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Reduction in disease severity and avoidable yield loss assessment due to turcicum leaf blight of maize caused by *Exserohilum turcicum*

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Maize is a member of the grassy family Poaceae. Maize is severely affected by turcicum leaf blight disease. Yield losses due to turcicum leaf blight in maize found that propiconazole 25 EC @ 0.1% treated plot significantly showing minimum per cent disease severity (33.89%), more shelling percentage (79.87%), maximum numbers of cob 65 and maximum seed index (35.56 g) as compared to control 66.11%, 79.87%, 50 and 24.91g, respectively. According to yield loss studies the results revealed that the per cent avoidable losses due to turcicum leaf blight was observed 34.01 and 31.77 per cent in grain and fodder yield, respectively in protected plot as compared to unprotected plot of maize crop.

Key words: *Zea mays*, *Exserohilum turcicum*, maize, yield loss, disease severity, shelling percentage, seed index

INTRODUCTION

Maize is a member of the grassy family Poaceae. It is now the third most important cereal crop in the world after wheat and rice. In maize, a number of diseases occur and cause loss in the crop.

Among these, Turcicum leaf blight (TLB) caused by *Exserohilum turcicum* (Pass.) Leonard & Suggs [syns. *Bipolaris turcica* (Pass.) Shoemaker] is the most important and destructive foliar disease (Gupta *et al*., 2015). In India, the disease is prevalent in almost all the maize growing areas. Severe losses in grain yield due to epidemics reported in several parts of country and these losses vary from 25 to 90 % depending upon the severity of the disease. In central Gujarat, TLB is the major constraint for maize production and account for losses of up to 83 per cent (Singh *et al*., 2016). Hence, the present has been conducted to assess the avoidable yield loss assessment due to turcicum leaf blight disease in maize.

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MATERIALS AND METHODS

The experiment was carried out at Main Maize Research Station, Anand Agricultural University, Godhra, Kharif 2018 season in maize crop with susceptible variety CM-202 sown in field with ABBA (Paired T test) method. There were 2 treatments viz. one protected plot and one unprotected plot with 10 replications. Each plot contained 6 rows of 5 m length with a spacing of 60 × 20 cm. Recommended package of practices were followed in all plot except the fungicide spray. The protected and unprotected plots were sprayed with artificial inoculation of pathogen culture for creating artificial epiphytotic condition. *Exserohilum turcicum* inoculum was multiplied on sterilized potato dextrose broth culture media and kept in 250 ml Erlenmeyer flask which incubated in incubator for 10-12 days at 25±2°C. A light water spray was given after inoculation to create optimum humidity condition for fungus growth for infection.

The protected plots were treated with two spray of propiconazole 25 EC @ 0.1% at 15 days interval starting from 40 days after sowing i.e. at 40 and 55 days after sowing.

The leaf blight severity was recorded at dry silking stage by 1-9 rating scale as given by Chung *et al*.

(2010) and Mitiku *et al*. (2014) and disease severity i.e. per cent disease index (PDI) was calculated by using following formula of Wheeler (1969).

The percentage disease control was calculated with the help of formula given by Mathur *et al*. (1971).

The observations on 100-grain weight (seed index), grain and fodder yield were recorded from both protected and unprotected plots and data were statistically analyzed.

Shelling (%): The five cobs from each net plot were selected randomly for calculation of the shelling percentage and their weights were assessed. After that, the grains were removed from cobs and again their weights were assessed. The Calculation of shelling percentage was assessed with the help of following formula.

Seed index (g): Randomly selected sample of seeds were collected from seed yield of each net plot, 100 seeds were counted and weight was recorded separately for each net plot.

Grain yield (q/ha): After harvesting, the cobs separated from plants as treatment wise from net plot basis were sundried, cleaned thoroughly, weighed (kg) and calculated per net plot grain yield kg/plot with the help of shelling % and moisture %. The grain yield of maize in kg/ha was computed from each net plot as following mention formula and finally converted in q/ha with divided by 100 from kg/ha.

Grain yield (kg/plot) = Ax B x C where,
A = Cob weight (kg)
B = Shelling %
C = (100 moisture %) 0.0117625
Grain yield (kg/ha) = Grain yield (kg/plot) x 10,000 m^2 / Plot size (m^2)

Fodder yield (q/ha) :After harvesting, the treatment wise green fodder was weighed (kg/plot) net plot basis. The fodder yield of maize in kg/ha was computed from each net plot as below mention formula and finally converted in q/ha with divided by 100 in kg/ha.

Fodder yield (kg/ha) = Fodder yield (kg/plot) x 10,000 m^2 / Plot size (m^2)
The avoidable loss in all the parameters was calculated using observed values in protected and corresponding unprotected treatment values using the formula by Harlapur *et al*. (2009).

Per cent avoidable (Yield) loss
Where, Vp = Values of protected plot
Vu = Values of unprotected plot

RESULTS AND DISCUSSION

The per cent disease severity was recorded after seven days of last spray and shelling percentage, cob/plot, seed index (100 seed weight), grain yield and fodder yield were recorded from each treatment after harvesting from protected and unprotected plot. The data are presented in Table1 and Table 2.

