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Evaluation of Chemicals against Purple Blotch of Onion caused by *Alternaria porri* for Seed Production

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A B S T R A C T

A present investigation for the management of purple blotch of onion (*Allium cepa*) was carried out at Department of Plant Pathology and Department of Vegetable Science, College of Horticulture, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola during 2018-19. In the experiment among the different treatments, treatment (T9) *i.e.* bulb dip (Copper oxychloride @ 0.25% + Streptomycin @ 200 ppm) + spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10% + Copper oxychloride@ 0.25%) treatment recorded lowest per cent disease intensity *i.e.* 15 per cent and it showed highest per cent disease control *i.e.* 55.13 per cent and followed by treatment (T6) *i.e.* spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10% + Copper oxychloride @ 0.25%). The maximum seed yield obtained in treatment T9 i.e.1022 kg/ha which was found significantly superior over rest of the treatments and followed by T7 bulb dip (Copper oxychloride @ 0.25% + Streptomycin 200ppm) + spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10%) i.e. 1003 kg/ha. Different chemical treatments effectively controlled the onion purple blotch with increased seed yield over control in the range of 26.62 % to 68.98 %.

Introduction

Onion (*Allium cepa* L.) is one of the oldest bulb crops belongs to Amaryllidaceae family. The genus *Allium* comprises over 700 species which can be found throughout the tropical, temperate and sub-temperate regions of the world (Fritsch and Friesen, 2002). There are five important species of *Allium* of which the onion (*Allium cepa*) is the major cultivated species grown all over the world. According to Vavilov (1951) the primary center of origin lies in central Asia.

Among vegetables, onion often called as "queen of kitchen" it is one of the oldest known and an important crop. Onion a bulbous, biennial herb, is one of the most important vegetable crop grown throughout world and in India. India is a traditional producer and assumes second global position in onion production with 19.40 million tones (mt) from 1.20 million hectares (mha) area (Anon, 2015). It is cultivated round the year throughout the country. The major onion growing states in India are Maharashtra (30%), Karnataka (11%), Gujarat (10%), Bihar (7%), Madhya Pradesh (15%), Andhra Pradesh (5%), Rajasthan (4%), Haryana (3%) and others (15%) (Anon, 2015).

Even though India ranks first in area, but second in world production and productivity is low (14.2 t/ha) as against the world productivity of 17.47 t/ha (Anon, 2011). Several factors have been identified for the low productivity of onion in India. Among several factors, diseases are the most important, especially numerous foliar, bulb and root pathogens that not only reduce the yield of onion. But also pose harmful effects during harvesting, post harvesting, processing and marketing stages, which lower the quality and export potential of the crop that significantly causes the economic loss. Among the diseases, purple blotch (*Alternaria porri*) are the most destructive disease, commonly prevailing in almost all onion growing pockets of the India, which causes heavy loss in onions under field conditions as well as in storage. Now days, this disease threaten to the onion seed and bulb production in India.

The purple blotch disease affects both aerial and underground parts in the field conditions (Ahmed and Hossain, 1985). It causes reduction in leaf production by 62-92% (Utikar and Padule, 1980), bulb yield by 59% (Gupta and Pathak, 1988) and seed yield by 97%. The yield loss of onion in India due to this disease under favorable conditions varies from 5.0 to 96.5 per cent (Gupta and Pathak, 1988). All these factors have led to a new dimension in research management of purple blotch of onion. In this context, the present investigation was undertaken to find out the effectiveness different fungicide and bactericide against the purple blotch of onion.

Materials and Methods

The present investigation was conducted during 2018-2019 at the Department of Plant Pathology and Department of Vegetable Science, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola.

Isolation, purification and maintenance of pathogen

Isolation of the *A. porri* was made from the diseased leaves collected from naturally infected onion field. The diseased leaves were washed under running water to remove excess dust but avoided breaking the leaves, then the typical diseased spots on leaves were selected and cut into small bits (1 to 1.5 mm) with the help of a sterilized blade. These bits of diseased tissues were washed with sterilized distilled water and disinfected with 0.1 per cent sodium hypochlorite solution for 30 to 60 seconds. These disinfected bits were immediately washed thrice with sterilized distilled water to remove the excess of sodium hypochlorite, then these bits were placed on the surface of Petri-plates containing potato dextrose agar (PDA) and incubated in BOD at 27 ± 1°C for 10 days. Growth of organism was observed regularly and after 10 days subculture to obtain the pure culture. All these operations were performed under the aseptic condition.

