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Response of onion to Purple Blotch disease under different level of Fungicide Spray frequency and Irrigation Interval in Adami Tulu Jido Kombolcha district of Ethiopia

[1]Alemu Jula, [2]Desta Abi, [3]Girma Adugna

[1]Jima university, College of Agriculture and Veterinary Medicine, Jima, Ethiopia

[2,3] Adami Tulu Agricultural research Center, Adami Tulu, Ethiopia

Abstract: **A yearlong experiment was conducted in the farmers field during 2017- 2018 to find out the level of purple blotch disease under different levels of irrigation and fungicide spray in onion farms. T1:No plot was sprayed with fungicide at 4 day irrigation interval; T2 :No plot was sprayed with fungicide at 10 day irrigation interval;T3 :plot was sprayed 9 times with fungicide at 4 days irrigation interval;T4: plot was sprayed 5 times with fungicide at 4 days irrigation interval; T5:plot was sprayed 9 times with fungicide at 6 days irrigation interval; T6 :plot was sprayed 5 times with fungicide at 6 days irrigation interval; T7: plot was sprayed 7 times with fungicide at 10 days irrigation interval;T8: plot was sprayed 9 times with fungicide at 10 days irrigation interval;T9:plot was sprayed 7 times with fungicide at 4 days irrigation interval; T10: plot was sprayed 7 times with fungicide at 8 days irrigation interval; T11: plot was sprayed 7 times with fungicide at 6 days irrigation interval; T12: No plot was sprayed with fungicide at 8 days irrigation interval; T13:plot was sprayed 9 times with fungicide at 8 days irrigation interval; T14: plot was sprayed 5 times with fungicide at 10 days irrigation interval; T15: no plot was sprayed with fungicide at 6 days irrigation interval; T16: plot was sprayed 5 was recorded in treatment thirteen T13 where 9 sprayed fungicide and applied at 8 day irrigation interval. The highest PDI (96.3%) was counted in treatment one (T1).**

Application of combined fungicide and irrigation interval has reduced the disease severity significantly, while irrigation alone had no significant effect on disease infection. But there was a decreasing of the disease severity with increasing irrigation frequency.

Keywords: **Purple Blotch disease, level of Fungicide Spray, Ethiopia.**

1. INTRODUCTION

Onion (*Allium cepa* L.) is the most popular vegetable all over the world. Onion (*Allium cepa*L.) crop belongs to alliaceous 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 Friesen2002). Onions are grown in all part of the world where plants are cultivated and can be grown from bulbs, sets or seeds. It shows abundant alternate in many characteristics such as color, shape size, and pungency (Griffiths *et al*., 2002). Onions are a good source of certain minerals, vitamins and carbohydrates. The bulb contains carbohydrates 11.0 g, proteins 1.2 g, fiber 0.6 g, moisture 86.8 g and energy 38 cal.(Maini*et al*., 1985).

In Ethiopia, onion is one of the most important vegetables produced by smallholder farmers mainly as a source of cash income and for flavoring the local stew 'wot' (Lemma D. and Shemelis A, 2003). The crop is believed to be more intensively consumed than any other vegetable crop.

The yield of onion can be augmented by proper management practices, especially emphasizing on irrigation and disease management.

Onion is afflicted by a large number of diseases of which leaf purple blotch caused by *Alternaria porri* (Ellis) Cif. is found all over and considered most destructive. The disease attacks both aerial and underground parts at field conditions (Ahmed and Hossain, 1985; Bose and Some, 1986; Meah and Khan, 1987; Rahman *et al.*, 1988; Ashrafuzzaman and Ahad, 1976). Severe infection may result in complete drying of the foliage, which ultimately causes considerable yield losses due to the reduction of green plant parts (Ghuge *et al.*, 1980). Many investigations have been done to control the disease of onion by spraying chemicals but a very few references are available on irrigation and disease interaction. Therefore, this experiment was undertaken to investigate the effect of irrigation frequency and fungicide spray on the severity and incidence of Purple Blotch in onion crop cultivated under Adami Tulu, Ethiopia condition.

2. MATERIALS AND METHOD

A field experiment was conducted in Adami Tulu Jido Kombolcha district, Oromia Regional State, Ethiopia during 2017 and 2018 The soil of the experimental field was sandy loam in texture. The study site under highly variable with space and time of rainfall. It is annual rainfall 775 mm per year and bi-modal distribution, with more than 85% of the rain falling within a period of four months from June to August. The mean monthly rainfall during wet season (June to August) varies from 79 to 124 mm. Maximum temperature is in April 27°C and minimum 9.8°C in December. The daily reference crop evapo-transpiration (ETo) of the area varied from 3.47 to 4.45 mm with maximum in April and minimum in August months. (New Locclim; of ziway meteorology station).

