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Management of Purple blotch of onion in field through a systemic spray schedule of fungicide

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The field experiment was conducted to find out a systemic spray schedule of mancozeb for management of Purple blotch of onion at C' Block Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, West Bengal in 2010-2012 during *rabi* season. The trial consisted of five treatments involving spraying of mancozeb three times @ 0.25% at every 15, 30, 45 and 60 days interval along with control (check) for its efficacy against Purple blotch disease of onion. Disease intensity increased due to increasing age of plants but never exceeded 30% due to fortnightly applications of mancozeb in all treated plants. The spray schedule was intensified late in the season due to prolonged leaf wetness and high relative humidity that increased disease severity. The present experimental result showed that three spraying of mancozeb @ 0.25% at 15 days interval was good enough followed by spraying of same chemical at 30 days interval, for effective management of Purple blotch disease of onion which also increased the bulb yield.

Key words: *Alternatia porri,* Per cent Disease Index (PDI), Purple blotch, Mancozeb, spraying schedule

INTRODUCTION

Onion is one of the most important and indispensable item in every kitchen as condiment and vegetable. The crop has gained the importance of a cash crop rather than vegetable crop because of its very high export potential. India ranks second in onion production after China. The area under onion cultivation is 4.78 lakh ha, with a production of 66.7 lakh mt. bulbs and having an average productivity of 10.38 (t/ha) (Prakasam & Sharma, 2012). Several factors have been identified for the low productivity of onion in India. The most important factors responsible are the diseases like Purple Blotch, *Stemphylium* blight, Downy Mildew, basal rot and storage rots and non availability of varieties resistant to biotic and abiotic stresses and weed population. Purple blotch is prevalent on leaves and seed stalk of onion and causes serious damage throughout the onion producing area in the country every year and production is reduced which adversely affects exports and also resulted price hike within the country. Purple blotch of onion caused by *Alternaria porri* (Ellis) Cif. is one among the serious fungal diseases that affect onion, causing heavy yield loss ranging from 2.5 to 87.8 per cent during *kharif* season (Srivastava *et al.*, 1994). Keeping in view of the above reason, management of Purple blotch of onion has become an issue in present condition. Some works have already been done on application of mancozeb on onion to reduce the disease but staggered use of this chemical causes uneconomic and environment pollution. No such work has yet been done regarding a sys-

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temic spray schedule of this chemical. An experiment has, therefore, been conducted under field conditions for two years by developing a systemic management strategy for the control of Purple blotch.

MATERIALS AND METHODS

The field experiment was conducted at C' Block Farm, Bidhan Chandra Krishi Viswavidyalaya, Kalyani, Nadia, West Bengal for the two consecutive years 2010-2012 during *rabi* season. The experiment was laid out in Randomized Block Design with three replications and recommended plot size (3x2 sq.m.). Seeds of local onion var. sukhsagar were used and sown in nursery bed on 10^{th} October in each year. The land was prepared following the usual agro-technique used for onion cultivation. The transplanting was done on 26^{th} November in each year giving a spacing of 15 cm × 10 cm. The recommended doses of fertilizers 150 N: 50 P: 80 K and 50 kg Sulphur with 20 t FYM ha^{-1} were applied in the field before transplanting in the form of urea (N-46%), single super phosphate (P-16%) and muriate of potash (K-60%). Full dose of P and K along with half N were applied as basal and rest N was top dressed in two equal splits at 30 and 45 days after transplanting.

