Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

J P P Journal of Pharmacognosy and Phytochemistry

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2017; 6(5): 90-93
Received: 10-07-2017
Accepted: 11-08-2017

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Eco-friendly management of powdery mildew and rust of garden pea (*Pisum sativum* L.)

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Abstract
An experiment was conducted at the Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh in *Rabi* season of- 2016-17. A field experiment was conducted in RBD with four botanicals i.e neem products (Neeem leaves extract 10%, NSKE 5%, Neem oil 3%, Nimbicidin 0.3%,), a bio-agent (*P.fluorescens* 0.5%), along with chemical spray (Carbendazim- 0.1%) as foliar sprays and control (no spray) against powdery mildew and rust of pea. During evaluation, all the six treatments were found to be significantly superior over control in managing the powdery mildew and rust disease. Among all the treatments T_6- carbendazim (0.1%), followed by T_2-NSKE (5%), T_4 - nimbicidin (0.3%), were significantly superior over other treatments for managing powdery mildew ,whereas T_6- carbendazim (0.1%), followed by T_4 - nimbicidin (0.3%), T_3- neem oil (3%), were significantly superior over other treatments in managing rust disease. During evaluation, Neem Seed Kernel Extract at 5% concentration and nimbicidin (0.3%) were found as best treatment to control for powdery mildew and rust disease respectively.

Keywords: Botanicals, Neem, Pea, Powdery mildew, Rust

1. 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* and a self-pollinated crop (Anonymous, 2004). Green peas are the number-one processed vegetable in UK and USA. Dried peas were the staple food of Europe during the middle ages. The plant is an annual, dwarf or climbing, growing as high as 2 meters. Pea is very ancient in origin and was grown by ancient Romans and Greeks. It is said to be native to the Mediterranean region of southern Europe and Western Asia comprising Italy and south western Asia and India. 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, it is cultivated mainly in Uttar Pradesh, Madya Pradesh, Jharkand, Punjab, West Bengal, Haryana, Andra Pradesh, Bihar, Uttarkhand and Himachal Pradesh, where it is grown for both vegetable and pulse purposes and is a highly remunerative crop (Singh and Singh, 2005) [13]. In India, field pea occupies an area of 475.89 hectare with an annual production and productivity of 4651.53 tonnes and 9.5 tonnes/ ha respectively (Indian Horticulture Database-2014-2015) [8]. Among the fungal diseases powdery mildew caused by *Erysiphe pisi* and rust caused by *Uromyces fabae* are two major diseases of pea and cause severe damage and which is responsible to reduction in yield throughout the world.

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. It causes about 30-40% yield loss annually (Singh 1999; Upadhyay and Singh, 1994) [14, 18]. The losses in yield in a 100% infected crop were estimated by Munjal *et al.* (1963) [10] to be 21-31% in pod number and 26-47% in pod weight.

Rust caused by *Uromyces fabae* de Barry is a major disease of pea. Yield reduction due to this disease is very high within short period of time. It is macrocyclic autoecious rust (Singh and Tripathi 2012) [15]. The average yield of pea is quite low as compared to its yield potential. They cause about 30-40% loss anually (Singh, 1999; Upadhyay and Singh, 1994) [14, 18].

Materials and Methods
The present investigation "Eco-friendly management of Powdery mildew and Rust of Garden pea (*Pisum sativum* L.) was conducted at the Central Research Farm, Department of Plant Pathology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad, Uttar Pradesh during the *Rabi* season of 2016-17.

Disease intensity of powdery mildew

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

(Wheeler, 1969)

Disease intensity for rust

Observations on powdery mildew disease intensity were recorded on randomly selected plants from the each bottom, middle and top leaves. The disease intensity was recorded on pea plant 1 day before spraying and 10 days and 20 days after spraying. Five plants in each plot were tagged and disease intensity was recorded by the following formula (Aduichy and Thakore, 2000) [4]

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

The seed variety Rachna were sown @ 20-25 kg/ha by dibbling method with spacing of 30 cm between row to row and 10 cm between plant to plant by placing 2 seeds per hill at depth of 4 cm. Sowing was done on 15th of december.

Yield - kg/plot.

Sl no.	Treatments	Conc.
T_1	Neem leaf extract	10 %
T_2	Neem seed kernel extract	5 %
T_3	Neem oil	3 %
T_4	Nimbicidin	0.3 %
T_5	*Pseudomonas fluorescens*	0.5 %
T_6	Carbendazim	0.1 %
T_0	Control (no spray)	-

Results and Discussion

Powdery Mildew

Among all the treatments the minimum disease intensity (%) was recorded in T_6- carbendazim (10.51 %), followed by T_2- NSKE (10.93 %). The disease intensity was highest in T_1 - neem leaves extract (14.21 %).

