	Yield (t/ha)
			15 days after first spray	15 days after second spray	30 days after second spray	60 days after second spray	90 days after second spray	100 days after second spray		
1.	Sulphur 80 % WP (Sultaf)	3.0	24.3	25.00	34.00	45.00	50.00	50.00	17.59	9.60
2.	Chlorothalonil 78.12 % WP (Kavach)	2.0	23.7	23.00	26.7	41.00	42.7	43.00	29.12	10.15
3.	Carbendazim (50 % WP) (Bavistin)	1.0	22	24.00	30.00	38.7	41.00	41.00	32.42	10.60
4.	Mycobutanil 10 % WP (Index)	1.0	19.00	15.00	27.00	29.7	32.00	34.00	43.96	10.90
5.	Difenconazole (Score)	0.5	19.7	14.00	27.00	30.00	32.00	33.00	45.61	11.00
6.	Sulphur (1 <sup>st</sup> spray)	3 and 1 g,	21.7	24.7	28.00	34.00	38.00	39.00	35.72	10.40
7.	Carbendazim (2 <sup>nd</sup> spray)	respectively								
	Sulphur (1 <sup>st</sup> spray)	3 and 1 g,	17	19.3	21.00	24.00	27.7	29.00	52.20	11.50
8.	Mycobutanil (2 <sup>nd</sup> spray)	respectively								
	Sulphur (1 <sup>st</sup> spray)	3 and 0.5 g,	16	19.7	23.00	24.00	24.7	25.00	58.79	11.90
9.	Difenconazole (2 <sup>nd</sup> spray)	respectively								
	Chlorothalonil (1 <sup>st</sup> spray)	2 and 1 g,	18	16.00	25.00	28.00	31.00	32.00	47.26	11.20
10.	Carbendazim (2 <sup>nd</sup> spray)	respectively								
	Chlorothalonil (1 <sup>st</sup> spray)	2 and 1 g,	14.3	12.00	13.00	15.00	18.7	19.00	68.68	12.40
11.	Mycobutanil (2 <sup>nd</sup> spray)	respectively								
	Chlorothalonil (1 <sup>st</sup> spray)	2 and 0.5 g,	13.7	7.7	9.7	12.00	13.3	14.00	76.93	13.10
12.	Difenconazole (2 <sup>nd</sup> spray)	respectively								
	Control		27.7	37.00	48.7	52.7	53.3	60.7		8.70
	S.E.±		1.37	1.33	1.34	1.43	1.08	1.55		
	C.D. (P=0.05)		2.84	2.79	2.78	2.97	2.25	3.21		
	C.D. (P=0.01)		3.86	3.75	3.78	4.04	3.06	4.36		
	CV		8.50	8.22	6.10	5.66	3.97	5.43		

**Table 2: Evaluation of different fungicides for the management of powdery mildew in chilli variety Ballapur local 2016**

Sr. No.	Treatments	Concentrations (g or ml/L)	PDI					100 days after second spray	Per cent disease over control	Yield (t/ha)
			15 days after first spray	15 days after second spray	30 days after second spray	60 days after second spray	90 days after second spray			
1.	Sulphur 80 % WP (Sultaf)	3.0	21.0	22.0	31.0	41.0	46.0	47.0	2.08	10.2
2.	Chlorothalonil 78.12 % WP (Kavach)	2.0	20.7	20.0	33.0	42.0	44.0	44.0	8.33	10.75
3.	Carbendazim (50 % WP) (Bavistin)	1.0	19.3	20.0	27.0	35.0	39.0	39.0	18.75	11.2
4.	Mycobutanil 10 % WP (index)	1.0	18.7	14.7	25.0	27.7	30.0	32.0	33.3	11.5
5.	Difenconazole (Score)	0.5	18.3	14.0	26.0	29.0	31.0	32.0	33.3	11.6
6.	Sulphur (1 <sup>st</sup> spray) Carbendazim (2 <sup>nd</sup> spray)	3 and 1 g, respectively	19.3	22.3	28.7	33.0	36.0	36.0	25.0	11.0
7.	Sulphur (1 <sup>st</sup> spray) Mycobutanil (2 <sup>nd</sup> spray)	3 and 1 g, respectively	15.0	17.3	20.0	23.0	25.0	26.0	45.8	12.1
8.	Sulphur (1 <sup>st</sup> spray) Difenconazole (2 <sup>nd</sup> spray)	3 and 0.5 g, respectively	14.3	15.7	18.7	19.7	20.0	21.0	56.25	12.5
9.	Chlorothalonil (1 <sup>st</sup> spray) Carbendazim (2 <sup>nd</sup> spray)	2 and 1 g, respectively	17.3	16.0	26.0	29.0	31.0	32.0	33.3	11.8
10.	Chlorothalonil (1 <sup>st</sup> spray) Mycobutanil (2 <sup>nd</sup> spray)	2 and 1 g, respectively	11.7	10.3	11.7	13.7	15.0	16.0	66.6	13.0
11.	Chlorothalonil (1 <sup>st</sup> spray) Difenconazole (2 <sup>nd</sup> spray)	2 and 0.5 g, respectively	10.0	7.3	10.0	12.0	13.7	14.0	70.8	13.7
12.	Control		27.7	23.7	31.7	42.0	46.0	47.0		9.3
	S.E.±		1.37	1.12	1.32	1.27	1.47	1.29		
	C.D. (P=0.05)		2.84	2.33	2.74	2.64	3.04	2.68		
	C.D. (P=0.01)		3.86	3.17	3.72	3.60	4.14	3.64		
	CV		8.50	7.92	9.19	6.28	6.16	5.04		

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