Eco-friendly Management of Powdery Mildew of Pea (*Pisum sativum* L.)

Abstract

Pea (*Pisum sativum* L) is an important crop grown all over the world, in India commonly known as "Matar". India is ranked second in both area and production of pea globally. *Erysiphepolygoni* DC causes powdery mildew in pea, it is a one ofmost devastating disease. An experiment was conducted at the SKNCOA farm in Jobner during the Rabi season of 2021. Six natural products, including Panchgavya (10%), Butter milk (10%), Neem seed kernel extract (NSKE 10%), Duranta (10%), Parthenium (10%), and Mehandi (10%), were used as two foliar sprays. During the assessment, all treatments were shown to be effective against powdery mildew of pea, although Neem Seed Kernel Extract (NSKE 10%) and Panchgavya (10%) were determined to be the best treatments for controlling powdery mildew disease in pea.

Keywords: Pea, *Erysiphepolygoni*, Panchagavya, Neem Seed Kernel Extract (NSKE), Per cent disease intensity

Introduction

Pea (*Pisum sativum* L.) is an important legume vegetable crop belongs to the *Leguminosae* family(Tulbek*et al.*, 2017). Peas are a significant human dietary item, supplying protein, carbs, and fibres. Various abiotic and biotic stresses reduce the profitability of pea for farmers by decreasing yield. India is ranking second next to China both in terms of area and production(NHB, 2018).In 2017-18, the country produced 540,000 hectares of Garden Peas with a yield of 5422.01 mt/ha. respectively, which accounted for 21% of global production(NHB, 2018).Uttar Pradesh, Bihar, Haryana, Punjab, Himachal Pradesh, Orissa, and Karnataka are India's top pea producing states(NHB, 2018).

Green peas are nutrient-dense and a great source of vitamins, minerals, and easily digested protein (7.2%) and carbohydrates (15.77%). Having a high protein content (27%), it plays a significant role in a vegetarian diet(Singh *et al.*, 2015).A significant amount of peas is prepared for consumption during the off-season by canning,

UNDER PEER REVIEW

freezing, or dehydrating. It also improves the soil because it is a leguminous crop and fixes atmospheric nitrogen into the soil (Singh *et al.*,2015).

Pea is a *rabi* season crop and its favourable temperature is 21 to 28°C for growth and production (Belanger and Labbe, 2002). Downy mildew, Powdery mildew, Pea rust, Ascochyta blight, White rot are disease attacked on pea crop. Among these diseases powdery mildew (*Erysiphepolygoni*DC) is most damaging disease that can result in 25-50 percent yield losses(Pramod and Dwivedi 2007).Major symptoms of powdery mildew disease are the presence of white floury patches appeared on the leaves as well as stems, tendrils, pods and in the severe condition its cover whole plant parts except root region and finally plant become older and later stage of the crop whole plant become comparatively greyish brown and it is the air borne disease, it reduces 24-27% pod weight, 21-30% pod number and up to 50% reduction in total yield loss (Pramod and Dwivedi 2007).

Materials and Methods

A field experiment was conducted in the Rabi season of 2021 at Plant Pathology's field number 7 at S.K.N. College of Agriculture, Jobner. Three replications of a local cultivar of pea were planted in RBD during the last week of November.

Table No. 1 List of natural products used in vivo

Treatment	Natural products	Concentration (%)
T_1	Panchgavya	10.0
T_2	Butter milk	10.0
T_3	NSKE	10.0
T_4	Duranta	10.0
T_5	Parthenium	10.0
T_6	Mehndi (*Lawsoniainermis*)	10.0
T_7	Control(Water)	-

UNDER PEER REVIEW

Preparation of panchagavya

Five fresh cow products—cow dung (3 kg), cow urine (3 L), cow milk (2 L), cow curd (2 kg), and cow ghee (1 kg)—were combined to make panchagavya. Mix the fresh cow dung and cow ghee well, then incubated for two days. Added urine + 5 litre of water and stirred properly (daily in the morning and evening for a week) (Raja andKurucheve, 1999) together with cow milk and cow curd, and well mixed (daily for two weeks, in the morning and evening) Panchagavya is ready to use (Chadha *et al.*, 2012).