Among all the treatments the minimum disease intensity (%) was recorded in T_6- carbendazim (15.49 %), followed by T_2- NSKE (20.26). The disease intensity was highest in T_0 - control (35.54%).

Among all the treatments the minimum disease intensity (%) was recorded in T_6- carbendazim (18.86 %), followed by T_2- NSKE (25.20 %). The disease intensity was highest in T_0 - control (43.25 %).

Effect of treatments on disease intensity (%) of powdery mildew (*Erysiphe polygoni* DC) on garden pea at different intervals.

Treatments		Concentrations (%)	PDI (%)			PDI (%) Mean
			One day Before spray	10 days after spray	20 days after spray	
T1	Neem leaves extract	10	14.21	28.29	35.54	25.97
T2	NSKE	5	10.93	20.26	25.20	18.80
T3	Neem oil	3	12.88	25.20	32.14	23.41
T4	Nimbicidin	0.3	11.99	22.52	27.37	20.63
T5	P. flouroscens	0.5	11.68	24.40	30.04	22.04
T6	Carbendazim	0.1	10.51	15.49	18.86	14.95
T0	Control (water spray)	-	11.97	35.54	43.25	30.25
	Mean		12.03	24.53	30.32	
	SE.d±		0.86	1.40	2.27	
	CD (5%)		2.06	3.05	4.94	

However, minimum disease intensity (%) of powdery mildew was found in treatment T6- carbendazim. Least significant was found with treatment T_1 - neem leaves extract.

The probable reason for such finding may be that, carbendazim fungicide killed the germinated spores of the fungus. When applied after the infection, carbendazim may have attacked the developing mycelium and arrested its spread by suppression of sporulation,it may cause irreparable damage to the pathogen which resulted in inhibition of disease producing activity on the leaves and pod by the pathogen in the plants and induced resistance in the host. Similar results were reported by (Surwase *et al*. 2009) [16], (Akhileshwari *et al.* 2012) [2], Parasad and Dwivedi (2007) [11], Jagtap and Khalikar (2012) [12] and Suryawanshi *et al. (*2009) [16-17]. Who also noticed that botanical NSKE found effective against powdery milew disease.

Rust

Among all the treatments the minimum disease intensity (%) was recorded in T_4- nimbicidin(18.90 %) followed by T_3 - neem oil (19.67 %). The disease intensity was highest in T_1 - neem leaves extract (23.15 %) at one day before spray.

Among all the treatments the minimum disease intensity (%) was recorded in T_6- carbendazim (26.56 %), followed by T_4 - nimbicidin (28.88 %). The disease intensity was highest in T_0 - control (43.25%) at 10 days after spray.

Among all the treatments the minimum disease intensity (%) was recorded in T_6- carbendazim (29.57 %), followed by T_4 - nimbicidin (33.15 %). The disease intensity was highest in T_0 - control (56.38 %) at 20 days after spray.

Effect of treatments on disease intensity (%) of rust (*Uromyces fabae*) on garden pea at different intervals.

Treatments		Concentrations (%)	PDI (%)			PDI(%) Mean
			One day Before spray	10 days After spray	20 days After spray	
T1	Neem leaves extract	10	23.15	37.06	43.74	34.65
T2	NSKE	5	22.52	35.54	41.38	33.15
T3	Neem oil	3	19.67	29.97	36.32	28.65
T4	Nimbicidin	0.3	18.86	28.88	33.15	26.96
T5	*P. flouroscens*	0.5	20.26	32.12	38.57	30.32
T6	Carbendazim	0.1	20.11	26.56	29.57	25.41
T0	Control (water spray)	-	21.35	43.25	56.38	40.33
	Mean		20.85	33.34	39.87	
	SE.d±		1.36	2.43	1.48	
	CD (5%)		-	5.29	3.23	

However, minimum disease intensity (%) of rust was found in treatment T6- carbendazim. Least significant was found with treatment T_1 - neem leaves extract

The probable reason for such finding may be that, carbendazim fungicide killed the germinated spores of the fungus. When applied after the infection, carbendazim may have attacked the developing mycelium and arrested its spread by suppression of sporulation, which resulted in inhibition of disease producing activity on the leaves and pod by the pathogen in the plants and induced resistance in the host. Similar results were reported by Varma (1986) [19], Bakr and Rahman (1998) [5], Singh and Tripathi (2012) [15], Rahman *et al.* (1984), Rahman *et al.* (2005) [12], Ahmed *et al.* (2006) [1], Singh (2007), Barnwal (2009) [6].

Effect of selected treatments on yield (q/ha).