The common popular fungicide, mancozeb @ 0.25% was used against Purple blotch disease (C.O. *Alternaria porii*) of onion. The plots were sprayed with mancozeb three times @ 0.25% at every 15, 30, 45, 60 days interval. Use of fungicide in different days after interval was treated as treatments. Ten randomly grown plants were selected from each plot for detailed disease assessment at 40, 50, 60 and 70 days after transplanting. Disease severity was recorded by using 5 point rating scale (Sharma, 1986). For disease severity, 10 plants per replication were randomly selected and PDI per replication were calculated by using the following formula (Wheeler, 1969).

$$\text{Per cent Disease Index (PDI)} = \frac{\text{Sum of all numerical ratings}}{\text{Total number of leaf observed x maximum rating}} \times 100$$

Per cent disease incidence was calculated by using the formula

$$\text{Per cent disease incidence} = \frac{\text{No. of infected plant}}{\text{Total number of plants observed}} \times 100$$

The treatment details used were as follows:

T1- spraying Mancozeb @0.25% at 15 days interval; T2- spraying Mancozeb @0.25% at 30 days interval T3- spraying Mancozeb @0.25% at 45 days interval; T4- spraying Mancozeb @0.25% at 60 days interval and T5- no spraying (control)

RESULTS AND DISCUSSION

The results of disease incidence and disease severity showed different reaction on different treatments and disease incidence was more in each treatment in comparison to disease severity and it was noticed in both the years (2010-11 & 2011-12) which were ultimately reflected on yield of onion.

Disease incidence

The results (Table 1) indicated that all the spray schedule of mancozeb @0.25 significantly reduced the disease incidence in comparison to untreated control. Disease incidence was different in two different years and it was more in 2010-11 in comparison to 2011-12 which was ultimately reflected on pooled mean. It was also noticed that with increasing the age of plants there was an increased in disease incidence and it was observed in both the years. In the year 2010-11 it was noticed that with increasing the date of interval of spraying schedule there was a significant increase in disease incidence and it was recorded in every date of disease observation. In final date of observation(70 days after transplanting) it was noticed that spraying of mancozeb @0.25% at 15 days interval for three times caused minimum disease incidence (31.52%) in comparison to others and untreated control (43.52%). Similar type of observation was also noticed in 2011-12 and minimum disease incidence (8.72%) was recorded in the plots spraying at 15 days interval of the fungicide (mancozeb@0.25%) in comparison to other treatments(spraying schedule) and untreated control(26.85%). Though, this year disease incidence was low in comparison to previous year. The increasing spraying schedule (spraying at increasing days interval) increased the disease incidence significantly in every treatments, but significantly low in comparison to untreated control. It was ob-

Table 1 : Spraying schedule of mancozeb against disease incidence of Purple blotch of onion

Treatments	Disease incidence (%)											
	2010-2011				2011-2012				Pooled			
	40DAT	50DAT	60DAT	70DAT	40DAT	50DAT	60DAT	70DAT	40DAT	50DAT	60DAT	70DAT
Spraying at 15 days interval	10.53 (18.9)	16.82 (24.22)	25.52 (30.35)	31.52 (33.98)	4.99 (12.88)	5.46 (13.47)	6.18 (14.36)	8.72 (17.03)	7.76 (16.7)	11.14 (19.92)	15.85 (23.79)	20.12 (26.97)
Spraying at 30 days interval	14.47 (22.34)	19.20 (26.01)	29.55 (32.91)	32.82 (34.95)	8.87 (17.32)	9.23 (17.70)	11.13 (19.50)	13.71 (21.74)	11.67 (20.41)	14.22 (22.54)	20.34 (27.12)	23.27 (29.13)
Spraying at 45 days interval	16.17 (23.73)	22.65 (28.40)	32.74 (34.90)	35.77 (36.73)	10.41 (18.82)	12.10 (20.37)	14.52 (22.42)	17.12 (24.44)	13.29 (21.79)	17.38 (25)	23.63 (29.4)	26.45 (31.24)
Spraying at 60 days interval	17.79 (24.98)	24.55 (29.80)	35.55 (36.61)	39.68 (39.05)	13.56 (21.58)	14.43 (22.33)	17.29 (24.58)	20.77 (27.10)	15.68 (23.71)	19.49 (26.54)	26.42 (31.22)	30.23 (33.64)
Untreated control (water spray)	17.84 (24.98)	25.65 (30.44)	37.41 (37.42)	43.52 (41.30)	13.75 (21.68)	21.56 (27.63)	24.60 (29.73)	26.85 (31.22)	15.80 (23.78)	23.61 (29.4)	31.01 (34.13)	35.19 (36.65)
SEm (±)	0.58	0.42	0.37	0.88	1.04	0.83	0.41	0.05	0.47	0.08	0.19	1.34
CD at 5%	1.34	0.96	0.86	2.02	2.26	1.81	0.88	1.09	1.56	0.27	0.63	4.38

