



Research Article

EFFICACY OF SOME FUNGICIDES IN CONTROLLING PURPLE BLOTCH OF ONION UNDER WEST BENGAL 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 effects of fungicides on Purple blotch disease of onion and investigated the efficacy on yield of onion. The field experiment was laid 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), Sekhampur, Birbhum, 731129, West Bengal, India during Rabi, 2020-21 and Rabi, 2021-22. The highest disease control was in Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water (56.62%) followed by Metiram 55% + Pyraclostrobin 5% WG @ 1.0 g/litre of water (53.11%) and Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1.0 ml/litre of water (48.05 %) at 15 days after 2nd spray. Maximum increase of marketable onion bulbs yield (67.98%) was obtained by the spray of Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water as compared to other treatments.

Keywords- Purple blotch disease, Fungicides, 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 important vegetables cum condiment crop grown throughout the world. The chief component which is responsible for pungency in onion is an alkaloid, allylpropyl disulphide. 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 tons 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 Deuteromycetes, 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. As there is no resistant variety presently available for cultivation in the state, the only alternative to reduce the damage caused by this disease is through the foliar application of fungicides in existing cultivars. Therefore, exploration of more effective fungicides for the control of this disease is unwarranted, which is the subject matter of the present studies. Keeping this in view, a field experiment was conducted to study the effect of fungicides on disease reaction of onion.

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, 2020-21 and Rabi, 2021-22. 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. Based on 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 (T₅) control. Depending on the prevailing weather conditions, maximum disease severity (52.38%) was recorded on plants in control. Among the treatments T₂: in Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water (22.72 %) exhibited minimum disease severity on plants followed by T₁: Metiram 55% +

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Table-1 Treatments details of fungicides

Treatments	Fungicides	Dosage (per litre)
T ₁	Metiram 55% + Pyraclostrobin 5% WG	1.0 g
T ₂	Boscalid 26.7%+Pyraclostrobin 13.3% WG	1.0 g
T ₃	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	1.0 ml
T ₄	Mancozeb 75 % WP	2.5 g
T ₅	Control (Water only)	--

Table-2 Effect of fungicides for control of Purple blotch disease of onion during 2020-21 and 2021-22 under natural condition

Treatments	Fungicides	Dose (per litre)	PDI (before spray)	PDI (15 days after 2 nd spray)	Per cent reduction over control
T ₁	Metiram 55% + Pyraclostrobin 5% WG	1 g	3.15(10.22)	24.56(29.71)	53.11
T ₂	Boscalid 26.7%+Pyraclostrobin 13.3% WG	1.5 ml	2.65(9.37)	22.72(28.47)	56.62
T ₃	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	1 ml	2.75(9.55)	27.21(31.44)	48.05
T ₄	Mancozeb 75 % WP	2.5 g	3.65(11.01)	34.86(36.19)	33.45
T ₅	Control (Water only)	--	2.85(9.72)	52.38(46.36)	0.00
	S Em (±)		0.440	0.623	
	CD 5%		NS	1.92	

Table-3 Effect of fungicidal management on bulbs yield of onion during 2020-21 and 2021-22

Treatments	Fungicides	Dose (per litre)	Bulbs Yield (t/ha)	Yield increase over control (%)
T ₁	Metiram 55% + Pyraclostrobin 5% WG	1 g	22.48	58.53
T ₂	Boscalid 26.7%+Pyraclostrobin 13.3% WG	1.5 ml	23.82	67.98
T ₃	Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC	1 ml	21.53	51.83
T ₄	Mancozeb 75 % WP	2.5 g	17.62	24.26
T ₅	Control (Water only)	--	14.18	0.00
	SEm (±)		0.566	
	CD 5%		1.75	

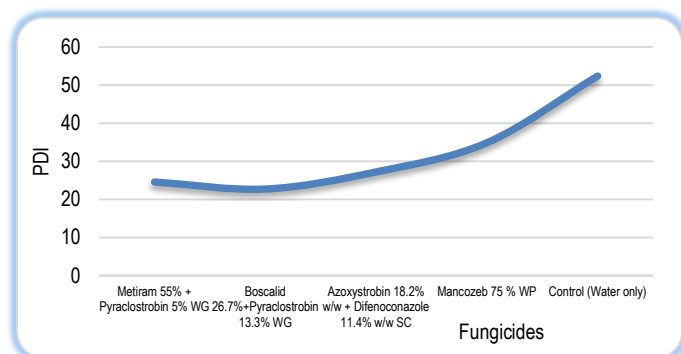


Fig-1 Percent disease index (PDI) in different fungicides against Purple blotch disease of onion

