



EVALUATION OF PROCHLORAZ 26.7% + TEBUCONAZOLE 13.3% EW AGAINST FRUIT ROT, DIEBACK AND POWDERY MILDEW ON CHILLI

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Abstract

Chilli (*Capsicum annum* L.) is an important cash crop among the spices and belong to family Solanaceae of dicots. Field trials were conducted to determine the evaluation of Prochloraz 26.7% + Tebuconazole 13.3% EW against fruit rot, die back and powdery mildew diseases of chilli. Experimental findings indicate that foliar sprays with Prochloraz 26.7% + Tebuconazole 13.3% EW was found most effective treatment against fruit rot, die back and powdery mildew which exhibited lowest disease severity and maximum yield as compared to other fungicides viz. Tebuconazole 25.9% EC, Azoxystrobin 23% SC, Myclobutanil 10% WP. So, it is evident from the present investigation that foliar spray with Prochloraz 26.7% + Tebuconazole 13.3% EW was found effective against fruit rot, die back and powdery mildew diseases of chilli @ 1000ml/ha and recorded excellent yield with higher cost - benefit ratio among all the treatments.

Key words : Tebuconazole, powdery mildew, dieback, randomized block design (RBD).

Introduction

Chilli is a very remunerative spice crop of the Indian subcontinent (Sharma *et al.*, 2002) and occupies an area of about 0.81 million ha (Suthin Raj and Christopher, 2009), which accounts for 25% of the world production (Chandra Nayaka *et al.*, 2009). Chilli suffers from many diseases caused by fungi, bacteria, viruses, nematodes and also abiotic stresses. Among the fungal diseases, powdery mildew, leaf spot and anthracnose or fruit rot are the most prevalent ones. The anthracnose or ripe fruit rot caused by *Colletotrichum capsici* (Sydow). Butler and Bisby is a wide spread problem limiting the profitable cultivation and seed production throughout the major chilli growing regions of India. The disease is both seed and air borne and affects seed germination and vigour to a greater extent (Asalmol *et al.*, 2001). Fruit rot up to 32 per cent and dieback up to 29 per cent have been noticed. Seedling decay and seed rot up to 21 per cent were recorded under Central Indian conditions. Thind and Jhooty (1985) reported that losses due to anthracnose of chilli varied between 66-84 per cent. 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 20%, 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).

Materials and Methods

The experiment on bio-efficacy of fungicides was conducted under natural conditions using hybrid variety of chilli, Super Deluxe during two seasons of 2012-13 and 2013-14 at Horticultural Research Station, Mahanandi, Kurnool (dt), Andhra Pradesh. The experiment was conducted in RBD with three replications and seven treatments. The agronomic package of practices such as nutrition, weed management and irrigation, insect management were followed as per the farmers practice. The sprays of test fungicide were given at the time of first appearance of fruit rot, dieback and powdery mildew diseases with the help of hand operated Knapsack sprayer and subsequent three sprays were given at 15 days intervals and the unsprayed treatments were kept as check. 500 liter spray volume was used per hectare.

Table 1 : Treatment details for bio-efficacy.

S. no.	Treatment	Dosage (per ha)		
		a.i.(g)	Formulation (ml)	Water volume (lit)
1	Prochloraz 26.7% + Tebuconazole 13.3% EW	200.25+99.75	750	500 lit/ha
2	Prochloraz 26.7% + Tebuconazole 13.3% EW	267+133	1000	
3	Prochloraz 26.7% + Tebuconazole 13.3% EW	333.75+166.25	1250	
4	Tebuconazole 25.9% EC (Folicur)	187.5	750	
5	Azoxystrobin 23% SC	125	500	
6	Myclobutanil 10% WP	0.004%	0.04%	
7	Control	—	—	—

Data analysis

The data on percent intensity of fruit rot, dieback and powdery mildew diseases at pre treatment of each spray (Before spray, 10th days after 1st, 2nd and 3rd spray) was recorded. The data on incidence on 10 randomly selected chilli plants from each replication were taken. The fruit rot, dieback and powdery mildew disease intensity was scored in 0-9 scale during every fruit picking and infected leaves, respectively. The data on per cent severity of fruit rot, dieback and powdery mildew were analyzed statistically.