The resulting fungus culture was purified by hyphal tip technique in PDA slant. The pathogen was sub cultured on PDA slants and allowed to grow at 27 ± 1°C for 10 days and such slants were preserved in a refrigerator at 4°C and renewed once in 30 days.

Cultural and morphological characterization of the pathogen

The observation on colony appearance and growth of the pathogen were recorded for ten consecutive days. Ten days old culture of fungus was used for morphological characterization and confirmation of identity of isolated pathogen. Identification of the fungus was made after examining conidia under microscope (400x magnification) from mature pure culture of the fungus obtained from infected leaves of onion. Stage and

ocular micrometer were used to measure the length, breadth, beak length and number of septa of the fungus. The average length and breadth of the conidial body, beak and septal number were recorded. These observations were compared with those of the standard measurements given by Ellis (1971) to identify the pathogen.

In-*vivo* evaluation of chemicals against *A. porri*.

The experiment was laid in Completely Randomized Block Design. The field trial laid in RBD with three replications during *rabi* season by using Akola Safed variety. The crop was planted on a plot (size 2.70 x 3.00 mt) and spacing 45 x 30 cm the first spraying was done immediately after initiation of disease symptoms i.e. at 90 DAP. The spraying of all treatment was undertaken at a 15 days interval.

One plot per replication was maintained as unsprayed control without receiving any chemical. Per cent disease intensity was recorded for each treatment after spray at 15 days interval up to the harvesting and workout the per cent disease intensity over the control. The observation on leaf spot infection were recorded at 90 DAP and continue up to harvesting at 15 days interval by selecting two leaves each from top, middle and lower portion of the plant. The observations were recorded on the basis of 0-5 scale (Sharma, 1986) and mentioned in Table 1.

The rating scales or grades are utilized for the calculation of PDI using the following formula (Wheeler, 1969) (Fig. 3).

$$\text{Percent Disease Intensity (PDI)} = \frac{\sum \text{of all numerical ratings}}{\text{Total number of leaves examined} \times \text{Maximum ratings}} \times 100$$

Seed yield (kg/plot)

Seed yield was recorded from each plot. Seed weighed properly and converted to kg/ha.

Results and Discussion

Effect of different chemical treatments on purple blotch intensity of onion

The data presented in Table 2 and Fig. 1 indicated that treatment (T9) bulb dip (Copper oxychloride @ 0.25% + Streptomycin @ 200 ppm) + spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10% + Copper oxychloride @ 0.25%) recorded lowest per cent disease intensity i.e. 15 per cent and it showed highest percent disease control i.e. 55.13 per cent, which was at par with the treatments *viz*., (T6) spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10% + Copper oxychloride @ 0.25%), (T7) bulb dip(Copper oxychloride @ 0.25% + Streptomycin @ 200 ppm) +spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10%) and (T4) spraying with (Mancozeb @ 0.25% + Carbendazim @ 0.10%) showed 15.10%, 16.03%, 16.57% disease intensity and 54.83%, 52.04%, 50.43% per cent disease control respectively.

Followed by (T8) bulb dip (Copper oxychloride @ 0.25% + Streptomycin @ 200 ppm) + spraying with (Copper oxychloride@ 0.25%) 18.00% disease intensity and 46.15% disease control. The treatments (T1) Copper oxychloride@ 0.25%, (T2) Streptomycin @ 200 ppm and (T3) Copper oxychloride @ 0.25% + Streptomycin @ 200 ppm have only bulb dip treatment at the time of planting and they did not show considerable effect on intensity of purple blotch. The highest intensity 33.43% was recorded in control.

Table.1 Disease rating scale

Grade	Description
0	No infection
1	A few spots towards tip covering 10 per cent leaf area.
2	Several dark purplish brown patches covering up to 20 per cent leaf area.
3	Several patches with paler outer zone covering up to 40 per cent leaf area.
4	Leaf streaks covering up to 75 per cent leaf area or breaking of the leaves from center.
5	Complete drying of the leaves or breaking of the leaves from center.