The experiment comprised of sixteen treatments viz. T1 (No plot was sprayed with fungicide at 4 day irrigation interval), T2 (No plot was sprayed with fungicide at 10 day irrigation interval),T3 (plot was sprayed nine times fungicide and applied at 4 day irrigation interval),T4 (plot was sprayed five times fungicide and a applied at 4 day irrigation interval),T5 (plot was sprayed nine times fungicide and applied at 6 day irrigation interval),T6 (plot was sprayed five times fungicide and applied at 6 day irrigation interval), T7 (plot will spray seven times fungicide and applied at 10 day irrigation interval),T8 (plot was sprayed nine times fungicide and apply at 10 day irrigation interval),T9 (plot was sprayed seven times fungicide and applied at 4 day irrigation interval), T10 (plot was sprayed seven times fungicide and applied at 8 day irrigation interval), T11 (plot was sprayed seven times fungicide and applied at 6 day irrigation interval), T12 (No plot was sprayed with fungicide at 8 day irrigation interval), T13 (plot was sprayed nine times fungicide and applied at 8 day irrigation interval),T14 (plot was sprayed five times fungicide and applied at 10 day irrigation interval),T15 (No plot was sprayed with fungicide at 6 day irrigation interval), T16 (plot was sprayed five times fungicide and applied at 8 day irrigation interval). The experimental plots were arranged in Randomized Complete Block Design (RCBD) with three (3) replications.

The experiment details was layout as bellow:

- Total plot area: 288 m2
- Number of plot: 48
- Plot size: 4.5 m2
- Block to block distance: 1.0 m
- Plot to plot distance: 0.5 m
- Farrow width 40cm
- Farrow length: 3m
- Row to row spacing: 20 cm
- Plant to plant spacing: 5 cm

All necessary data were recorded and analyzed statistically using SAS.20 programme.

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3. RESULTS AND DISCUSSION

Status of purple blotch on onion

An experiment was conducted to assess the disease severity of purple blotch of onion in Adami Tulu Jido kombolcha district of Oromia Regional State, Ethiopia. In this study significant difference ($P<0.05$) was found among treatments for the area under disease progress curve (AUDPC). The highest (155.23) area under disease progress curve (AUDPC) was found for T1 while the lowest (50.60) area under disease progress curve (AUDPC) was found for T8 . During survey various purple blotch disease symptoms were observed both on bulbs as well as leaves (Fig. 2 and 3). The older leaves were more susceptible to infection. Initially, oval to elliptical water soaked lesion appeared on the leaves which later gets progressed and forms discolored tissue around the spots. Spots were white initially and later turns to light purple or pink. The colour change emerge from center to progress towards the periphery region and completely turns to purplish in color. During change in colour, concentric rings can be seen easily through naked eye. The disease symptoms were documented in the infected field and presented in the photo 1.

Photo 1. Field observation of initial stageof onion from experimental field in 2018.

Among the treatments, nine times sprayed fungicide and applied 9 times irrigation with Ridomil Gold MZ 68 WP (metalaxyl - M 4% + mancozeb 64%) and Nativo (Tebuconazole 200g/L + trifloxystrobin 100g/L) and different irrigation times reduced the disease which was statistically identical. The incidence and severity of the disease increased gradually with the decreasing number of spraying. This study is well in agreement with the previous researchers. Sultana *et al.* (2008) who conducted an experiment in the field of Plant Pathology Division, BARI, Joydebpur to assess effect of purple blotch disease on onion productivity. She reported that 71.95% disease reduced in the fungicide spraying plot over control.

The finding also supported the findings of Rahman (2004) and Ali (2008). Rahman (2004) who have reported that eight spraying of Rovral 50WP (0.2 %) or Ridomil MZ-72 (0.2) with 7 days interval minimized the disease incidence and disease severity of purple blotch complex of onion and increased the bulb yield. Ali (2008) reported that spraying of Rovral 50WP (0.2%) along with application of micronutrients remarkably reduced the incidence and severity of purple blotch of onion.

Similarly, Significant variation ($P<0.05$) (Table 1.) was found among treatments with respect to area under disease Index curve (AUDIC).And also, the highest (4184.60) area under disease index curve (AUDPC) was found for T1 while the lowest (2159.70) area under disease index curve (AUDPC) was found for T8 .

