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Management of *Stemphylium* Blight Disease Caused by *Stemphylium vesicarium* in Onion through Different Methodology

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

A field experiments was conducted at NHRDF, Regional Research Station, Nashik in two consecutive years during *rabi* 2022-23 and 2023-24 on onion for the management of *stemphylium* blight disease through different methodology like alteration in transplanting dates, chemical and bio-pesticides management as well as screening of *stemphylium* tolerant variety. In case of alteration in transplanting dates that the lowest intensity (9.83%) of *stemphylium* blight and highest yield (391.83 q/ha) was recorded on 3rd week of December. In case of chemical fungicides with bio pesticides the lowest *stemphylium* blight disease intensity (7.27%) as well as highest yield (399.17 q/ha) was recorded in treatment T_4 (Tebuconazole50% + Trifloxystrobin 25% WG @ 0.15% at 45, 60 and 75

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DAT while, in case of varietal screening the lowest intensity (10.93%) of *stemphylium* blight as well as highest gross yield (397.00 q/ha) with marketable (383.83 q/ha) was recorded in variety NHRDF Red-4.

Keywords: Management; methodology; onion; disease; stemphylium blight; incidence; intensity; variety; fungicides; pesticides; bio-agents.

1. INTRODUCTION

Onion (*Allium cepa* L.) is an important vegetable or spices crop cultivated in almost all the states of the country. In India onion is cultivated in 3 seasons (*rabi, kharif* and late *kharif*). Many fungicides have been tested for the management of *Stemphylium* blight of onion. The date of transplanting plays a major role in onion bulb production as well as reduced the load of *stemphylium* blight disease of onion. Mancozeb 75 WP (@ 0.2%) was found effective against *Stemphylium* blight (Pandey et al., 2008). Carbendazim, copper oxychloride, difenoconazole, chlorothalonil and hexaconozole have been reported, in the order of their merit as effective in the management of the *Stemphylium* blight of onion, potato, mustard and other crops by Gorawar and Hegde, (2005). Pandey et al., (2023a) reported that alternative spray of bio-pesticides and fungicides for more effective aginst *stemphylium* blight and increase the yield. Pandey et al., (2022) found triazole fungicides most effective in reducing the *stemphylium* blight incidence and intensity and the increase the bulb yield. Pandey et al., (2023b) tested some fungicides and bio-agents and found effective against purple blotch of onion during *kharif* season.

2. MATERIALS AND METHODS

1- Effect of cultural practice like alteration in transplanting dates on the disease development

Experiment was conducted on highly infested field at NHRDF, Regional Research Station, Nashik Maharashtra, India using onion variety NHRDF Red-4 with a plot size of 3 x 1.2m using randomized block design. The transplanting was carryout in three replications after 15 days interval under seven different dates starting from 1st week of December to 3rd week of January 2023-24 and irrigated as and when required. Disease intensity was recorded at 75 days after transplanting.

2 - Impact of different fungicides and bio agents against the *stemphylium* blight

For evaluating of efficacy of various fungicides and bio- agents as spray against the *stemphylium* blight disease, an experiment was conducted at research farm of Regional Research Station, National Horticulture Research and Development Foundation, Nashik, Maharashtra during the *Rabi* season (2022-2023 and 2023-24). The onion seedlings were transplanted with plot size (1.2 x 3m) in a randomized block design (RBD) with three replications. The first spraying was given 45 days after transplanting and three sprays were given at 15 days of intervals. The controlled plots were sprayed with water only. The observation on disease intensity was recorded after 5 days of each spray and yield data was recorded after the harvest of the crop. The average yield was calculated in q/ha.

Details of Treatments:

T_1: Spray of Carbendazim12% + Mancozeb 63% WP @2.0g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_2*:* Spray of Metalaxyl 4% + Mancozeb 64% WP @2.0g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_3*:* Spray of Captan 70% + Hexaconazole 5% WP @2.0g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_4: Spray of Tebuconazole50% + Trifloxystrobin 25% WG @1.5.0g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_5: Spray of Metiram55% + Pyraclostrobin 5% WG @1.5g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_6: Spray of *T.viride* @ 5.0g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_7: spray of *Ps. fluorocence* @ 5.0g/litre at first appearance of disease and 15 days intervals starting from first appearance

T_8: *Bacillus subtillis* @5.0g/litre at first appearance of disease and 15 days intervals starting from first appearance
T_9: Control (Unsprayed)

3- Screening of available variety for the resistance of disease

Experiment was conducted during the *Rabi* season 2022-2023 and 2023-24 at Regional Research Station, National Horticulture Research and Development Foundation, Nashik, Maharashtra. The onion seedlings were transplanted with plot size (1.2 x 3m) in a randomized block design (RBD) with three replications. The standard agronomical practices were followed uniformly in all the varieties. The crop was harvested after attending the maturity. The data recorded on intensity of *Stemphylium* blight disease after 75 days after transplanting and also recorded the gross and marketable yield of onion.