Preparation of Neem Seed Kernel Extract (NSKE)

The versatile native Indian tree known as neem (*Azadirachtaindica*) (Maurya*et al.*, 2004). Indian farmers have known about the neem tree's insecticidal qualities for thousands ofyears (Rettinassababady*et al.*, 2000). For preparing NSKE of plant parts seeds to be tested were first washed with tap water followed by sterilized distilled water and then air-dried. The plant material that had been weighed was crushed using a warring blender at a ratio of 1:1 w/v, added distilled water using 100g of seed, and then filtered through two layers of muslin fabric. This was utilized to provide the necessary dilution and was regarded as a 100% concentration. Plants were treated with diluted neem seed kernel extract in 10 and 20 per cent concentration separately and sprayed on plants (Sindhan *et al., 1999).*

Application of natural products

Two foliar applications of natural products, first at 45DAS (before disease appearance) and second at 75DAS (after disease appearance) under field condition. Per cent disease intensity was recorded after 15 days of second spray by examining 20 leaves from 10 randomly selected plants in field

$$\text{Per cent disease intensity (PDI)} = \frac{\text{Sum of all the disease ratings X 100}}{\text{Total number of ratings X maximum disease grade}}$$

(Patil *et al.*,2017).

UNDER PEER REVIEW

Table No.2:Disease rating scale for powdery mildew disease of pea

Ratingscale	Description	Diseasereaction
0	No symptoms onleaves	Highlyresistant
1	1-10% area of leavesinfected	Resistant
2	11-25% area of leavesinfected	Moderatelyresistant
3	26-50% area of leavesinfected	Moderatelys usceptible
4	51-75%area of leavesinfected	Susceptible
5	Morethan75%areaofleavesinfected	Highlysusceptible

(Mckinney, 1923)

Results

Results analysis observed that minimum 22.73 per cent disease intensity was recorded in neem seed kernel extracts by decreasing 62.38 per cent disease intensity. And next best noted panchgavya with 25.68 per cent disease intensity by decreasing 57.50 per cent disease intensity over control.

Duranta, butter milk, and parthenium with 32.49, 35.05 and 37.47 per cent disease intensity by decreasing 46.23, 41.99 and 37.98 per cent disease intensity over control respectively. Maximum disease intensity was observed of mehandi(*Lawsoniainermis*)with 39.78 per cent disease intensity over control.

Table No. 3 Effect of natural products on powdery mildew of pea under naturalfield condition

UNDER PEER REVIEW

Treatment	Natural product	Concentration (%)	*PDI	Percent disease control
T_1	Panchgavya	10	25.68	57.50
			(30.45)	
T_2	Butter milk	10	35.05	41.99
			(36.30)	
T_3	Neem seed kernel extract	10	22.73	62.38
			(28.41)	
T_4	Duranta	10	32.49	46.23
			(34.75)	
T_5	Parthenium	10	37.47	37.98
			(37.74)	
T_6	Mehandi(*Lawsoniainermis*)	10	39.78	34.16
			(39.10)	
T_7	Control (Water)	-	60.42	0.00
			(51.01)	
	Sem±		0.54	
	CD (=0.05)		1.66	

