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Original Article

Performance Evaluation Of Azoxystrobin In The Control Of Fruit Rot And Powdery Mildew Diseases On Chilli

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ABSTRACT

The performance of azoxystrobin was tested against anthracnose and powdery mildew diseases of chilli. Anthracnose and powdery mildew diseases are the major economic constraints to chilli production worldwide, especially in tropical and subtropical regions. Although the management and control of these two diseases are still being extensively researched, commercial cultivars of *Capsicum annuum* that are resistant to the pathogens that cause chilli anthracnose and powdery mildew have not yet been developed. In this study azoxystrobin was sprayed at various doses (62.5, 125.0, 187.5 and 250.0 g a.i./ha) at fifteen days interval for three times starting from 35 days after planting. It was found that azoxystrobin at 250 g a.i / ha effectively controlled fruit rot and powdery mildew diseases of chilli. This treatment also recorded the highest fruit yield. Azoxystrobin did not induce any phytotoxic effect in chilli crop.

Keywords:

Chilli, fruit rot, azoxystrobin, bio- efficacy, phytotoxicity .

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Introduction:

Chilli (*Capsicum annuum* L.) belongs to the family solanaceae comprising of several cultivated and wild accessions. It forms an indispensable adjunct essentially used in every Indian cuisine due to its pungency, spicy taste, appealing odour and flavor (Purseglove. 1977). Chilli crop suffers from many diseases caused by fungi, bacteria and viruses. Among the fungal diseases, powdery mildew and anthracnose are the most prevalent ones. The powdery mildew caused by *Leveillula taurica* (Lev.) Arn and fruit rot caused by *Colletotrichum capsici* (Syd.) Butler and Bisby are the major constraints in chilli production causing heavy yield loss ranging from 14 to 20 per cent and 10 to 60 per cent respectively (Asalmol et al., 2001).

It is imperative to concentrate on the development of highly effective and ecologically safe fungicide for the management of powdery mildew and fruit rot diseases of chilli . Azoxystrobin a strobilurin group of fungicide has its origin from some of the naturally occurring mushrooms. It is a broad spectrum fungicide with protectant, curative, eradicant and systemic properties. It is absorbed through the roots and translocated in the xylem to the stems and leaves, or through leaf surfaces to the leaf tips and growing edges. The mode of action is by inhibition of mitochondrial respiration in fungi. It inhibits spore germination, mycelial growth, and spore production of fungi (Mejia Arreaza and Hernandez 2001). The present study was undertaken to evaluate the performance, phytotoxicity and persistence of azoxystrobin against fruit rot and powdery mildew of chilli.

Materials And Methods

Source of fungicides

The fungicide azoxystrobin was obtained from Willowood Agrochemicals Pvt. Ltd., India.

Performance evaluation of azoxystrobin

A field experiment was conducted with the chilli variety "Bullet" during September – December, 2012 at a farmer field located at Naraseepuram village, Coimbatore district of Tamil Nadu, India to study the performance of azoxystrobin against fruit rot and powdery mildew diseases. The experiment was laid out in randomized block design with three replications and a plot size of 5 x 4 m (20 m2). Regular agronomic practices were followed according to the Tamil Nadu Agricultural University crop production guide (CPG).

The various treatments include:

T1-Azoxystrobin 250 ml/ha (62.5 g a.i /ha),
T2- Azoxystrobin 500 ml / ha (125 g a.i / ha),
T3- Azoxystrobin 750 ml / ha (187.5 g a.i / ha),
T4- Azoxystrobin 1000 ml / ha (250 g a.i / ha),
T5- Check Amistar 25 SC 500 ml /ha. (125 g a.i/ ha),
T6- Mancozeb 75 % WP. 1.5 kg / ha (1. 25 kg a.i / ha),
T7- Tebuconazole 25.9 % m/m EC (125 g a.i / ha)
T8 – Control.