The observations of chilli fruit rot, die back incidence and severity of powdery mildew was recorded using different disease rating scales given as below:

Rating scale for assessment of fruit rot infection in Chilli (Paul *et al.*, 2008)

Severity scale	Fruit surface infected (%)
0	0
1	1-10
2	11-20
3	21-30
4	31-40
5	41-50
6	51-60
7	61-70
8	71-80
9	81-90
10	91-100

Rating scale for assessment of powdery mildew disease (Jenkins-Wehner, 1983)

Grade	Description of the symptoms
0	No symptoms of powdery mildew disease (PMD) on leaf
1	Less than 1% leaf area showing PMD symptoms
3	1 -10% of leaf area showing PMD colonies
5	11 – 25% area of leaf showing PMD colonies

7	26 – 50% area of leaf showing PMD and development of colonies on petiole and pedicel of fruit
9	Above 50% area of leaf affected and yellowing and drying of leaves; Powdery growth of the fungus covers the pedicel.

The percent disease index of fruit rot and powdery mildew of chilli was calculated using the following formula:

Percent Disease Index (PDI) =

$$\frac{\text{Sum of the individual diseases grade} \times 100}{\text{Number of branches or fruits/leaves observed} \times \text{Maximum Disease grade}}$$

Results

Bio-efficacy study:

I. Powdery mildew (*Leveillula taurica*)

During 1st season, the data on powdery mildew are presented in table 2. Among the test dosages, Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 and 1000 ml/ha exhibited the best control of this disease with three spray and terminal PDI for powdery mildew was 7.04 and 7.78, respectively over control (43.70). The market standard Azoxystrobin 23% SC @ 500 ml/ha with PDI 11.85 was at par with Tebuconazole 25.9% EC (12.59).

The maximum percent disease reduction was recorded in treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha (83.90%), which was at par with treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (82.20%) formulation.

During 2nd season, application of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha (Terminal PDI-7.78) exhibited the best control with three spray which was at par with treatment Prochloraz 26.7% + Tebuconazole 13.3% @ 1000 ml/ha (Terminal PDI-8.15) (table 3). As compared to testing compound and other market standards Tebuconazole 25.9, EC Azoxystrobin 23% SC, Myclobutanil 10% WP. and control were

Table 2 : Efficacy of Prochloraz 26.7% + Tebuconazole 13.3% EW on Powdery mildew disease of Chili – 1st Season.

S. no.	Treatment	a.i. g	Formulation (ml/ha)	Percent Powdery mildew incidence on Chili leaves					Percent disease control
				Before spray	10 days after 1st spray	10 days after 2nd spray	10 days after 3rd spray (Terminal)		
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	200.25+99.75	750	4.81 (10.52)	10.74 (12.17)	15.56 (16.19)	16.30 (17.72)	62.71	
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	267+133	1000	5.19 (9.91)	3.70 (6.99)	7.04 (9.27)	7.78 (10.52)	82.20	
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	333.75+166.25	1250	5.56 (9.27)	3.33 (6.05)	6.67 (7.82)	7.04 (9.91)	83.90	
T ₄	Tebuconazole 25.9% EC (Folicur)	187.5	750	5.19 (8.57)	7.04 (10.52)	12.59 (12.68)	12.59 (15.79)	71.19	
T ₅	Azoxystrobin 23% SC	125	500	4.81 (9.27)	6.30 (9.91)	11.85 (12.17)	11.85 (14.96)	72.88	
T ₆	Myclobutaniil 10% WP	0.004%	0.04%	5.56 (10.52)	9.26 (22.03)	14.07 (26.30)	14.44 (27.61)	66.95	
T ₇	Control	-	-	5.93 (9.91)	21.48 (23.81)	36.67 (28.38)	43.70 (29.63)		
	CD at 5%			NS	1.32	1.11	1.34		

Note: Figures in parenthesis are angular transformed value.

