



Research Article

EVALUATION OF FUNGICIDES AGAINST POWDERY MILDEW (*Erysiphe polygoni*) OF FENUGREEK, *Trigonella foenum graecum* L.

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Abstract- In Rajasthan, fenugreek crop is attacked by a number of diseases. Powdery mildew of fenugreek is an important and serious disease caused by *Erysiphe polygoni*. A field experiment was conducted during Rabi 2012-13 and 2013-14 to determine the effect of fungicides on powdery mildew disease of fenugreek caused by *Erysiphe polygoni*. Nine fungicides (Wettable sulphur, Hexaconazole, Dinocap, Propiconazole, Tridemorph, Difenoconazole, Azoxystrobin, Mancozeb and Carbendazim) were evaluated for their efficacy to control the powdery mildew disease of fenugreek in field conditions. All the fungicides were significantly effective in reducing the powdery mildew disease intensity over control. Among these fungicides, hexaconazole recorded minimum (9.60%) per cent disease intensity with maximum (84.68%) per cent disease control and seed yield (24.61 q/ha) by increasing 63.08 per cent seed yield. Dinocap with two sprays was second best and recorded 10.39 per cent disease intensity with 56.05 per cent increased seed yield after two sprays at 15 days interval over unprotected check. .

Keywords- Fungicides, Powdery mildew, Fenugreek, *Erysiphe polygoni*

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Introduction

Fenugreek (*Trigonella foenum graecum* L.) is an important seed spice crop belongs to family *Fabaceae*, cultivated widely in India. The importance of this crop has increased due to its medicinal values and presence of diosgenin that is used for the synthesis of sex hormone and oral contraceptive. Fenugreek seeds are rich source of protein [1] and leaves are rich in minerals, proteins, vitamin A and C. In industry, seeds are used for dye making and for extraction of alkaloids and steroids. The dried leaves and flowers are used for flavouring vegetable curries [2]. Fenugreek can be grown in all types of soils provided that they are rich in organic matter with good drainage.

Fenugreek is attacked by a number of diseases. Powdery mildew of fenugreek is an important and serious disease especially during flowering and pod formation stage of the crop and cause significant losses (27-33 per cent) in grain quality as well as quantity [3].

In Rajasthan, powdery mildew disease caused by *Erysiphe polygoni* appeared in first week of January and reaches at peak in March [4]. The disease is characterized by white floury patches appear on both sides of leaves as well as tendrils, stems, pods etc. As the plant become older, the powdery growth almost covers the entire plant; become more or less grayish brown and the infected part impart dirty appearance. In later stage, powdery growth also covers the pods. The seeds in pods do not either set or remain very small. The present study was undertaken to evaluate the newer fungicides available in the market against powdery mildew disease of fenugreek caused by *Erysiphe polygoni*.

Materials and Methods

Effect of Fungicides: To evaluate the effect of fungicide on powdery mildew of fenugreek, the field experiment was conducted during rabi 2012-13 and 2013-14

in randomized blocked design (RBD) on susceptible fenugreek local cultivar (Rmt-1) at Agronomy farm of S.K.N. College of Agriculture, Jobner (Sri Karan Narendra Agriculture University, Jobner). The crop was sown in the last week of October in both the years with plot size of 2 x 2 m². To know the effect of fungicide, nine fungicides viz., Wettable sulphur (@ 0.2 %), Hexaconazole (@ 0.1%), Dinocap (@ 0.1%), Propiconazole (@ 0.1%), Tridemorph (@ 0.1%), Difenoconazole (@ 0.1%), Azoxystrobin (@ 0.1%), Mancozeb (@ 0.2%) and Carbendazim (@ 0.2%), were sprayed twice at an interval of 15 days starting from the initial appearance of the disease. One untreated control was maintained. The per cent diseases intensity was recorded after 15 days of last spray of fungicides by examining 20 leaves from 10 randomly selected plants in each treatment. For disease, scoring on leaves 0-5 scale [Plate-1] was used as mentioned below [5]. Per cent disease intensity was calculated by using formula given below. At harvesting, seed yield per plot was recorded and calculated in kg/ha. Cost benefit ratio was also worked out and results were analyzed statistically.

Disease rating and per cent disease intensity (PDI) was calculated as per method suggested with slight modifications [5].

