Int.J.Curr.Microbiol.App.Sci (2020) *9*(4): 1970-1976

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 4 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.904.235

Efficacy of Novel Fungicides against Purple Blotch in Onion (*Allium cepa* L.) in the Western Undulating Zone of Odisha, India

Niranjan Mandi*, Bhabani Shankar Nayak, Bibhuti Bhusan Sahoo, Ganesh Prasad and Chandramani Khanda

All India Coordinated Research Project on Cotton, Regional Research and Technology Transfer Station (OUAT), Bhawanipatna, Kalahandi, Odisha-766001, India

**Corresponding author*

Keywords

Onion, Purple blotch, Bulb yield, Fungicide, Percentage Diseases Index (PDI)

Article Info

Accepted:
15 March 2020
Available Online:
10 April 2020

ABSTRACT

A field experiment was conducted to assess the effect of novel fungicides against the purple blotch disease in onion during *Rabi* 2016-17 and 2017-18 at the Regional Research and Technology Transfer Station (OUAT), Bhawanipatna in the Western Undulating Zone of Odisha. The experiment was laid out in randomized block design with eight treatments in three replications. The treatment combinations consist of seed treating chemical (Vitavax power) along with the new fungicides against the purple blotch in onion. The percentage diseases index (PDI) of purple blotch in onion varied from 28.67% to 65.33%. Seed treatment with Vitavax power @ 0.2% along with foliar application of Tebuconazol 25 EC @ 1 ml l^{-1} was most effective in reducing the PDI (28.67 %) which was at par with Azoxystrobin 23 SC @ 1 ml l^{-1} with PDI of 31.33 %. Similarly, application of Difenoconazole 25 EC @ 0.6 ml l^{-1} with PDI of 41.33% was followed by Mancozeb 75 WG @ 2.5 g l^{-1} with PDI of 43.33% as compared to control (65.33 %). Maximum disease control was recorded in Tebuconazol 25 EC @ 1 ml l^{-1} with PDC of 56.12% which was followed by Azoxystrobin 23SC @ 1ml l^{-1} with 52.04%, Difenoconazole 25EC @ 0.6 ml l^{-1} with 36.74%. Maximum bulb yield (145.8 q ha^{-1}) was recorded in Tebuconazol 25 EC @ 1 ml l^{-1} which was statistically at par with Azoxystrobin 23 SC @ 1ml l^{-1} with 143.3 q ha^{-1}. The minimum bulb yield of 76.1 q ha^{-1} was recorded in control plot. The increase in bulb yield in Tebuconazol 25 EC @ 1 ml l^{-1} was 91.59 % over the control. Tebuconazol 25 EC @ 1 ml l^{-1} recorded the maximum B:C ratio (3.22) followed by Azoxystrobin 23 SC @ 1ml l^{-1} with 3.14.

Introduction

Onion (*Allium cepa* L.) is one of the most important horticultural crops grown worldwide and typically used as a spicy ingredient of both vegetarian and non-vegetarian dishes. The therapeutic uses of onion add value to its importance. The total area under onion in the world was 5.04 million ha with a production of 96.8 million tonnes and productivity of 19.2 tonnes ha^{-1}, whereas in India the area under this crop was 1.31 million ha with a production of 22.1 million tonnes and productivity of 16.87

tonnes ha^{-1} (FAOSTAT, 2018). During the year 2013-14, the area under onion in Odisha was 0.035 million ha with a production of 0.43 million tonnes and productivity of 12.28 tonnes ha^{-1} (Odisha Agriculture Statistics, 2013-14). Hence, there is a wide gap in productivity of this crop in Odisha as compared to the country and the world. This efficiency of onion production is mostly dependent upon the adequate agronomic practices and plant protection measures adopted during the cropping season. Schwartz and Mohan, 2008 documented that the decrease in yield in onion is caused by around 66 diseases. According to Gupta *et al.*, (1994), 36 diseases are prevailing in India including 29 fungal, 3 viral and 4 bacterial diseases. Diseases like purple blotch, *Stemphylium*-blight and anthracnose are the most important bottlenecks for commercial cultivation of onion. Yadav *et al*., 2013 reported that around 80% yield loss of onion in India is caused by purple blotch disease *Alternaria porri* (Ellis) Cif. Seed treatment with fungicides like cabendazim, mancozeb, thiram and vitavax is one of the most important practices adopted as a precaution measure to protect the crop from fungal infection in the very early stage of the crop growth. Apart from that foliar spray of fungicides like Mancozeb, Difenoconazole, Hexaconazole, Propiconazole, Tebuconazole and Azoxystrobin is the cheapest tool to protect the crop from this disease. But very often it has been observed that the favorable environment promote the fungal growth and the injudicious application of plant protection chemicals increase the production cost. In such cases, the occurrence of diseases may be due to the presence of host-pathogen in seeds as well as in soil. Hence, seed treatment is important to protect the crop. Keeping this in mind the present experiment was conducted to find out the efficacy of fungicides for the control of purple blotch disease in onion.