Table 3 : Efficacy of Prochloraz 26.7% + Tebuconazole 13.3% EW on Powdery mildew disease of chili – 2nd season.

S. no.	Treatment	a.i. g	Formulation (ml/ha)	Percent Powdery mildew incidence on Chili leaves					Percent disease control
				Before spray	10 days after 1st spray	10 days after 2nd spray	10 days after 3rd spray (Terminal)		
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	200.25+99.25	750	4.44 (6.99)	11.85 (14.96)	13.70 (17.35)	17.41 (19.81)	59.48	
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	267+133	1000	4.07 (8.57)	4.81 (9.91)	7.41 (11.10)	8.15 (12.17)	81.03	
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	333.75+166.25	1250	3.70 (7.82)	4.44 (9.27)	6.67 (10.52)	7.78 (11.64)	81.90	
T ₄	Tebuconazole 25.9% EC (Folicur)	187.5	750	4.07 (6.99)	8.52 (12.68)	10.74 (14.53)	13.70 (18.08)	68.10	
T ₅	Azoxystrobin 23% SC	125	500	4.81 (6.05)	7.78 (11.64)	10.00 (13.63)	12.96 (17.35)	69.83	
T ₆	Myclobutaniil 10% WP	0.004%	0.04%	4.44 (8.57)	10.37 (23.81)	12.22 (28.63)	15.56 (32.51)	63.79	
T ₇	Control	-	-	3.70 (7.82)	22.59 (24.66)	33.33 (30.12)	42.96 (34.13)	-	
	CD at 5%			NS	1.15	1.13	1.27		

Note: Figures in parenthesis are angular transformed value.

recorded maximum powdery mildew incidence (Terminal PDI-42.96). Among the market standards, Azoxystrobin 23% SC @ 500 ml/ha and Tebuconazole 25.9% EC @ 750 ml/ha was found at par with each other (Terminal PDI-12.96 & 13.70, respectively).

The highest percent disease reduction was recorded in treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha (81.90%), which was at par with treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (81.03%).

II. Fruit rot & dieback (*Colletotrichum capsici*)

In first season, results presented in table 4 indicated that all the treatments were superior over control against fruit rot disease. However, minimum disease incidence after 3rd spray was recorded in foliar sprays with Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha, which was found most effective treatment against fruit rot and die back disease of chilli (2.96 & 3.33%, respectively). Foliar sprays with Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (3.33 & 3.70%, respectively) was on par with dosage Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha next in order of efficacy on fruit rot and die back disease. The all other standard checks Tebuconazole 25.9% EC, Azoxystrobin 23% SC and Myclobutanil 10% WP. were less effective for the control of fruit rot and die back of chilli when compared to all doses of Prochloraz 26.7% + Tebuconazole 13.3% EW.

Three sprays of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha (87.88% & 87.14%) was recorded maximum percent disease reduction in case of fruit rot and dieback, respectively which was at par with treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (86.36% & 85.71%, respectively).

In second season, Prochloraz 26.7% + Tebuconazole 13.3% EW against fruit rot and dieback are presented in table 4. Three subsequent foliar sprays with Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha recorded minimum incidence of powdery mildew disease which was found most effective treatment against Fruit rot and die back disease of chilli (4.44 & 3.70%, respectively). Foliar sprays with Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (4.81 & 4.07%, respectively) was on par with dosage Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha next in order of efficacy on fruit rot and die back disease. The all other market standards were less effective for the control of fruit rot & dieback of chilli when compared to all doses of Prochloraz 26.7% + Tebuconazole 13.3% EW (table 5).