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Table 1. Effect of combined irrigation interval and frequency of fungicide spray on area under disease curve (AUDPC) and area under disease incidence curve (AUDIC) of onion disease severity

TREATMENTS	*AUDPC	*AUDIC
T1	155.23 a	4184.60a
T15	146.46 a	3930.00c
T12	140.55 a	4057.30b
T2	136.99 a	4057.20b
T14	84.85 b	2894.20f
T11	81.09 b	3179.80d
T3	76.31 b	2578.80f
T7	74.77 c	2675.70f
T16	74.02 c	3059.10e
T10	72.07 c	2725.40f
T13	71.90 c	2665.90f
T5	71.57 c	2187.50e
T6	63.98 c	2510.50f
T9	62.44 c	2441.70f
T4	60.00 c	2410.80f
T8	50.60 d	2159.70e
LSD	0.00	0.00
SEM	8.69	335.15
CV	16.93	19.46

*Mean values in a column sharing similar letters do not differ significantly as determined by the LSD test ($P \leq 0.05$).

Photo 2. Effect of different treatments against disease incidence and severity (% leaf area diseased) of purple blotch of onion.

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Photo 3. Yield parameters measure in laboratory from field data 2018.

The lowest percent of disease incidence (78.57) was observed in the treatment T3 (sprayed nine times fungicide and applied 20 times irrigation) where T1 (no sprayed fungicide and applied 20 times irrigation) treatment showed the highest disease incidence (96.30). Results obtained from the effect of different treatments along with field spraying and number of irrigation in controlling disease incidence and severity of purple blotch of onion are presented in Table 2. Different treatments showed statistically significant variation where the lowest rated scale of disease severity (2.5) was observed for the treatment T8, T9 and T1). All the selected treatments showed statistically significant variation ($P<0.05$) in respect of disease severity (rating scale) where the treatment T8 gave the best performance rating scale in minimizing disease severity. The highest rating scale was observed in T1 treatment (4.3), where no sprayed fungicide and applied irrigation 20 time.

Table.2. Effect of combined irrigation interval and fungicide spray frequency against percent of disease incidence and disease scale score of purple blotch of Onion.

Treatments	PDI	DSS
T1	96.30a	4.30a
T12	96.30a	4.20a
T2	92.59b	4.00 a
T15	88.43c	3.83b
T6	86.57d	3.00d
T14	86.31d	3.20c
T4	85.52d	3.00d
T7	85.52d	3.00d
T16	84.72e	2.80d
T11	83.02e	2.50d
T10	80.16f	2.67d
T13	79.96f	2.83d
T5	79.68f	3.00d
T9	79.05f	2.50d
T8	78.57f	2.50d
T3	83.02e	2.67d
LSD	0.01	0.00
SEM	3.78	0.26
CV	7.72	14.70

* Average of 4 observations taken on 55days, 79days, 84 and 107 days at different stages.

*Mean values in a column sharing similar letters do not differ significantly as determined by the LSD test ($P \leq 0.05$).

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4. CONCLUSION

The treatments interaction factors applications were significantly influenced on the parameters like AUDPC, AUDIC, DSS and PDI. The lowest AUDPC (50.60), AUDIC (2159.7) and PDI(78.57 %) were recorded from the field where nine times fungicide sprayed and seven times irrigated. The highest AUDPC (155.23), AUDIC (4184.6) and PDI (96.3 %) were recorded from plot no sprayed fungicide and 20 times irrigated. The effect of different treatments with AUDPC, AUDIC and PDI on purple blotch disease severity and incidence of onion production decreased with the increasing number of spraying and decreasing number of irrigation times.

Disease incidence of onion did not vary significantly by irrigation frequencies only. But there was a decreasing trend in disease severity with increasing number of irrigation under the tested irrigation sequences of no irrigation to six irrigations. Unlike irrigation, fungicide spray had significant influence on disease incidence. Disease severity was found the minimum by spraying fungicide for three times. The yield of onion increased almost linearly with irrigation. The highest bulb yield was obtained from the treatment which received a total six irrigations at 10 days interval. So it is evident that frequent irrigation (10 days interval) along with 3 sprays may be the optimal practice for onion production Adami Tulu area. However, an irrigation interval of less than 10 or in between 10 and 20 days (e.g.,15 days) may be tested for further confirmation of the suitable irrigation intervals.

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