The trial plots were sprayed three times with azoxystrobin 35 days after sowing at 15 days interval along with the standard checks. Fruit rot and powdery mildew incidence were recorded at 7 days after each spray. The intensity was assessed using the score chart of 0 to 5 scale as described by Jamadar and Desai (1997). The per cent disease index (PDI) was calculated with the following formula (Mckinney, 1923).

$$PDI = \frac{\text{Sum of numerical ratings}}{\text{Total number of leaves observed}} \times \frac{100}{\text{Maximum category value}}$$

The trial was once again repeated during September to December 2013 in the same location to confirm the results. The weight of fruits from each plot during harvest was recorded and the average yield per treatment was calculated.

Phytotoxic effect of azoxystrobin

In both the trials, plants sprayed with azoxystrobin were observed on 1, 3, 5, 7, 10 and 15 days after spraying for any phytotoxic symptoms such as injury to leaf tips, leaf surface, wilting, vein clearing, necrosis, epinasty and hyponasty. Leaf injury was graded based on visual ratings on a 1–10 scale (CIB, 1989).

Results

a.Management of anthracnose

In the first season trial, among the different treatments, azoxystrobin 1000 ml / ha (250 g a.i / ha) showed the maximum disease reduction over control which was recorded to be 93.11 per cent. Azoxystrobin 250 ml / ha (62.5 g a.i / ha), 500 ml / ha (125 g a.i / ha) and 750 ml / ha (187.5 g a.i / ha) showed the disease reduction over control viz., 74.60, 82.97 and 86.88 per cent respectively. Amistar 25 SC 500 ml /ha (125 g a.i/ ha), mancozeb 75 % WP. 1.5 kg / ha (1. 125 g a.i / ha) and tebuconazole 25.9 % m/m EC (125 g a.i / ha) have recorded 82.00, 62.64 and 77.33 per cent disease reduction respectively over control.

b.Management of powdery mildew

In the case of powdery mildew, azoxystrobin 1000 ml / ha (250 g a.i / ha) showed the maximum disease reduction over control (87.76 per cent) in the first season. Whereas,

azoxystrobin 250 ml / ha (62.5 g a.i / ha), 500 ml / ha (125 g a.i / ha) and azoxystrobin 750 ml / ha (187.5 g a.i / ha) showed 74.04, 79.95, and 84.83 per cent disease reduction over control respectively. Amistar 25 SC 500 ml / ha (125 g a.i/ ha), mancozeb 75 % WP. 1.5 kg / ha (1. 125 g a.i / ha) and tebuconazole 25.9 % m / m EC (125 g a.i / ha) have recorded 78.69, 65.11 and 73.93 per cent disease reduction respectively over control.

A similar trend was observed in the second season and 250 g a.i / ha was found to be the best among the different doses of azoxystrobin against fruit rot and powdery mildew diseases recording the lowest PDI of 4.88 and 6.01 respectively. The plot treated with azoxystrobin @ 250 g a.i / ha revealed the maximum yield of about 27.68 t / ha in the first season and 26.47 t / ha in the second season trial.

Phytotoxicity

None of the plant in the azoxystrobin sprayed plots showed phytotoxicity symptoms.

Table.1 Effect of different fungicides on the incidence of anthracnose of chilli (Season I)

