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Studies on management of foliar diseases in onion (*Allium cepa* L.)

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ABSTRACT

For commercial cultivation of onion, both thrips and foliar diseases play the key role in reducing the bulb yield and quality of produce. Among the various foliar diseases affecting leaves and bulbs, purple blotch incited by Alterrinari porri, while thrips among the insects are the most devastating & prevalent in many parts of India including Odisha. This is more important due to change in climatic conditions during the growing season. The study on management of foliar diseases in onion conduced during rabi season of 2010-11 and 2011-12 revealed significant variations among the treatments with respect to disease incidence, disease severity, thrips populations and bulb yield (marketable & total yield). Significantly minimum disease incidence (74.26 % and 68.17 %), severity (54.25 % and 31.25 %), thrips plant^{-1} (33.50 and 17.79) , marketable bulb yield (19.58 tha^{-1} and 13.75 tha^{-1}) as well as total bulb yield (27.95 tha^{-1} and 24.88 tha^{-1}) was recorded with spray schedule of mancozeb @ 0.25% + methomyl @ 0.8g litre^{-1}, tricyclazole @ 0.1% + carbosulfan @ 2 ml litre^{-1} to be and hexaconazole @0.1% + profenofos 1ml litre^{-1} at 30, 45 and 60 dat (t_4) during 2010-11 and 2011-12, respectively. The next best recommendation was application of mancozeb @ 0.25% + methomyl @ 0.8g litre^{-1}, propiconazole @ 0.1% + carbosulfan @ 2 ml litre^{-1} and copper oxychloride @0.25 % + profenofos 1mll^{-1} at 30, 45 and 60 dat (t_3) in onion. Thus, it may be concluded that in onion combined application of insecticides and fungicides not only reduces the incidence of foliar disease and thrips infestation but also increases bulb yield instead of their sole application.

***Keywords*:** Foliar disease, onion thrips, onion yield

Onion (*Allium cepa* L.) is an important export oriented vegetable among the cultivated *allium* in India. It is also known as "queen of kitchen". Productivity of onion is affected by many biotic and abiotic stresses. For commercial cultivation of onion, both thrips and foliar diseases play the key role in reducing the bulb yield and quality of produce. Among the various foliar diseases affecting leaves and bulbs, purple blotch incited by *Alternaria porri* (ciferri), and thrips (*Thrips tabaci* Lindeman) among the insects are the most devastating and prevalent in many parts of India (Gupta *et al.,*2011), including in Odisha. This is more important due to change in climatic conditions during the growing season. The onion thrips (*T. tabiaci*) can indirectly aggravate purple blotch and vector for viral diseases, iris yellow spot as well (Kumar *et al*, 2011). Hence, there is an immense need to develop proper integrated management practice to contain onion pests (onion thrips) and diseases, particularly purple blotch in order to produce higher yield with better quality bulbs. The present study was therefore, conducted to study the management of foliar diseases in onion.

MATERIALS AND METHODS

The experiment was carried out under All India Network Research Project on Onion and Garlic, College of Horticulture (OUAT), Sambalpur, Odisha, India during the *rabi* season of 2010-11 and 2011-12 in RBD with six treatments replicated four times. The details of treatments are presented in table 1.

Table 1: Treatment details of management of foliar diseases in onion

Treatments	First spray (30 DAT)	Second spray (45 DAT)	Third spray (60 DAT)
T_1	Mancozeb 0.25%	Propiconazole 0.1%	Copper oxychloride 0.25%
T_2	Mancozeb 0.25%	Tricyclazole 0.1%	Hexaconazole 0.1%
T_3	Mancozeb 0.25% + Methomyl 0.8g litre^{-1}	Propiconazole 0.1% Carbosulfan 2 ml litre^{-1}	Copper oxychloride 0.25% Profenofos 1 ml litre^{-1}
T_4	Mancozeb 0.25% + Methomyl 0.8 lg litre^{-1}	Tricyclazole 0.1% Carbosulfan 2 ml litre^{-1}	Hexaconazole 0.1% Profenofos 1 ml litre^{-1}
T_5	Untreated check	—	—
T_6	Methomyl 0.8g litre^{-1}	Carbosulfan 2 ml litre^{-1}	Profenofos 1 ml litre^{-1}

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Forty five days old onion seedlings of cv. Agrifound Dark Red were transplanted in plot size of 3 x 2 m^{-2} for each replication with a spacing of 15 cm x 10 cm on 23.12.2010 and 01.12.2011, respectively. All the recommended package of practices was adopted uniformly to all the modules except the plant protection measures which were adopted on the basis of treatment schedules.

