



Research Article

EFFECT OF SALICYLIC ACID ON GROWTH, YIELD AND DISEASE REACTION AGAINST LEAF BLIGHT OF ONION

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Abstract: The study was conducted Kalyani, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal on Onion cultivar Sukhsagar during Rabi season. The field experiment was consisted of six treatments of foliar spray of Salicylic acid (SA) at 30 days after sowing (DAS) in nursery and subsequent spray at 30, 45 or 60 days after transplanting (DAT) either alone or in combination along with one control. Salicylic acid; in their subsequent spray have been used to induce resistance against leaf blight disease. From the present investigation, it may be concluded that foliar application of SA is essential for onion crop. Foliar application of salicylic acid at 30 days after sowing and second spray at 30 days after transplanting and third spray at 45 days after transplanting during crop growth stage not only increased the growth, yield and quality bulbs but also to minimized the loss occurred due to disease pests in field.

Keywords: Onion, Alternaria, Salicylic acid and Systemic Acquired Resistance

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Introduction

Onion (*Allium cepa* L), also known as the bulb onion or common onion, is a vegetable and is the most widely cultivated species of the genus Alliums. 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. The reason behind low productivity of onion in India is due to cultivation of low yield varieties. To cope up with these continuous challenges under field conditions, plants have evolved efficient mechanism to obtain an adequate defense 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]. *Stemphylium vesicarium* (Wall.) Simmons is the causal agent of leaf blight in onion [3] in the main production areas of the world. In Egypt (Assiut Governorate) the first report of *Stemphylium* blight in onion caused by *S. Vesicarium* [4]. Induction of SAR is one of the best methods for reduction of disease severity. Certain chemicals were reported to induce SAR against plant pathogens [5]. Salicylic acid (SA) is a common plant-produced phenolic compound which increases plant growth and induce tolerance to both biotic and abiotic stresses. Salicylic acid also reverses the closure of stomata caused by abscisic acid [6]. Exogenous application of salicylic acid improves the yield in crops [7]. SA retards ethylene synthesis; stimulates photosynthetic machinery and increase the content of chlorophyll [8]. Recently, it has been recognized that salicylic acid is required in the signal transduction for inducing systemic acquired resistance against pathogenic infections [9-11]. The induced resistance can be defined as an increased expression of natural defence mechanisms of plants against different pathogens provoked by various type external factors. Depending on the mode of its expression, induced resistance can be systemic (SAR) or local (LAR). These studies clearly suggests the involvement of SA in realization of different anti stress functions in crop plants, but not much information was available on the efficacy of SA in one of the most important export oriented commercial vegetable crop.

Keeping this in view, a field experiment was conducted at Kalyani, Bidhan Chandra Krishi Viswavidyalaya, India, to study the effect of SA on growth and yield and disease reaction of onion and the observations on disease intensity were recorded using 0-5 scale [Table-1].

Methods and material

The field experiment was conducted by Randomized Block Design with six treatments replicated three times. The six treatment schedule consisted of foliar application of SA (SA) at 250 mg/l at 30 days of sowing (DAS) and second spraying at 30 days after transplanting (DAT) (T1), foliar application of SA at 30 DAT and second spraying at 45 DAT (T2), foliar application of SA at 30 DAT and second spraying at 60 DAT (T3), Foliar application of SA at 30 days after sowing and second spraying at 30 days after transplanting and third spray at 45 days after transplanting (T4), Foliar application of SA at 30 DAT and second spray at 60 DAT (T5), along with untreated control i.e., without SA water spray only (T6). The onion local variety Sukhsagar seedlings were raised in nursery bed. The seedlings were sprayed with SA @ 250 mg/l 30 DAT except the control treatment. Forty five days old seedlings of 10-15 cm height were transplanted in the main field at a spacing of 15cm X 10 cm. the crop was raised by following the recommended package of practice and the treatments were imposed as per the schedule.

Result and Discussion

Growth parameters of onion

The observation given in [Table-2] indicated that, different treatments did not significantly influence plant height in onion. However foliar application of SA at 250 mg/L at 30 days after sowing + 30 and 45 days after transplanting treated plots recorded higher plant height, highest number of leaves per plant and highest collar thickness closely followed by application of SA at 30 DAS + second spray at 45 DAT and control with no SA treatment recorded the lowest value. These results indicated that foliar application of SA to onion improved crop growth and the extent of improvement was more in the treatment with a greater number of foliar sprays.