Table.2a Effect of different chemical treatments on purple blotch intensity of onion under field condition

Tre. No.	Treatment Name	Conc.	Before spraying	15 days after spraying	
			Per cent disease intensity at 90 DAP	Per cent disease intensity at 105 DAP	Per cent disease control
	Bulb dip				
T_1	Copper oxychloride	0.25%	6.30 (2.61)*	17.00 (4.18)	0.00
T_2	Streptomycin	200 ppm	5.00 (2.34)	15.77 (4.03)	7.23
T_3	Copper oxychloride + Streptomycin	0.25% + 200 ppm	6.20 (2.59)	16.37 (4.11)	3.70
	Spraying				
T_4	Mancozeb + Carbendazim	0.25% + 0.10%	6.33 (2.61)	9.17 (3.11)	46.05
T_5	Copper oxychloride	0.25%	5.50 (2.45)	10.63 (3.34)	37.47
T_6	Mancozeb + Carbendazim + Copper oxychloride	0.25% + 0.10% + 0.25%	5.73 (2.50)	8.20 (2.95)	51.76
	Bulb dip + Spraying				
T_7	Bulb dip(Copper oxychloride + Streptomycin) +Spraying (Mancozeb + Carbendazim)	0.25% + 200 ppm + 0.25% + 0.10%	5.57 (2.46)	9.03 (3.09)	46.88
T_8	Bulb dip(Copper oxychloride + Streptomycin) + Spraying (Copper oxychloride)	0.25% + 200 ppm + 0.25%	6.03 (2.55)	10.93 (3.38)	35.70
T_9	Bulb dip(Copper oxychloride + Streptomycin) + Spraying (Mancozeb + Carbendazim + Copper oxychloride)	0.25% + 200 ppm + 0.25% + 0.10% + 0.25%	5.27 (2.40)	8.13 (2.94)	52.17
T_{10}	Control	-	6.03 (2.55)	17.00 (4.18)	-
		F test	Non-Sig.	Sig.	
		SE(m)±	0.075	0.069	
		CD @ 5%	-	0.20	

*Mean of three replications. Figures in parenthesis are square root values. DAP - Days After Planting

Table.2b Effect of different chemical treatments on purple blotch intensity of onion under field condition

Tre. No.	Treatment Name	Conc.	30 days after spraying		At harvesting time	
			Per cent disease intensity at 120 DAP	Per cent disease control	Per cent disease intensity at 135 DAP	Per cent disease control
	Bulb dip					
T_1	Copper oxychloride	0.25%	24.10 (29.39)*	5.49	30.60 (33.58)	8.46
T_2	Streptomycin	200 ppm	25.17 (30.11)	1.29	32.00 (34.44)	4.27
T_3	Copper oxychloride + Streptomycin	0.25% + 200 ppm	24.07 (29.37)	5.06	31.67 (34.24)	5.26
	Spraying					
T_4	Mancozeb + Carbendazim	0.25% + 0.10%	13.03 (21.16)	48.90	16.57 (24.02)	50.43
T_5	Copper oxychloride	0.25%	15.67 (23.31)	38.54	19.67 (26.32)	41.16
T_6	Mancozeb + Carbendazim + Copper oxychloride	0.25% + 0.10% + 0.25%	11.50 (19.81)	54.90	15.10 (22.85)	54.83
	Bulb dip + Spraying					
T_7	Bulb dip(Copper oxychloride + Streptomycin) +Spraying (Mancozeb + Carbendazim)	0.25% + 200 ppm + 0.25% + 0.10%	12.20 (20.44)	52.15	16.03 (23.60)	52.04
T_8	Bulb dip(Copper oxychloride + Streptomycin) + Spraying (Copper oxychloride)	0.25% + 200 ppm + 0.25%	14.20 (22.13)	44.31	18.00 (25.09)	46.15
T_9	Bulbdip(Copper oxychloride + Streptomycin) + Spraying (Mancozeb + Carbendazim + Copper oxychloride)	0.25% + 200 ppm + 0.25% + 0.10% + 0.25%	11.33 (19.66)	55.56	15.00 (22.77)	55.13
T_{10}	Control	-	25.50 (30.33)	-	33.43 (35.32)	-
		F test	Sig.		Sig.	
		SE(m)±	0.46		0.55	
		CD @ 5%	1.38		1.63	

*Mean of three replications. Figures in parenthesis are arc sine values. DAP - Days After Planting.