Materials and Methods

The field experiment was conducted to assess the effect of novel fungicides against the purple blotch disease of onion during *rabi* 2016-17 and 2017-18 at the Regional Research and Technology Transfer Station (OUAT), Bhawanipatna, in the western undulating zone of Odisha. The experiment was laid out in randomized block design having eight treatment combinations including control in three replications. The details of the treatment combinations are as follows:

T_1: Seed treatment with Vitavax power @ 0.2%.
T_2: Seed treatment with Vitavax power @ 0.2% + Azoxystrobin 23 SC @ 1ml l^{-1}
T_3: Seed treatment with Vitavax power @ 0.2% + Tebuconazole 25 EC @ 1ml l^{-1}
T_4: Seed treatment with Vitavax power @ 0.2% + Propiconazole 25 EC @1ml l^{-1}
T_5: Seed treatment with Vitavax power @ 0.2% + Hexaconazole 5 EC @ 2 ml l^{-1}
T_6: Seed treatment with Vitavax power @0.2% + Difenoconazole 25 EC @ 0.6 ml l^{-1}
T_7: Seed treatment with Vitavax power @ 0.2% + Mancozeb 75 WP @ 2.5 g l^{-1}
T_8: Control (No chemical treatment)

Seedlings were raised in well prepared nursery bed. Eight weeks old seedlings of variety N-53 were manually transplanted with a spacing of 15 cm x 10 cm. Soon after transplanting, light irrigation was provided for the quick establishment of the seedlings. All other recommended package of practices were uniformly adopted to obtain the maximum bulb yield as per the treatment. The rainfall received during the crop season during the year 2016-17 and 2017-18 was 89.0 mm and 27.4 mm, the mean maximum was 35.5 and 33.2 ^{0}C and the mean minimum temperature was 17.3 and 17.9 ^{0}C and the mean maximum was 65.4% and 54.8 % and the mean minimum relative humidity was 48.4% and 45.6%, respectively. Three sprays of different chemicals as per the treatment were given at 10 days interval starting from appearance of the disease. Observations on percentage disease index (PDI) were recorded from 10 randomly selected plants by using 0-5 point scale derived by Shrama, 1986. The details of the 0-5 point scale are as follows.

0- No disease symptom

1- A few spots towards the tip covering less than 10% of the leaf area.
2- Several dark purplish-brown patches covering less than 20% of leaf area.
3- Several patches with paler outer zone covering up to 40% of leaf area.
4- Long streak covering up to 75% of leaf area or breaking of the leaves from the center.
5- Complete drying of the leaves or breaking of the leaves from the base.

PDI was calculated using the following formula derived by Wheeler (1969). The percentage value was transformed and subjected to statistical analysis.

PDI =

$$\frac{\text{Sum of the individual disease ratings}}{\text{Total number of plants assessed} \times \text{Maximum disease rating}} \times 100$$

The percentage of disease control (PDC) was calculated by using the following formula given by Chester, 1959.

PDC =

$$\frac{\text{PDI in control plot} - \text{PDI in treated plot}}{\text{PDI in control plot}} \times 100$$

Results and Discussion

The data presented in Table-1 and depicted in Figure 1 revealed that all the fungicidal treatments were significantly superior to the untreated check (control) in reducing the disease severity and increasing the bulb yield.

There was significant variation in PDI, PDC and bulb yield in onion due to the effect of seed treatment with vitavax power and the foliar application of different fungicides. The PDI of purple blotch in onion varied from 28.67% to 65.33%. Seed treatments with vitavax power @ 0.2% were uniformly adopted in all treatment combinations except the control, which expressed its considerable effect to control the disease incidence during the cropping period. However, the variation in PDI was due to the effect of different fungicides as foliar spray.

