



Application of SAR Activator for Management of Pea Powdery Mildew (*Erysiphe polygoni*)

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Powdery mildew of pea is one of the foremost diseases of pea incited by *Erysiphe polygoni* DC. Present study conducted to find out the comparative performance of SAR activators for control of powdery mildew. An experiment was conducted at farm of SKNCOA, Jobner during Rabi season 2021. Five SAR activators along with control viz. ethylene (100 ppm), salicylic acid (250 ppm), hydrogen peroxide (200 ppm), fosetyl al (1000 ppm) and benzothiadiazole (1000 ppm) were

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applied as two foliar sprays. During evaluation, all the treatments were found effective against powdery mildew of pea but Salicylic acid (250 ppm) and Fosetyl AL (1000 ppm) were found as best treatment to control powdery mildew disease of pea.

Keywords: SAR activator; pea; powdery mildew; disease management.

1. INTRODUCTION

Pea (*Pisum sativum* L.) is a significant legume vegetable crop from the Leguminosae family [1]. Peas are an important nutritional component, including carbohydrates, proteins, and fiber. Various abiotic and biotic factors diminish pea profitability for producers by limiting output over time. India ranks second to China in terms of both area and output [2]. In 2017/18, the country produced 540,000 hectares of garden peas with a yield of 5422.01 mt ha⁻¹, accounting for 21% of world output [2]. Uttar Pradesh, Orissa, Karnataka, Bihar, Haryana, Punjab and Himachal Pradesh are India's leading pea producers [2].

The vegetable pea fits to the family (*Fabaceae*) Leguminosae. "*Pisum sativum* L." sub species "*Hortense*" initiated from common field pea. *Pisum sativum* sub species "*arvense*" is considered to be native to Ethiopia, the Mediterranean and Central Asia. It has chromosome number 2n=14.

Duke [3] reported that peas are of four types i.e. Garden pea (*Pisum sativum* spp. *Hortense*, Field pea (*Pisum sativum* spp. *arvense* (L.) Poir.), Edible podded peas (*Pisum sativum* spp. *Macrocarpon*,) and Early dwarf pea (*Pisum sativum* var *humile*). Pea was probably originated in Southwestern Asia, possibly in Northwestern India, Pakistan or adjacent areas of former USSR and Afghanistan. Pea was found in Switzerland dating back to about 7000 BC, in China in the first century, in America soon after Columbus and in Austria in 1922. This crop was grown by the Greeks and Romans, [4].

Frost can damage the plants during flowering stage. High humidity and gloomy weather condition results into spread of fungal diseases like damping-off and powdery mildew. Favorable temperature for growth is 13-18°C. Pea is affected by various fungal and bacterial diseases in high humid condition.

Nutrient value in pea, generally pea seed contain 17 to 22 g carbohydrates, 20 to 50 g starch, 14 to 26 g dietary fiber, 6.2 to 6.5 g protein, 0.4 g fat,

1.0 g ash per 100 g with 9 to 10 mg calcium, 3 to 5 mg sodium, 97 to 99 mg potassium per advance techniques like pulse electric field or ultra-sonication have shown remarkable impact on the efficiency by improving nutritional quality and techno functional properties of pea and its protein [5,6].

The crop is very much valuable in crop rotation [3]. It is an important legume crop next to soybean, groundnut and beans [7]. Field pea contains 5 to 20 per cent less of the trypsin inhibitors than soybean and it allows directly fed to livestock without having to go through the extrusion heating process. In India pulses productivity is low because of its grown on marginal lands and low rainfall areas, poor management practices using by farmers.

Powdery mildew disease is one of the major diseases of pea which occurs globally in the countries viz., India, Philippines, Brazil, South Australia, Sri Lanka, Bangladesh, Pakistan, Tropical Africa, Taiwan, Thailand, France, USA, Pakistan, China, Russia, Canada and many other areas of the world it is a major disease.

In India, powdery mildew (*Erysiphe polygoni* DC) was reported to occur and cause heavy qualitative and quantitative loss in pea, urdbean, mungbean, methi and many other important pulse crops grown in the states of Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Orissa, Madhya Pradesh and Tamilnadu [8].

Key symptoms of powdery mildew disease are the presence of silver floury patches appeared on the leaves as well as stems, tendrils, pods and in the severe condition it covers the whole plant parts except the root region and finally the plant becomes older and in the later stage of the crop the whole plant becomes comparatively greyish brown and the infected parts convey a dull appearance. In extreme condition infected pods and leaves fall down from the plant [9].

Powdery mildew is the major disease of pea throughout the world and it is the air borne disease with worldwide distribution. In severe form it

reduces 24-27% pod weight, 21-30% pod number and up to 70% reduction in total yield loss [9].

The yield losses were reported to the tune of 50 to 90% when the intensity was high at pod formation stage [10]. Yield loss of 10-65% due to the disease has been reported [11].

Considering the above facts, the field experiment was conducted to find out the comparative performance of SAR activators for control of powdery mildew.

2. MATERIALS AND METHODS

2.1 Field Evaluation of SAR Activators

The field experiment was conducted to find out the comparative performance of SAR activators for control of powdery mildew in a randomized block design with six treatments including control and three replications with plot size of 2 x 1.2 m² during 2021. Sowings were done in the last week of November in this year. Following treatments were taken during study.

Foliar applications of SAR were done at 30 days after sowing (before disease appearance). Per

cent disease intensity was recorded by examining 20 leaves from 10 randomly selected plants in each plot starting from the initiation of disease using 0-5 rating scale [12]. The results were analysed statistically.

3. RESULTS AND DISCUSSION

Five SAR were evaluated to measure the efficacy of various SAR activators, for management of powdery mildew of pea by spraying one time at 30DAS under field condition.

