



Management of purple blotch and Stemphylium blight of onion in Tarai and Bhabar regions of Uttarakhand, India

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Abstract: Purple blotch [*Alternaria porri*] (Ellis) Cif. and Stemphylium blight [*Stemphylium vesicarium*] (Wallr.) E. Simmons) of onion cause serious problems in onion seed crop in Tarai and Bhabar region of Uttarakhand. In present study different bio agents and fungicides have been evaluated *in vivo* against both the diseases. The severity of both purple blotch and Stemphylium blight varied in both Tarai and Bhabar region and even more pronounced in Tarai region than in Bhabar region. A correlation was observed in between the severity of both the diseases with the yield in seed crop. The minimum disease severity of purple blotch and stemphylium blight with the foliar spray of mancozeb (@ 0.3%) + monochrotophos (@ 0.05%) were observed 2.67% and 2.57% respectively with the total yield of seed was 1844.44 kg/ha over check 893.33 kg/ha in 2011. While with the foliar spray of neembicidine (@ 0.3%) disease severity of both the diseases were 5.57% and 4.78% respectively providing a yield of 1827.78kg/ha in seed crop of onion in 2011. Amongst the applied bio-agents, the foliar spray of *Trichoderma harzianum* (@ 1%) the disease severity of purple blotch and stemphylium blight were recorded 15.44% and 13.11% respectively which was found to be most effective in delaying the disease appearance and providing a yield of 1134.44kg/ha in 2011. However, all the treatments helped to reduce both the diseases in comparison with check.

Keywords: *Alternaria porri*, Bio-agents, Onion, Purple blotch, Stemphylium blight.

INTRODUCTION

Onion a member of Amaryllidaceae belongs to genus *Allium*. It (*Allium cepa* L.) is an extremely important vegetable crop not only for consumption but also as the highest foreign exchange earner among the vegetables. It has gained the importance of a cash crop rather than vegetable crop because of its very high export potential. The productivity of onion can be affected by number of factors including diseases. Wherever, diseases play an important role in reduction of production and quality. Seed is a basic and vital input and decides the commercial success of a crop variety. For the past few years purple blotch is spreading in epiphytotic proportions in areas wherever onion is being grown. The disease has international dimensions and has an epidemic form in the year 2013 in West Pokot, District Rift Valley, Kenya (Source: Business Daily, Kenya: Rift Valley, 2013). In India, the diseases caused by unseasonal rains have ruined almost 70 per cent of the *kharif* onion crop in Maharashtra in 2010, which is responsible for the nationwide shortage of the commodity (Shrivastava, 2010). The two important leaf blight diseases purple blotch and Stemphylium blight commonly affect onion crop in almost all onion growing pockets causing considerable damage to the crops (Mathur and Sharma, 2006). The plentiful harvest could be achieved only with seeds having quality stan-

dards of purity, germination, uniformity in weight and size apart from freedom from pest and diseases (Tomar and Negi, 2002).

Aveling *et al.* (1993) have also found that *S. vesicarium* in conjunction with *A. porri* has been reported as one of the destructive foliar and seed stalk pathogens of onion under warm and moist conditions. The low productivity of onion was attributed to infestation by onion thrips along with these pathogens. Gupta *et al.* (1994) found Stemphylium blight and purple blotch as diseases of national importance. Gupta and Pathak (1998) reported that the yield losses in both bulb and seed crop due to these diseases under favorable conditions may go upto 96% in India. Suheri and Price (2000) found *A. porri* and *S. vesicarium*, as potentially important pathogens of winter grown onion crops and found purple leaf blotch symptoms as a complex caused by both the pathogens. Thrips play an important role in enhancing crop losses and aggravate the disease incidence (Lawande *et al.*, 2011).

In Northern India, the purple blotch and Stemphylium blight are two most important diseases, which cause considerable losses in bulbs and seed crops in onion. Thrips are also known as important agents which aggravate the problem of purple blotch and Stemphylium blight, infection which again reduces the productivity. The injuries made by thrips are found to enhance the invasion of the fungus *A. porri*. Keeping in view the

problem of purple blotch and *Stemphylium* blight of onion in Tarai and Bhabar region of Uttarakhand causing enormous losses in seed production, the present study is undertaken to evaluate different bioagents and fungicides for the management of both purple blotch and *Stemphylium* blight of onion.

MATERIALS AND METHODS

Field trials were conducted both in tarai and bhabar region of Uttarakhand for two successive years (2009-10 and 2010-11) during Rabi season on onion seed crop following the Randomized Block Design [RBD] pattern with three replications and twelve treatments. Different bioagents and fungicides were evaluated for their field efficacy against purple blotch and *Stemphylium* blight of onion. The onion cultivar Agri found Dark Red susceptible to purple blotch was used for the experiment. The trial was conducted in an area of 32.5×9.5m. The plot size was maintained at 2×1.5m keeping row to row distance as 30 cm and plant to plant distance 25 cm in three rows @ 8 bulbs per row, and twenty four 24 bulbs per plot. A total of six foliar sprays of different treatments and dosages are given at 15 days interval starting first spray at 75 days after sowing (DAS) in seed crop (Table1).