Foliar application of Tebuconazol 25 EC @ 1 ml l^{-1} was most effective in reducing the PDI (28.67 %) which was at par with application of Azoxystrobin 23SC @ 1ml l^{-1} with 31.33 % PDI. Application of Difenoconazole 25 EC @ 0.6 ml l^{-1} resulted in PDI of 41.33%, which was followed by Mancozeb 75 WG @ 2.5 g l^{-1} with 43.33% and Propiconazole 25 EC @ 1 ml l^{-1} with 44.00 % as compared to control with a PDI of 65.33 %. Maximum disease control was recorded in plots treated with Tebuconazol 25 EC @ 1 ml l^{-1} with PDC of 56.12%, which was followed by Azoxystrobin 23 SC @ 1ml l^{-1} (52.04%), Difenoconazole 25 EC @ 0.6 ml l^{-1} (36.74%) and Mancozeb 75 WP @ 2.5 g l^{-1} (33.17%).

The yield data revealed that there was significant effect of fungicidal treatments on bulb yield (Table 1).

Table.1 Effect on different fungicides on purple blotch in onion under western undulating zone of Odisha (Pooled data of two years)

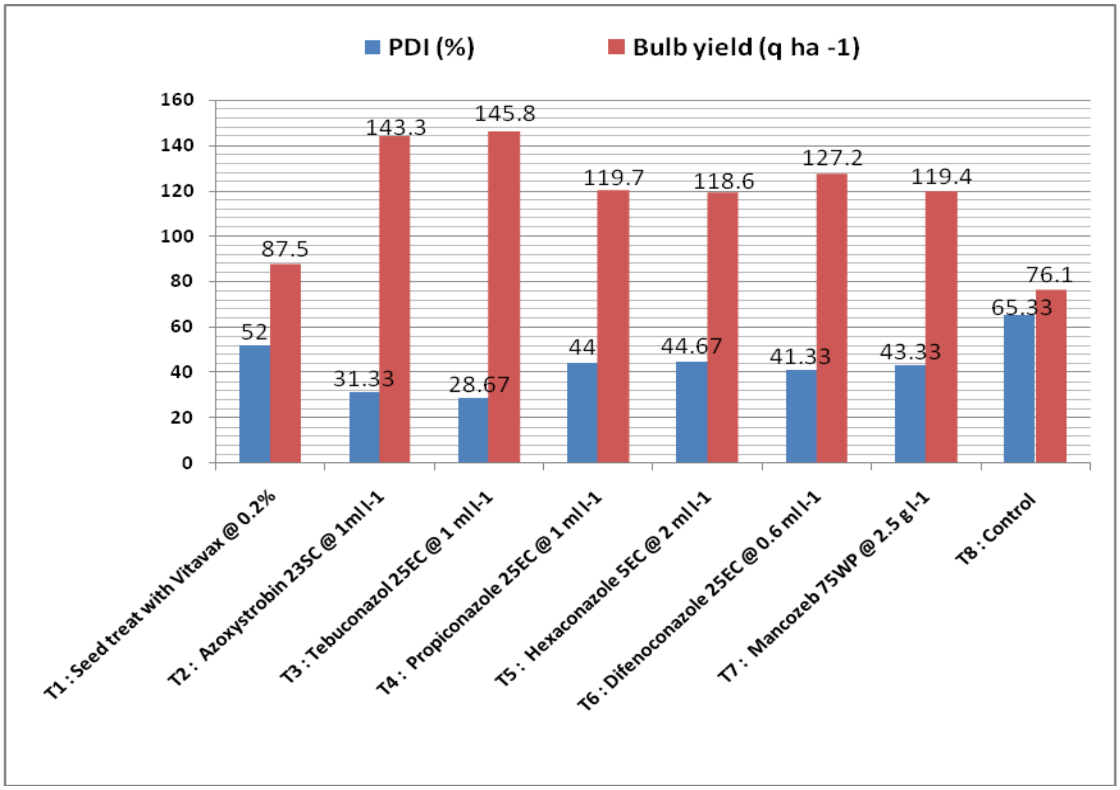
Treatment	Percent Disease Index (PDI)	Percent Disease Control (PDC)	Total bulb Yield (q ha^{-1})	Increase in bulb yield over control (%)
T_1 : Seed treatment with Vitavax power @ 0.2%	52.00 *(46.14)	20.40	87.5	14.98
T_2 : Seed treatment with Vitavax power @ 0.2% + Azoxystrobin 23SC @ 1ml l^{-1}	31.33 (33.99)	52.04	143.3	88.30
T_3 : Seed treatment with Vitavax power @ 0.2% + Tebuconazol 25EC @ 1 ml l^{-1}	28.67 (32.37)	56.12	145.8	91.59
T_4 : Seed treatment with Vitavax power @ 0.2% + Propiconazole 25EC @ 1 ml l^{-1}	44.00 (41.54)	32.65	119.7	57.29
T_5 : Seed treatment with Vitavax power @ 0.2% + Hexaconazole 5EC @ 2 ml l^{-1}	44.67 (41.93)	31.62	118.6	55.85
T_6 : Seed treatment with Vitavax power @ 0.2% + Difenoconazole 25EC @ 0.6 ml l^{-1}	41.33 (40.00)	36.74	127.2	67.19
T_7 : Seed treatment with Vitavax power @ 0.2% + Mancozeb 75WP @ 2.5 g l^{-1}	43.33 (41.14)	33.17	119.4	56.90
T_8 : Control (No chemical treatment)	65.33 (53.96)	-	76.1	-
SE(m)$\pm$	**2.41**	**-**	**7.04**	**-**
CD @ 5%	**4.97**	**-**	**14.5**	**-**