	Yield
T_1 -Neem leaves extract	13.87
T_2 -NSKE	16.45
T_3 -Neem oil	16.75
T_4 -Nimbicidin	17.85
T_5 -*Pseudomonas fluorescens*	15.93
T_6 -Carbendazim	19.18
T_0 -Control	10.35
F-test	S
SE.d	0.42
C.D.(P=0.05)	0.91

All the treatments are significantly effective over control. Among all the treatments highest yield was recorded in T_6 - carbendazim (19.18 q/ha), followed by T_4 - (17.85 q/ha), T_3 - neem oil (16.75 q/ha), T_2 -NSKE (16.45 q/ha), T_5 -*P. fluorescens* (15.93 q/ha), T_1 -neem leaves extract (13.87 q/ha) as compared to control -T_0 (10.35 q/h).

Conclusion

From present study, it was concluded that Neem Seed Kernel Extract at 5% concentration and Nimbicidin 0.3% were found as best treatment to control for powdery mildew and rust disease respectively after chemical. From cost benefit ratio Nimbicidin treatment followed by Neem oil as well as NSKE treatments were found as most economic method over control after chemical treatment. Yield obtained from Nimbicidin 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, Nimbicidin as well as NSKE would be considered as better as it is eco-friendly. Since one year data is not sufficient to conclude concurrent results, further experimentations are required to confirm the results.

References

1. Ahmed AU, Bakr MA, Chowdhury JA, Sarkar MA. Efficacy of six fungicides in controlling rust (*Uromyces fabae*) disease of lentil (*Lens cullinaris*). Bangladesh J. Plant Pathol. 2006; 22(1,2):39-40.
2. Akhileshwari SV, Amaresh YS, Naik MK, Kantharaju V, Shankergoud I, Ravi MV. Kar. J. Agric. Sci. 2012; 25(2):278-280.
3. Alam MM, Sadat MA, Hoque MZ, Rashid MH. Management of powdery mildew and rust diseases of garden pea using fingicides. Int. J. Sustain. Crop Prod. 2007; 2(3):56-60.
4. Audichya, Pankaj, Thakore BBL. Management of powdery of opium poppy by systemic fungicides. J. Mycol. Pl. Pathol. 2000; 30(1):103-104.
5. Bakr MA, Rahman ML. Current status of research on lentil diseases and future needs. Pro. Of the workshop on disease resistance breeding in pulses, TCTTIP, Bangladesh. Project pub. 1998; 11:23-31.
6. Barnwal MK, Sah A, Kumar Rajiv. Integrated management of location specific diseases of pea. J. Myco. Pl. Pathol. 2009; 39(2):365-366.
7. Gupta SK, Shyam KR. Control of powdery mildew and rust of pea by fungicide. Ind. Phytopathol. 1998; 51(2):184-186.
8. Indian Horticulture Database. 2014-15.
9. Jagtap GP, Khalikar PV. Integrated management of pea powdery mildew caused by Erysiphe polygoni DC. Scientific Journal of Agricultural, 2012; 1(2):33-38.
10. Munjal RL, Chenulu VV, Hora IS. Assessment of losses due to powdery mildew Erysiphe polygoni on pea. Ind. Phytopath. 1963; 16:260-267.
11. Prasad P, Dwivedi SN. Fungicidal management of garden pea (*Pisum satium* L.) powdery mildew caused by Erysiphe polygoni DC. Society for Scientific Devision In Agriculture and Technology. 2007; 2(1/2):116-118.
12. Rahman MA, Bhattiprolu SL. Management of okra powdery mildew by fungicides. Ka. J. Agri. Sci. 2005; 18(4):998-1002.
13. Singh C, Singh P, Singh R. Modern technique of raising field crops. Ox and Public Co. Pvt. Ltd., New Delhi, India, Second Edition. 2005, 220.
14. Singh RS. Plant Diseases. Oxford and IBH, New Delhi. 1999, 686.
15. Singh SK, Tripathi HS. Pantnagar journal of research. 2012; 10(1):51-55.
16. Surwase AG, Badgire DR, Suryawanshi, AP. Management of Pea powdery mildew by fungicides, Botanicals and Bio-agents. Annals of Plant Protection Sciences, 2009; 17(2):384-388.
17. Suryawanshi AP, Wadje AG, Gawade DB, Kadam TS, Pawar AK. Field evaluation of fungicides and botanicals

against powdery mildew of mungbean. Agricultural Science Digest, 2009; 29(3):209-211.
18. Upadhyay AL, Singh VK. Performance of pea varieties/lines against powdery mildew and rust. Annals of Agricultural Research, 1994; 7:92-93.
19. Varma BK. Groundnut rust disease. Proceedings of discussion on group meeting held at ICRISAT Center, Patanchern, India. 1986, 59.