The disease intensity for purple blotch and *Stemphylium* blight is rated using 0-5 scale (Sharma, 1986).

Rating number	Reaction description
0	No disease symptom
1	A few spots towards tip covering 10 percent leaf area
2	Several purplish brown patches covering upto 20 percent of leaf area
3	Several patches with paler outer zone covering upto 40 percent leaf area
4	Leaf streaks covering upto 75 percent leaf area or breaking of the leaves from center
5	Complete drying of the leaves or breaking of leaves from center

Percent Disease Index (PDI) was calculated using formula given by Wheeler (1969). The data were statistically analyzed.

$$PDI = \frac{\text{Total sum of numerical rating}}{\text{Number of observations}} \times \frac{100}{\text{Maximum disease rating}}$$

Yield kg/plant was recorded and percent increase in yield due to different treatment was calculated using following formula:

$$\text{Percent increase in yield} = \frac{\text{Yield in treatment} - \text{Yield in check plot}}{\text{Yield in check plot}} \times 100$$

Based on Percent Disease Index, the data of two years (2009-10 and 2010-11) on seed yield was pooled and analyzed for each treatment.

RESULTS AND DISCUSSION

Out of eleven treatments, six foliar spray of mancozeb @ (0.3%) + monochrotophos @ (0.05%) at fortnight interval was found to be the best and significantly superior in reducing diseases intensity and increasing the yield of onion seed crop followed by neembicidine and folicur. In this treatment lowest disease severity was recorded for purple blotch 10.90%, 4.67% and 6.33%, 2.67% and *Stemphylium* blight 17.45%, 5.78% and 4.57%, 2.57%, respectively in Tarai and Bhabar region during 2010 and 2011. In neembicidine (@ 0.03) treated plot the disease severity was observed for purple blotch 11.90%, 7.67% and 11.57%, 5.57% and *Stemphylium* blight 18.63%, 8.44% and 10.23%, 4.78%, respectively whereas in check the disease severity was recorded 71.33%, 57.33% and 59.57%, 47.90% for purple blotch and 82.00%, 72.57% and 53.00%, 38.57%, respectively for *Stemphylium* blight in Tarai and Bhabar region during the same year. The disease severity in folicur treated plot for purple blotch 16.23%, 10.23% and 12.90%, 10.00% and *Stemphylium* blight 21.90%, 12.11%, and 11.60%, 8.78% which was stastically at par. The foliar spray of mancozeb + monochrotophos resulted a highest yield of onion seed 1470 kg/ha, 1755.55kg/ha and 1790kg/ha, 1844.44kg/ha followed by neembicidine 1453.33kg/ha, 1694.68kg/ha and 1772.22kg/ha, 1827.78kg/ha and folicur 1436kg/ha, 1683kg/ha and 1735.56kg/ha, 1800kg/ha, respectively in Tarai and Bhabar region of Uttarakhand during 2009-2010 and 2010-2011. In check plot the yield of onion seed was recorded 280kg/ha, 404.87kg/ha and 873.33kg/ha, 893.33kg/ha in Tarai and Bhabar during the both consecutive years. It seems that monochrotophos and neembicidine when used either alone or in combination with fungicides reduce the thrips population, which by way of injury to the plant, helped the fungi to invade and increased the diseases severity. Sprays of mancozeb + carbendazim, carbendazim and iprobenfos were found ineffective in management of both purple blotch and *Stemphylium* blight. The highest disease severity and lowest yield was recorded in control plot as listed (Tables 1 and 2).

The results are in the conformity with Vijaya and Rahman (2004) who observed the foliar spray of mancozeb (@ 0.3%) with monochrotophos (@ 0.05%) was the best treatment and recorded the least diseases incidence and the highest yield. Borkar and Patil (1995) observed that mancozeb reduced the disease intensity by 6% whereas the yield was increased by 10.99% and also had a higher cost: benefit ratio than the other fungicides used. Schwartz and Mohan (1995) found that foliar application of folicur, mancozeb, strobilurin fungicides were effective for the management of purple blotch of onion. Wickramaarachchi *et al.* (2004) also found folicur (@ of 3.5 ml/10l) to be an effective fungicides in reducing both the diseases and increasing yield. In the present study, the performance of fungicides in reducing disease severity and increasing seed

Table 1. Effect of different fungicides and bio control agent on the severity of disease Purple blotch and Stemphylium blight (2009-10 and 2010-11).