Treatment	PDI on leaves				Per cent decrease over control	Yield t/ha
	Before Spray	After I spray	After II spray	After III Spray		
T1-Azoxystrobin 250 ml / ha (62.5 g a.i / ha)	22.68 $(28.39)_c$	19.22 $(25.99)_d$	15.80 $(23.65)_d$	11.43 $(19.76)_e$	74.60	25.57
T2- Azoxystrobin 500 ml / ha (125 g a.i / ha)	21.34 $(27.49)_a$	17.48 $(24.65)_b$	12.26 $(20.44)_b$	7.66 $(16.07)_c$	82.97	26.12
T3- Azoxystrobin 750 ml / ha (187.5 g a.i / ha)	22.47 $(22.25)_b$	20.22 $(26.71)_e$	11.26 $(19.64)_a$	5.90 $(14.06)_b$	86.88	26.85
T4- Azoxystrobin 1000 ml / ha (250 g a.i / ha)	23.48 $(28.93)_e$	15.98 $(23.5)_a$	10.46 $(18.89)_a$	3.10 $(10.14)_a$	93.11	27.68
T5- Check Amistar 25 SC 500 ml /ha. (125 g a.i / ha)	21.36 $(27.49)_a$	18.12 $(25.18)_c$	15.98 $(23.5)_d$	8.10 $(16.54)_c$	82.00	22.43
T6- Mancozeb 75 % WP . 1.5 kg / ha (125 g a.i / ha)	25.32 $(30.20)_f$	24.45 $(29.60)_f$	20.30 $(26.78)_e$	16.81 $(24.20)_f$	62.64	22.00
T7 – Tebuconazole 25.9% m/m EC (125 g a.i / ha)	23.24 $(28.93)_d$	20.42 $(26.85)_e$	14.87 $(22.63)_c$	10.20 $(18.62)_d$	77.33	24.04
T8 – Control	27.16 $(31.37)_g$	35.11 $(36.33)_g$	41.46 $(40.05)_f$	45.00 $(42.13)_g$	00.00	16.40

Values are means of three replications
Figures in the parentheses represent arcsine transformed values
The common letters show non- significant differences among the treatments based on DMRT

Table.2 Effect of different fungicides on the incidence of anthracnose of chilli (Season II)

Treatment	PDI				Per cent decrease over control	Yield t/ha
	Before Spray	After I spray	After II spray	After III Spray		
T1-Azoxystrobin 250 ml/ha (62.5 g a.i / ha)	25.30 $(30.09)_f$	22.49 $(28.51)_c$	16.55 $(24.02)_d$	12.61 $(21.10)_e$	71.24	24.21
T2- Azoxystrobin 500 ml / ha (125 g a.i / ha)	24.86 $(29.80)_e$	19.87 $(26.68)_b$	15.38 $(23.10)_c$	9.32 $(18.08)_c$	78.75	24.86
T3- Azoxystrobin 750 ml / ha (187.5 g a.i / ha)	22.75 $(28.37)_b$	19.33 $(26.42)_b$	13.21 $(21.32)_b$	6.28 $(15.87)_b$	84.08	25.22
T4- Azoxystrobin 1000 ml / ha (250 g a.i / ha)	24.32 $(29.44)_c$	17.76 $(25.14)_a$	11.15 $(19.52)_a$	4.88 $(13.15)_a$	88.87	26.47
T5- Check Amistar 25 SC 500 ml /ha. (125 g a.i/ ha)	25.98 $(30.54)_g$	23.64 $(29.94)_d$	18.93 $(25.8)_f$	11.36 $(19.98)_d$	74.09	22.11
T6- Mancozeb 75 % WP. 1.5 kg / ha (125 g a.i / ha)	26.23 $(30.70)_h$	24.65 $(29.96)_d$	22.54 $(28.35)_g$	17.54 $(25.00)_f$	60.01	20.84
T7- Tebuconazole 25.9 % m/m EC (125 g a.i / ha)	24.65 $(29.66)_d$	22.36 $(28.42)_c$	17.28 $(24.58)_e$	11.67 $(20.25)_d$	73.39	23.15
T8 – Control	20.21 $(26.60)_a$	25.83 $(30.73)_e$	38.27 $(38.23)_h$	43.86 $(41.66)_g$	00.00	15.73

Values are means of three replications
Figures in the parentheses represent arcsine transformed values
The common letters show non- significant differences among the treatments based on DMRT

Table.3 Effect of different fungicides on the incidence of powdery mildew of chilli (Season I)

