

Original Research Article

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Reaction of Maize Inbred lines to Maydis Leaf blight Incited by *Bipolaris maydis*

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ABSTRACT

Evaluation of 10 maize inbreds against Maydis Leaf Blight of maize (*Bipolaris maydis* (Nisik) Shoemaker) was carried out in ANGRAU - AICRP Maize Research Station, Peddapuram, Andhra Pradesh during rainy season for two consecutive years of 2019 & 2020. Disease scoring was done as per standard rating scale (1-9) on individual plant at 7 days intervals starting from 37 days after sowing. Among these ten inbreds (CM 400, CM 500, CM 501, CM 600, BML 6, BML 7, SURYA, Early Composite, LM 14 and IIMRSBTPOOL) CM 501 showed resistant reaction with disease score of 3.0, CM 400 showed moderately susceptible reaction to the MLB and remaining inbred lines expressed moderately resistant reaction to the disease with disease score between 3.1 to 5.0.

Introduction

Maize (*Zea mays* L) is one of the most versatile emerging crops having wider adaptability under varied agro-climatic conditions. Under the changing climate and farming scenario, maize being a thermo and photo insensitive crop has been emerging as one of the potential crops that address several issues like food and nutritional security, climate change, water scarcity, farming systems and bio-fuels. Maize is an important food crop and an important raw material for livestock and many agro allied industries throughout the world (Bello *et al.*, 2010; Randjelovic *et al.*, 2011). The limitation of

rising temperature during grain filling of wheat particularly in eastern India, water scarce areas in peninsular India (AP and Tamil Nadu) and the declining yield of boro rice in West Bengal and Orissa affecting yield of *rabi* rice has shown a path to maize as better option. There are so many biotic stresses affecting the potential yield of maize. In Andhra Pradesh Maydis leaf blight is one of the important diseases affecting maize crop. It is a severe problem of maize in warm and humid weather conditions (White, 1999). Regions with a warm (20 to 32°C) and damp growing season are most at risk from maydis leaf blight. Long, dry, sunny periods during the growing season are unfavorable for the

disease. Upto 70% yield loss is recorded due to SCLB (Wang *et al.*, 2001; Ali *et al.*, 2011). Among three races (race O, race T & race C) of *Bipolaris maydis* (Smith *et al.*, 1970; Wei *et al.*, 1988) in India race O is the important one. The Southern Corn Blight spreads from the basal leaves to the developing ear and then flag leaf of maize plant (CIMMYT 1985). The fungi over winters in infected crop debris and therefore regions where infected crop debris overwinters and where maize is cultivated continuously are at risk. Race O pathotypes are widely distributed, although Race T pathotypes are only prevalent where hybrids have the Texas source of male sterility (Hooda *et al.*, 2018). Yield losses of maize up to 40 percent or more have been demonstrated in inoculated yield trails (Byrnes *et al.*, 1989). The best way of bypassing these hazardous effects of diseases is use of resistant hybrids. Development of resistant hybrids is dependent on selection of suitable resistant Inbred Lines. The present investigation carried out with an objective of knows the occurrence and the disease pressure under natural conditions.

Materials and Methods

The basic materials screened in the present study comprised 10 diverse maize inbred (*Z. mays*) lines. All 10 inbred lines are CM 400, CM 500, CM 600, CM 501, BML 6, BML 7, SURYA, Early Composite, LM 14, IIMRSBTPOOL were received from the Winter Nursery Center, Indian Institute of Maize Research, Hyderabad during *khari* season of two consecutive years of 2019 & 2020. The work of disease screening and determination of resistance was done under AICRP on maize, in an experimental plot maintained at ANGRAU-Agricultural Research Station, Peddapuram, Andhra Pradesh. Diseased leaf samples were collected from maize growing areas of RARS Chintapalle. The Inbred Lines were sown in a

single row of 4 m length spaced at 70 x 20 cm. Recommended agronomic practices and insect pest control measures were followed as per schedule. The disease severity on test entries was scored at weekly intervals using 1-9 disease rating scale (Hooda *et al.*, 2018). The reaction of various lines was recorded. The Inbred Lines were grouped into the different reaction categories viz., resistant, moderately resistant, moderately susceptible and susceptible.

Disease assessment

Disease scoring was started 37 days after sowing. The disease incidence was measured on individual plant visually at 7 days intervals. A total of 9 scorings were done from July to August, in two consecutive years 2019 & 2020, i.e. 37 DAS, 44 DAS, 51 DAS, 58 DAS, 65 DAS, 72 DAS, 79 DAS, 86 DAS and 93 DAS. Disease assessment on basis of modified 1-9 rating scale of AICMIP (1983) and Hooda *et al.*, (2018). The genotypes showing disease score between 1.0–3.0 were considered as resistant (R), 3.1 – 5.0 as moderately resistant (MR), 5.1 – 7.0 as moderately susceptible (MS) and 8.0 – 9.0 as susceptible (S).

Results and Discussion

The trial revealed that none of the tested inbred lines was completely free from Southern Corn Leaf Blight (SCLB) / Maydis Leaf Blight (MLB) disease infection caused by *Bipolaris maydis*. However, significant variations in disease score and severity for MLB was observed in inbred lines. The present study revealed that out of 10 inbred lines tested, only one line CM 501 (Score – 3.0) showed resistant reaction against MLB disease. IIMRSBTPOOL, Surya, Early Composite, BML 6, CM 500, LM 14, BML 7, CM 600 showed disease score of 3.1, 3.6, 4.1, 4.1, 4.1, 4.3, 4.5 and 4.7 respectively thereby

exhibited Moderately Resistant reaction (MR), one line CM 400 recorded disease score of 5.6 and was found Moderately Susceptible (MS) to the disease and no inbred is recorded disease score between 7.1 to 9.0 which represents susceptible.

