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Research Article

IMPACT OF RESISTANCE INDUCERS AGAINST PURPLE BLOTCH DISEASE OF ONION UNDER FIELD CONDITIONS

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Abstract- Purple blotch disease has become a very serious disease of onion causing considerable yield loss in onion production. In the absence of resistant cultivars, management of Purple blotch disease has relied principally on application of synthetic fungicides. The present study evaluated the efficacy of resistance inducers on purple blotch disease and investigated the effects on the yield of onion bulbs. The field experiment used a randomized block design, with five treatments and four replications in subtropical climatic condition of West Bengal at Regional Research Sub-Station (R & L Zone), Bidhan Chandra Krishi Viswavidyalaya, Sekhampur, Birbhum, West Bengal, India during *Rabi*, 2021 and *Rabi*, 2022. Among the plant inducers, two foliar sprays at 30 days after planting and 60 days after planting with Chitosan @ 0.1 % was best followed by Salicylic acid @ 150 ppm and Benzoic acid @ 0.15 % to manage the purple blotch disease of onion. The findings of the present study demonstrated a promising approach of management of purple blotch disease of onion with resistance inducers.

Keywords- *Purple blotch disease, Management, Resistance inducers, Onion*

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Introduction

Onion (*Allium cepa* L.) is one of the major bulb crops of India. It belongs to the Alliaceae family. It is one of the most significant vegetable condiment crops farmed worldwide. The main ingredient in onions that causes pungency is allylpropyl disulphide, an alkaloid. It is a nutritious vegetable and contains a good amount of Vitamin A and C, rich source of minerals (calcium, manganese and iron) and dietary fibers. The total annual production in India is 18.73 million tonnes from an area of 0.88 million hectares and the productivity is 21.2 t/ha [1]. The major onion growing states of India are Maharashtra, Bihar, Karnataka, Gujarat, Andhra Pradesh, Uttar Pradesh, Orissa and Madhya Pradesh. In India, about 60 percent of onion is cultivated during winter followed by 20% each in kharif and late kharif seasons. To cope up with these continuous challenges under field conditions, plants have evolved efficient mechanism to obtain an adequate defence and one more such mechanism against pathogen attack is the synthesis of vast array of low molecular weight components with disparate functions in plant pathogen interactions [2]. The pathogen *Alternaria porri* belongs to class Deutromycetes, order Moniliales, family Dematiaceae, genus *Alternaria* and species *A. porri*.

Purple blotch is a major disease affecting the foliage severely resulting in crop loss ranging from 30 to 100 per cent. The disease may reach epidemic states during the favourable conditions of high relative humidity (80-90%) and optimum temperature (24±1°C) [3]. One of the major factors responsible for this low productivity is a regular attack of several diseases and pests in this crop. In the absence of resistant cultivars, the treatment of purple blotch disease of onion has primarily relied on the use of synthetic fungicides. However, many of these fungicides have a significant negative impact on the environment, harming non-target species and negatively affecting the agro-ecosystem. The goal of the current research is to determine whether environmentally friendly methods of disease management are effective.

Materials and methods

The investigation was carried in a randomized block design with five treatments and four replications in subtropical climatic condition of West Bengal at Regional Research Sub-Station (Red & Laterite Zone), Bidhan Chandra Krishi Viswavidyalaya, Sekhampur, Birbhum, West Bengal, India.The experiment was conducted on variety Sukhsagar during *Rabi*, 2021 and *Rabi*, 2022. Two sprays in case of resistance inducers were applied on 30 and 60 days after planting at main field and three sprays of each recommended fungicide were applied fortnightly on 60,75 and 90 days after sowing. The treatments were imposed as per details of spray schedules given in [Table-2. Observations were recorded 15 days after spraying by randomly selecting 10 plants. First foliar application of these fungicides was started just after the appearance of disease symptoms followed by one more sprays at an interval of 15 days. On the basis of Percent Disease Index (PDI), the disease scoring was done by taking five plants from each plot on a disease rating scale *i.e.*, 0 to 5, where 0 = no lesions, 1 = 1 to 4 lesions, 2 = 5 to 10 lesions, 3 = 11 to 20 lesions, 4 = 21 to 30 lesions and 5 = more than 30 lesions on each floral stalk [4]. The observations regarding disease incidence were recorded before each spray. Percentage Disease Index was worked out using the formula, PDI = [Sum of all numerical rating/total number of observations taken x maximum disease score] x 100 [5]. The PDI values were transformed by angular transformation and analyzed statistically. The yield data was also analyzed statistically. Marketable yield of bulb (t /ha) was recorded. Finally, the disease severity percent and yield over the control were also calculated.

Results and discussion

Results presented in [Table-2] and [Fig-1] from the experimental trials revealed that all the treatments reduced the disease severity of purple blotch disease over (T_5) control. Depending on the prevailing weather conditions, maximum disease severity (58.38%) was recorded in control.