Details of variety:

V_1- Agrifound Light Red
V_2-NHRDF Red
V_3- NHRDF Red-2
V_4- NHRDF Red-4
V_5-NHRDF Fursungi
V_6- Agrifound White
V_7- Agrifound Rose

3. RESULTS AND DISCUSTION

Consequences of altered transplanting dates on disease development: Experiments were conducted in the field during the *rabi* season 2022-2023 and 2023-24 on onion variety NHRDF Red-4 to observe the impact of different dates of transplanting on disease intensity. Different dates of transplanting were arranged between 1st week of December to 3rd week of January as weekly intervals (Table 1). The disease intensity was recorded after 75 days after transplanting and the results are summarized in Table 1.

The combined data of two years trial are presented in Table 1 revealed that the significantly lowest intensity 9.83% and highest yield 391.83 q/ha was recorded in 3rd week of December and the intensity it was found at par with 3rd week of December. The crop transplanted in 3rd week of January recorded highest disease intensity (17.60%) with lowest yield (242.83q/ha).

Impact of different fungicides and bio agents against the *Stemphylium* blight: The combined data of two years trial are presented in Table 2 revealed that the disease intensity recorded after five days of first spray ranged from 0.60 to 3.0 %. The significantly lowest intensity 0.60% was recorded in treatment T4 (Tebuconazole50% + Trifloxystrobin 25% WG @ 0.15% at 45, 60 and 75 DAT). At after five days of second and third spray the significantly lowest intensity (2.87% and 7.27) as well as highest yield (399.17 q/ha) was recorded in treatment T4.

Screening of available variety for the resistance of disease: Experiment was conducted during the *rabi* season (2022-2023 and 2023-24). The two years trial are presented in Table 3 revealed that lowest *Stemphylium* blight intensity (10.93%) and gross yield (397.0 q/ha) with marketable (383.83 q/ha) was recorded in variety NHRDF Red-4, while highest *Stemphylium* blight intensity (15.60%) as well as lowest gross yield (240.0 q/ha) was recorded in variey Agrifound White. The lowest marketable yield (234.17 q/ha) was recorded in variety Agrifound Rose.

Table 1. Effect of alterations in dates of transplanting on the disease intensity and yield (Combined data 2022-23 and 2023-24)

S.N.	Date of transplanting	Av. Disease Intensity% (0-5 scale)	Yield of bulb in (q/ha)
1	1st week of December	11.27 (3.43)	324.50
2	2nd week of December	12.47 (3.60)	320.17
3	3rd week of December	9.83 (3.22)	391.83
4	4th week of December	10.33 (3.29)	371.83
5	1st week of January	14.87 (3.92)	312.50
6	2nd week of January	16.20 (4.09)	283.0
7	3rd week of January	17.60 (4.25)	242.83
	S.Em±	**0.05**	**2.93**
	CD@ 5%	**0.11**	**6.05**

Note: The data shows parenthesis square root transformed value

Table 2. Fungicidal and bio agents control of the disease in field (2022-23 and 2023-24)

Treatments	*Stemphylium* blight intensity %			Yield q/ha
	Intensity % after five days of first spray	Intensity %after five days of second spray	Intensity % after five days of third spray	
T1	1.67 (1.47)	4.33 (2.19)	11.40 (3.45)	366.33
T2	1.27 (1.32)	3.53 (2.0)	9.40 (3.15)	381.67
T3	1.40 (1.38)	3.93 (2.10)	9.80 (3.21)	373.17
T4	0.60 (1.04)	2.87 (1.82)	7.27 (2.78)	399.17
T5	0.93 (1.18)	3.13 (1.90)	8.20 (2.94)	394.17
T6	2.07 (1.60)	4.87 (2.31)	14.07 (3.82)	319.67
T7	2.33 (1.68)	5.13 (2.37)	14.67 (3.89)	314.67
T8	2.73 (1.79)	5.13 (2.37)	15.13 (3.95)	310.67
T9	3.0 (1.87)	6.33 (2.61)	18.67 (4.38)	290.67
S.Em±	**0.07**	**0.08**	**0.07**	**2.99**
CD@ 5%	**0.14**	**0.16**	**0.14**	**6.09**

Note: The data shows parenthesis square root transformed value

Table 3. Screening of available variety for the resistance of disease (2022-23 and 2023-24)

