

Evaluation of Fungicides for Management of Field Pea (*Pisum sativum* L.) Powdery Mildew Caused by *Erysiphe polygoni* DC

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ABSTRACT

A field experiment was conducted to evaluate the efficacy of fungicides against Field pea powdery mildew (*Erysiphe polygoni* DC.) in the experimental field of Department of Plant Protection, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad in Rabi Season of 2012-2013. Treatments of foliar spray of Tilt 25% EC (propiconazole) @ 0.1%, Contaf 5% EC (hexaconazole) @ 0.05%, Bavistin 50% WP (carbendazim), Kavach 75% WP (chlorothalonil), Sulfex 80% WP (wettable sulphur), Indofil 75% WP (mancozeb) and control (spray of plain water) were applied at the onset of disease. Minimum disease severity was recorded in propiconazole (11.40 % and 14.96 % at 10 and 20 days after spray respectively) followed by hexaconazole (15.77 % and 16.09 % at 10 and 20 days after spray respectively) and significantly maximum disease intensity was observed in mancozeb (17.33 % and 22.81 % at 10 and 20 days after spray respectively) as compare to control.

Key words: Field pea, *Erysiphe polygoni* and Fungicides.

INTRODUCTION

Pea (*Pisum sativum* L.) is a valuable vegetable as well as pulse crop all over the world. It belongs to the family *Leguminosae*, self-pollinated crop². The field pea is believed to be native to the Mediterranean region of southern Europe and Western Asia comprising Italy and south western Asia and India. In India, it is cultivated mainly in UP, MP, Bihar, Punjab, Haryana, Delhi etc⁹. Uttar Pradesh is the major field pea growing state. Uttar Pradesh alone produces about 60 per cent of total pea produced in India. Besides, Uttar Pradesh, Madhya Pradesh and Bihar are the major field

pea producing states⁹. Pea is cultivated for the fresh green seeds, tender green pods, dried seeds and foliage and cooked as a vegetable, marketed fresh, canned and frozen. They are excellent source of heart healthy food that may be beneficial to the prevention of cardiovascular disease.

In general, there is low productivity of pulse including pea because, the crop is grown on marginal lands, low rainfall, poor management, poor crop husbandry, high rate of flower and susceptibility to pest and disease.

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Major obstacles in the way of increased pea production are the diseases caused by the fungal, viral and bacterial pathogens. Pea is affected by several plant pathogens includes fungi, viruses and bacteria diseases. Among the fungal diseases powdery mildew incited by *Erysiphe polygoni* DC considered as one of the most devastating disease and cause severe damage throughout the worldwide in the countries viz. India, Bangladesh, Brazil, Phillipines, South Australia, Sri Lanka, Taiwan, Thailand, Tropical Africa, France, USA, Pakistan, China, Russia, Canada and many other countries.

The loss due to powdery mildew is proportionate to the disease intensity and varies considerably depending on the stage of plant growth at which disease occurs. Pod forming stage is the most critical stage which should not be coincided with the favourable environmental conditions for disease development. The disease is worst in dry weather with low humidity and low temperature. Yield reduction due to this disease is very high within short period of time. Powdery mildew appears in epidemic form almost every year when the plants are in the pod stage towards the end of January and

in February¹². Severe infection may result in 24-27% reduction in pod weight, 21-30% reduction in pod number and up to 70% reduction in total yield⁶.

Pea powdery mildew is traditionally suggested to be managed by many systemic and non-systemic fungicides which are found to have effect on controlling powdery mildew. Selection of proper fungicides and testing of their efficacy are essential aspects of this management strategy. Several researchers had reported the effective control of the disease with the application of fungicide and also the use of chemicals is economic for farmers. So, application of fungicides is an important tool. Hence, it's necessary to evaluate fungicides for effective management of field pea powdery mildew (*Erysiphe polygoni* DC.).

MATERIAL AND METHODS

Evaluation of fungicides for management of field pea powdery mildew (*Erysiphe polygoni* DC.) was conducted at the Central Research Farm, Department of Plant Protection, Sam Higginbottom Institute of Agriculture, Technology and Sciences Allahabad (Deemed-to-be-University), Allahabad, Uttar Pradesh during the *Rabi* season of 2012-13.

