

## 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 ~~in~~ globally. 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. It is susceptible to a variety of fungal, bacterial, and viral diseases. *Erysiphe polygoni* DC causes powdery mildew in pea, it is a most 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, [Powdery](#) Mildew, Panchgavya, Neem Seed Kernel Extract (NSKE), Per cent disease intensity

Comment [a1]: Word of Key words has to be different with title

### Introduction

Pea (*Pisum sativum* L.) is an important legume vegetable crop belongs to the *Leguminosae* family (Tulbeker *et al.*, 2017). India is ranking second next to China both in terms of area and production. 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. Uttar Pradesh, Bihar, Haryana, Punjab, Himachal Pradesh, Orissa, and Karnataka are India's top pea producing states. It is grown in Rajasthan, and Maharashtra, Himachal Pradesh, [Punjab](#), West Bengal, Haryana (NHB, 2018).

Comment [a2]: Delet repeated

Green peas are incredibly 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. A significant amount of peas is prepared for consumption during the off-season by canning, 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).

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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 (Kai *et al.*, 1999). Among these diseases powdery mildew (*Erysiphe polygoni* DC) is most damaging disease that can result in 25-50 percent yield losses. 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 70% reduction in total yield loss (Pramod and Dwivedi 2007).

Comment [a3]: Must be Italic

Comment [a4]: Where? + Reference

## 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 <sub>1</sub>	Panchgavya	10.0
T <sub>2</sub>	Butter milk	10.0
T <sub>3</sub>	NSKE	10.0
T <sub>4</sub>	Duranta	10.0
T <sub>5</sub>	Parthenium	10.0
T <sub>6</sub>	Mehndi	10.0
T <sub>7</sub>	Control	-

Comment [a5]: What are they and how they been prepared?

Comment [a6]: What was the Control? Is it water?

## 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 and Kurucheve, 1999) adding 500 grams of powder, 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).

Comment [a7]: Which powder

### Preparation of Neem Seed Kernel Extract (NSKE)

The versatile native Indian tree known as neem (*Azadirachta indica*) (Maurya et al., 2004). Indian farmers have known about the neem tree's insecticidal qualities for thousands of years (Retinassababady 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).

Comment [a8]: Ust be Italic

First foliar application of natural products was started with first disease symptom appear on plant and second spray after 15 days of first spray. Percent disease intensity was recorded after 15 days of second spray by examining 20 leaves from 10 randomly selected plants per plot.

Comment [a9]: How do you rate the diseases?

Sum of all the disease ratings X 100

Per cent disease intensity = -----

(PDI) Total number of ratings X maximum disease grade

(Patil et al., 2017)

Comment [a10]: How do you analysis the results?

## 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.

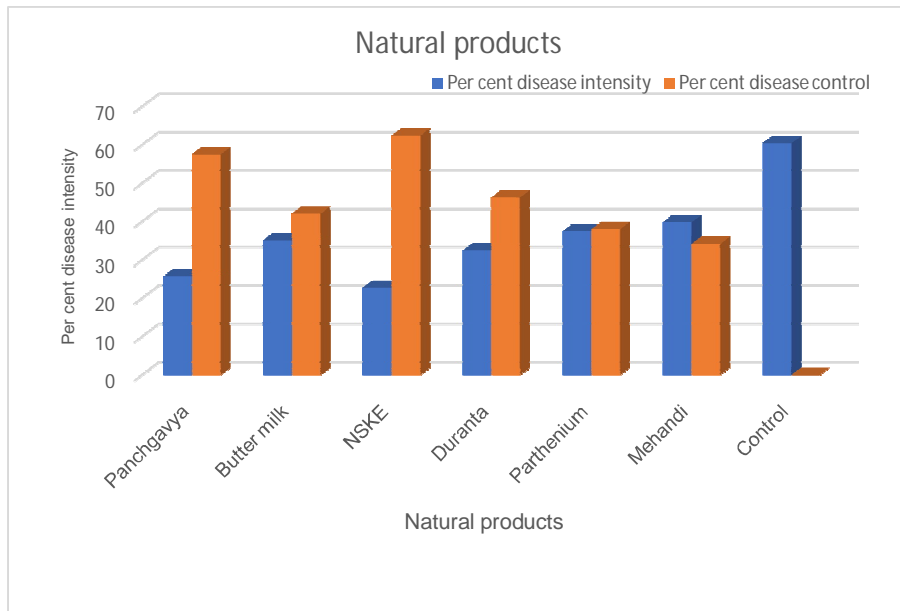
Duranta, butter milk, and parthenium with 32.49, 35.05 and 37.47 per cent disease intensity by decreasing 46.23, 41.99 and 37.98 per cent disease intensity over control respectively. Maximum disease intensity was observed of mehandi with 39.78 per cent disease intensity over control.

Comment [a11]: Where is the ANOVA results?

**Table No. 2 Effect of natural products on powdery mildew of pea under natural field condition**

Treatment	Natural product	Concentration (%)	*PDI	Percent disease control
T <sub>1</sub>	Panchgavya	10	25.68	57.50
			(30.45)	
T <sub>2</sub>	Butter milk	10	35.05	41.99
			(36.30)	
T <sub>3</sub>	Neem seed kernel extract	10	22.73	62.38
			(28.41)	
T <sub>4</sub>	Duranta	10	32.49	46.23
			(34.75)	
T <sub>5</sub>	Parthenium	10	37.47	37.98
			(37.74)	
T <sub>6</sub>	Mehandi	10	39.78	34.16
			(39.10)	
T <sub>7</sub>	Control	-	60.42	0.00
			(51.01)	
	Sem±		0.54	
	CD (=0.05)		1.66	

\*Average of three replication



**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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