*Figure in parenthesis represent percent disease index in angular transformed value

Table.2 Economics of different fungicidal treatments

Treatment	Cost of cultivation (Rs.)	Gross return (Rs.)	Net return (Rs.)	B:C ratio
T_1 : Seed treatment with Vitavax power @ 0.2%	82000	175000	93000	2.13
T_2 : Seed treatment with Vitavax power @ 0.2% + Azoxystrobin 23SC @ 1ml l^{-1}	91200	286600	195400	3.14
T_3 : Seed treatment with Vitavax power @ 0.2% + Tebuconazol 25EC @ 1 ml l^{-1}	90500	291600	201100	3.22
T_4 : Seed treatment with Vitavax power @ 0.2% + Propiconazole 25EC @ 1 ml l^{-1}	88000	239400	151400	2.72
T_5 : Seed treatment with Vitavax power @ 0.2% + Hexaconazole 5EC @ 2 ml l^{-1}	87300	237200	149900	2.71
T_6 : Seed treatment with Vitavax power @ 0.2% + Difenoconazole 25EC @ 0.6 ml l^{-1}	90300	254400	164100	2.82
T_7 : Seed treatment with Vitavax power @ 0.2% + Mancozeb 75WP @ 2.5 g l^{-1}	85200	238800	153600	2.80
T_8 : Control (No chemical treatment)	80000	152000	72000	1.90

Fig.1 Efficacy of fungicides on bulb yield and percentage diseases index in onion (Pooled data for two years)



Maximum bulb yield of 145.8 q ha^{-1} was recorded in plots treated with Tebuconazol 25 EC @ 1 ml l^{-1}, which was statistically at par with Azoxystrobin 23 SC @ 1ml l^{-1} having bulb yield of 143.3 q ha^{-1}. The minimum bulb yield of 76.1 q ha^{-1} was recorded in control plot. The increase in bulb yield in Tebuconazol 25EC @ 1 ml l^{-1} treated plot was 91.59 % over the control.

The present findings are in agreement with the observation made by Arunkumar *et al.,* (2016) who reported that application of 0.1% Tebuconazole 25EC and 0.1% Azoxystrobin 23SC is very effective in managing purple blotch disease of onion. Excellent performance of Tebuconazole 25 EC in controlling purple blotch disease of onion was reported earlier by Yadav *et al.,* (2017), Aujila *et al.,* (2013), Aujila *et al.,* (2010), Deshmukh *et al.,* (2007) and Bhatia and Chahal (2014). Bachkar *et al.,* (2018) reported that Azoxystrobin 25SC and Tebuconazole 25EC are most effective fungicides against purple blotch disease of onion. Similarly, the present findings are in agreement with the results reported by Gupta *et al.,* (2012) who observed that systemic fungicides Tebuconazole 25% EC at 0.1% and Azoxystrobin 23 EC at 0.15% effectively controlled purple blotch disease of Garlic.

