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Screening of inbred lines and hybrids against maydis leaf blight (*Bipolaris maydis*. Nisikado) Shoemaker in maize

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Abstract

A field experiment was conducted to screen the inbred lines and hybrids against maydis leaf blight of maize at Main Agriculture Research Station, University of Agriculture Sciences, Dharwad to find out the resistant sources against maydis leaf blight of maize caused by *Bipolaris maydis* Shoemaker. Totally 34 inbred lines and 26 hybrids were screened against maydis leaf blight, 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. Out of 26 hybrids screened, no hybrid was immune and highly resistant, nine hybrids registered resistant reaction, eight hybrids were rated as moderately resistant, whereas rest of the hybrids were susceptible.

Keywords: *Bipolaris maydis*, hybrids, inbred lines, maydis leaf blight

Introduction

Maize area and production is increasing due to introduction of hybrids and the potential of heterosis has just begun to be exploited in developing countries. Globally maize occupies an area of 182.06 million hectares, with the production of 987 million tonnes and productivity accounts for 5423 kg ha⁻¹. In India, maize occupies an area of 8.55 million hectares with a production of 22.33 million tonnes and average productivity of 2600 kg ha⁻¹. States with highest production potential and productivity is Andhra Pradesh followed by Karnataka. In Karnataka, the crop occupies an area of 1.36 million hectares and production of 4.09 million tonnes with productivity of 3018 kg ha⁻¹ (Anon., 2013) [1]. Maydis leaf blight (MLB) a fungal disease caused by *Bipolaris maydis* (Nisikado) Shoemaker is an important foliar disease in almost all the maize growing regions of India. The maize growing regions in Karnataka, Andhra Pradesh, Bihar, Maharashtra, Uttaranchal and Tamil Nadu have been identified as endemic areas for the disease. Losses up to 40 percent or more have been demonstrated in inoculated yield trails (Byrnes *et al.*, 1989) [2].

The incidence of this disease was first reported by Drechsler (1925) from United States. In India, it was reported for the first by Munjal and Kapoor (1960) from the Maldah, West Bengal. In India the disease is present in almost all the major maize growing states. Globally, three races of the pathogen designated as race O, race T and race C. Race C is predominant in China. In India, the race O is the predominant race. Race T is highly virulent to the hybrids having Texas male sterility (Tms) gene.

The maydis leaf blight injures or kills the leaf tissues and thereby reduces the area of chlorophyll which involved in photosynthesis. If considerable leaf area is killed, then vigour and yields are reduced drastically. If much of the green area is killed starch formation is restricted and the kernels become chaffy. The blighted leaves are not suitable for fodder because of the lowered nutrition value. In northern Karnataka, the disease is becoming important in recent years and there is lack of resistant sources which is one of the effective management strategies. Hence the present investigation was carried out to find out the resistant sources against maydis leaf blight which are very helpful in management of the disease.

Material and methods

Thirty four inbred lines and twenty six hybrids collected from All India Coordinated Maize Improvement Project, Agricultural Research Station, Arabhavi, University of Agriculture Sciences, Dharwad, and Directorate of Maize Research, Indian Council of Agriculture

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Research, New Delhi. These lines were screened in the field under artificial epiphytotic conditions at Main Agricultural Research Station, Dharwad, University of Agriculture Sciences Dharwad, Karnataka.

The test lines were sown in a randomized block design with plot size of 12 m² spaced at 60 x 20 cm and replicated twice. Recommended agronomic practices and insect pest control measures were followed as per the package of practices of University of Agriculture Sciences, Dharwad. Three weeks old culture of *Bipolaris maydis* multiplied on sorghum grains was powdered and inoculated in to the whorls of test plants at 35 and 45 DAS and was followed by water spray so as to maintain humidity for infection. The inoculation was done in the evening time between 5 and 6 pm. The disease severity on test entries was scored at silk drying stage using 0-5 disease rating scale (Payak and Sharma, 1983) [6]. The reaction of various lines was recorded. The evaluated lines were grouped into the different reaction categories viz., highly resistant, resistant, moderately resistant, susceptible and highly susceptible.

Results and discussion

Screening of inbred lines against maydis leaf blight

Screening was undertaken to evaluate inbred lines against *Bipolaris maydis* under artificially inoculated field conditions. The lines were evaluated based on 0-5 disease rating scale. The present study revealed that out of 34 lines tested, only two lines viz., BM-55 and BM-148 have registered high level of resistance which have recorded least disease rating of 1. (Table 1 and Table 1a.). Thus, it can be emphasized from the results that the identified highly resistant lines hold excellent promise for resistance against *Bipolaris maydis* of maize and can be used for developing hybrids and composites in future programme of breeding for disease resistance. Chandrashekar *et al.* (2012) [13] reported the inbred lines viz., V373, V398, V407, V418, VQL2 and CM 145 showed high degree of resistance to MLB where as V351, V414, VQL1 and CM212 were found to be highly susceptible. Kaur *et al.* (2010) [5] evaluated twenty maize inbred lines against maydis leaf blight, one genotype E-10 (LET DR99 × Ent 49-2) was resistant and five genotypes (E1, E2, E8, E9, E15) were moderately resistant to maydis leaf blight.