Spraying with Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha (85.88% & 87.50%) was recorded maximum percent disease reduction in case of fruit rot and dieback, respectively which was at par with treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (84.71% & 86.25%, respectively).

Yield & cost-benefit ratio: First season

In present investigation, the data revealed that three sequential application of Prochloraz 26.7% + Tebuconazole 13.3% EW (@ 1250 and 1000 ml/ha exhibited very effective control of fruit rot, dieback and powdery mildew and the fruit yield reached up to 23.78 & 23.07 q/ha, respectively followed by market standard Azoxystrobin 23% SC *i.e.* 22.42 q/ha. Hence, the application of Prochloraz 26.7% + Tebuconazole 13.3% EW induced more effective branching and significantly enhanced fruit bearing per plant (table 6). The treatment of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha exhibited the highest cost benefit ratio (1:1.63) followed by Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha *i.e.* 1:1.52 (table 8).

Yield & cost-benefit ratio: Second season

The data on dry pod yield of chilli was revealed that three sequential application of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 and 1000 ml/ha exhibited very effective control of fruit rot/dieback and powdery mildew and the fruit yield increased up to 22.00 & 21.29 q/ha, respectively which was at par with each other (table 7). Hence, the application of Prochloraz 26.7% + Tebuconazole 13.3% EW induced more effective branching and significantly enhanced fruit bearing per plant as compared to other market standards and control. The treatment of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha exhibited the highest cost benefit ratio (1:1.84) followed by Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha *i.e.* 1:1.70 (table 9).

Discussion

The results indicated that Azoxystrobin 23% SC @ 500 ml/ha and Tebuconazole 25.9% EC @ 750 ml/ha was found at par with each other (Terminal PDI-12.96 & 13.70, respectively).

The highest percent disease reduction was recorded in treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha (81.90%), which was at par with treatment Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha (81.03%). The strobilurin fungicides, azoxystrobin (Quadris), trifloxystrobin (Flint) and pyraclostrobin (Cabrio) have recently been labeled for

Table 4 : Efficacy of Prochloraz 26.7% + Tebuconazole 13.3% EW on percent disease incidence of Fruit rot & dieback in Chilli – 1st season.

S. no.	Treatment	a.i. g	Formulation ml/ha	Percent fruits infected (Fruit Rot)				Percent disease control	Percent disease incidence on chilli (Dieback)				Percent disease control
				Before spray	10 days after 1st spray	10 days after 2nd spray (Terminal)	10 days after 3rd spray		Before spray	10 days after 1st spray	10 days after 2nd spray (Terminal)	10 days after 3rd spray	
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	200.25 + 99.75	750	3.33 (10.52)	4.44 (12.17)	7.41 (15.79)	8.52 (16.97)	65.15	4.44 (12.17)	7.04 (15.38)	7.78 (16.19)	8.52 (16.97)	67.14
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	267+133	1000	2.96 (9.91)	1.48 (6.99)	2.59 (9.27)	3.33 (10.52)	86.36	3.70 (11.10)	1.85 (7.82)	2.59 (9.27)	3.70 (11.10)	85.71
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	333.75+ 166.25	1250	2.59 (9.27)	1.11 (6.05)	1.85 (7.82)	2.96 (9.91)	87.88	4.07 (11.64)	1.48 (6.99)	1.85 (7.82)	3.33 (10.52)	87.14
T ₄	Tebuconazole 25.9% EC (Folicur)	187.5	750	2.22 (8.57)	3.33 (10.52)	4.81 (12.68)	7.41 (15.79)	69.70	3.33 (10.52)	5.56 (13.63)	6.30 (14.53)	7.04 (16.38)	71.86
T ₅	Azoxystrobin 23% SC	125	500	2.59 (9.27)	2.96 (9.91)	4.44 (12.17)	6.67 (14.96)	72.73	3.70 (11.10)	4.81 (13.68)	5.19 (13.16)	6.67 (14.96)	73.29
T ₆	Myclobutamil 10% WP	0.004%	0.04%	3.33 (10.52)	8.52 (16.97)	8.89 (17.35)	9.63 (18.08)	60.61	4.07 (11.64)	9.26 (17.27)	9.63 (18.08)	10.00 (18.43)	61.43
T ₇	Control	-	-	2.96 (9.91)	16.30 (23.81)	22.59 (28.38)	24.44 (29.63)		3.70 (11.10)	17.78 (24.94)	25.93 (30.61)	25.93 (30.61)	
	CD at 5%			NS	1.14	1.47	1.06		NS	1.32	1.55	1.40	

