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

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Abstract

Five treatments viz. neem leaves extract 3%, eucalyptus leaves extract 3%, neem oil 3%, *Trichoderma harzianum* 3% and *Pseudomonas fluorescens* 0.2% with treated control hexaconazole 0.1% and control (distilled water) were used as foliar spray on plants. Among all the treatments, neem leaf extract was found to be effective to controlling rust disease of pea. Minimum per cent disease incidence (30.80) was recorded from this plot. Two foliar sprays of neem leaf extract at interval of 10 days may be the option for the management of rust disease in severe condition. Neem leaf extract can be alternative method for farmers to have eco-friendly management of Rust disease whereas chemicals have negative impact on human and plant health.

Keywords: pea, rust, botanicals, bio-agents, disease management.

Introduction

Among the various diseases of pea, rust caused by *Uromyces fabae* is a major disease causing severe loss with in short period of time. Pea rust has become an important pathogen of pea since the mid-1980s and is mostly distributed in Europe, North and South America, India, China, Australia and New Zealand, particularly in regions with warm, humid weather (EPPO, 2012) [3]. The pathogen usually appears during mid-spring when the crop is at flowering or podding stage. *Uromyces fabae* as the major causal agent of pea rust is becoming evident only recently (Emeran *et al.*, 2005; Barilli *et al.*, 2009) [2, 1]. Low resistance is available in pea so far and only partial resistance, not associated with host cell death, has been found. Considering the high potential of pea in Europe, India, Australia and Mediterranean conditions, emphasize the need of resistance to solve rust problem (Emeran *et al.*, 2005) [2].

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

Material and methods

The effective 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 rust were recorded at 10 days interval and yield data were obtained after the harvest on physiological maturity. For recording observations, five leaves per plant from each plot were selected randomly and intensity was measured by using rust disease severity was recorded by referring the following 0-9 scale given by Mayee and Datar (1986) [5]. The recorded grade values were converted into per cent disease incidence – PDI (Severity) by using following formula proposed by Wheeler (1969) [6]. Data was subjected to ANOVA test.

Result and discussion

The initial per cent disease incidence recorded at 80 DAS (before first spray) ranged from 18.7 to 41.5. The results indicated that before the spray of chemicals and other treatments, T₁ (neem leaf extract 3%) treated plot recorded least PDI (18.9) which was followed by T₂ (Neem oil 3%) (19.7), T₃ (eucalyptus leaf extract 3%) (21.1), T₅ (*Pseudomonas fluorescens* 3%) (21.8) and T₄ (*Trichoderma harzianum* 3%) (31.7) as compared to treated check (hexaconazole

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5 EC 0.1%) (18.7) and untreated check (control plot) (41.5). The per cent disease incidence recorded at 90 DAS ranged from 28.6 to 65.3. The results indicated that after application of treatment, T₁ (neem leaf extract 3%) (32.3) followed by T₂ (neem oil 3%) (35.2), T₃ (eucalyptus leaf extract 3%) (38.1), T₅ (*Pseudomonas flourescens* 0.2%) (42.3) and T₄ (*Trichoderma harzianum* 3%) (53.1) as compared to treated check (hexaconazole 5 EC 0.1%) (28.6) and untreated check (65.3). After chemical, eucalyptus leaf extract 3% and neem leaf extract 3% were found most effective in managing the rust disease, whereas *Trichoderma harzianum* 3% was least effective.

The per cent disease incidence recorded at 100 DAS ranged from 34.7 to 88.1. Least PDI (41.3) was observed with T₁ (neem leaf extract 3%) followed by T₂ (neem oil 3%) (46.9), T₃ (eucalyptus leaf extract 3%) (50.1), T₅ (*Pseudomonas flourescens* 0.2%) (55.1) and (*Trichoderma harzianum* 3%) (65.5) as compared to treated check (34.7) and untreated check (88.1). All treatments were found to be superior over

control in managing the rust disease. After chemical, eucalyptus leaf extract 3% and neem oil 3% were found to be most effective in managing the rust disease.

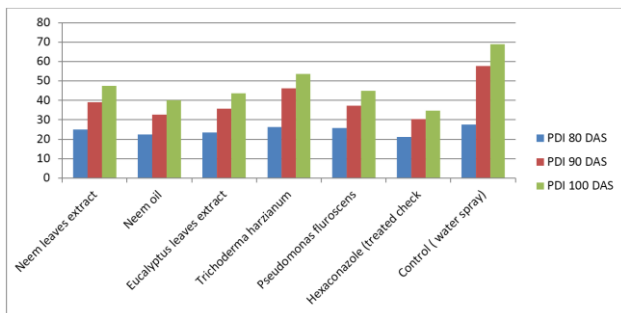
According to present study, results after last spray revealed that all the five treatments were significantly superior over control in managing the rust disease. Among all treatments, T₁ (neem leaf extract 3%), T₂ (neem oil 3%), T₃ (eucalyptus leaf extract 3%) and T₅ (*Pseudomonas flourescens* 0.2%) were significantly superior whereas T₄ (*Trichoderma harzianum* 3%) was least effective in managing rust disease. Similar results were reported by Rehman *et al.*, 2005^[8]; Monda *et al.*, 2009^[7], Shabana *et al.*, 2017^[9].

The probable reason for such findings may be due to leaves of neem mainly contains quercetin and nimbosterol as well as number of liminoids (nimbin and its derivatives). Quercetin (a poly phenolic flavonoid) is known to have anti-fungal properties. This may perhaps account for the curative properties of leaves.

Effect of treatments on per cent disease incidence of rust on garden pea at different time intervals.

Treatment	Concentrations (%)	PDI (%)			Mean	
		Before spray 80DAS	90 DAS	100 DAS		
T1	Neem leaves extract	3	18.9	32.3	41.3	30.8
T2	Neem oil	3	19.7	35.2	46.9	33.9
T3	Eucalyptus leaves extract	3	21.1	38.1	50.1	36.4
T4	<i>Trichoderma harzianum</i>	3	31.7	53.1	65.5	50.1
T5	<i>Pseudomonas flourescens</i>	0.2	21.8	42.3	55.1	39.7
T6	Hexaconazole	0.1	18.7	28.6	34.7	27.3
T0	Control (water spray)	-	41.5	65.3	88.1	64.9
	Mean		24.8	42.17	54.55	
	SEm±		2.12	1.35	1.63	
	CD (5%)		6.47	4.13	3.54	

Values are average of three replicates



Per cent disease incidence of rust disease in garden pea in different treatments.

Conclusion

From present study, it was concluded that neem leaf extract at 3% concentration were found as best treatment to control for rust disease followed by Neem oil at 3% concentration. Neem leaf extract at 3% concentration treated plot was 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, neem leaf extract as well as neem oil would be considered as better as it is eco-friendly.

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