Table.3 Effect of different chemical treatments on seed yield of onion

Tre. No.	Treatment Name	Conc.	Seed yield gm/plot	Seed yield kg/ ha	Per cent increased seed yield over control
	Bulb dip				
T_1	Copper oxychloride	0.25%	350*	432	26.62
T_2	Streptomycin	200 ppm	455	561	43.49
T_3	Copper oxychloride + Streptomycin	0.25% + 200 ppm	520	641	50.54
	Spraying				
T_4	Mancozeb + Carbendazim	0.25% + 0.10%	445	549	42.25
T_5	Copper oxychloride	0.25%	365	450	29.55
T_6	Mancozeb + Carbendazim + Copper oxychloride	0.25% + 0.10% + 0.25%	463	571	44.48
	Bulb dip + Spraying				
T_7	Bulb dip (Copper oxychloride + Streptomycin) + Spraying (Mancozeb + Carbendazim)	0.25% + 200 ppm + 0.25% + 0.10%	813	1003	68.39
T_8	Bulb dip (Copper oxychloride + Streptomycin) + Spraying (Copper oxychloride)	0.25% + 200 ppm + 0.25%	745	919	65.50
T_9	Bulb dip (Copper oxychloride + Streptomycin) +Spraying (Mancozeb + Carbendazim + Copper oxychloride)	0.25% + 200 ppm + 0.25% + 0.10% + 0.25%	828	1022	68.98
T_{10}	Control	-	257	317	-
		F test	Sig.	-	-
		SE(m)±	6.79	-	-
		CD @ 5%	20.17	-	-

*****Mean of three replications

Fig.1 Effect of different chemical treatments on purple blotch intensity of onion