Treatment	PDI on leaves				Per cent decrease over control	Yield t/ha
	Before Spray	After I spray	After II spray	After III Spray		
T1-Azoxystrobin 250 ml/ha (62.5 g a.i / ha)	26.96 $(31.24)_a$	22.21 $(28.11)_d$	16.57 $(24.02)_d$	12.33 $(20.55)_e$	74.04	25.57
T2- Azoxystrobin 500 ml / ha (125.0 g a.i / ha)	24.48 $(29.60)_a$	21.57 $(27.67)_c$	13.35 $(21.39)_c$	9.52 $(17.97)_c$	79.95	26.12
T3- Azoxystrobin 750 ml / ha (187.5 g a.i / ha)	27.32 $(31.50)_e$	20.45 $(26.88)_b$	11.80 $(20.08)_b$	7.44 $(15.81)_b$	84.83	26.85
T4- Azoxystrobin 1000 ml / ha (250 g a.i / ha)	26.21 $(30.79)_c$	20.00 $(26.56)_a$	10.19 $(18.60)_a$	5.87 $(13.99)_a$	87.76	27.68
T5- Check Amistar 25 SC 500 ml /ha. (125 g a.i / ha)	25.76 $(30.50)_b$	23.10 $(28.72)_e$	16.26 $(23.77)_d$	10.12 $(18.55)_d$	78.69	22.43
T6- Mancozeb 75 % WP. 1.5 kg / ha (125.0 g a.i / ha)	24.45 $(29.60)_a$	23.48 $(28.93)_e$	18.56 $(25.51)_e$	16.57 $(24.02)_f$	65.11	22.00
T7- Tebuconazole 25.9 % m/m EC (125.0 g a.i / ha)	27.47 $(31.61)_f$	24.66 $(29.77)_f$	15.67 $(23.31)_d$	12.38 $(20.59)_e$	73.93	24.04
T8 – Control	28.44 $(32.20)_g$	38.26 $(38.20)_g$	42.13 $(40.47)_e$	47.50 $(43.56)_g$	-	16.40

Values are means of three replications
Figures in the parentheses represent arcsine transformed values
The common letters show non- significant differences among the treatments based on DMRT

Table.4 Effect of different fungicides on the incidence of powdery mildew of chilli (Season II)

Treatment	PDI				Per cent decrease over control	Yield t/ha
	Before Spray	After I spray	After II spray	After III Spray		
T1-Azoxystrobin 250 ml/ha (62.5 g a.i /ha)	25.34 $(30.43)_{d}$	20.39 $(27.07)_{ab}$	17.32 $(24.82)_{de}$	13.12 $(21.50)_{e}$	72.29	24.21
T2- Azoxystrobin 500 ml / ha (125 g a.i / ha)	26.24 $(31.02)_{g}$	22.13 $(28.28)_{bc}$	15.13 $(23.13)_{c}$	10.75 $(19.43)_{c}$	77.30	24.86
T3- Azoxystrobin 750 ml / ha (187.5 g a.i / ha)	24.73 $(30.03)_{c}$	19.87 $(27.69)_{abc}$	13.96 $(22.19)_{b}$	8.64 $(17.40)_{b}$	81.75	25.22
T4- Azoxystrobin 1000 ml / ha (250 g a.i / ha)	28.39 $(32.40)_{h}$	20.28 $(26.89)_{a}$	11.58 $(20.16)_{a}$	6.01 $(14.55)_{a}$	87.30	26.47
T5- Check Amistar 25 SC 500 ml /ha. (125 g a.i/ ha)	24.16 $(29.65)_{b}$	21.66 $(27.63)_{abc}$	17.46 $(24.93)_{def}$	11.33 $(19.95)_{d}$	76.07	22.11
T6- Mancozeb 75 % WP . 1.5 kg / ha (125 g a.i / ha)	25.98 $(30.85)_{f}$	22.57 $(28.37)_{c}$	19.87 $(26.69)_{g}$	15.72 $(23.60)_{g}$	66.80	20.84
T7- Tebuconazole 25.9 % m/m EC (125 g a.i / ha)	23.47 $(29.19)_{a}$	20.98 $(27.86)_{abc}$	17.26 $(24.78)_{d}$	13.25 $(21.61)_{f}$	72.02	23.15
T8 – Control	25. 67 $(30.65)_{e}$	37.76 $(38.10)_{d}$	43.61 $(40.47)_{h}$	47.36 $(43.67)_{h}$	-	15.73