*Average of three replication

UNDER PEER REVIEW

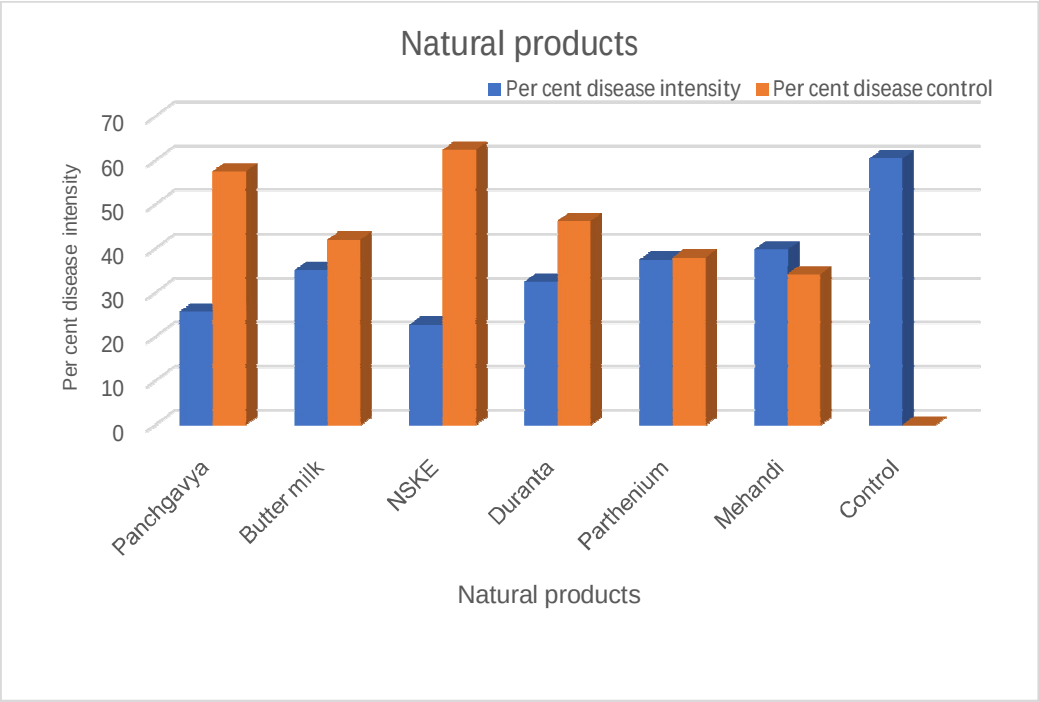

Fig.1 Graphical representation of natural product and percent disease intensity

Conclusion

From present study, it was concluded that out of six natural products, 10% concentration of neem seed kernel extract was extremely successful and Panchgavya 10% concentration reported as second-best treatment for controlling pea powdery mildew disease.

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UNDER PEER REVIEW

3.

References

1. Belanger RR, Labbe C (2002) Control of powdery mildew without chemicals: Prophylactic and biological alternatives for horticultural crops. The powdery mildew: A comprehensive treatise pp 256-267
2. Chadha S, Rameshwar A, Saini JP, Paul YS (2012) Sustainable livelihood option for small and marginal farmers. Indian Journal of Traditional Knowledge Vedic Krishi 11(3):480-482
3. Maurya S, Singh DP, Srivastava JS, Singh UP (2004) Effect of some plant extracts on pea powdery mildew (*Erysiphepolygoni*). Ann. Pl. Protec. Sci. 12(2): 296-300
4. MckinneyHH(1923)ANewSystemofGradingofPlantDiseaseManagement. JournalofAgricultureResearch26:195-218
5. NHB. 2018. Indian Horticultural Database. 2018. National Hort. Board, Guregaon, India
6. Patil N B, Zacharia S and Kumari M (2017) Eco-friendly management of powdery mildew of garden pea (Pisum sativum L.). *Int. J. Curr. Microbiol. Appl. Sci*, *6*, 684-689.
7. Pramod P, Dwivedi SN (2007) Fungicidal management of field pea (*Pisum sativum* L.) powdery mildew caused by *Erysiphepolygoni* DC. Progressive Research, 2(1/2): 116-118
8. Raja J, Kurucheve V (1999) Fungicidal activity of buffalo (*Babulusbubalis)* urine: A new record. Madras Agricultural Journal 86(10, 12):614-616
9. Rettinassababady C, Ramadoss N, Thirumeni S (2000) Effect of plant extract in the control of powdery mildew of black gram (*Erysiphepolygoni* DC). Agricultural Science Digest 20 (3):193- 194
10. Sindhan GS, Hooda I, Parashar RD (1999) Evaluation of plant extract for the control of powdery mildew of pea. Journal of Mycology and Plant Pathology 29 (2): 257-25
11. Singh J, Chaudhary D R And Kumar S (2015) Effect of post-emergence herbicides on productivity and profitability of garden pea (Pisum sativum L.) in Lahaul valley of Himachal Pradesh. Indian J. Agric. Sci., 41 (2) : 172 - 176
12. Tulbek MC, Lam RSH, Asavajaru P, Lam A (2017) Pea A sustainable vegetable protein crop. Sustainable Protein Sources (pp. 145–164). Academic Press.

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