SA treated plant

Untreated plant

Table-1 Scale adopted to indicate disease severity against leaf blight of onion

Grade	Percent Damage %	Disease severity
0	0	No disease
1	1-10	A few spots towards tip covering 10 percent leaf area.
2	11-20	Several purplish brown patches covering upto 20 percent of leaf area.
3	21-30	Several patches with paler outer zone covering upto 40 percent leaf area.
4	31-50	Leaf streaks covering up to 75 percent leaf area or breaking of the leaves from centre
5	51-100	Complete drying of the leaves or breaking of leaves from centre

Table-2 Effect of SA on growth, yield parameters and disease pest reaction of onion

Treatments	*PH (cm)	NOL	CTh (mm)	Avg. wt. of bulb (g)	Bulb equatorial diameter (mm)	Bulb polar diameter (mm)	Total bulb yield (t/ha)	Cost Economics (B:C ratio)	Disease severity rating	Pest (Thrips) damage (1-5 scale)
T ₁	51.94	8.00	1.2	46.13	47.03	50.34	25.90	1 : 1.47	1.54	3
T ₂	54.21	9.33	1.12	52.51	50.03	53.37	28.01	1 : 1.52	2.87	2
T ₃	50.39	7.67	1.07	55.46	50.37	53.39	29.58	1 : 1.79	2.23	2
T ₄	54.51	9.67	1.01	56.30	49.96	54.60	31.43	1 : 2.39	1.34	1
T ₅	51.49	7.67	1.1	52.81	50.59	55.62	28.47	1 : 2.07	2.61	2
T ₆	49.76	8.67	1.17	48.57	46.18	53.16	22.37	1 : 1.03	4.56	4
Mean	52.05	8.87	1.11	44.53	49.02	53.41	23.72	-	-	-
CD (5%)	3.17	1.29	0.27	6.66	6.31	7.37	15.61	-	-	-
CV(%)	3.35	8.05	13.68	8.41	7.08	7.58	3.70	-	-	-

(*PH-plant height, NOL- number of leaves, CTh- collar thickness, B:C ratio- Benefit: cost ratio)

Yield and disease pest reactions of onion

The study on yield attributing parameters of onion outcome that there was a significant variation in onion bulb diameter (polar and equatorial) and average bulb weight and total bulb yield due to spraying of Salicylic acid at different times [Table-2]. Significantly maximum polar diameter (PD) of 54.60mm and total bulb yield (31.43t/ha) was recorded in foliar application of SA at 250 mg/L at 30 days after sowing + 30 and 45 days after transplanting treated plots but, maximum equatorial diameter (ED) was recorded in SA at 30 DAS + second spray at 30 DAT + third spray at 60 DAT treated plots (50.59mm) as compared to control (46.18 mm). The results presented on disease severity rating and pest damage of onion revealed numerical variations among different treatments due to exogenous application of SA [Table-2]. The results indicated that the plot treated with foliar application of SA at 250 mg/L at 30 days after sowing + 30 and 45 days after transplanting has lower disease severity rating (1.34) and also lowest pest (thrips) populations [1] as compared to control. Total yield also affected with the increase in disease severity. Results of higher values of polar and equatorial diameter in onion bulbs also reported [12-14] in onion and in garlic.

Conclusion

From this research, results show foliar spray of Salicylic acid is essential for onion crop. Foliar spray of Salicylic acid at 30 days after sowing during nursery seedling stage, subsequently second spray at 30 days after transplanting and third spray at 45 or 60 days after transplanting during crop growth stage not only increased the vegetative growth but also the bulb yield of onion and found as best compared to other treatments for high B:C ratio (1:2.39).

Application of research: Study of foliar spray of Salicylic acid on onion crop

Research Category: Crop disease and management

Abbreviations: DAT: Days after transplanting

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Sample Collection: Study was conducted Kalyani, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal on Onion cultivar Sukhsagar

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

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