

Original Research Article

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Efficacy of Various Fungicides for the Management of Cumin Powdery Mildew Caused by *Erysiphe polygoni* DC

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ABSTRACT

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Powdery mildew caused by *Erysiphe polygoni* DC is one of the major constraints in the production of cumin. Farmers have to spray fungicides regularly for disease management. In order to find out the effective fungicides against *Erysiphe polygoni* experiment was carried out under *in vivo*. The relative efficacies of six different fungicides were tested in different concentration. Among the different fungicides, propiconazole (0.025%) was the most effective fungicide with mean 4.43 per cent (pooled) disease intensity and maximum disease control of 79.28 per cent followed by wettable sulphur (0.2%). The highest yield of 798 kg/ha (two year pooled) was obtained in the treatment of propiconazole closely followed by wettable sulphur with 701 kg/ha.

Introduction

Powdery mildew has long been known as important disease of plants in all parts of world. Salmon (1900) defined *Erysiphe polygoni* DC causing powdery mildew. Cumin (*Cuminum cyminum* L.) locally known as *Jeera* and is an annual herb of the family *Apiaceous*. The seed content essential oil between 2.5 to 4.5% (Pruthi, 1996). In India, the major cumin growing states are Gujarat (59%) and Rajasthan (12%), together contribute 71 per cent of total country's cumin production (Anon., 2013). The area under cumin cultivation in India is about 593980 ha with annual production of 394330 tonnes (2012-13). Cumin crop is affected mainly with three important diseases viz., blight

(*Alternaria burnsii*), wilt (*Fusarium oxysporum* f.sp. *cumini*) and powdery mildew (*Erysiphe polygoni*) (Dange, 1995), among these, powdery mildew of cumin caused by *E. polygoni* is an important disease. It is a routine practice for farmers to spray fungicides onward from one month age to maturity of the crop to save seed yield from the epidemic of disease. There is complete failure of the crop, if disease occurs in epidemic form. Gohil *et al.*, (1988) reported losses 19.1 per cent in North Gujarat due to *Erysiphe polygoni* in cumin. The disease is air borne in nature and spreads in entire field within short duration under moderately cool and dry weather condition (25⁰ and 30⁰ C). In

such congenial condition, the crop must be protected with frequent applications of fungicides. The conventional fungicides has been recommended earlier and currently used for control of disease but may cause phytotoxic effect under high temperature and residue problems which affect the export of produce. Nowadays, new molecules are available in market with less toxicity used by various workers in different crops. The effectiveness of propiconazole in various crop viz, fenugreek (Dhruj *et al.*, 2000), coriander (Singh, 2006), pea (Prasad and Dwivedi 2007), coriander (Akbari and Parakhia 2010), and sunflower (Dinesh *et al.*, 2011) has been reported. The wettable sulphur for controlling powdery mildew disease in fenugreek (Dange *et al.*, 2003), coriander (Patel *et al.*, 2008 and okra (Dhutraaj, 2011) has been reported. However, the effectiveness of new molecules are essential to be tried for management of powdery mildew of cumin in Gujarat region of India. Although, chemical control by fungicides may have negative environmental effects and limitations but fungicides still constitute the predominate part of the control measures used against powdery mildew. Use

of relatively safe chemicals has become more popular in recent times because of their quick results, less pesticides residue toxicity and especially in absence of resistant varieties.

Methodology

For studying the efficacy of different fungicides against *E. polygonion* cumin *in vivo*, six different fungicides viz., hexaconazole, difenoconazole, propiconazole, picoxystrobin, dinocap and wettable sulphur were tested on cumin cv. Gujara cumin- 4 under field conditions during the Rabi, 2014-15 and 2015-16. The first spray of the fungicides was started on initiation of disease and followed by one spraying at fifteen days interval. Control was maintained by water spraying (Average 400 lit/ha) and without spraying of any fungicides. Observations on disease intensity were recorded from ten plants randomly selected from each treatment after seven days of last spray using 0-4 scale given by Patel, *et al.*, (2012) cumin crop. Each plant was evaluated for its disease reaction by scoring the per cent disease intensity.

Grade	Powdery Mildew
1	Nil.
2	Symptoms on leaf tips and scattered on leaves only.
3	Symptoms on leaves, branches, inflorescences and sparse on the stem.
4	Symptoms on leaves, branches, stem, inflorescences including seeds, drying and/or blacking/whitening of plants.