Table 1: Details of fungicides used for management of field pea powdery mildew

Treatment	Common name	Concentration	Trade Name
T ₀	Control	Plain water	–
T ₁	Propiconazole	0.1%	(Tilt 25% EC)
T ₂	Hexaconazole	0.05%	(Contaf 5% EC)
T ₃	Carbendazim	0.1%	(Bavistin 50% WP)
T ₄	Chlorothalonil	0.1%	(Kavach 75 % WP)
T ₅	Wettable Sulphur	0.3%	(Sulfex 80% WP)
T ₆	Mancozeb	0.25%	(Indofil 75% WP)

Preparation of Fungicidal Spray Solution

The insecticidal spray solution of desired concentration as per treatment was freshly prepared every time at the site of experimentation just before the start of

spraying operations. The quantity of spray materials required for average of crop was gradually increased as the crop advanced in age.

The spray solution of desired concentration was prepared by adoption of the following formula¹⁰.

$$N = \frac{T \times P}{a. i.}$$

Where,

N = quantity of a formulated pesticide required.

T = total spray fluid required.

P = percentage strength required.

a. I = GIVEN PERCENTAGE STRENGTH OF A FORMULATED PESTICIDE.

Observations on powdery mildew disease intensity were recorded on randomly selected plants from the each bottom, middle and top leaves¹³. The powdery mildew disease was

graded on the basis of disease intensity observed on leaves by applying 0-9 disease rating scale developed by Mayee and Datar³ as described below (plate 1).

$$\text{Disease intensity (\%)} = \frac{\text{Sum of all disease rating}}{\text{Total number of leaves} \times \text{maximum grade}} \times 100$$

Table 2: Disease rating scale:

Grade	Per cent disease severity with description
0	No symptoms on leaves
1	Small powdery spots on leaves covering 1% or less leaf area
3	Powdery lesions on leaves small, scattered, covering 1-10% of leaf area
5	Powdery lesions bigger, covering 11-25% of leaf area
7	Powdery patches bigger coalescing covering 26-50% of leaf area.
9	Powdery growth covering 51% or more of leaf area, white coating on petioles, flowers and pods resulting in its shedding, reduced pod set.

RESULTS AND DISCUSSION

Disease intensity (%) at one day before spray: The data on disease intensity (%) of field pea powdery mildew at one day before spray is furnished in table 3 and depicted in figure 1.

Disease intensity (%) at ten days after spray: The data on disease intensity (%) of field pea powdery mildew at 10 days after spray is furnished in table 3 and depicted in figure 1

Among all the treatments the minimum disease intensity (%) was recorded in T₁-propiconazole (11.40 %), followed by T₂ -hexaconazole (15.77 %) and T₆ -mancozeb recorded 17.33 % disease severity. The disease intensity was highest in T₀ - control (28.74 %).

The results revealed that all the treatments are significantly superior over

control. The response of chemicals against powdery mildew disease of pea as under field condition perusal of the data indicated that all the treatments significantly reduced the disease intensity as compared to control.

Disease intensity (%) at twenty days after spray: The data on disease intensity (%) of field pea powdery mildew at 20 days after spray is furnished in table (3) and depicted in figure 1. The data showed that all the treatments are significantly superior over control. Among all the treatments the minimum disease intensity (%) of powdery mildew was recorded in T₁ -propiconazole (14.96) followed by T₂ -hexaconazole (16.09) and T₆ -mancozeb recorded 22.81% disease intensity. significantly higher disease intensity were recorded in Control (39.85).

The probable reason for such finding that, propiconazole fungicide have interfered with the biosynthesis of fungal sterols and inhibited ergosterol biosynthesis. Ergosterol is essential for the structure of cell wall and its absence causes irreparable damage to the cell wall and fungus dies. It have also interfered in conidia and haustoria formation. It may have changed the sterol content and saturation of the polar fatty acids leading to alterations in membrane fluidity and behaviour of membrane bound

enzymes^{1,5}. Several workers have reported that, propiconazole was found to be effective in reducing powdery mildew incidence [Parasad and Dwivedi⁶, Nargund *et al*⁴. This finding is supported by Sharma⁷ who observed that mancozeb and wettable sulphur were least effective in by managing the powdery mildew (*Erysiphe betae*) of sugar beet. Upadhyay and Gupta¹¹ have also reported that mancozeb and sulphur managed powdery mildew of pea only to a considerable extent.