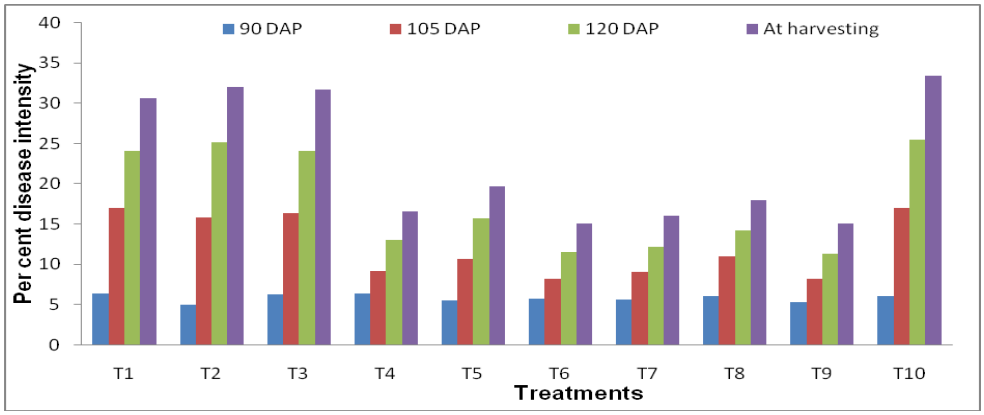


Fig.2 Effect of different chemical treatments on seed yield of onion

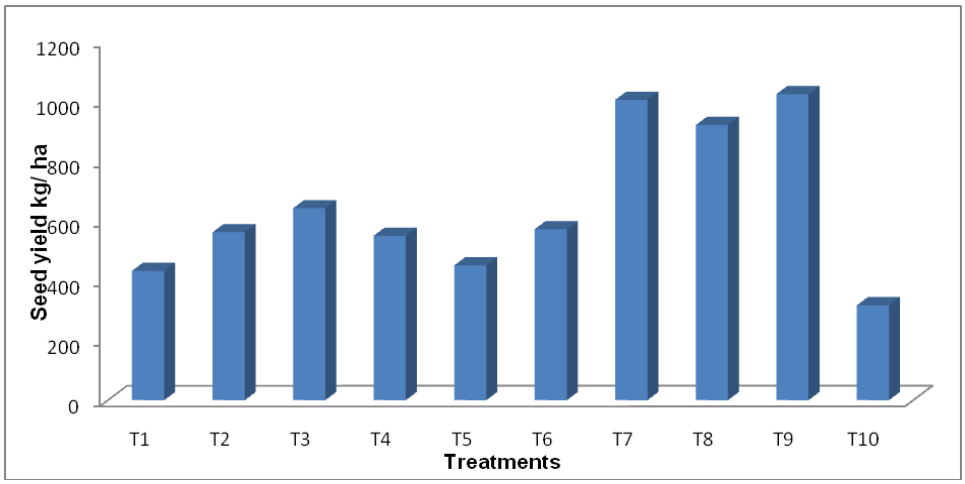
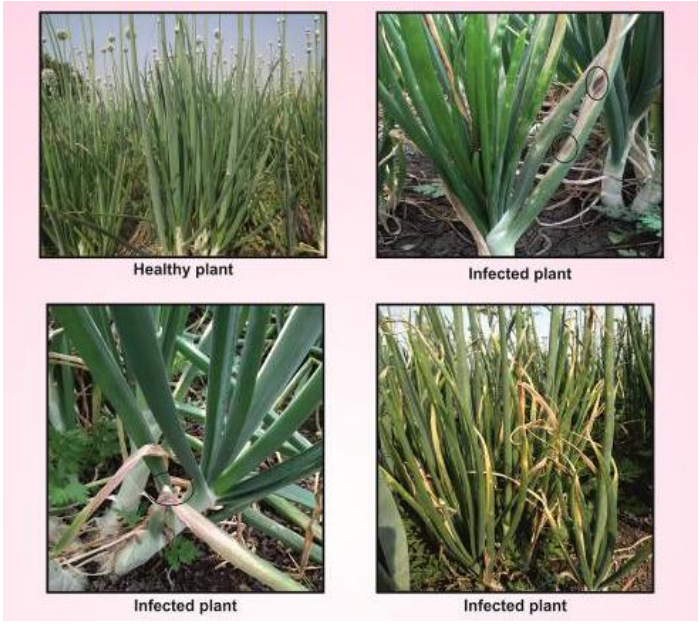


Fig.3 Disease rating scale

Fig.4 Symptoms of purple blotch of onion in field



The results are in accordance with findings of Mishra *et al.,* (1989) found maximum disease control with the application of mancozeb (0.2%) followed by carbendazim. Borkar and Patil (1995) found that Mancozeb @ 0.2% reduced the disease intensity by 6% and increased the yield by 10.99%. Mathur and Sharma (2006) found that Mancozeb and Copper oxychloride to be most effective in reducing purple blotch intensity and increasing the yield of onion bulbs. Rao *et al.,* (2015) recorded that Mancozeb 70% WP @ 2500 ppm was effective in reducing the disease severity by 52.88 % over untreated control. Umme Sarifun Akter *et al.,* (2015) recorded Dithene M-45 was found most effective to minimize disease severty as well as increase of yield. Wanggikar *et al.,* (2014) recorded Mancozeb (@ 0.2%) and Copper oxychloride (0.25%) which recorded significantly mean disease incidence of 6.83 and 8.53 per cent and intensity, 15.00 and 20.00 per cent, respectively.The present results are also in confirmation with earlier workers, Srivastava *et al.,* (1991) and Upadhaya and Tripathi (1995) who reported that Copper oxychloride, Mancozeb and Carbendazin against *Alternaria porri* and all the fungicides significantly reduced the disease incidence and intensity and gave increased yields over the control.

Effect of different chemical treatments on seed yield of onion

Data on onion seed yield is presented in Table 3 and Fig. 2 result of different chemical treatments on the seed yield onion was found significant over control and was ranged from 432 to 1022 kg/ha as against 317 kg/ha seed yield in control plot.

The treatment T9 was found significantly superior over rest of the treatment in which the maximum seed yield of onion 1022 kg/ha was obtained and followed by T7 i.e. 1003 kg/ha. Different chemical treatments effectively controlled the onion bulb rot incidence and purple blotch with increased seed yield over control in the range of 26.62 % to 68.98 %.

Ali *et al.,* (2015) recorded that seed yield of onion in the ranged of 370 – 500 Kg/ha. Ahmed *et al.,* (2018) reported highest onion seed yield i.e 580 kg/ha against purple blotch of onion. Zakirul islam (2013) observed maximum seed yield (649.40 kg/ha) with low incidence and intensity of purple blotch of onion.

In conclusion the field, *Alternaria porri* attacks above ground plant parts of onion. It showed different types of symptoms of purple blotch disease like small water-soaked lesions or white flecks, white zonate spots, purple coloured zonate spots, spots with black spore mass and drying and breaking of leaves (Fig. 4). Field experiment conducted for evaluation of different chemicals revealed that, the lowest disease intensity at 15% was observed in treatment T9 with highest disease control (55.13%). The highest seed yield was recorded in treatment T9 *i.e* 1022 kg/ha as compared to control.