The crop was observed for both onion thrips as well as purple blotch disease at 15 days intervals commencing from 30 days after transplanting. The data on disease incidence were recorded and % disease intensity was calculated in 0-5 scale such as 0 = no disease, 01= 1-10%, 02 = 11-20 %, 03 = 21- 30%, 04 = 31-50% and 05 = 51-100%. The data on thrips infestation were transformed and subjected to statistical analysis. The total bulb yield for each cultivar was recorded and statistically analysed as per the standard procedure (Sukhatme and Amble, 1995).

RESULTS AND DISCUSSION

The results presented in table 2 and 3, revealed significant variations among the spray schedule for disease incidence, disease severity, thrips plant^{-1} as well as bulb yield (marketable and total) of onion. Both the years of study. The disease incidence during 2010-11, varies from 74.26 % (t_4) to 91.60 % (t_5) with an average incidence of 81.67%. Significantly minimum disease incidence was recorded with spray schedule of mancozeb @ 0.25% + methomyl @ 0.8g litre^{-1}, tricyclazole @ 0.1% + carbosulfan @ 2 ml litre^{-1} and hexaconazole @0.1% + profenofos 1ml litre^{-1} at 30, 45 and 60 dat (t_4) than rest of the treatments except mancozeb @ 0.25% + methomyl @ 0.8g litre^{-1}, propiconazole @ 0.1% + carbosulfan @ 2 ml litre^{-1} and copper oxychloride @0.25 % + profenofos 1ml litre^{-1} at 30, 45 and 60 dat (t_3), which were at par statistically. While during 2011-12, the disease incidence was varies from 68.17% to 85.11%, with an average incidence of 75.20%, significantly minimum incidence being recorded in t_4. The better efficacy of propiconazole @ 0.1% and hexaconazole @0.1% against purple blotch was also reported by dinakaran *et al.* (2011). Similar report on efficacy of tricyclazole, propiconazole and hexaconazole in controlling *Alternaria porri* was reported by kanzaria *et al.*(2011) under Junagarh condition.

Similarly, the disease severity, expressed as PDI, varies from 54.25 % (t_4) to 70.73 % (t_5) with average of 59.81% during 2010-11. Significantly minimum severity was observed in t_4 than rest of the spray schedules except combined application of insecticides with fungicides (t_3), only spraying of fungicides, t_2 (mancozeb @0.25%, tricyclazole @ 0.1% and hexaconazole @ 0.1%) as well as only spraying of insecticides, t_6 (methomyl @ 0.8g litre^{-1}, carbosulfan @ 2 ml litre^{-1} and profenofos 1ml litre^{-1}), which were statistically at par. Similar results were also recorded during 2011-12 which varies from 31.25 % (t_4) to 50.00 % (t_5) with average pdi of 41.25 %. The results of both the years indicated the superiority of t_4, t_2, t_3 and t_6 over other treatments with respect to disease severity in onion. The results also showed that sole application of insecticides significantly reduces the disease severity in onion, indicating the vital role play by onion thrips in controlling foliar diseases in onion. This result corroborates the findings of Krishna Kumar *et al.* (2011) in onion. The better efficacy of propiconazole @ 0.1% and mancozeb @ 0.25%

Table 2: Management of foliar disease of onion cv. Agrifound Dark Red (2010-11)