Note: Figures in parenthesis are angular transformed value.

Table 5 : Efficacy of Prochloraz 26.7% + Tebuconazole 13.3% EW on percent disease incidence of *Fruit rot and Die back* in Chilli – 2nd season.

S. no.	Treatment	a.i. g	Formula- tion ml/ha	Percent fruits infected (Fruit Rot)				Percent disease control	Percent disease incidence on chilli leaves (Dieback)				Percent disease control
				Before spray	10 days after 1st spray	10 days after 2nd spray (Terminal)	10 days after 3rd spray		Before spray	10 days after 1st spray	10 days after 2nd spray (Terminal)	10 days after 3rd spray	
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	200.25 +99.25	750	1.48 (6.99)	6.67 (14.96)	8.89 (17.35)	11.48 (19.81)	63.53	2.59 (9.27)	7.78 (16.19)	8.52 (16.97)	9.26 (17.72)	68.75
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01) *	267+133	1000	2.22 (8.57)	2.96 (9.91)	3.70 (11.10)	4.81 (12.68)	84.71	3.33 (10.52)	2.96 (9.91)	3.70 (11.10)	4.07 (11.64)	86.25
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01) *	333.75+ 166.25	1250	1.85 (7.82)	2.59 (9.27)	3.33 (10.52)	4.44 (12.17)	85.88	2.96 (9.91)	2.59 (9.27)	3.33 (10.52)	3.70 (11.10)	87.50
T ₄	Tebuconazole 25.9% EC (Folicur)	187.5	750	1.48 (6.99)	4.81 (12.68)	6.30 (14.53)	10.00 (18.43)	68.24	2.59 (9.27)	6.61 (14.96)	7.41 (15.97)	8.15 (16.59)	72.5
T ₅	Azoxystrobin 23% SC	125	500	1.11 (6.05)	4.07 (11.64)	5.56 (13.63)	9.26 (17.72)	70.59	2.22 (8.57)	5.93 (14.09)	6.67 (14.96)	7.41 (15.79)	74.00
T ₆	Myclobutanil 10% WP	0.004%	0.04%	2.22 (8.57)	10.74 (19.13)	12.22 (20.46)	12.59 (20.78)	60.00	2.96 (9.91)	9.63 (18.08)	10.37 (18.79)	11.11 (19.47)	62.50
T ₇	Control	-	-	1.85 (7.82)	17.41 (26.66)	25.19 (30.12)	31.48 (34.13)	-	3.33 (10.52)	18.15 (25.21)	25.93 (30.61)	29.63 (32.98)	-
	CD at 5%			NS	1.32	1.35	1.31		NS	1.15	1.03	1.10	

Note: Figures in parenthesis are angular transformed value.

Table 6 : Effect of Prochloraz 26.7% + Tebuconazole 13.3% EW on yield of Chilli – 1st season.

S. no.	Treatment	a.i. g	Formulation (ml/ha)	Yield (q/ha)
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	200.25+99.75	750	20.28
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	267+133	1000	23.07
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	333.75+166.25	1250	23.78
T ₄	Tebuconazole 25.9% EC (Folicur)	187.5	750	21.81
T ₅	Azoxystrobin 23% SC	125	500	22.42
T ₆	Myclobutanil 10% WP	0.004%	0.04%	18.63
T ₇	Control	-	-	17.36
CD at 5%				0.90

Table 7 : Effect of Prochloraz 26.7% + Tebuconazole 13.3% EW on yield of chilli – 2nd season.

