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MANAGEMENT OF POWDERY MILDEW (*ERYSIPHE PISI*) OF PEA USING FUNGICIDES

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ABSTRACT

The pea, or *Pisum sativum*, is the third most popular grain crop grown worldwide and a member of the Leguminaceae family. With an area of 294 million hectares, a production of million tons and an average productivity of 1460 q/ha, Uttar Pradesh leads India in this regard. Numerous biotic and abiotic elements include accountable for the crop's poor production. Powdery mildew is one of the fungus foliar diseases that is most prevalent in the Himachal Pradesh and causes significant losses, both in terms of quantity and quality. The powdery mildew investigation, "management of powdery mildew (*Erysiphe pisi*) of pea," was carried out at Agriculture research farm in 2023–2024 at Abhilashi University. The data indicated that all the fungicides used were found effective to reducing the disease severity index of powdery mildew as compare to control. The minimum (22.22%) severity index was recorded in T_6 (Karathane) followed by T_1 (24.44%). The maximum disease severity was recorded in T_4 Tridemorph (33.33%) whereas, 57.77% was recorded in case of control. Maximum PDC was recorded T_6 Karathane (61.33%) followed by T_1 Hexaconazole (57.69%), T_5 Wettable sulphur (53.85%). While, minimum PDC was recorded in T_4 Tridemorph (42.30%).

Key words : Pea, *Erysipe pisi* and fungicides, disease and management.

Introduction

Peas (*Pisum sativum*) are an important vegetable and pulse crop. After common beans and soybeans, it is the third-largest crop of legumes in the world. The pea, which is a member of the Fabaceae family and subfamily Papilionaceae, is thought to have originated in the Mediterranean region, which includes Italy, South-Western Asia, and India. With chromosomal number 2n=14, it is a self-pollinating crop (Das and Kalloo, 1970). Peas can be effectively produced in a variety of seasons from the terai to high alpine locations (3000 m). In India, peas are mostly grown as a summer crop in hilly areas and as a winter food in the plains of North India. With a total production of 9.20 million tons and an average productivity of roughly 8.35 tonnes/ha, peas are farmed on over 1.1 million hectares of land worldwide. After pigeon peas and chickpeas, peas are the third most important pulse crop in India. Across 7.45 lakh hectares, field pea is cultivated, yielding approximately 9.10 lakh tons and a productivity of about 1222 kg/ha nationwide (Khadka, 1987). In India, the majority of pea farms are located in states like Uttar Pradesh and Madhya Pradesh. Eight states in India account for around 92% of the country's total pea output and cultivation area: Uttar Pradesh, Madhya Pradesh, Jharkhand, Assam, Odisha, Manipur, West Bengal and Bihar. Uttar Pradesh is the state that produces the most peas out of all of them, with 3.43 lakh hectares under cultivation and 5.03 lakh tons of output. With a productivity of about 1467 kg/ha, this state makes up about 46% of all cultivated area and 55% of all production in India (Anonymous, 2022). The pea, is a multipurpose crop used in horticulture and agriculture. It is grown in India for both its green pods, which are eaten as vegetables, especially in the northern parts, and its

dried seeds, which are used as pulses (Sanwal *et al*., 2013).

The field peas are produced for their tender green pods, dried seeds, fresh green seeds, and foliage. In the UK and the USA, green peas are the most widely consumed processed vegetable. Duke (1981). Peas are eaten as green vegetables when their green pods and young leaves are devoured. They can also be dried and used as a vegetable and pulse in off-season times (Abhishek and Simon, 2017). Peas are considered a low-fat, low-sodium, and cholesterol-free food that is also high in essential minerals like iron, calcium, potassium, and phosphorus (Muneer *et al*., 2018). Peas are also known to be a health-conscious food choice that lowers the risk of a number of health issues, including heart disease because they are low in cholesterol and can help prevent cardiovascular diseases. The oil extracted from mature pea seeds has an anti-sex hormone effect that results in sterility and counteracts the effects of male hormones. Peas are regarded as another possible component of aquaculture diets. Pease is a major export and cash crop in international trade, accounting for around 40% of all pulse trade (Oram and Agcaoili, 1994).