Treatments	Disease incidence (%)	Disease severity (PDI) (%)	Thrips plant^{-1}	Marketable yield (t ha^{-1})	Total yield (t ha^{-1})
T_1	82.96 (65.61)	61.65 (51.76)*	42.00(6.51)**	15.96	22.87
T_2	83.84(66.29)	57.55(49.34)	39.88(6.35)	15.89	26.43
T_3	77.17(61.46)	55.82(48.34)	34.90(5.95)	18.98	27.28
T_4	74.26(59.53)	54.25(47.43)	33.50(5.82)	19.58	27.95
T_5	91.60(73.24)	70.73(57.25)	45.63 (6.77)	14.13	21.31
T_6	80.12(63.52)	58.88(50.13)	35.75(6.01))	15.30	22.86
Grand mean	**81.67(64.94)**	**59.81(51.71)**	**38.61(6.23)**	**16.64**	**24.78**
SEm(±)	**1.23**	**1.47**	**0.30**	**1.60**	**1.88**
LSD(0.05)	**2.61**	**3.13**	**0.64**	**3.41**	**4.00**

** Figures in parentheses indicate angular transformed values ** figures in the parentheses indicate the (x+0.5) transformed values*

Table 3: Management of foliar disease of onion during 2011-12

Treatments	Disease incidence (%)	Disease severity (PDI) (%)	Thrips plant^{-1}	Marketable yield (t ha^{-1})	Total yield (t ha^{-1})
T_1	76.71 (61.16)	41.25 (49.00)*	19.57 (4.48)**	11.90	20.85
T_2	76.11(60.84)	31.25(46.30)	18.50(4.36)	12.70	20.61
T_3	71.59(57.79)	31.25{45.83)	17.25(4.21)	12.92	22.92
T_4	68.17(55.69)	31.25(44.89)	17.79(4.27)	13.75	24.88
T_5	85.11(67.29)	50.00(55.03)	25.64(5.11)	10.25	18.35
T_6	73.51(59.03)	41.25 (47.52)	17.14(4.19)	12.61	22.08
Grand mean	**75.20(60.30)**	**41.25 (48.10)**	**19.32 (4.44)**	**12.35**	**21.61**
SEm(±)	**1.47**	**1.35**	**0.13**	**0.86**	**1.10**
LSD(0.05)	**3.14**	**2.87**	**0.28**	**1.83**	**2.34**

** Figures in parentheses indicate angular transformed values ** Figures in parentheses indicate (x+0.5) transformed values*

against foliar diseases in onion was also reported by Gupta and Pandey (2011).

Significant variations were also recorded among the treatment schedules for thrips infestation in both the years. The thrips population (thrips plant^{-1}) varies from 33.50 (t_4) to 45.63 (t_5) during 2010-11 while from 17.14 (t_4) to 25.64 (t_5) during 2011-12. Significantly least thrips population was recorded in t_4 than other treatments. However, statistical *parity* was observed for with t_2, t_3 and t_6 during both the years. The results obtained from two years trials clearly indicated the role of combined application of fungicides and insecticides for controlling the foliar diseases and thrips in onion.

Significantly highest marketable bulb yield of 19.58 t ha^{-1} and 13.75 t ha^{-1} was recorded in t_4 during 2010-11 and 2011-12, respectively than rest of the treatment schedules. However, statistical parity was recorded with t_3 (18.98 t ha^{-1}) during 2010-11 while t_2, t_3 and t_6 (12.61 to 13.75 t ha^{-1}) during 2011-12. Similarly, significant variations were recorded among the treatment schedules for total bulb yield, which varies from 21.31 t ha^{-1} (t_5) to 27.95 t ha^{-1}(t_4) during 2010-11 while 18.35 t ha^{-1} (t_5) to 24.88 t ha^{-1}(t_4) during 2011-12. However, statistical parity was recorded in t_2 and t_3 during 2010-11 while t_3 during 2011-12 with t_4.the results on bulb yield (both marketable and total) in onion revealed that combined application of insecticides with fungicides (t_4 and t_3) recorded significantly higher yield than rest of the treatment schedules by controlling the thrips and foliar diseases.

The results obtained from two years research, it can be concluded that combined application of mancozeb @ 0.25% + methomyl @ 0.8g litre^{-1} tricyclazole / propiconazole @ 0.01% + carbosulfan @ 2 ml litre^{-1} and copper oxychloride @0.25%/ hexaxonazole @0.1% + profenofos @ 1 ml litre^{-1} at 30, 45 and 60 days after transplanting, respectively not only reduces the foliar disease and thrips population but also produces higher bulb yield in onion.

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