S. no.	Treatment	a.i. g	Formulation (ml/ha)	Chilli yield (q/ha)
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	200.25+99.25	750	18.47
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	267+133	1000	21.29
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	333.75+166.25	1250	22.00
T ₄	Tebuconazole 25.9% EC (Folicur)	187.5	750	19.90
T ₅	Azoxystrobin 23% SC	125	500	21.02
T ₆	Myclobutanil 10% WP	0.004%	0.04%	16.50
T ₇	Control	-	-	14.85
CD at 5%				1.30

Table 8 : Economics of using Prochloraz 26.7% + Tebuconazole 13.3% EW against fruit rot, dieback and PM on Chilli – 1st season.

S. no.	Treatment	Formulation (ml/ha)	Yield (q/ha)	Total cost of input (Rs.)	Additional yield (q/ha)	Value of additional yield (Rs.)	Economic benefit over control
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	750	20.28	3645.00	2.92	3791.67	1:1.04
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	1000	23.07	4560.00	5.70	7414.33	1:1.63
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	1250	23.78	5475.00	6.42	8341.67	1:1.52
T ₄	Tebuconazole 25.9% EC (Folicur)	750	21.81	4590.00	4.45	5785.00	1:1.26
T ₅	Azoxystrobin 23% SC	500	22.42	11025.00	5.05	6569.33	1:0.60
T ₆	Myclobutanil 10% WP	0.04%	18.63	2154.00	1.27	1651.00	1:0.77
T ₇	Control	-	17.36	-	-	-	-

Rates:

- Prochloraz 26.7% + Tebuconazole 13.3% EW- Rs.1220.00/liter
- Azoxystrobin 23% SC-Rs.6750.00/liter
- Market price of chilli- Rs.1300.00/q
- Tebuconazole 25.9% EC- Rs.1640.00/liter
- Myclobutanil 10% WP-Rs. 2090.00/kg
- Labour wedges per application- Rs.300.00

the management of powdery mildew and anthracnose on chilli, but only preliminary reports are available on the efficacy of these fungicides against the severe form of the disease (Alexander and Waldenmaier, 2002). Dale (1999) found that Amistar (Azoxystrobin) at 125-250 mg ai/l provided longer disease protection than benomyl against anthracnose disease of chilli. The strobilurin

fungicides represent important class of chemicals for the management of a broad range of fungal diseases in agricultural production systems. Sundaravadana *et al.* (2007) found that treating trees with azoxystrobin 8.3% w/w + mancozeb 66.7% w/w *viz.*, 1, 2 and 4 ml/l. concentrations provided 100 and more than 60 per cent reduction of panicle and leaf anthracnose compared to

Table 9 : Economics of using Prochloraz 26.7% + Tebuconazole 13.3% EW against fruit rot, dieback and PM on Chilli – 2nd season.

S. no.	Treatment	Formulation (ml/ha)	Dry pod yield (q/ha)	Total cost of input (Rs.)	Additional yield (q/ha)	Value of additional yield (Rs.)	Economic benefit over control
T ₁	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	750	18.47	3645.00	3.62	4701.67	1:1.29
T ₂	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	1000	21.29	4560.00	6.44	8367.67	1:1.84
T ₃	Prochloraz 26.7% + Tebuconazole 13.3% EW (MAPT-01)*	1250	22.00	5475.00	7.15	9295.00	1:1.70
T ₄	Tebuconazole 25.9% EC (Folicur)	750	19.90	4590.00	5.05	6565.00	1:1.43
T ₅	Azoxystrobin 23% SC	500	21.02	11025.00	6.17	8021.00	1:0.73
T ₆	Myclobutanil 10% WP	0.04%	16.50	2154.00	1.65	2149.33	1:1.00
T ₇	Control	-	14.85	-	-	-	-

