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Vivek Mishra
Department of Plant Pathology,
Sam Higginbottom University of
Agriculture, Technology and
Sciences, Allahabad,
Uttar Pradesh, India

Abhilasha A Lal
Department of Plant Pathology,
Sam Higginbottom University of
Agriculture, Technology and
Sciences, Allahabad,
Uttar Pradesh, India

Sobita Simon
Department of Plant Pathology,
Sam Higginbottom University of
Agriculture, Technology and
Sciences, Allahabad,
Uttar Pradesh, India

Efficacy of botanicals and bio-agents against powdery mildew disease of garden pea (*Pisum sativum* L.)

Vivek Mishra, Abhilasha A Lal and Sobita Simon

Abstract

Five treatments viz. neem leaf extract @ 3%, eucalyptus leaf extract @ 3%, neem oil @ 3%, *Trichoderma harzianum* @ 3% and *Pseudomonas flourescens* @ 0.2% were applied as foliar spray as two doses at the interval of ten days. Hexaconazole @ 0.1% was used as treated check whereas, distilled water was used as untreated check. From the results, it is evident that all the treatments exhibited effectiveness over the powdery mildew of pea. However, among the treatments, neem oil was found to be the most effective organic amendment performing better than others in controlling powdery mildew disease of pea. The minimum per cent disease incidence was found in neem oil (31.80%) followed by eucalyptus leaf extract (34.33%), neem leaf extract (37.20%), *Pseudomonas flourescens* (35.93%) and *Trichoderma harzianum* (42.02%) as compared to treated check (28.77%) and untreated check (51.33%). Maximum pod yield (q/ha) was observed in neem oil (12.6 q/ha) which was followed by eucalyptus leaf extract (11.5 q/ha), neem leaf extract (11.1 q/ha), *Pseudomonas flourescens* (10.6 q/ha) and *Trichoderma harzianum* (10.2 q/ha) as compared to treated check (13.1 q/ha) and untreated check (7.6 q/ha).

Keywords: Bio-agents, botanicals, disease management, pea, powdery mildew

Introduction

Pea is a valuable vegetable crop all over the world. In India, the area under green peas rose continuously. During the year 2008-09, the area under pea in India was 348 thousand hectares with production of 29.16 lakh tonnes while during the year 2014-15 the area under pea was 495 thousand hectares with production 43.29 lakh tonnes.

Among the various diseases of pea, powdery mildew caused by *Erysiphe pisi* is a major disease causing severe loss with in short period of time. In years of epidemics, affected leaf dry up and fall off, and pods remain undeveloped, which consequently results in yield losses of higher than 30% (EPPO, 2012).

To check the heavy loss caused by powdery mildew it becomes necessary to manage this disease. In order to do this there is a need to evaluate the botanicals and bioagents for their efficacy against the pathogen. Considering the economic importance of the powdery mildew disease of pea, studies were undertaken with the objective to manage the disease with the help of botanicals and bioagents.

Material and methods

The botanicals and bio-agents were evaluated under field condition. Field experiments were laid-out in Randomized Block Design with three replications at research plot of the Department of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad during the *Rabi* season (2016-17). Treatments were imposed at 75-80 days after sowing by spraying botanicals and bio agents in each replication and 2 sprays were taken at an interval of 10 days, untreated control were maintained by spraying the distilled water. Observations on disease severity of powdery mildew were recorded at 10 days interval and yield data were obtained after the harvest on physiological maturity. For recording observations, five plants selected randomly were tagged from each plot, and intensity was measured by using 0-9 scale given by Mayee and Datar (1986). The recorded grade values were converted into per cent disease index – PDI (Severity) by using following formula proposed by Wheeler (1969). Data was subjected to ANOVA test.