Erysiphe pisi is an obligate biotrophic fungus that causes pea powdery mildew, an airborne disease that is spread around the world. It is more common in regions with warm, dry days and cool nights (Smith *et al*., 1996) Butler initially documented powdery mildew in India in 1918 from Dehradun (Uttarakhand). When powdery mildew (*E. pisi*) infects field peas, transpiration is decreased, water potential is initially increased, and tissue moisture content is decreased. The pathogen grows best in regions with warm, dry days and nights that are at or below the dew point. The disease usually appears late in the season and peaks in strength during the formation of pods. Varieties that mature in January typically avoid the highest intensity of the illness, whereas varieties that mature earlier suffer less harm. A common and serious fungal illness that nearly always manifests as catastrophic outbreaks is powdery mildew. Rainfall, however, does not help the condition since it efficiently washes away the conidiophores, which are the structures that originate in the plants and disseminate the disease. The disease most commonly affects late-planted crops or late-maturing cultivars. Little, sporadic light-colored dots on the upper surface of the oldest and lowest leaves are the initial indications of powdery mildew. White, powdery fungal colonies cover these patches as the condition worsens. Mycelial hyphae on the plant surface produce short conidiophores, and conidia are usually borne singly on conidiophores (Falloon *et al*., 1989). A closed fruiting form known as a cleistothecium represents the sexual stage of the fungus that causes powdery mildew in peas. The pea plant's above-ground portions are heavily infected with a fungus that produces a lot of conidia on the upper leaf surface, which gives the illness its powdery appearance. Powdery mildew is a serious hazard to pea crops in semi-arid climates, where it can cause substantial reductions in pod quality and overall output. An estimated 30–40% of the annual production is lost due to the disease. Severe infections can cause a drop of 24-27% in pod weight, 21–30% in pod number, and up to 70% in total yield. While, fungicidal treatments can successfully manage the illness, genetic resistance offers a more cost-effective, dependable, safe, and healthful way to guarantee a healthy pea harvest. Fungicides are crucial for managing the disease, several chemical treatments have been used to prevent powdery mildew. An experiment was carried out to assess the efficacy of different fungicides in controlling powdery mildew in susceptible *P. sativum* (T163 cultivar) pea plants, including carbendazim WG, carbendazim WP, wettable sulfur, dinocap and penconazole. From 1994 to 1996, the study was carried out in Kanpur during the Rabi season. Every fungicide that was tried was successful in containing the illness. Penconazole stood out as the most effective among them, with a notable increase in seed output as compared to the crop that did not get fungicide spraying. Additionally, wettable sulfur and dinocap demonstrated effective disease management. It's interesting to note that even a simple water spray greatly enhanced seed yield and successfully suppressed the disease; this may have been because the moisture prevented fungal spores from germinating (Singh *et al*., 2000).

Materials and Methods

The materials used and techniques adopted in the accomplishing the objectives of the present investigations were carried out on entitled "Management of powdery mildew (*Erysiphe pisi*) through fungicides". Experiment was conducted out in the premises of School of Agriculutre and laboratory studies were done in Plant Pathology Laboratory, School of Agriculture, Abhilashi University, Mandi (H.P.), India; during *rabi* season 2023-2024. Below is a description of the specific materials utilized and methodology used.

Variety : Goldy

Treatments : 7

Replications : 3

Design : Randomized Block Design (RBD)

Plot size : 1 × 1m^2

Spacing : 30 × 10 cm

Treatment details

T_1 -Foliar spray of Propiconazole @ 0.2%

T_2- Foliar spray of Hexaconazole @ 0.2%

T_3 - Foliar spray with Tebuconazole @ 0.2%

T_4 - Foliar spray with Kerathane @ 0.2%

T_5 - Foliar spray with Tridemorph @ 0.2%

T_6 - Foliar spray with Wettable sulphur @ 0.2%

T_7- Control (Water Spray).

Observations

The first appearance of the disease in each treatments were recorded. The first spray was given after 10 days of first appearance of the disease and repeated the spray at interval. Observations on per cent disease severity were recorded at 60 day.

Per cent disease severity was calculated by using the following formula. It was calculated according to Mc Kinney (1923) formula

$$\text{Percent disease severity (PDI)} = \frac{\text{Sum of all numerical rating}}{\text{Total number of leaves examined} \times \text{Highest rating}} \times 100$$

$$\text{Percent disease control} = \frac{\text{PSI in control plant} - \text{PSI in treated plot}}{\text{PSI in control plot}} \times 100$$

Where,

PSI = Per cent disease severity.

