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Economical Benefits of Fungicidal Application in Field Pea for Powdery Mildew (*Erysiphe polygoni* DC.) Management

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ABSTRACT

A field experiment was conducted to know the economical benefits of fungicidal application in management of field pea powdery mildew (Erysiphe polygoni DC.) The experimental field of Department of Plant Protection, Sam Higginbottom Institute of Agriculture, Technology and Sciences, Allahabad in Rabi Season of 2012-13. Significantly maximum number of pods per plant, seed weight (1000) and grain yield q/ha was recorded in propiconazole treatment followed by carbendazim as compared to control. The significantly highest cost benefit ratio was recorded in propiconazole (1:2.53) followed by carbendazim (1:2.50) as compared to control (1:1.77).

Key words: *Field pea, fungicides, pod and cost benefit ratio.*

INTRODUCTION

Pea (*Pisum sativum* L.) is a valuable vegetable as well as pulse crop all over the world, is also known as 'Matar'. It belongs to the family *Leguminoceae* crop. Globally, pea is grown in an area of 1.1 million ha with total production of 9.2 million tonnes and the productivity is 8.35 tonnes/ ha. In India, field pea occupies an area of 0.42 million hectare with an annual production and productivity of 4.01 million tonnes and 9.5 tonnes/ ha respectively[5]. 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 states[12].

Pea contains low amount of fat, low in sodium, cholesterol free, several minerals including iron, calcium, potassium and phosphorus. Mature seed contain (g/100g weight food) 10.9g water 22.9g protein, 1.4g fat, 60.7g carbohydrate, 1.4g fibre and 2.7g ash[4]. The pea has a great agronomic value. In crop rotation, it helps improvement of soil fertility and yield of succeeding crops[10]. Field pea as potential ingredients for aquaculture feeds. In Europe and Canada pea is mainly used as livestock feed where as in America and Asia it is used as food of human beings[3].

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. 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, Phillippines, South Australia, Sri Lanka, Taiwan, Thailand, Tropical Africa, France, USA, Pakistan, China, Russia, Canada and many other countries. 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 February[14]. The losses in yield in a 100% infected crop were estimated by[7] to be 21-31% in pod number and 26-47% in pod weight.

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 disease. Selection of proper fungicides and testing of their efficacy are essential aspects of management strategy to have higher yield with less cost of cultivation, which helps farmers get higher profit through selection of appropriate chemical fungicide for management of powdery mildew disease in a economical way with maximum cost benefit ratio. Hence, it's necessary to evaluate fungicides for their efficacy against powdery diseases of pea to have higher yield with less cost of cultivation and more cost benefit ratio.

MATERIAL AND METHODS

A field experiement 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, to know the economical benefits of fungicidal application in field pea powdery mildew management

Table 1: Details of fungicides used in field experiment on field pea plant

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)

Details of Experimental field lay out

Experimental design	RBD
Number of replications	3
Number of treatments	7
Total number of plots	21
Plot size	2.0 x 1.0 = 2.0 m^2
Seed rate	20-25 kg / ha
Spacing: Row to Row	30 cm
Spacing: Plant to plant	10 cm
Crop	Pea
Variety	Rachna

Cost of cultivation: Cost of cultivation is the total expenditure incurred for raising crops in a cropping system. The cost included for this purpose consists of own or hired human labour, value of seed, manure, fertilizer, pesticides and irrigation charges.

Gross returns: The total monetary value of economic produce and by products obtained from the crop raised in the cropping system is calculated based on the local market price.

Net returns: Net return is obtained by subtracting cost of cultivation from gross return. It is good indicator of suitability of a cropping system since this represents the actual income to the farmer.

Cost Benefit Ratio: Gross returns were calculated by multiplying total yield with the market price of the produce. Cost of cultivation and cost of treatment imposition was deducted from the gross returns, to find out net returns and cost benefit ratio by following formula[11].

$$\text{B: C ratio} = \frac{\text{Net returns}}{\text{Cost of treatment}}$$

Where,

B: C = Benefit Cost Ratio

RESULTS AND DISCUSSION

Economics of treatments: The data on Cost benefit ratio of field pea are furnished in table 4. The grain yields among the treatment were significant. The highest grain yield was recorded in T_1 -propiconazole (19.60 q/ha), followed by T_3 -carbendazim (19.41 q/ha), T_4 -chlorothalonil (19.18 q/ha), T_2 -hexaconazole (19.10 q/ha), T_5 -wettable sulphur (18.98 q/ha), T_6 -mancozeb (18.95 q/ha) as compared to control (13.75 q/h) the data is furnished in table (4). When cost benefit ratio was worked out, interesting result was achieved. Among the treatment studied, the best and most economical treatment was T_1 –propiconazole (1:2.53), followed by T_3 -carbendazim (1:2.50), T_4 (1:2.47), T_2 (1:2.46), T_5 (1:2.45), T_6 (1:2.44) in compared to control (1:1.77) the data is furnished in table (4).