Table-1 Treatments details of resistance inducers

Treatments	Fungicides	Dosage
T_1	Salicylic acid	150 ppm
T_2	Chitosan	0.10%
T_3	Benzoic acid	0.15%
T_4	Mancozeb 75 % WP	2.5 g/litre of water
T_5	Control (Water only)	--

Table-2 Effect of resistance inducers against purple blotch disease of onion during 2021 and 2022 under field condition

Treatments	Fungicides	Dose	PDI (15 days after last spray)	Per cent reduction over control
T_1	Salicylic acid	150 ppm	40.25(39.38)	31.06
T_2	Chitosan	0.1 %	38.5638.39)	33.95
T_3	Benzoic acid	0.15 %	41.53(40.12)	28.86
T_4	Mancozeb 75 % WP	2.5 g/l	34.86(36.19)	40.29
T_5	Control (Water only)	--	58.38(49.82)	0.00
	S Em (±)		0.474	
	CD 5%		1.46	

Table-3 Effect of resistance inducers on yield of tomato during 2021 and 2022 under field condition

Treatments	Fungicides	Dose(per litre)	Bulbs Yield(t/ha)	Yield increase over control (%)
T_1	Salicylic acid	150 ppm	17.86	25.95
T_2	Chitosan	0.1 %	18.72	32.02
T_3	Benzoic acid	0.15 %	16.85	18.83
T_4	Mancozeb 75 % WP	2.5 g/l	21.82	53.88
T_5	Control (Water only)	--	14.18	0.00
SEm (±)			0.410	
CD 5%			1.26	

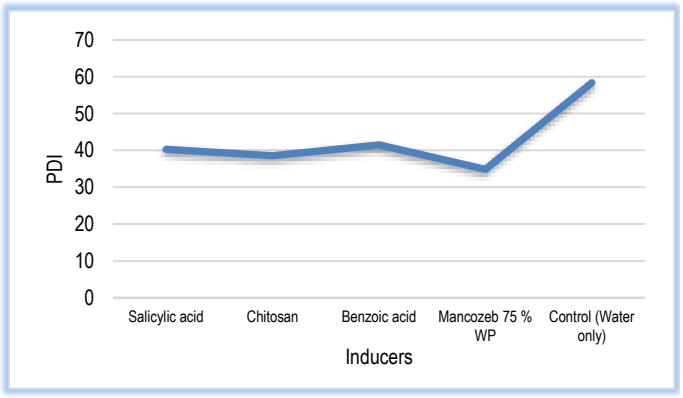

Fig-1 Percent disease index (PDI) in different resistance inducers and chemical fungicide against Purple blotch disease of onion

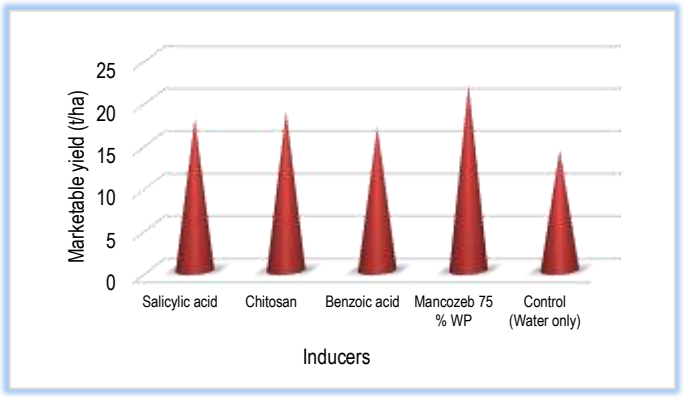

Fig-3 Effect of resistance inducers and chemical fungicide on marketable bulbs yield in onion

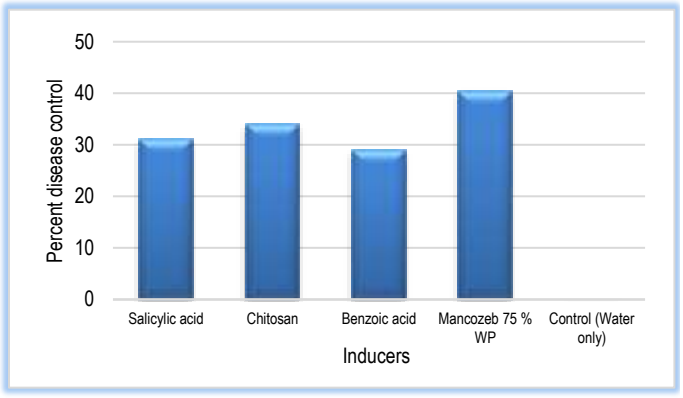

Fig-2 Influence of resistance inducers and chemical fungicide on Purple blotch disease control in onion

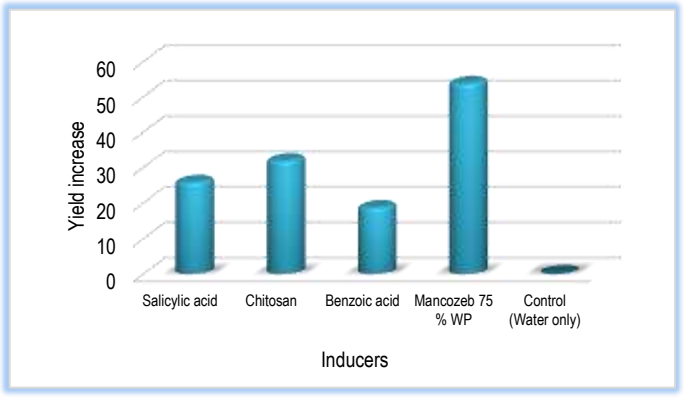

Fig-4 Influence of resistance inducers and chemical fungicide on marketable bulbs yield increase in onion