Values are means of three replications
Figures in the parentheses represent arcsine transformed values
The common letters show non- significant differences among the treatments based on DMRT

Discussion

This study clearly reveals that, azoxystrobin 1000 ml / ha (250 g a.i / ha) recorded the maximum disease reduction over control against fruit rot and powdery mildew diseases of chilli and also recorded the maximum yield. Azoxystrobin showed protectant, post infection, post symptom, translaminar and vapor activities which provides effective control of downy mildew and powdery mildew diseases of grapevine (Wilcox et al., 1999). The fungicide azoxystrobin had been found to increase the resistance in plants against plant pathogens. The activity of the defense enzymes peroxidase (PO), polyphenol oxidase (PPO), Phenylalanine ammonia lyase (PAL), Chitinase and defense inducing chemicals increased in the azoxystrobin treated cucumber plants (Anand et al., 2007). Furrow applications of azoxystrobin at six- to eight-leaf stage reduced the crown rot incidence and increased the yield in sugarbeet (Poindexter et al., 2005). Hence, various modes of action and defense activities of azoxystrobin could be the reason for reduced fruit rot and powdery mildew incidence and increased yield in chilli.

All concentrations of azoxystrobin did not cause any phytotoxicity symptoms. This is an additional advantage in azoxystrobin spray indicating its safety to chilli crop. Ranganathan (2001) reported that, there were no phytotoxic symptoms throughout the cropping season due to azoxystrobin application. Sendhil Vel et al. (2004) also found that, there was no leaf injury on grapevine at a higher concentration of azoxystrobin. This study exhibits conclusive evidences for the recommendation of azoxystrobin biomolecule @ 250 g a.i / ha for the management of fruit rot and powdery mildew diseases in chilli.

References:

1.Anand, T., Chandrasekaran, A., Kuttalam, S., Raguchander, T., Prakasam, V. and Samiyappan, R. 2007. Association of some plant defense enzyme activities with systemic resistance to early leaf blight and leaf spot induced in tomato plants by azoxystrobin and Pseudomonas fluorescens. J. Plant Interactions, 2: 233-244.
2.Asalmol, M.N., Kale, V.P. and Ingle, S.T., 2001, Seed borne fungi of chilli, incidence and effect on seed germination. Seed Res., 29(1): 76-79.
3.CIB 1989. Manual for Testing Phytotoxicity of Pesticides on Agricultural Crops. Pesticides Association of India, New Delhi, 120 pp.
4.Jamadar, M.M. and Desai, S.A.1997. Bioefficacy of dimethomorph against downy mildew of grapevine. Adv. Agric. Res. India, 4: 81-85.
5.Mckinney H.H. 1923. A new system of grading of plant diseases. J. Agric. Res. 26: 195–218.
6.Mejia Arreaza J., Hernandez M.M. 2001. Evaluation of azoxystrobin on the early blight control (Alternaria solani) in tomatoes. Revista de la faculated de Agronomia, Universidad del zulia 18 (2): 106–116.
7.Poindexter, S., D.A. Ruppal, and W. Kirk. 2005. Impact of strobilurin fungicide on yield of sugar beets with natural inoculation of Rhizoctonia crown rot J. Sugar Beet Res. 42:54 (Abstr.).
8.Purseglove JW. 1977. Reported vitamin P content rutin in chilli. Tropical Crops Dictyledons I and II Longman, Landon pp 524-525.9. 10.
9.Ranganathan, T. 2001. Azoxystrobin (Amistar 25 SC) a novel fungicides for the control of downy mildew and powdery mldew of grapevine. Pestology, 25: 28-31.
10.Sendhil Vel, V., Kuttalam, S., Chandrasekhar, S., Raguchander, T. and Marimuthu, T. 2004a. Persistance and dissipation of azoxystrobin 25 SC in grapes. Pestology, 28: 75- 80.
11.Wilcox W.F., Riegel D.R., Wong F.P. 1999. Evaluation of fungicide programs for control of grapevine downy mildew. Fungic. Nematic. Tests 54, p. 111.