Variety	*Stemphylium* blight intensity % at 75 DAT	Gross yield	Marketable yield
Agrifound Light Red	12.80 (3.64)	330.0	321.67
NHRDF Red	13.87 (3.79)	278.17	266.0
NHRDF Red-2	12.13 (3.56)	355.50	347.83
NHRDF Red-4	10.93 (3.38)	397.0	383.83
NHRDF Fursungi	11.47 (3.46)	387.17	376.83
Agrifound white	15.60 (4.01)	240.0	234.17
Agrifound Rose	11.67 (3.49)	240.67	231.83
S.Em±	**0.07**	**3.40**	**2.63**
CD@ 5%	**0.14**	**7.02**	**5.42**

Note: The data shows parenthesis square root transformed value

Similar study has been done by Chaurasia et al., (2007) who reported that two to three spray of Dithane M-45 @ 0.3% and Bavistin @ 0.3% was effective against purple blotch disease of garlic as well as increased yield. According to Gupta and Sharma (2017) soil application of *Ps. fluorescens* and foliar spray of Pyraclostrobin + Metiram was most effective for control of *Stemphylium* blight in garlic. Tebuconazole and procymidone have been reported to provide effective control of *stemphylium* leaf blight in garlic (Basallote-Ureba et al., 1971). Singh et. al., (2021) reported that some bio agents and botanicals were found most effective against foliar diseases of garlic. Gupta et. al., (1996) reported that *Stemphylium vesicarium* is one of the major destructive diseases of onion crop grown in the state of Maharashtra. Bio-efficacy of eight fungicides was evaluated *in vitro* against *Stemphylium vesicarium*. All the fungicides tested were found fungicidal against the pathogen and inhibited mycelial growth of the pathogen over untreated control. Srivastava et. al., (1996) reported that Chlorothalonil 75 WP, Difenconazole 25 EC, Thiophanate methyl 70 WP, Penconazole 10 EC and Hexaconazole 5 EC were promising for effective management of *Stemphylium* leaf blight of garlic. Jakhar et. al., (1996) reported that fungicide Mancozeb and Copper oxychloride have been most effective and economical fungicides against *stemphylium* blight and purple blotch disease *in vitro* as well as under *in vivo* conditions. Pandey et. al. (2022, 2023a and 2023b) reported that combined fungicides and alternative spray of bio agents as well as fungicides are more effective against *stemphylium* blight of onion and increased the bulb yield. The present study is in accordance with the reports by Kamal et al., (2017) was found alternative application of bio- pesticide (*Trichoderma harzianum)* and fungicide Metallaxyl 4.0% + Mancozeb 64.0% most effective for controlling of *Stemphylium* blight of onion. Ureba et al., (1998) found Tebuconazole effective in controlling garlic leaf spots. Bhatia and Chahal, (2014) reported that Tebuconazole 25.9EC, Propiconazole 25EC etc are effective in managing *stemphylium* blight in onion. Results of field trials by Gupta et al., (2021) showed that alternative spray of Paraclostrobin+ Metiram,

Trifloxistrobin + Tebuconazole, Zineb+ Hexaconazole and Carbendazim + Mancozeb were most effective in reducing *stemphylium* leaf blight, purple blotch as well as increased yield. Mishra et al., (2018) reported that 5 spray of difenaconazole as most effective for control of *stemphylium* blight as well as increased yield which is supporting the finding of the present study that 3 alternative sprays of different fungicides are providing the better *stemphylium* blight disease control. Gupta and Gupta, (2014) have also observed Propiconazole, Tebuconazole and Mancozeb as effective against *S.vesicarium* by increasing bulb yield in onion. Similar findings have been reported in case of Mancozeb against *S. vesicarium* in garlic (Kumar et al., 2011). Jhala, and Mali. (2017) reported that use of fungicides and botanicals and bio- pesticides can be best control of purple blotch disease in onion. These finding are also supported with our study that fungicide and bio-pesticides application for the management of *stemphylium* blight disease.

4. CONCLUSION

The data of two years trial conducted during *rabi,* 2022-23 and 2023-24 on onion revealed that in case of alterations in transplanting dates the best transplanting date of onion was recorded during 3rd week of December with lowest *stemphylium* blight intensity (9.83%) and highest yield (391.83 q/ha). In case of Fungicidal and bio agents control the lowest intensity (7.27%) with highest yield (399.17 q/ha) was reocorded in foliar spray of Tebuconazole50% + Trifloxystrobin 25% WG @ 0.15% at 45, 60 and 75 DAT while, in case of varietal screening the lowest *stemphylium* blight intensity (10.93%) as well as gross yield (397.0 q/ha) with marketable (383.83 q/ha) was recorded in variety NHRDF Red-4.

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 writing or editing of this manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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