Per cent disease intensity (PDI) was calculated by using the following formula:

$$PDI = \frac{\text{Sum of total rating}}{\text{Total plants observed}} \times \frac{100}{\text{Maximum disease rating}}$$

The per cent disease control and the percentage deviation in seed yield were calculated with the help of the following formula (Mathur *et al.*, 1971).

$$PDC (\%) = \frac{\text{P.D.I. in check} - \text{P.D.I. in treatment}}{\text{P.D.I. in check}} \times 100$$

Results and Discussion

Effect of different fungicides against *Erysiphe polygoni* on cumin was tried in field condition during Rabi 2014-15 and 2015-16. Data presented in table 1 revealed that all fungicides tested reduced the disease significantly as compared to the control. The propiconazole (0.025 %) was the most effective fungicides with 4.43 per cent (pooled) least mean disease intensity followed

by wettable sulphur (0.2 %) with 7.25 per cent mean disease intensity. Difenoconazole, hexaconazole, dinocap and picoxystrobin were found moderately effective with 10.50, 15.81, 24.14 and 33.30 per cent disease intensity, respectively. Maximum disease control of 79.28 per cent was also observed in the treatment of propiconazole followed by treatment wettable sulphur by 73.35 per cent as compared to control. Similar trend was observed in both the seasons.

Table.1 Effect of different fungicides against powdery mildew of cumin caused by *E. polygoni*

Sr. No.	Fungicides	Concentration (%)	Disease intensity (%)		Pooled mean	Disease control (%)
			2014-15	2015-16		
1	Hexaconazole 5% EC	0.005	23.87** (16.38)*	22.98 (15.24)	23.42 (15.81)	60.03
2	Difenoconazole 25% EC	0.025	18.57 (10.14)	19.23 (10.85)	18.90 (10.50)	67.75
3	Propiconazole 25% EC	0.025	11.70 (4.11)	12.59 (4.75)	12.15 (4.43)	79.28
4	Picoxystrobin 25% EC	0.025	35.59 (33.87)	34.90 (32.73)	35.24 (33.30)	39.87
5	Dinocap 48% EC	0.048	29.97 (24.96)	28.88 (23.32)	29.42 (24.14)	49.80
6	Wettable Sulphur 80% WP	0.25	16.08 (7.67)	15.16 (6.84)	15.62 (7.25)	73.35
7	Control (Water Spray)	-	46.52 (52.66)	44.87 (49.77)	45.70 (51.21)	22.03
8	Control	-	56.42 (69.41)	60.79 (76.19)	58.61 (72.80)	-
	(mean)	-	29.84 (27.4)	29.92 (27.46)	-	-
T	S.Em. ±	-	(1.70)	(1.56)	(1.15)	-
	C.D. at 5%	-	(5.15)	(4.73)	(3.34)	-
	C.V. %	-	(9.85)	(9.02)	(9.44)	-
Y	S.Em. ±	-	-	-	(0.58)	-
	C.D. at 5%	-	-	-	(NS)	-
Y×T	S.Em. ±	-	-	-	(1.63)	-
	C.D. at 5%	-	-	-	(NS)	-