Disease rating	Description	Host reaction
0	Free from disease	Immune
1	1 to 10 per cent area of leaves/plant parts infected	Resistant
2	11 to 25 per cent area of leaves/plant parts infected	Moderately Resistant
3	26 to 50 per cent area of leaves/plant parts infected	Moderately Susceptible
4	51 to 75 per cent area of leaves/plant parts infected	Susceptible
5	More than 75 per cent area of leaves/plant parts infected	Highly Susceptible

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

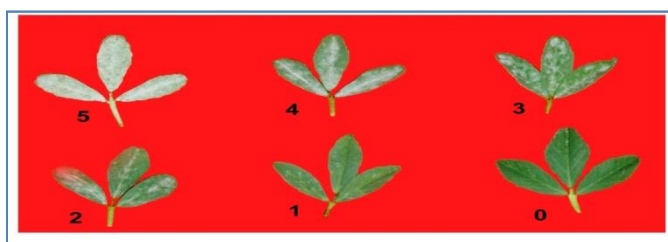


Plate-1 Area of leaf affected by powdery mildew disease (0-5 scale rating)

Results and Discussion

Nine different fungicides were evaluated for management of powdery mildew of fenugreek by spraying twice at 15 days interval under natural field conditions.

Two years pooled results on per cent disease intensity [Table-1] & [Fig-1] revealed that all the fungicides were significantly effective in reducing the powdery mildew disease intensity over control (62.67 per cent). The minimum 9.60 per cent disease intensity was recorded with the application of hexaconazole by decreasing 84.68 per cent disease intensity. However, dinocap was second best and recorded 10.39 per cent disease intensity by decreasing 83.43 per cent

disease intensity. Propiconazole and wettable sulphur were observed statistically at par with 12.50 per cent and 14.28 per cent disease intensity. Tridemorph, difenoconazole and azoxystrobin were found moderately effective where, 17.55 per cent, 23.94 per cent and 25.28 per cent disease intensity was recorded. Among the fungicides maximum 31.68 and 28.81 per cent disease intensity was recorded with carbendazim and mancozeb, respectively.

Pooled analysis of two year seed yield data of fenugreek was found statistically significant over control. The result showed that maximum 24.61 q/ha seed yield was recorded in hexaconazole with increasing 63.08 per cent seed yield followed by dinocap recorded 23.54 q/ha seed yield with increasing 56.00 per cent seed yield. Propiconazole and wettable sulphur recorded 23.08 q/ha and 22.08 q/ha seed yield [Table-1] & [Fig.-1]. Minimum 15.09 q/ha seed yield was recorded in control. The result are agreement with several workers reported that hexaconazole and karathane was found to be effective in reducing powdery mildew incidence in different crops. Plots sprayed with hexaconazole exhibited minimum disease severity and maximum disease control [6]. Hexaconazole and propiconazole were highly effective and economic against *Erysiphe polygoni* causing mango powdery mildew [7]. Maximum powdery mildew disease reduction caused by *Erysiphe polygoni* and higher grain yield in coriander with hexaconazole followed by propiconazole and wettable sulphur [8]. Hexaconazole provided the highest control of grape powdery mildew disease and crop yield [9].

Table-1 Effect of fungicides on powdery mildew disease intensity and seed yield of fenugreek

Fungicides	Concentration (%)	Per cent disease intensity*			Decrease in PDI over control (%)	Yield (q/ha)*			Increase in yield over control (%)
		2012-13	2013-14	Pooled		2012-13	2013-14	Pooled	
Wettable sulphur	0.2	16.44 (23.92)	12.11 (20.36)	14.28 (22.20)	77.22	20.85	23.30	22.08	46.32
Dinocap	0.1	11.55 (19.87)	9.22 (17.68)	10.39 (18.80)	83.43	22.32	24.76	23.54	56.00
Propiconazole	0.1	13.66 (21.69)	11.33 (19.67)	12.50 (20.70)	80.05	22.05	24.10	23.08	52.95
Hexaconazole	0.1	10.32 (18.74)	8.88 (17.34)	9.60 (18.05)	84.68	23.71	25.51	24.61	63.08
Tridemorph	0.1	18.44 (25.43)	16.66 (24.09)	17.55 (24.77)	71.99	20.35	23.50	21.93	45.33
Difenoconazole	0.1	25.77 (30.51)	22.11 (28.05)	23.94 (29.29)	61.79	18.45	23.73	21.09	39.77
Azoxystrobin	0.1	27.22 (31.45)	23.33 (28.88)	25.28 (30.18)	59.67	18.75	22.45	20.60	36.52
Mancozeb	0.2	30.40 (33.46)	27.22 (31.45)	28.81 (32.46)	54.02	18.65	20.88	19.77	31.02
Carbendazim	0.2	32.00 (34.45)	31.35 (34.05)	31.68 (34.25)	49.44	18.51	20.10	19.31	27.97
Control		63.33 (52.73)	62.00 (51.94)	62.67 (52.34)	-	14.40	15.77	15.09	-
SEm±		1.22	1.14	1.18		0.47	0.52	0.49	
CD (p=0.05)		3.77	3.51	3.64		1.44	1.60	1.52	
CV		7.25	7.21	7.23		4.07	4.01	4.04	

*Average of three replications, Figures in parentheses are angular transformed values

The efficacy of penconazole, triadimefon, carbendazim, tridemorph, dinocap, sulphur, sulphur dust against powdery mildew of fenugreek under filed and laboratory condition and observed that dinocap was the best treatment, exhibited

the highest yield and minimum per cent disease index [10]. Penconazole was the most effective fungicide followed by hexaconazole and propiconazole [11].