The data presented in Table 1 reveals that treated plots were significantly showing minimum per cent disease severity (33.89%) as compared to control (66.11%) and also showing (48.73%) disease reductions over untreated plot during kharif 2018. These results indicated that the Turcicum leaf blight was reduced when maize crop treated with two foliar spray of propiconazole first at starting of disease initiation and second at 15 days interval after first spray.

Table 1: Disease severity due to Turcicum leaf blight of maize

Tr. No.	Treatment	Disease severity (%)*	Disease reduction over control (%)
T_1.	A. Protected (Propiconazole 25 EC 0.1%)	33.89	48.73
T_2.	B. Unprotected (Control)	66.11	
	Calculated t-test value	12.479**	-
	T test (2) tailed	0.0001(significant)	-

* Mean of ten replications
**Significant of at 1% level of probability

The data presented in Table 2 shows that shelling percentage was greater in protected plot (79.87%) as compared to untreated control (71.61%) and indicated that unprotected plot exhibited 10.34 percent avoidable losses in shelling percentage due to the disease. Further, it was also observed that the maximum number of cobs were significantly highest in protected plot (65) as compared to unprotected plot with minimum number of cobs (50) indicating that the unprotected plot gave 23.08 per cent avoidable losses in number of cobs as compared to protected plot due to the disease. Significant increase in seed index was observed in protected plot over unprotected plot. The data

presented in Table 2 revealed that 31.10 per cent avoidable losses in seed index were observed significantly as compared to unprotected plot. In protected plots significantly more mean weight of seed 35.56 g was recorded as compared to unprotected control was 24.91 g. The losses increased due to increase in severity of Turcicum leaf blight disease in maize crop in unprotected plot.

kg/ha) and less in unprotected plot (4614.2 kg/ ha). Harlapur *et al*. (2009) also observed results that significant losses in grain yield, fodder yield, test weight, reduction in plant height, cob length, cob diameter and shelling percentage were observed with the disease. The avoidable yield losses in various germplasm ranged from 2.87 to 51.93 % with a mean of 14.51 per cent. The other losses were directly proportional to the disease

Table 2: Avoidable crop loss assessment due to turcicum leaf blight of maize

Treatment no.	Treatment	Shelling (%)*	Avoidable loss (%)	Cobs per plot*	Avoidable loss (%)	Seed index (100 seed weight in gram)*	Avoidable loss (%)
T_1.	A. Protected (Propiconazole 25 EC 0.1%)	79.87	10.34	65.00	23.08	35.56	31.10
T_2.	B. Unprotected (Control)	71.61		50.00		24.91	
	Calculated t-test value	12.361**	-	10.548**	-	23.525**	-
	T test (2) tailed	0.0001 (signi-ficant)	-	0.0001 (signi-ficant)	-	0.0001 (signi ficant)	-

* Mean of ten replications

**Significant of at 1% level of probability

Table 3: Avoidable yield loss assessment due to Turcicum leaf blight of maize

Treatment no.	Treatment	Grain yield (q/ ha)*	Avoidable loss (%)	Fodder yield (q/ ha)*	Avoidable loss (%)
T_1.	A. Protected (Propiconazole 25 EC 0.1%)	34.84	34.01	172.59	31.77
T_2.	B. Unprotected (Control)	22.99		117.76	
	Calculated t-test value	13.51**	-	10.032**	-
	T test (2) tailed	0.0001 (significant)	-	0.0001 (significant)	-

* Mean of ten replications

**Significant of at 1% level of probability

The results presented in Table 3 indicates that 34.01 and 31.77 per cent avoidable loss was observed significantly in grain yield and fodder yield, respectively due to turcicum leaf blight disease of maize in unprotected plot. Nevertheless, the protected plot was recorded significantly higher 34.84 q/ha grain yield and 172.59 q/ha fodder yield increase over 22.99 q/ha and 117.76 q/ha grain yield and fodder yield, respectively of unprotected control plot and became disease free after two foliar spray of propiconazole at 15 days interval from disease initiation and second at first spray.

Shankara *et al*. (2017) carried out an experiment and observed analogous results that the highest disease severity (76.8%) in the unprotected plot CM-202 recorded and 8.2% in protected plot. CM-202 showed high yield in protected plot (8360.7

severity with fodder yield (20%) and in shelling percentage (2.5 to 8%). Similar denouement on avoidable grain yield losses were also observed by Rani (2015) who reported that losses in grain yield varied from 18.32 to 60.52 % depending upon the disease severity in different germplasm. Bunker and Mathur (2006) determined the losses in grain and fodder yield due to leaf blight *E. turcicum*, and reported that the percent disease index in Kekri local ranged from 43 to 74 and resulted in 20 to 30% reduction in grain and 12 to 27% in fodder yield. In the hybrid CSH 14, 38 to 62% disease index were observed with 14 to 27% reduction in grain yield and 9 to 22% in reduction fodder yield.An experiment by Shivankar and Shivankar (2000) revealed that inoculated plots showed high incidence of Turcicum leaf blight in maize germplasm AMC1 (39.23%), AMC2

(35.46%), Manjari composite (33.61%) and Kargil 633 (31.42%). The inoculated plots recorded lowest grain yield and exhibited significant losses in the grain yield of AMC1 (18.77%), AMC2 (15.45%), Manjari composite (13.81%) and Kargil 633 (10.50%).

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