Results and Discussion

The data presented in Table 1 indicated that all the fungicides used were found effective to reducing the disease severity index of powdery mildew as compare to control. The minimum (22.22%) severity index was recorded in T_6 (Karathane) followed by T_1 (24.44%). The maximum disease severity was recorded in T_4 Tridemorph (33.33%) whereas, 57.77% was recorded in case of control. Maximum PDC was recorded T_6 Karathane (61.33%) followed by T_1 Hexaconazole (57.69%), T_5 Wettable sulphur (53.85%). While, minimum PDC was recorded in T_4 Tridemorph (42.30%). Similarly, Singh *et al*. (2000) conducted an experiment to evaluate the effectiveness of various fungicides, including carbendazim WG, carbendazim WP, wettable sulfur, dinocap, and penconazole, in controlling powdery mildew in susceptible pea plants (*Pisum sativum*) of the T_{163} cultivar. The study

T_1 Hexaconazole **T_2 Propiconazole** **T_3 Tebuconazole** **T_4 Tridemorph**

T_5 Wettable sulphur **T_6 Karathane** **T_7 Control**

Plate 1 : Effect of fungicides on disease severity against powdery mildew.

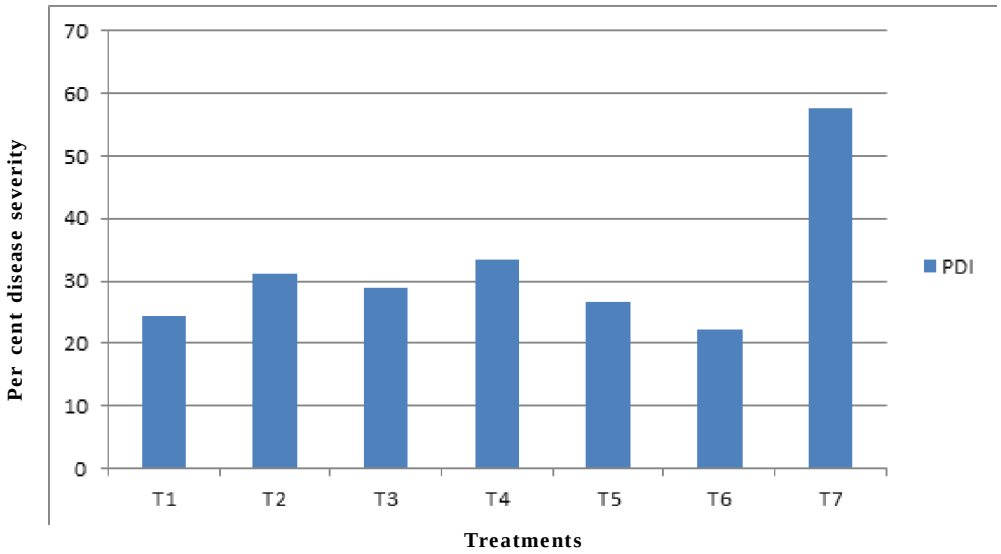

Fig. 1 : The effect of fungicides on disease severity of powdery mildew of pea.

Table 1 : Effect of fungicides on disease severity against powdery mildew.

Treatment	Chemicals	Per cent disease index (PDI)	Per cent disease control (PDC)
T_1	Hexaconazole	24.44	57.69
T_2	Propiconazole	31.11	46.14
T_3	Tebuconazole	28.88	50.00
T_4	Triedemorph	33.33	42.30
T_5	Wettable sulphur	26.66	53.85
T_6	Karathane	22.22	61.53
T_7	Control	57.77	-
	CD at 5 % level	**1.55**	-

was conducted in Kanpur during the *Rabi* season from 1994 to 1996. All the tested fungicides effectively controlled the disease. Among them, propiconazole demonstrated the highest efficacy and significantly increased seed yield compared to the crop that was not sprayed with fungicides. Dinocap and wettable sulfur also showed good control of the disease. Interestingly, even a plain water spray effectively controlled the disease and significantly increased seed yield, possibly due to the presence of moisture, which inhibited the germination of fungal spores. Meena and Godika (2019) evaluated six fungicides for management of powdery mildew of pea by spraying twice at 15 days interval under natural field conditions. Two years pooled data on per cent disease intensity revealed that all the fungicides were significantly effective in reducing the powdery mildew disease intensity over control (64.63 per cent). The minimum 12.65 per cent disease intensity was recorded with the application of Karathane by decreasing 80.43 per cent disease intensity. However, hexaconazole was second best and recorded 18.47 per cent disease intensity by decreasing 71.43 per cent disease intensity. Wettable sulphur and propiconazole were found moderately effective whereas, 22.68 per cent and 30.47 per cent, respectively disease intensity was recorded. Among the fungicides maximum 34.11 per cent disease intensity was recorded in the treatment of wettable sulphur.

Conclusion

On the basis of present investigation, it was concluded that Karathane (61.53%) was the best treatment to manage the powdery mildew disease followed by Hexaconazole (57.69%), Wettable sulphur (53.85%), Tebuconazole (50.00%), Propiconazole (46.14%) and Tridemorph (42.30%), over untreated unsprayed plot control was worked out.

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