Results and Discussion

The initial symptoms are faintly dark areas on the lower leaves. These areas develop small, white specks on the upper surface of the leaves which enlarge and coalesce forming bigger patches. Later the disease spreads on upper leaves also and appears on both the surfaces. Coalescing of spots and enlargement in their size ultimately results almost complete coating of

Correspondence

Vivek Mishra
Department of Plant Pathology,
Sam Higginbottom University of
Agriculture, Technology and
Sciences, Allahabad,
Uttar Pradesh, India

white powdery fungal mass on leaves, stems, pods etc. The superficial mass consists of mycelium and spores of the fungus.

The initial per cent disease incidence recorded at 80 DAS (before first spray) ranged from 21.2 to 27.5.

The per cent disease incidence at 90 DAS (after the first spray) ranged from 30.5 to 57.6. The result indicated that after application of treatment, least severity (32.8) was recorded in neem oil hexaconazole (treated check) followed by eucalyptus leaf extract (35.8), neem leaf extract (39.1), *Pseudomonas fluorescens* (37.2) and *Trichoderma harzianum* (46.3) compared to treated check (30.5) and untreated check (57.6). Neem oil treatment was found to be best in managing the disease.

The per cent disease incidence at 100 DAS (after the second spray) ranged from 34.6 to 68.9. Least PDI (40.2) was observed with neem oil followed by eucalyptus leaf extract (43.6), *Pseudomonas fluorescens* (44.8), *Trichoderma harzianum* (53.6) and neem leaf extract (47.6) as compared to treated check (34.6) and untreated check (68.9). Neem oil was found to be most effective in managing the powdery mildew

disease as compared to other treatments.

In present study, results after last spray revealed that all the six treatments were significantly superior over control in managing the powdery mildew disease. Among all treatments neem oil, *Eucalyptus* leaf extract, neem leaf extract and *Pseudomonas fluorescens* were significantly superior whereas *Trichoderma harzianum* were least effective over powdery mildew disease. Same results have been reported by Rettinassababady *et al.*, 2000; Deora and Sawant, 2004; Ahmad *et al.*, 2005; Kiran and Ahmad, 2005; Vikas and Ratnoo, 2011 [8, 2, 1, 5, 7].

The pod yield of pea is ranged from 7.6 q/ha to 13.1 q/ha. Among all the treatments the maximum yield (q/ha) was recorded in treatment with neem oil (12.6) followed by eucalyptus leaf extract (11.5), neem leaf extract (11.1), *Pseudomonas fluorescens* (10.6) and *Trichoderma harzianum* (10.2) as compared to treated check (13.1) and untreated check (7.6). All the treatments were found to be significant over control.

The result showed that the highest yield was recorded in neem oil (12.6 q/ha) followed by eucalyptus leaf extract (11.5 q/ha).

Table 1: Effect of treatments on per cent disease index of powdery mildew on garden pea at different time intervals

Treatment	Concentrations (%)	PDI (%)			Mean	Pod yield (q/ha)	
		Before spray	80DAS	90 DAS			100 DAS
T1	Neem leaves extract	3	24.9	39.1	47.6	37.20	11.1
T2	Neem oil	3	22.4	32.8	40.2	31.80	12.6
T3	<i>Eucalyptus</i> leaves extract	3	23.6	35.8	43.6	34.33	11.5
T4	<i>Trichoderma harzianum</i>	3	26.2	46.3	53.6	42.02	10.2
T5	<i>Pseudomonas fluroscens</i>	0.2	25.8	37.2	44.8	35.93	10.6
T6	Hexaconazole	0.1	21.2	30.5	34.6	28.77	13.1
T0	Control (water spray)	-	27.5	57.6	68.9	51.33	7.6
	Mean		24.51	39.9	47.61		10.97
	SEm±		0.79	2.71	2.53		0.33
	CD (5%)		1.73	5.91	5.51		0.71

Conclusion

From present study, it was concluded that neem oil were found as best treatment to control for powdery mildew disease followed by eucalyptus leaf extract. Yield obtained from neem oil treated plot were comparable to that of chemical treated one. Since chemicals have many hazardous effects on the environment as well as the person who handles it while application in the field, botanical neem oil as well as eucalyptus leaf extract would be considered as better as it is eco-friendly.

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