Figures in the parentheses are angular transformed values, DAT= Days after transplanting

served in every date of observation (40 DAT to 70 DAT at 10 days interval) (Table 1).

The two years pooled mean also showed similar results and with increasing the age of plant and days interval of spraying, there was a significant increase in disease incidence, though spraying of mancozeb reduced the disease incidence significantly in comparison to untreated control irrespective of days interval of spraying. Minimum disease incidence was recorded in 15 days interval (20.12%) at 70 DAT followed by 30 days interval (23.27%) and 45 days interval spraying (26.45%) and maximum in 60 days interval spraying (30.23%) and their differences were statistically significant (Table 1).

Disease severity

Disease severity was different in two different years and maximum was noticed in 2010-11 in comparison to 2011-12, which might be due to the weather condition favourable for disease severity. It was noted that, with increasing age of plants and days interval for spraying there was a significant increase in disease severity and it was noticed in both the years. It was also observed that in every date of observation there was increased in disease severity and maximum was noticed in 70 days after transplanting irrespective of days interval of spraying. In the year 2010-11, the minimum disease severity was recorded in the plots sprayed at 15 days interval (20.21%) followed by 30 days interval (26.06%) and maximum in 60 days interval (32.66%) of spraying of mancozeb@0.25%, though every spraying reduced the disease severity in comparison to untreated control irrespective of days of interval of spraying. In the year 2011-12 the disease severity was low due to unfavourable weather condition yet minimum disease severity was noticed in 15 days interval spraying(6.04%) at 70 DAT followed by 30 days interval (11.59%) and maximum in 60 days interval of spraying (18.82%) in the same date of observation. The two years pooled mean data showed that in every date of observation disease severity was increased with

Table 2 : Spraying schedule of mancozeb against disease severity of Purple blotch of onion

Treatments	Disease severity (%)											
	2010-2011				2011-2012				Pooled mean			
	40DAT	50DAT	60DAT	70DAT	40DAT	50DAT	60DAT	70DAT	40DAT	50DAT	60DAT	70DAT
Spraying at 15 days interval	4.67 (12.5)	7.56 (15.99)	11.14 (19.52)	20.21 (26.73)	2.70 (9.44)	3.28 (10.45)	3.84 (11.30)	6.04 (14.53)	3.69 (11.79)	5.42 (14.07)	7.49 (16.41)	13.13 (21.66)
Spraying at 30 days interval	10.78 (19.18)	12.87 (21.02)	19.88 (26.49)	26.06 (30.68)	4.91 (12.76)	7.32 (15.71)	8.59 (17.10)	11.59 (19.89)	7.85 (16.71)	10.10 (18.99)	14.24 (22.58)	18.83 (26.07)
Spraying at 45 days interval	11.62 (19.94)	16.88 (24.27)	24.33 (29.58)	29.77 (33.07)	7.05 (15.35)	10.11(1 8.51)	11.81 (20.13)	14.53 (22.42)	9.34 (18.17)	13.50 (21.97)	18.07 (25.53)	22.15 (28.42)
Spraying at 60 days interval	15.62 (23.29)	20.31 (26.78)	25.48 (30.33)	32.66 (34.88)	7.98 (16.34)	12.45(2 0.67)	14.82 (22.65)	18.82 (25.73)	11.80 (20.51)	16.38 (24.25)	20.15 (27.02)	25.74 (30.8)
Untreated control (water spray)	16.52 (23.97)	20.89 (27.21)	30.26 (33.38)	37.68 (38.05)	10.16 (18.52)	14.70(2 2.56)	19.74 (26.40)	24.25 (29.51)	13.34 (21.84)	17.80 (25.31)	25.00 (30.32)	30.97 (34.1)
SEm (±)	0.47	0.28	0.29	0.38	0.87	2.97	0.37	0.63	1.00	0.32	0.34	0.57
CD at 5%	1.08	0.65	0.66	0.87	1.9	6.48	0.81	1.38	3.28	1.05	1.12	1.86