S. N.	Treatments	Doses of foliar spray (%)	Disease severity of Purple blotch (%)				Disease severity of Stemphylium blight (%)			
			Tarai region		Bhabar region		Tarai region		Bhabar region	
			2010	2011	2010	2011	2010	2011	2010	2011
1	<i>Pseudomonas flouresence</i>	1	25.33	19.44	24.44	19.11	33.44	24.33	19.90	16.44
2	<i>Trichoderma harzianum</i>	1	21.11	15.93	20.33	15.44	28.00	20.33	17.23	13.11
3	<i>P. flouresence</i> + <i>T. harzianum</i>	1	37.00	28.90	27.90	22.44	46.66	32.00	24.57	20.67
4	Iprobenfos	0.10	43.11	39.23	40.33	31.90	53.33	45.00	34.57	25.44
5	Copperoxychloride	0.30	38.57	30.00	36.57	22.11	47.00	38.00	30.23	18.00
6	Mancozeb	0.20	31.23	22.33	26.57	18.33	40.00	32.67	24.23	15.33
7	Carbendazim	0.10	47.23	41.23	45.67	33.67	57.66	48.33	43.00	26.00
8	Mancozeb + Carbendazim	0.20	52.23	47.00	51.23	36.23	59.66	52.67	48.90	31.33
9	Monochrotophos + Mancozeb	0.3+0.05	10.90	4.67	6.33	2.67	17.45	5.78	4.57	2.57
10	Tebuconazole	0.10	16.23	10.23	12.90	10.00	21.90	12.11	11.60	8.78
11	Neembidine	0.03	11.90	7.67	11.57	5.57	18.63	8.44	10.23	4.780
12	Control	Water	71.33	57.33	59.57	47.90	82.00	72.57	53.00	38.57
Mean			33.84	26.99	30.28	22.11	42.14	32.69	26.83	18.41
CD(P=0.05)			6.97	4.08	5.28	7.48	9.82	7.91	7.73	4.84
CV			12.23	9.06	10.22	19.52	13.75	14.28	17.01	15.32

Data based on means of three replications

Table 2. Effect of foliar spray of fungicides and biocontrol agents on the yield of onion seed crop 2009-10 and 2010-11.

S. N.	Treatments	Doses of foliar spray (%)	Yield (kg/ha)			
			Tarai region		Bhabar region	
			2010	2011	2010	2011
1	<i>Pseudomonas flouresence</i>	1%	800.11	831.47	1062.22	1116.67
2	<i>Trichoderma harzianum</i>	1%	842.22	860.12	1073.33	1134.44
3	<i>P. flouresence</i> + <i>T.harzianum</i>	1%	503.33	527.99	1001.11	1056.67
4	Iprobenfos	0.10%	563.33	587.67	1016.67	1062.22
5	Copperoxychloride	0.30%	494.44	502.46	927.78	1024.44
6	Mancozeb	0.20%	626.67	671.67	1116.67	1204.44
7	Carbendazim	0.10%	470.00	496.15	918.89	1003.33
8	Mancozeb + Carbendazim	0.20%	336.67	492.91	901.11	906.67
9	Monochrotophos + Mancozeb	0.3%+0.05%	1470.00	1755.00	1790.00	1844.44
10	Tebuconazole	0.10%	1436.67	1683.12	1735.56	1800.00
11	Neembidine	0.30%	1453.33	1694.68	1772.22	1827.78
12	Control	Water	280.00	404.87	873.33	893.33
Mean			773.11	875.69	1182.41	1239.54
CD(P=0.05)			59.74	61.24	87.18	152.45
CV			4.55	4.15	4.35	7.26

Data based on means of three replications.

production has been shown in Tables 1 and 2. Among the bioagents, *T. harzianum* @ (1%) was found to be effective in delaying diseases severity with optimum yield (1134.44kg/ha) over check (893.33kg/ha). Similar results on antifungal activity of bioagents has been reported against *A. porri* and *S. vesicarium* by Vannaci and Harman (1987); Sharma (2012); Shahnaz *et al.* (2013). Researcher revealed that among bio-control agents *T. harzianum* was the most effective against *A. porri*. This indicates the foliar spray of bioagents is an important approaches for successful disease management in onion. Bio- control agents *T. harzianum*, *Ps. fluorescence* and their combination gave higher level of disease reduction as compared to many other fungicides used (Table-1). The foliar spray of neembidine was also effective next to mancozeb +

monochrotophos in reducing the diseases severity as well as thrips population with increased yield 1827.78 kg/ha as compared to check (Table 1). Our results were more similar to Nemane *et al.* (2001); Singh *et al.* (2010) that the neem based bio-pesticides were useful in the management of onion thrips. Bandi and Sivasubramanian (2012) suggested the foliar application of *Ps. fluorescens* to enhance the activity of defense related enzymes which are involved in the production of phytoalexins and phenolics in onion plant and induce plant resistance against *T. tabaci*. It was also observed that among both the diseases, the crop of Tarai region was more pronounced than Bhabar region and might be correlated with the environmental conditions at both the places. The present study indicates that suitable integration of more efficient

treatments like fungicides, bioagents in combination with bio-insecticides and insecticides, may provide a better management of the purple blotch and Stemphylium blight of onion (Table 1).

Conclusion

For the management of diseases the combination of mancozeb + monochrotophos (@ 0.3% + 0.05% respectively), proved to be the most effective among all fungicidal treatments as gave the highest yield of onion seed 1844.44kg/ha followed by neembicidine 1827.78 kg/ha, folicur 1800kg/ha and *T. harzianum* 1134.44 kg/ha, respectively as compared to check 893.33kg/ha. However, in integrated approach of diseases management under organic crop production, bio-insecticide (neembicidine) and bio-control agent (*T. harzianum*) may be looked upon as promising alternative for the management of purple blotch and stemphylium blight of onion.

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