The data on economics of different treatments (Table 2) revealed that higher net returns of Rs. 2,01,100 ha^{-1} in the treatment Tebuconazol 25 EC @ 1 ml l^{-1} was recorded which was followed by Azoxystrobin 23 SC @ 1ml l^{-1} (Rs. 1,95,400 ha^{-1}). Application of Tebuconazol 25 EC@ 1 ml l^{-1} recorded the maximum B:C ratio (3.22) followed by Azoxystrobin 23 SC @ 1 ml l^{-1} with 3.14.

It can be concluded from the two years experiment that the purple blotch disease of onion can be effectively and economically controlled with use of seed treating chemicals like vitavax powder @ 0.2% along with the foliar spray of Tebuconazol 25 EC @ 1 ml l^{-1}. This treatment recorded maximum bulb yield of 145.8 q ha^{-1} which was 91.59 % more than the untreated plot (76.1 q ha^{-1}).

Acknowledgement

We gratefully acknowledge the Orissa University of Agriculture and Technology, Odisha, India for the research facilities provided to carry out the experiment.

References

Anonymous. 2013. Odisha Agriculture Statistics, Director of Agriculture and Food Production, Odisha. pp. 70.

Arunkumar, K.T., Satyanarayan, C. and Anandkumar, V. 2016. Varietal reaction of onion cultivars against *Alternaria porri* causing purple blotch and its management. The Bioscan. 11(4): 2925-2929.

Aujila, I.S., Amrate, P.K., Kumar, P. and Thind, T.S. 2013. Efficacy of some new fungicides in controlling purple blotch of onion under Punjab condition. Plant Disease Research. 28: 171-173.

Aujila, I.S., Goswami, S., Thind, T.S., Raheja, S. and Kumar, P. 2010. Relative effectiveness of fungicides in controlling purple blotch of onion seed crop. Plant Disease Research. 25:73-74.

Bachkar, C.B., Bhalekar, M.N. and Pawar, S.A. 2018. Control of *Alternaria porri* causing purple blotch of onion during *Kharif* season. J. Allium Research. 1(1):57-59.

Bhatia, J.N. and Chahal, D. 2014. Studies on effectiveness of certain new fungicides in controlling Stemphylium blight of onion seed crop. Agric. Sci. Digest. 34:237-239. DOI: 10.5958/0976-0547.2014.01011.8

Deshmukh, V.S., Dhruj, I.U. and Chavan,

R.V. 2007. Chemical control of purple blotch (*Alternaria porri*) (Ellis) Cif. of onion. Plant Disease Research. 22: 34-36.

FAOSTAT, 2018. Website (*http://faostat3.fao.org/home/E*) accessed on 13th January, 2019.

Gupta, R.P., Srivastava, K.J. and Pandey, U.B. 1994. Diseases and insect pests of onion in India. Acta Horticulture. 358: 365-369.

Gupta, R.C., Pandey, N.K. and Gupta, R.P. 2012. Management of purple blotch (*Alternaria porri*) disease of garlic (*Allium sativum* L.) In: Abstract, IV National symposium on plant protection in horticultural crops: Emerging challenges and sustainable pest management organized at Indian Institute of Horticultural Research, Bengaluru held on 25-28 April, pp. 115.

Schwartz, H.F. and Mohan, S.K. 2008. Compendium of Onion and Garlic Diseases and pests. IInd Ed. APS Press. St. Paul. MN. USA.

Sharma, S.R. 1986. Effect of fungicidal sprays on purple blotch and bulb yield of onion. Indian Phytopath. 39 (1): 78–82.

Wheeler, B.E.J. 1969. An introduction to plant diseases. John Willey and Sons Ltd. London, 301.

Yadav, P.M., Rakholiya, K.B. and Pawar, D.M. 2013. Evaluation of bio agents for management of the onion purple blotch and bulb yield loss assessment under field conditions. The Bioscan 8(4):1295-98.

Yadav, R.K., Singh, A., Jain, S. and Dhatt, A.S. 2017. Management of purple blotch complex of onion in Indian Punjab. Int. J. Appl. Sci. Biotechnol. Vol 5(4): 554-565.

How to cite this article:

Niranjan Mandi, Bhabani Shankar Nayak, Bibhuti Bhusan Sahoo, Ganesh Prasad and Chandramani Khanda. 2020. Efficacy of Novel Fungicides against Purple Blotch in Onion (*Allium cepa* L.) in the Western Undulating Zone of Odisha, India. *Int.J.Curr.Microbiol.App.Sci.* 9(04): 1970-1976. doi: https://doi.org/10.20546/ijcmas.2020.904.235