*Data given in parentheses are retransformed values

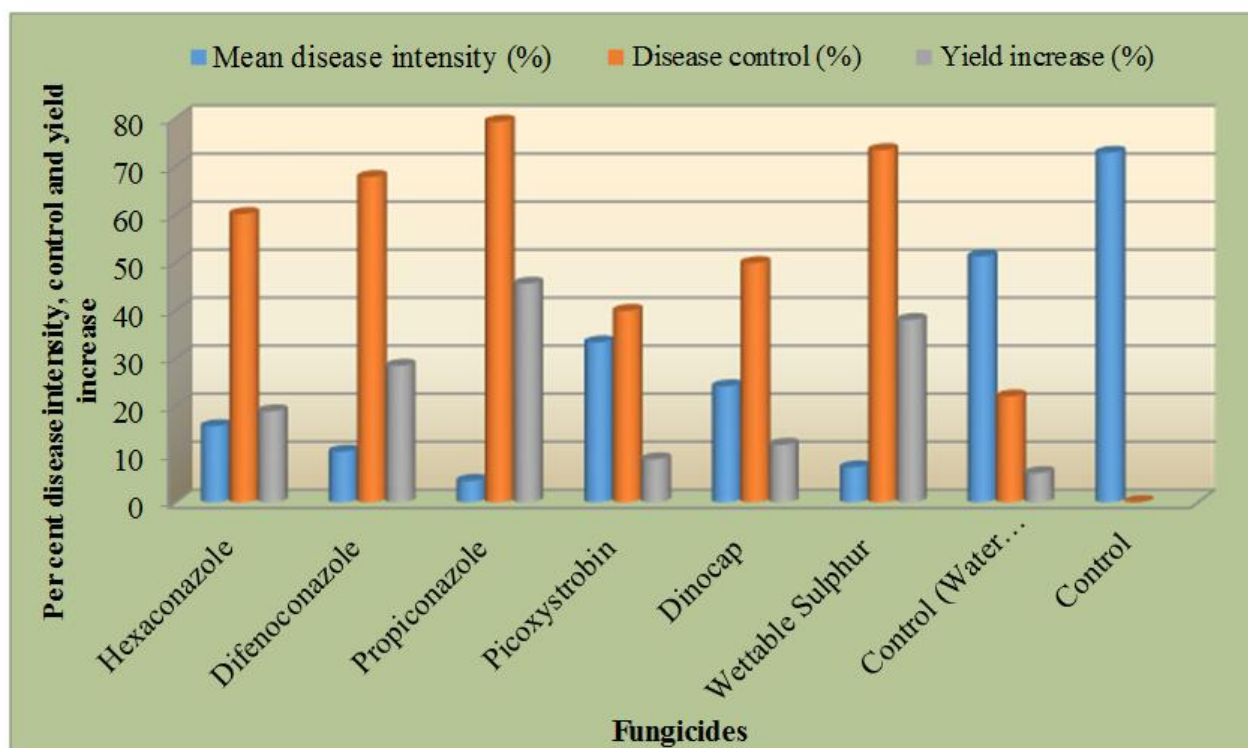
**Arcsine transformation used

Water was used average 400 lit/ha for spraying

Table.2 Effect of different fungicides on seed yield

Sr. No.	Fungicides	Seed yield (kg/ha)		Pooled mean	Yield increased (%)
		2014-15	2015-16		
1	Hexaconazole 5% EC	568	504	536	18.94
2	Difenoconazole 25% EC	670	544	607	28.42
3	Propiconazole 25% EC	861	734	798	45.52
4	Picoxystrobin 25% EC	516	438	477	8.91
5	Dinocap 48% EC	530	457	494	11.96
6	Wettable Sulphur 80% WP	761	640	701	37.97
7	Control (Water Spray)	503	422	463	6.05
8	Control	471	398	435	-
	(mean)	610	517.12	-	-
T	S.Em. ±	30.12	27.83	20.51	-
	C.D. at 5%	91.39	84.42	59.40	-
	C.V. %	8.55	9.32	8.91	-
Y	S.Em. ±	-	-	10.25	-
	C.D. at 5%	-	-	29.69	-
Y×T	S.Em. ±	-	-	29.00	-
	C.D. at 5%	-	-	NS	-

Fig.1 Per cent disease intensity, control and yield increased as influenced by different fungicides *in vivo* during Rabi 2014-15 and 2015-16



The effectiveness of propiconazole in controlling of powdery mildew in various crop viz, fenugreek (Dhruj *et al.*, 2000), coriander (Singh, 2006), pea (Prasad and Dwivedi, 2007), coriander (Akbari and Parakhia, 2010) and sunflower (Dinesh *et al.*, 2011) has been reported by several workers. It is evident from the data presented in table 2 that all fungicidal treatments significantly increased the cumin yield. The highest cumin yield of 798 kg/ha (two year pooled) was recorded in the treatment of propiconazole closely followed by wettable sulphur with 701 kg/ha. They were at par. The other treatments viz., difenoconazole, hexaconazole, dinocap and picoxystrobin gave significantly higher yield as compared to control. Maximum per cent yield increase was found in the treatment propiconazole (45.52%) followed by wettable sulphur (37.97%). The other treatments like difenoconazole, hexaconazole, dinocap, picoxystrobin and water spray gave 28.42, 18.94, 11.96, 8.91 and 6.05 per cent yield increased, respectively over the control (Fig. 1).

It is concluded from the experiment that effect of different fungicides against *Erysiphe polygoni* on cumin was tried in field condition during Rabi 2014-15 and 2015-16. Propiconazole (0.025%) was the most effective fungicides with 4.43 per cent (pooled) least mean disease intensity followed by wettable sulphur (0.2%) with 17.25 per cent (pooled) mean disease intensity. The highest cumin yield of 798 kg/ha (two year pooled) was recorded in the treatment of propiconazole 0.025 per cent followed by wettable sulphur (701 kg/ha).

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