Table 3: Effect of fungicidal spray on disease intensity (%) of powdery mildew (*Erysiphe polygoni* DC) of field pea at different days of intervals

Treatments	Conc (%)	Percent of disease index (PDI)			Percent of disease control (PDC)	
		One days before spray	After spray		After spray	
			10 days	20 days	10 days	20 days
T ₀ . Control	-	15.26	28.74	39.85	-	-
T ₁ . Propiconazole	0.1%	7.54	11.40	14.96	60.33	62.45
T ₂ . Hexaconazole	0.05%	8.47	15.77	16.09	45.12	59.62
T ₃ . Carbendazim	0.1%	10.11	14.66	18.14	48.99	54.47
T ₄ . Chlorothalonil	0.1%	10.29	15.38	20.44	46.88	48.70
T ₅ . Wettable Sulphur	0.3%	11.25	15.85	21.55	44.85	45.92
T ₆ . Mancozeb	0.25%	12.04	17.33	22.81	39.90	42.76
Overall Mean		10.71	17.02	21.98		
F- test		S	S	S		
S. Ed. (±)		1.398	2.157	2.670		
C. D. (P = 0.05)		2.963	4.572	5.660		

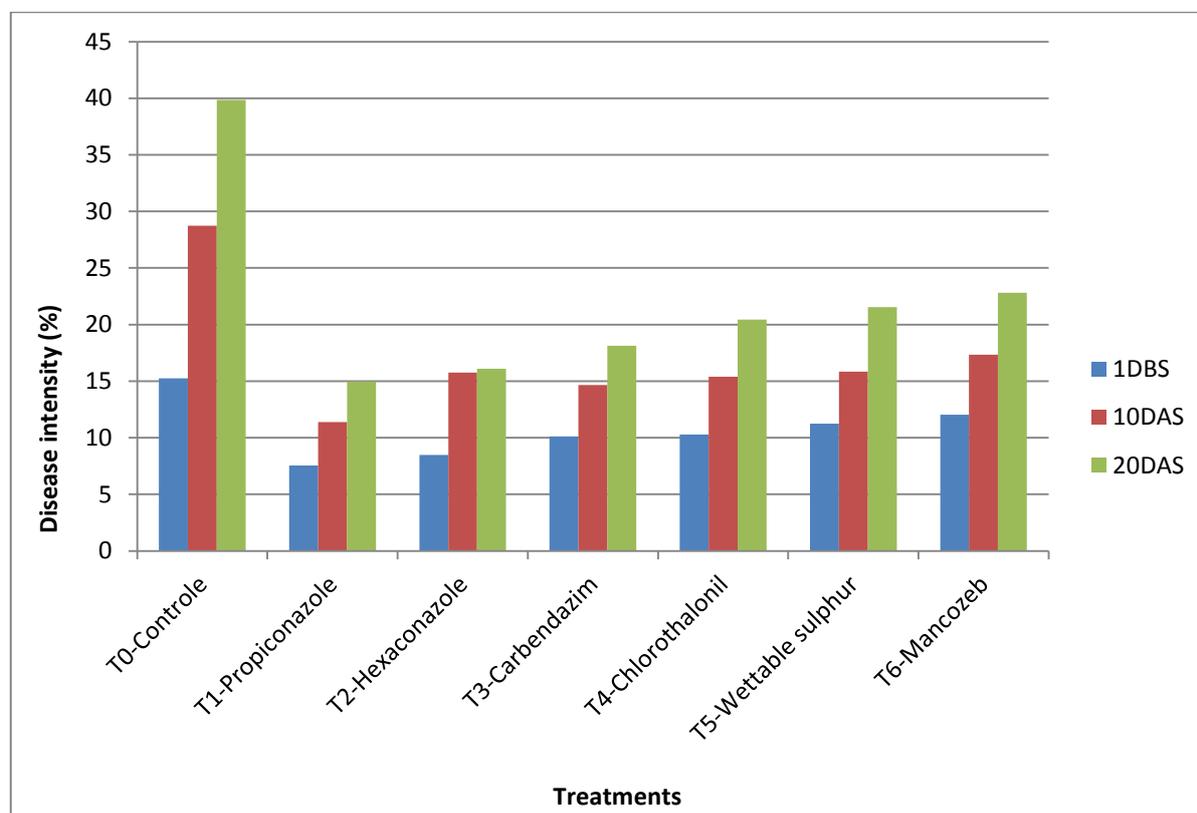


Figure 1: Effect of fungicidal sprays on disease intensity (%) of powdery mildew on field pea



Plate 1: Disease scoring scale of pea powdery mildew (0-9scale).

CONCLUSION

Use of propiconazole @ 0.1 % and hexaconazole @ 0.05 % are effective for the management of powdery mildew on field pea. These fungicides also promote growth of plant by preventing disease caused by *Erysiphe polygoni* DC.

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