References

Ahmed, H. U. and Hossain, M. M, 1985. Final report of the project, crop disease survey and establishment of herbarium at BARI, Plant Pathology Division., BARI, Joydebpur, Gazipur. 170.

Ahmed, S. Quddus, A. F. M. R, Kamrozzaman M. M, Sarker R, Uddin M. M, 2018. Integrated approaches for controlling purple blotch of onion for true seed production in Faridpur of Bangladesh. *FundamAppl Agric* 3(1): 390–397.

Ali, M. A., M. M. Hossain, M. Zakaria, A. Naznin, M. d. M. Ismail, 2015. Effect of bulb size on quality of seed production of onion in Bangladesh. *Int. J. of Agro. and*

Agril. Res. 6(4): 174-180.

Anonymous, 2011. Food and Agriculture Organization. Accessed on 3rd January 2012.

Anonymous, 2015. Indian Horticulture Database2014. National Horticulture Board, Ministry of Agriculture, Government of India. Pp 160-255.

Borkar, S. G. and B. S. Patil, 1995. Chemical control of purple blotch of onion. *Indian J. Mycol*. P1. Pathol., 25(3): 288-289.

Ellis, M. B, 1971. Dematiaceous hypomycetes. Commonwealth Mycological Institute, Kew, England. pp. 485-486.

Fritsch, K. M and Friesen N, 2002. Evolution, domestication and Taxonomy. p. 5-30. In: Allium Crop Science, Recent Advances (H.D. Rabinowitch and L. Currah. ed.). CAB1 Publishing, Oxon.

Gupta, R. B. L and Pathak, V. N, 1988. Yield losses in onions due to purple leaf blotch disease caused by *Alternaria porri*. *Phytophylactica* 20:21-23.

Mathur, K and Sharma S. N, 2006. Performance of chemical against disease and thrips in Semi-Arid Agroclimate. *Journal of Mycology and Plant Pathology* 34(2): 296-298.

Mishra, D., Mahanta, I. C. and Chhotaray, P. K, 1989. Chemical control of purple blotch of onion in Orrisa. *Orrisa J. Agri. Res.*, 2(1): 25-28.

Rao A. S, Girija Ganeshan, Ramachandra, Y. L. and Chethana B. S, 2015. Field evaluation of fungicides against *Alternaria porr*i (Ellis) Cif., causing purple blotch of onion (*Allium cepa* L.). *International Journal of Agriculture, Environment and Biotechnology Citation: IJAEB:* 8(1): 89-95

Sharma, S. R. 1986. Effect of fungicidal spray on purple blotch and bulb yield of onion. *Indian Phytopath*, 39:78.

Shrivastava, K. T.; S. M. H. Qadri; B. K. Tiwari; S. R. Bhonde and U. B. Pandey, 1991. Chemical. control of purple blotch of onion bulb crop in Kharif season. *Indian Phytopath*, 44:251-253.

Umme, S. A, Md. Harun Or Rashid, Md. Aminur Rahman, Md. Rafiqul Islam and Md Maskudul Haque, 2015. Effect of the Treatments in controlling Purple Blotch Complex of Onion (*Allium cepa* L.*) Academic Journal of Plant Sciences* 7 (2):14-19.

Upadhyay, J. and K. C. Tripathi. 1995. Field evaluation of fungicides against purple blotch of onion Seed Crops. Recent Horti. 2:2, 153-155.

Utikar, P. G and Padule, D. N. 1980. A virulent species of *Alternaria* causing leaf blight of onion. *Indian Phytopathology*. 33: 335.

Vavilov, 1951. The origin, variation, immunity and breeding of cultivated plants. Chronica Botanica Waltham, Mass, (USA).

Wanggirkar, A. A., S. S. Wagh, D. P. Kuldhar and D. V. Pawar, 2014. Effect of fungicides botanicals and bioagent against purple blotch of onion caused by *Alternaria porri*. *International J. Plant Prot*., 7: 405-410.

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

Zakirul islam. 2013. Seed yield loss assessment for purple blotch complex of onion. Thesis, (unpub) M.sc (Agri) Sher-e-Bangla Agricultural university, Dhaka.

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