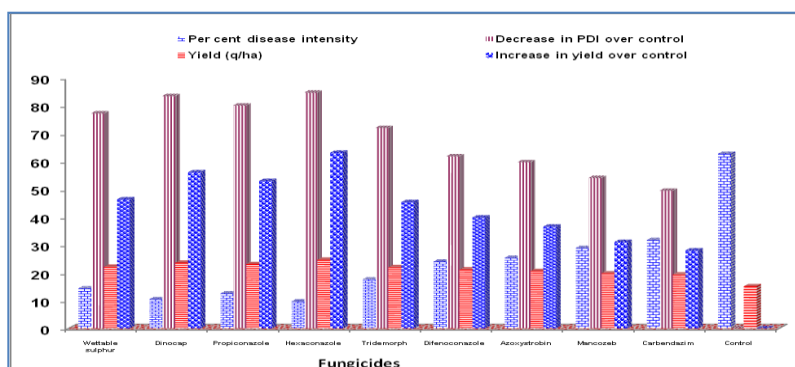


Fig-1 Effect of fungicides on powdery mildew disease intensity and seed yield of fenugreek

Cost: benefit ratio: Based on the cost of different treatment and net profit, benefit cost ratio was worked out. The highest net profit of Rs. 67150 and benefit cost ratio 2.15 was obtained with the application of hexaconazole and second best with wettable sulphur (1.87). Spray of propiconazole @ 0.1% also good with 1.80 B: C

ratio. [Table-2] & [Fig-2]. The effectiveness of hexaconazole @ 0.1% against powdery mildew of coriander was also reported [12]. The highest B: C ratio (2.15) was registered with the application of hexaconazole followed by wettable sulphur (1.87).

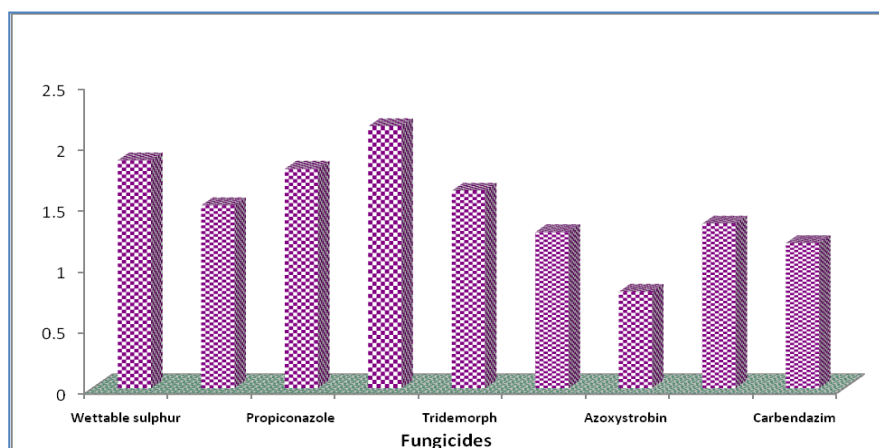


Fig-2 Economic benefit: cost ratio of various treatments used for powdery mildew disease of fenugreek

Table-2 Economic benefit: cost ratio of various treatments used for powdery mildew disease of fenugreek

Fungicides	Concentration	Cost of cultivation/ha	Price of fungicides/ha	Labour ('/ha)	Total cost	Seed yield (kg/ha)*	Gross income	Net profit	B:C ratio
Wettable sulphur	0.2	29200	720	840	30760	2208	88320	57560	1.87
Dinocap	0.1	29200	4660	840	37700	2354	94160	56460	1.50
Propiconazole	0.1	29200	2900	840	32940	2305	92200	59260	1.80
Hexaconazole	0.1	29200	1250	840	31290	2461	98440	67150	2.15
Tridemorph	0.1	29200	3400	840	33440	2193	87720	54280	1.62
Difenoconazole	0.1	29200	6900	840	36940	2109	84360	47420	1.28
Azoxystrobin	0.1	29200	16000	840	46040	2060	82400	36360	0.79
Mancozeb	0.2	29200	3600	840	33640	1977	79080	45440	1.35
Carbendazim	0.2	29200	5200	840	35240	1931	77240	42000	1.19

Selling price Rs/kg =40

Labour Rs /spray = 140 (6 labour for 2 spray)

Price of fungicides Rs /kg for 2 spray

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