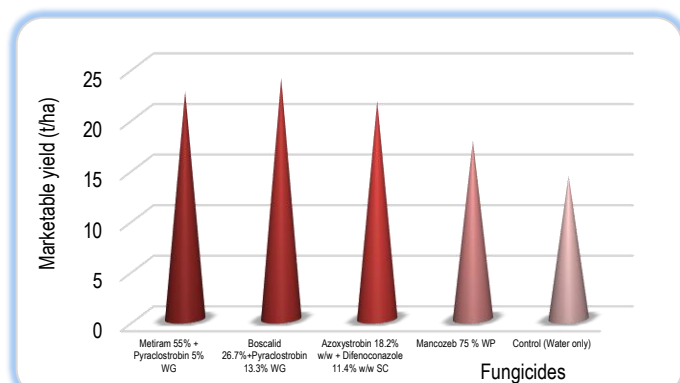


Fig-3 Effect of fungicides on marketable bulbs yield in onion

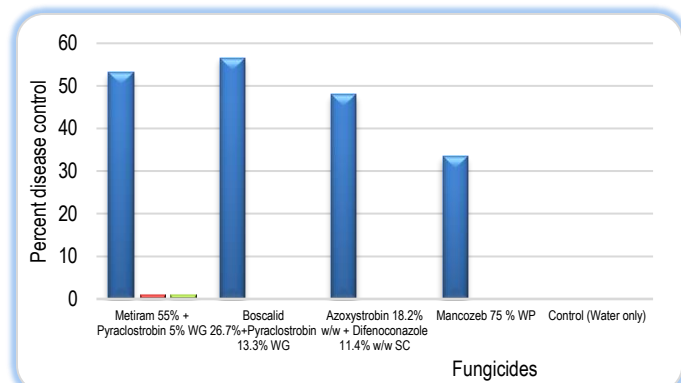


Fig-2 Influence of fungicides on Purple blotch disease control in onion
Pyraclostrobin 5% WG @ 1.0 g/litre of water (24.56 %), T₃: Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1.0 ml/litre of water (27.21%) and T₄: Mancozeb 75 % WP @ 2.5 g/litre of water (34.86 %) at 15 days after final spray. Results among these four treatments (T₁, T₂, T₃ & T₄) were found good efficacy against the disease over control.

The per cent reduction in terminal PDI was also calculated over control [Table-2] and [Fig-2]. The data revealed that highest disease control was in T₂: in Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water (56.62 %) exhibited minimum disease severity on plants followed by T₁: Metiram 55% + Pyraclostrobin

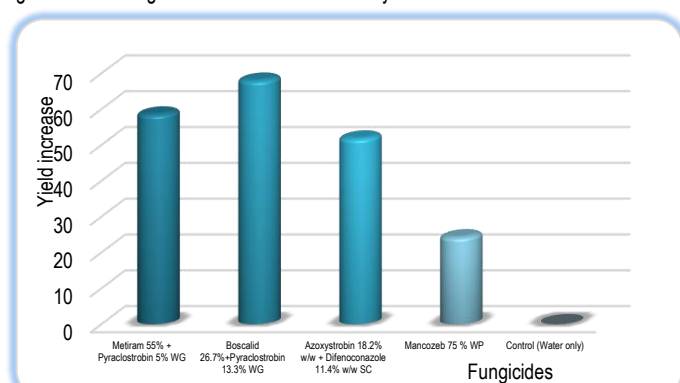


Fig-4 Influence of fungicides on marketable bulbs yield increase in onion

5% WG @ 1.0 g/litre of water (53.11%), T₃: Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1.0 ml/litre of water (48.05%) and T₄: Mancozeb 75 % WP @ 2.5 g/litre of water (33.45 %) at 15 days after final spray. All treatments controlled effectively the purple blotch disease in onion.

The yield data has been presented in [Table-3] and [Fig-3]. The results revealed that maximum yield was obtained from T₂: Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water (23.82 t/ha) followed by T₁: Metiram 55% +

Pyraclostrobin 5% WG @ 1.0 g/litre of water (22.48 t/ha), T₃: Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1.0 ml/litre of water (21.53 t/ha) and T₄: Mancozeb 75 % WP @ 2.5 g/litre of water (17.62 t/ha). The lowest yield was recorded in control (14.18 t/ha).

Highest increase of marketable yield was recorded from T₂: in Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water (67.98 %) followed by T₁: Metiram 55% + Pyraclostrobin 5% WG @ 1.0 g/litre of water (58.53 %), T₃: Azoxystrobin 18.2% w/w + Difenoconazole 11.4% w/w SC @ 1.0 ml/litre of water (51.83%) and T₄: Mancozeb 75 % WP @ 2.5 g/litre of water (24.26%) presented in [Table-3] and [Fig-4]. Strobilurin fungicides are quinone outside inhibitors and are effective in inhibiting the germination of fungal spores. Triazole fungicides inhibit ergosterol biosynthesis in pathogenic fungi. Because spores already contain ergosterol, the triazole fungicides are generally not very effective in preventing spore germination. Triazole fungicides work best by inhibiting fungi's mycelial growth [6]. Mancozeb was reported as highly effective fungicide in the management of purple blotch of onion [7,8].

Conclusion

The findings of the present investigation are comparable with the findings of the previous researchers. Based on findings of the present study, it may be concluded that two times foliar spray with Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water at an interval of 15 days may be recommended to management of Purple blotch disease of onion in West Bengal condition.

Application of research: The fungicide Boscalid 26.7%+Pyraclostrobin 13.3% WG @ 1.0 g/litre of water will be very effective for management of Purple blotch disease of onion.

Research Category: Plant disease management by chemical fungicide.

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****Principal Investigator or Chairperson of research: Dr Raju Das**

University: Bidhan Chandra Krishi Viswavidyalaya, Mohanpur, 741252, India
Research project name or number: Research station study

Author Contributions: Sole author

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

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