Disease reaction indicating satisfactory level of disease development and the categorization of materials into different classes was appropriate (Table 1). According to Chandrashekara *et al.*, (2012) the inbred lines viz., V373, V398, V407, V418, VQL2 and CM 145 showed high degree of resistance to MLB and V351, V414, VQL1 & CM212 were found to be highly susceptible. Goudar

& Harlapur (2019) reported that among the 34 inbred lines, only two lines, viz., BM-55 and BM-148, registered highly resistant reaction, five lines were identified as resistant, ten lines were found moderately resistant and remaining were susceptible.

Srabani Debnath and Sonali Biswas (2020) reported among these ten inbreds (CM 400, CM 500, CM 501, CM 600, BML 6, BML 7, SURYA, Early Composite, LM 14 and IIMRSBTPOOL) only LM 14 showed resistant reaction and CM 501 & IIMRSBTPOOL showed Moderately Resistant reaction against Southern Corn Leaf Blight under natural condition.

Table.1 Rating scale (1-9) for assessment of MLB (*Bipolaris maydis*)

Rating scale	Degree of infection (Per cent DLA*)	PDI**	Disease reaction
1.0	Nil to very slight infection ($\leq 10\%$).	≤ 11.11	Resistant (R) (Score: ≤ 3.0) (DLA: $< 30\%$) (PDI: ≤ 33.33)
2.0	Slight infection, a few lesions scattered on two lower leaves (10.1-20%).	22.22	
3.0	Light infection, moderate number of lesions scattered on four lower leaves (20.1-30%).	33.33	
4.0	Light infection, moderate number of lesions scattered on lower leaves, a few lesions scattered on middle leaves below the cob (30.1-40%).	44.44	Moderately Resistant (MR) (Score: 3.1–5.0) (DLA: 30.1-50%) (PDI: 33.34-55.55)
5.0	Moderate infection, abundant number of lesions scattered on lower leaves, moderate number of lesions scattered on middle leaves below the cob (40.1-50%).	55.55	
6.0	Heavy infection, abundant number of lesions scattered on lower leaves, moderate infection on middle leaves and a few lesions on two leaves above the cob (50.1-60%).	66.66	Moderately Susceptible (MS) (Score: 5.1-7.0) (DLA: 50.1-70%) (PDI: 55.56-77.77)
7.0	Heavy infection, abundant number of lesions scattered on lower and middle leaves and moderate number of lesions on two to four leaves above the cob (60.1-70%).	77.77	
8.0	Very heavy infection, lesions abundant scattered on lower and middle leaves and spreading up to the flag leaf (70.1-80%).	88.88	Susceptible (S) (Score: > 7.0) (DLA: $> 70\%$) (PDI: > 77.77)
9.0	Very heavy infection, lesions abundant scattered on almost all the leaves, plant prematurely dried and killed ($> 80\%$).	99.99	

Table.2 MLB incidence in trap nursery

S. No.	Inbreeds	Time of observation DAS	Disease severity 1-9 scale		Terminal Disease severity	Reaction
			<i>Kharif</i> 2019	<i>Kharif</i> 2020		
1	CM 400	65	3.0	6.9		
		72	3.0	7.4		
		79	3.0	8.2	5.6	MS
		86	3.0	8.2		
		93	3.0	8.2		
2	CM 500	65	3.0	3.8		
		72	3.0	4.2		
		79	3.0	5.2	4.1	MR
		86	3.0	5.2		
		93	3.0	5.2		
3	CM 501	65	3.0	2.1		
		72	3.0	2.5		
		79	3.0	3.0	3.0	R
		86	3.0	3.0		
		93	3.0	3.0		
4	CM 600	65	2.0	3.5		
		72	2.0	3.9		
		79	2.0	7.3	4.7	MR
		86	2.0	7.3		
		93	2.0	7.3		
5	BML 6	65	2.0	3.8		
		72	2.0	4.6		
		79	2.0	6.2	4.1	MR
		86	2.0	6.2		
		93	2.0	6.2		
6	BML 7	65	5.0	3.1		
		72	5.0	3.5		
		79	5.0	3.9	4.5	MR
		86	5.0	3.9		
		93	5.0	3.9		
7	Surya	65	4.0	2.5		
		72	4.0	2.8		
		79	4.0	3.1	3.6	MR
		86	4.0	3.1		
		93	4.0	3.1		

8	Early Composite	65	3.0	3.6		
		72	3.0	3.8		
		79	3.0	5.1	4.1	MR
		86	3.0	5.1		
		93	3.0	5.1		
9	LM 14	65	2.0	6.0		
		72	2.0	6.2		
		79	2.0	6.6	4.3	MR
		86	2.0	6.6		
		93	2.0	6.6		
10	IIMR SBT POOL	65	2.0	2.4		
		72	2.0	2.7		
		79	3.0	3.1	3.1	MR
		86	3.0	3.1		
		93	3.0	3.1		

Azra and Hussain (2019) evaluated thirty-six maize genotypes against MLB under artificial epiphytotic conditions during *kharif* season 2015 and 2016 and found that 14 genotypes were moderately resistant, 14 genotypes were moderately susceptible and the remaining eight genotypes were grouped as highly susceptible.

So, the promising high yielding Maydis leaf blight / SCLB resistant genotypes identified in present study would be helpful for their deployment in breeding programme and as donors for different research programmes and could be used to develop lines for Maydis leaf blight.

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