Result presented that all SAR activators were found significantly greater to control. Salicylic acid noted minimum 25.71 per cent disease intensity by decreasing 55.07 per cent disease intensity. Fosetyl AL was next best, being 30.45 per cent disease intensity with decreasing 46.78 per cent disease intensity over control (Table 2).

Benzothiadiazole and ethylene recorded 33.85 and 36.33 per cent disease intensity respectively with reduction 40.85, 36.50 per cent disease intensity over control. Hydrogen peroxide resulted in 38.53 per cent disease intensity as mentioned earlier that yield loss of 10-65% due to the disease has been reported.

Table 1. List of SAR activators

Treatment	SAR activators	Concentration (ppm)
T ₁	Ethylene	100
T ₂	Salicylic acid	250
T ₃	Hydrogen peroxide	200
T ₄	Fosetyl Al	1000
T ₅	Benzothiadiazole	1000
T ₆	Control(water)	-

Table 2. Effect of SAR activators on powdery mildew of pea under natural field condition

Treatment	SAR activators	Concentration (ppm)	*PDI	Per cent disease control
T ₁	Ethylene	100	36.33 (37.07)	36.50
T ₂	Salicylic acid	250	25.71 (30.47)	55.07
T ₃	Hydrogen peroxide	200	38.53 (38.37)	32.66
T ₄	Fosetyl Al	1000	30.45 (33.49)	46.78
T ₅	Benzothiadiazole	1000	33.85 (35.58)	40.85
T ₆	Control	-	57.22 (49.15)	0.00
	Sem±		0.52	
	CD (p=0.05)		1.60	

*Average of three replication

Fig. 1 in parenthesis are angular transformed values.

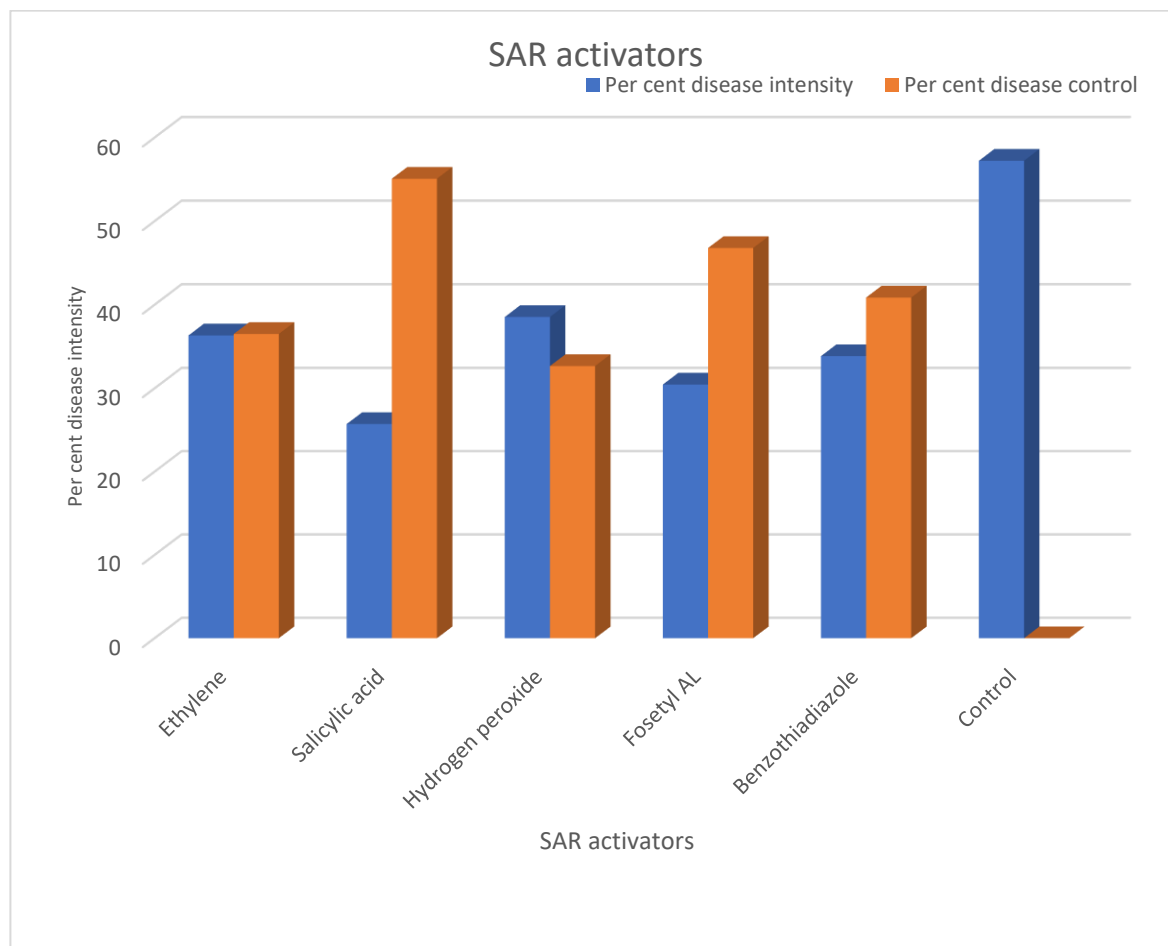


Fig. 1. Effect of SAR activators on powdery mildew of pea under natural condition

4. CONCLUSION

Among five SAR activators, salicylic acid was most effective in controlling powdery mildew of pea 25.71 per cent disease intensity by decreasing 55.07 per cent disease intensity over control and second best recorded fosetyl AI with 30.45 per cent disease intensity with decreasing 46.78 per cent disease intensity over control.

DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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