Screening of maize hybrids against maydis leaf blight

The present study revealed that out of 26 hybrids screened, no hybrid was found to be immune or highly resistant. Nine hybrids showed resistant reaction, eight lines were resistant, whereas remaining hybrids were susceptible. Among the hybrids evaluated against maydis leaf blight hybrids viz., DKC 9133, DKC 7074R, S6217, DMH 8255, DKC 9120, DKC 9135, DKC 9126, NK 30, PHI 3501 were resistant and

hybrids DKC 9125, DKC 8101, 30 V 92, DKC 9117, DKC 4141, PHI 3396, DKC 9081, Pinnacle, were moderately resistant (Table 2 and Table 2a.). Rai *et al.* (2009) [7] screened fifty one maize genotypes against *Helminthosporium maydis* under artificial inoculated conditions of full season maturity group, out of 51 genotypes rated as 26 resistant, 8 moderately resistant, 13 moderately susceptible, 2 susceptible and 2 highly susceptible against maydis leaf blight. Kumar and Saxena (2008) [4] reported that the resistant reactions of 30 genotypes of maize demonstrated that none of the genotypes was immune or highly resistant against maydis leaf blight. African tall genotype was resistant; another J-1006 was moderately resistant. Nine genotypes IG01-535, IG01-728, IG01-674, IG01-804, IG01-792, IG01-678, and IG01-782 were moderately susceptible.

Table 1: Screening of maize inbred lines against maydis leaf blight

Sl. No.	Inbred lines	Disease rating
1	BML-10	2
2	HKI-163	3
3	HKI-193-1	3
4	BM-23	2
5	BM-96	3
6	BM-426	3
7	BM-201	3
8	BM-55	1
9	BM-102	4
10	BM-191	3
11	BM-40	2
12	BM-256	4
13	BM-255	2
14	BM-188	3
15	BM-134	3
16	BM-148	1
17	BM-24	4
18	BM-32	2
19	BM-36	3
20	BM-59-1	4
21	BM-59-2	5
22	BM-59-3	4
23	BM-60	4
24	BM-127	4
25	BM-253	5
26	BM-254-1	5
27	BM-254-2	5
28	BM-254-3	5
29	BM-258-1	5
30	BM-258-2	4
31	BM-258-3	3
32	BM-258-4	4
33	DhR-12 5816	4
34	DhR-12 5817	4

Table 1a: Reaction of maize inbred lines against maydis leaf blight

Disease rating	Disease reaction	No. of entries	Inbred lines
0	Immune	-	Nil
1	Highly resistant	2	BM-55, BM-148
2	Resistant	5	BML-10, BM-23, BM-40, BM-255, BM-32
3	Moderately resistant	10	HKI-163, HKI-193-1, BM-96, BM-426, BM-201, BM-191, BM-188, BM-134, BM-36, BM-258-3
4	Susceptible	11	BM-102, BM-256, BM-24, BM-59-1, BM-59-3, BM-60, BM-127, BM-258-2, BM-258-4, DhR-12 5816, DhR-12 5817
5	Highly susceptible	6	BM-59-2, BM-253, BM-254-1, BM-254-2, BM-254-3, BM-258-1

Table 2: Screening of maize hybrids against maydis leaf blight

Sl. No.	Hybrids	Disease rating
1	DKC 9106	5
2	DKC 9133	2
3	DKC 7074R	2
4	S6217	2
5	DMH 8255	2
6	Hishell	4
7	900M	5
8	DKC 9125	3
9	DKC 4141	3
10	DKC 8101	3
11	DKC 9120	2
12	900M Gold	4
13	NK 6240	4
14	DKC 9135	2
15	30 V 92	3
16	PHI 3502	5
17	DKC 9117	3
18	DKC 9126	2
19	CP 818	4
20	NK 30	2
21	PHI 3396	3
22	DKC 9081	3
23	Pinnacle	3
24	DKC 972	4
25	PHI 3501	2
26	Arjun	4

Table 2a: Reaction of maize hybrids against maydis leaf blight

Disease rating	Disease reaction	No. of entries	Hybrids
0	Immune	-	Nil
1	Highly resistant	-	Nil
2	Resistant	9	DKC 9133, DKC 7074R, S6217, DMH 8255, DKC 9120, DKC 9135, DKC 9126, NK 30, PHI 3501
3	Moderately resistant	8	DKC 9125, DKC 8101, 30 V 92, DKC 9117, DKC 4141, PHI 3396, DKC 9081, Pinnacle,
4	Susceptible	6	Hishell, 900M Gold, NK 6240, DKC 972, CP 818, Arjun
5	Highly susceptible	3	DKC 9106, 900M, PHI 3502

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