Among the treatments the lowest disease severity was observed from T_4: Mancozeb 75% WP @ 2.5 g/l of water (34.86 %). Among the plant inducers, T_2: Chitosan 0.1 % gave the lowest disease severity (38.56 %) followed by T_1: Salicylic acid @ 150 ppm (40.25 %), T_3: Benzoic acid 0.15 % (41.53%). The per cent reduction in PDI was also calculated over control [Table-2] and [Fig-2]. The data revealed that highest disease control was in T_4: Mancozeb 75% WP @ 2.5 g/l of water (40.29 %). Among the plant inducers, T_2: Chitosan 0.1 % gave the highest disease control (33.95%) followed by T_1: Salicylic acid @ 150 ppm (31.06 %), T_3: Benzoic acid 0.15 % (28.86 %).

Yield data has been presented in [Table-3] and [Fig-3]. The results revealed that maximum bulb yield was obtained from T_4: Mancozeb 75% WP @ 2.5 g/l of water (21.82 t/ha). Among the plant inducers, T_2: Chitosan 0.1 % gave the highest yield (18.72 t/ha) followed by T_1: Salicylic acid @ 150 ppm (17.86 t/ha), T_3: Benzoic acid 0.15 % (16.85 t/ha). The lowest yield was recorded in control (14.82 t/ha).
Highest increase of yield was calculated from T_4: Mancozeb 75% WP @ 2.5 g/l of water (53.88 %). Among the plant inducers, T_2: Chitosan 0.1 % gave the highest yield increase (32.02 %) followed by T_1: Salicylic acid @ 150 ppm (25.95 %), T_3: Benzoic acid 0.15 % (18.83 %) presented in [Table-3] and [Fig-4].

Effective disease management involves inducing resistance in plants to ward off the pathogen infection. In plants that are often sensitive to pathogen infection, exogenous or endogenous stimuli may have a considerable impact on host physiology, resulting in the rapid and coordinated activation of defense-genes [6]. This pathogen-induced resistance can be stimulated by using several abiotic agents (chemical inducers/ elicitors) such as Jasmonic acid, Salicylic acid, β-amino butyric acid and Chitosan [7]. Responses were observed both in the originally injured plant organ (local response) and in far away unaffected portions of the plant (systemic response). Induced Systemic Resistance (ISR) is one of these responses according to Hunt *et al*., 1996[8].

So, the result of the present investigation is comparable with the findings of the previous researchers. Based on findings of the present study, it may be concluded that two times foliar spray 30 days after planting and 60 days after planting with Chotosan @ 0.1 % was potential as ecofriendly alternate management strategy for purple blotch disease of onion followed by Salicylic acid @ 150 ppm and Benzoic acid @ 0.15 %.

Conclusion

This study demonstrates the ability of resistance inducers to be used as an alternative plant protection strategy in cropping systems. A significant reduction in the disease with an increase in yield. Plant inducers' ability to reduce disease increases the activity of a broad range of defense systems. This research supports integrating resistance inducers for sustainable disease management and enhancing yield in onion where there is a high use of fungicides.

Application of research: Using of resistance inducers for ecofriendly management of early blight disease of onion.

Research Category: Plant disease management

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University: Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, 741252, West Bengal, India
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Author statement: Author read, reviewed, agreed and approved the final manuscript. Note-Author agreed that- Written informed consent was obtained from all participants prior to publish / enrolment

Study area / Sample Collection: Regional Research Sub-Station (Red & Laterite Zone), Sekhampur, Birbhum, 731129

Cultivar / Variety / Breed name: Onion (*Allium cepa* L.) - Sukhsagar

Conflict of Interest: None declared

Ethical approval: This article does not contain any studies with human participants or animals performed by any of the authors.
Ethical Committee Approval Number: Nil

References

[1] Amin A.A., Rashad M., EL-Sh EL-Abagy H.M.H. (2007) *Journal of Applied Science Research*, 3(11), 1554-1563.
[2] Anonymous (2015) www.indiastat.com
[3] Yadav P.M., Rakholia K.B., Pawar K.B. (2013) *The Bioscan*, 8(4), 1295-1298.
[4] Sharma S.R. (1986) *Indian Phytopathol*., 39, 78-82.
[5] McKinney H.H. (1923) *J. Agri. Res*., 26, 195-217.
[6] Smith C.J. (1996) *New Phytol*., 132, 1-45.
[7] Yigal R.C. (2002) *Pl. Dis*., 86, 448-457.
[8] Hunt M.D., Neuenschwander U.H., Delaney T.P., Weymann K.B., Friedrich L.B., and Lawto, K.A., et al. (1996) *Gene*, 179, 89-95.