In the present study all the treatments significantly improved the grain yield as compared to control. Grain yield was maximum in T_1 -propiconazole (19.60 q/ ha) followed by T_3 -carbendazim (19.41 q/ ha) the data is furnished in table (4). Similar findings are reported by Khunti *et al.*[6], Parasad and Dwivedi [9]. and Nargund *et al.*[8].

CONCLUSION

The highest cost benefit ratio was recorded in propiconazile (1:2.53) followed by carbendazim (1:2.50)

Table 2: Cost of agronomical practices of cultivation/ha.

Sr .no	Particular	Requirement	Rate/unit Rs	Cost (Rs)
(A)	**Land preparation**			
I.	Ploughing	3 hours	500 Rs/hours	1500
II.	Harrow	3 hours 10	500 Rs/hours	1500
III.	Layout of field	labour	150 Rs/labour	1500
(B)	**Manures and fertilizer**			
I.	FYM	10 tons	100 Rs./q	10000
II.	Urea	26.470kg	7 Rs/Kg	185.29
III.	DAP	43.500kg	20 Rs/Kg	870
IV.	MOP	33.330kg	10 Rs/Kg	333.30
V.	Labour	2 labour	150 Rs/labour	300
(C)	**Seed sowing**			
I.	Seed material	25 kg	80 Rs/Kg	2000
II.	Sowing and levelling	10 labour	150 Rs/labour	1500
(D)	**Irrigation**			
I.	First time	10 hours	120 Rs./hours	1200
II.	Labour	2 labour	150 Rs/labour	300

III.	Second time	10 hours	120 Rs/hours	1200
IV.	Labour	2 Labour	150 Rs/labour	300
(E)	**Weed Management**	10 labour X 2 times	150 Rs/labour	3000
(F)	**Harvesting**	10 labour	150 Rs/labour	1500
I.	Threshing	5 hours	300 Rs/hours	1500
II.	Labour	5 Labour	150 Rs/labour	750
(G)	**Total cost of cultivation**			29438.50

Table 3: Total cost involved in fungicidal treatments/ha

Treatments	Use of chemical	Cost of chemical (Rs)/kg	Total cost of chemical (Rs)	Use of 4 labours	Total labours cost (Rs)	Total cost of treatment (Rs)
T_0 -Control	-	-	-	-	-	-
T_1 -Propiconazole	1.4 l/ha	800 Rs/l	3360	150 Rs	600 Rs	3960
T_2 -Hexaconazole	1.5 l/ha	300 Rs/l	1350	150 Rs	600 Rs	1950
T_3 -Carbendazim	1.2 kg/ha	600 Rs/kg	2160	150 Rs	600 Rs	2760
T_4 - Chlorothalonil	0.80kgl/ha	920 Rs/kg	2208	150 Rs	600 Rs	2808
T_5-Wettable Sulphur	2.25kg/ha	116 Rs/kg	783	150 Rs	600 Rs	1383
T_6-Mancozeb	1.l6 kg/ha	470 Rs/kg	1635	150 Rs	600 Rs	2235

Table 4: Cost benefit ratio of fungicidal application in field pea powdery mildew Management

Treatments	Yield q/ha	Cost of yield	Total cost of yield (Rs)	Common cost (Rs)	Treatment cost (Rs)	Total cost (Rs)	C:B ratio
T_0 -Control	13.75	3800 Rs/q	52250	29438	0	29438	1:1.77
T_1 -Propiconazole	19.60	3800 Rs/q	74480	29438	3360	32798	1:2.53
T_2 -Hexaconazole	19.10	3800 Rs/q	72580	29438	1350	30788	1:2.46
T_3 -Carbendazim	19.41	3800 Rs/q	73758	29438	2160	31598	1:2.50
T_4 -Chlorothalonil	19.18	3800 Rs/q	72884	29438	2208	31646	1:2.47
T_5 -Wettable Sulphur	18.98	3800 Rs/q	72124	29438	783	30221	1:2.45
T_6 -Mancozeb	18.95	3800 Rs/q	72010	29438	1635	31073	1:2.44

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