Figures in the parentheses are angular transformed values, DAT= Days after transplanting

increasing age and increasing the days of interval of spraying, though it was less in comparison to untreated control. Minimum disease severity was noticed in 15 days interval of spraying(13.13%) at 70 days after transplanting (70 DAT) followed by 30 days interval spraying (18.83%) and maximum in 60 days interval spraying (25.74%) though every spraying reduced the disease severity significantly in comparison to untreated control irrespective of days of interval of spraying (Table 2).

Table 3 : Bulb yield of onion on different spraying schedule of mancozeb

Treatments	Yield (t/ha)		
	2010-2011	2011-2012	Pooled
Spraying at 15 days interval	20.83	31.8	26.32
Spraying at 30 days interval	14.25	26.97	20.61
Spraying at 45 days interval	11.67	20.97	16.32
Spraying at 60 days interval	7.39	14.24	10.82
Untreated control (water spray)	6.30	10.57	8.44
SEm (±)	1.82	1.49	0.79
CD at 5%	4.21	3.27	2.59

Yield of onion

The effect of disease incidence and disease severity and application of fungicide mancozeb @ 0.25% at different days interval have been reflected in the bulb yield of onion in both the years(2010-12). The bulb yield of onion was also different in two different years and it was due to effect of different blight diseases in two different years. Maximum bulb yield of onion was harvested in the year 2011-12 due to minimum disease incidence as well as disease severity in comparison to previous year (2010-11). In the year 2010-11 maximum bulb yield was harvested from the plots sprayed with mancozeb @0.25% at 15 days interval (20.83 t/ha) followed by 30 days interval (14.25 t/ha). Minimum yield was recorded from the plots sprayed at 60 days interval (7.39 t/ha) which was statistically at par with untreated control (6.30 t/ha). It was noticed that spraying of mancozeb @0.25% at 30 days interval and 45 days interval showed no significant difference in respect to bulb yield of onion(14.25 t/ha and 11.76 t/ha respectively). In the year 2011-12, the difference in bulb yield of onion at different spraying interval was statistically significant among themselves and maximum was harvested at 15 days interval (31.8 t/ha) followed by 30 days interval (26.97 t/ha) and minimum in 60 days interval of spraying (14.24 t/ha), though

every sprays interval of mancozeb increased the bulb yield of onion significantly in comparison to untreated control (10.57 t/ha).

The two years pooled mean also showed the similar results and maximum was harvested in 15 days spray interval of fungicides (26.32 t/ha) followed by 30 days spray interval (20.61 t/ha) and minimum in 60 days spray interval (10.82 t/ha) though, every spray interval increased the bulb yield of onion significantly in comparison to untreated control (8.44 t/ha).

The result therefore concluded that three spraying of mancozeb @0.25% at 15 days interval was highly effective in the management of Purple blotch of onion as well as increases the bulb yield than the other spraying schedules. This result was confirmed by earlier worker like Srivastava *et al* (1995) that fortnightly spraying of mancozeb @0.25% was effective in controlling the seed diseases of onion caused by *Alternaria porri* at seed growing area of north india. Though Gupta *et al* (1991) suggested that three spraying of mancozeb @0.25% at 7 days interval provided good control when applied just after appearance of disease and resulted maximum yield of onion.

The present study therefore suggested that three spraying of mancozeb @0.25% at 15 days interval after appearance of disease (40 days after transplanting) can be recommended for effective management of Purple blotch of onion and increased bulb yield in West Bengal condition.

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