Rates:

Prochloraz 26.7% + Tebuconazole 13.3% EW- Rs.1220.00/liter

Azoxystrobin 23% SC-Rs.6750.00/liter

Market price of Chilli- Rs.1300.00/q

Tebuconazole 25.9% EC- Rs.1640.00/liter

Myclobutanil 10% WP-Rs. 2090.00/kg

Labour wedges per application- Rs.300.00

untreated mango trees where 27.73 and 53.68 PDI were recorded. In the present study, the maximum pooled yield of 21.91 q/ha was recorded with UPF 509 (Azoxystrobin 8.3% + Mancozeb 66.7%) 75% WG (1800 g/ha) in the two seasons. Kalra *et al.* (2000) reported that early planting coupled with application of dinocap reduced the powdery mildew disease severity on coriander. Sharma *et al.* (2002) reported that hexaconazole (0.05%) sprays were found highly effective in reducing the severity of powdery mildew followed by fenarimol and bitertanol in controlling the powdery mildew of pea. Khunti *et al.* (2002) reported that application of hexaconazole (0.05%) and penconazole (0.1%) were found effective in managing powdery mildew and *Cercospora* leaf spot of mung bean caused by *Erysiphe polygoni* and *Cercospora canescens*. Fugro *et al.* (2004) reported that carbendazim 80% WDG at 250g a.i./ha was most effective in managing powdery mildew of chilli. Reuveni (2003) reported that azoxystrobin at 40 g 100 l-1 water gave 95.9% reduction over control of grapes downy mildew *P. viticola* in field experiments. Azoxystrobin at 0.3g l-1 as pre-inoculation spray significantly reduced the lesion length (2.75 mm) compared with the water control (26.4 mm) caused by *D. bryoniae* (stem blight) of cucumber (Utkhede and Koch, 2004). In the present study, maximum yields of 27.18 and 30.16 t/ha were recorded with Azoxystrobin at 150 g ai/ha in the two seasons. The results were in accordance with the following reports: Sendhil Vel (2003) recorded 43.06% increase in yield over farmer practices in the first season and 33.98%

increase over farmer practices in the second season trial by azoxystrobin (150 g a.i ha⁻¹) treatment. Anand *et al.* (2009) reported maximum fruit yield of 10.54 and 10.35 tonnes ha⁻¹ cucumber at azoxystrobin (250 ml ha⁻¹) for the first and second seasons, respectively (4.08 - 4.63 tonnes ha⁻¹). Tebuconazole appeared the most effective amongst the fungicides tested, with reduction in fruit rot incidence and intensity to the tune of 69.96% and 73.56%, respectively over unsprayed control, followed immediately with similar efficacy by other two triazoles *viz.*, difenconazole and hexaconazole. In protective field spray condition, hexaconazole was found most effective in reducing fruit rot (PEDC 81.7%) and increasing fruit yield (223.50 q ha) followed by trifloxystrobin (75.9%, 218.42 q ha). The results were supported by effective management of powdery mildew and anthracnose diseases of chilli by Ahiladevi and Prakasam (2013, 2014) and UPF-509 (Azoxystrobin 8.3% + Mancozeb 66.7%) 75% WG at 1800 g/ha proved to be best for the management of powdery mildew (16.33) and anthracnose (6.67) with minimum per cent disease index (PDI) (Azith, 2014).

Conclusion

A field experiment carried on Prochloraz 26.7% + Tebuconazole 13.3% EW at Horticultural Research Station, Mahanandi, Kurnool (dt), Andhra Pradesh during 2012-2013 and 2013-2014 concluded that-

- The application of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1250 ml/ha was

more effective than rest of the treatments for controlling fruit rot/dieback and powdery mildew disease in chilli and was at par with Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha.

- Subsequently, three spray of Prochloraz 26.7% + Tebuconazole 13.3% EW @ 1000 ml/ha recorded excellent yield with higher cost-benefit ratio among all the treatments.

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