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Short Communication

Evaluation of maize inbreds and their hybrids against turcicum leaf blight, maydis leaf blight and banded leaf and sheath blight under natural epiphytotic conditions

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Abstract

The experimental material consisted of 25 lines, 2 testers, their 50 crosses and two checks *viz*., Palam Sankar Makka-2 and PSCL 4640 were evaluated in RBD during *Kharif* 2020 against turcicum leaf blight (TLB), maydis leaf blight (MLB) and banded leaf and sheath blight (BLSB) under natural epiphytotic conditions at SAREC, Kangra. Among lines, 14 showed resistant to BLSB and 15 were resistant to TLB. 18 lines were moderately resistant to MLB. Three crosses viz., $L_3 \times T_1$, $L_{24} \times T_2$ and $L_{25} \times T_1$ exhibited resistant towards BLSB, MLB and TLB. The cross combinations can be further evaluated for yield and other characters and released as promising hybrids resistant to TLB, MLB and BLSB.

Key words: Maize, TLB, MLB, BLSB

Maize (*Zea mays* L.) is the world's third largest grain crop after wheat and rice mainly grown in temperate highlands, tropical as well as in sub-tropical regions. Various pathogenic organisms are responsible for causing widespread losses in maize. Among them, *Rhizoctonia solani f. sp. sasakii* causing banded leaf and sheath blight, *Exoserohilum turcium* causing turcicum leaf blight and *Bipolaris maydis* causing maydis leaf blight are prevalent in maize growing areas of State. TLB initially exhibits small elliptical spots on leaves. These spots turn greenish with age and get bigger in size, finally attaining a spindle shape. MLB produces lesion that are initially small and diamond shaped. These lesions elongate as they mature. BLSB appears on leaves and sheaths of 40-50 days old plant and later on spread to the ears. The affected plant produces large, gray, tan or brown discoloured areas alternating with dark brown bands. Though disease can be managed through chemicals, these are serious threat to soil and human health. Host plant resistance is considered to be most practical, feasible and reliable way to control plant diseases. Therefore, present study was undertaken to identify disease resistance in newly developed inbreds and their hybrids.

The experimental material consisted of 25 lines, 2 testers, their 50 crosses and two checks *viz*., Palam Sankar Makka-2 and PSCL 4640 were evaluated in RBD during *Kharif* 2020 against TLB, MLB and BLSB under natural epiphytotic conditions at SAREC, Kangra. Disease rating scale for recording MLB reaction consisted of 9 broad categories designated by numerals 1 to 9 (Balint Kurti *et al*., 2006; Chung *et al*., 2010 and Mitiku *et al*., 2014) and disease rating of TLB was done at dough stage following 1-9 scale (Chung *et al*., 2010; Mitiku *et al*., 2014). Disease rating of BLSB was done following modified 1 to 9 scale of AICMIP (1983) and Muis and Quimio (2006). The details of inbred lines, testers and standard checks are presented in Table 1.

Under natural conditions, three crosses viz., $L_3 \times T_1$, $L_{24} \times T_2$ and $L_{25} \times T_1$ were found resistant towards MLB. Among parents, nineteen genotypes were moderately resistant, five genotypes were moderately susceptible and three genotypes were susceptible. Both checks were moderately resistant. Among crosses, five exhibited moderately resistance, thirty nine were moderately susceptible and three were

Table 1. Details of inbred lines, testers and standard checks

Symbol/Code	Inbred line	Source/Pedigree
A) Lines		
L_1	CML 33	ICAR-IIMR, WNC, Hyderabad
L_2	CML 117	—do—
L_3	CML 138	—do—
L_4	CML 139	—do—
L_5	CML 140	—do—
L_6	CML 162	—do—
L_7	CML 163	—do—
L_8	CML 292	—do—
L_9	CML 295	—do—
L_{10}	CML 338	—do—
L_{11}	CML 411	—do—
L_{12}	CML 426	—do—
L_{13}	CML 439	—do—
L_{14}	CML 451	—do—
L_{15}	CML 452	—do—
L_{16}	CML 494	—do—
L_{17}	CM 212	VPKAS, Almora
L_{18}	V 335	—do—
L_{19}	V 340	—do—
L_{20}	V 405	—do—
L_{21}	HKI-1040	ICAR-IIMR, Karnal
L_{22}	HKI-1105	—do—
L_{23}	CM 502	—do—
L_{24}	KI-3	CML161/CML165-B-B-B-4-B-B
L_{25}	KI-7	CML165-B-B-B-1-B-B
B) Testers		
T_1	LM 13	PAU, Ludhiana
T_2	LM 14	—do—
C) Checks		
C_1	PalamSankar Makka-2	CSKHPKV, Palampur
C_2	PSCL 4640	Bayers

susceptible (Table 2). Similar results were earlier reported by Omprakash *et al*. (2016). Under natural epiphytotic conditions, genotypes were screened for their resistance towards TLB. Fifteen parents, forty two crosses and both checks were resistant towards TLB. Twelve parents and eight crosses were moderately resistant towards TLB. None of the parent or crosses were susceptible towards TLB (Table 2). Similar results were earlier reported by Nida *et al*. (2018); Razzaq *et al*. (2019). Under natural conditions, genotypes were screened for their resistance towards banded leaf and sheath blight. Fifteen parents, ten crosses and Palam Sankar Makka-2 was found to be resistant towards BLSB. Eleven parents, thirty eight crosses and PSCL 4640 were showing moderately resistance towards BLSB. Three parents and two crosses were moderately susceptible towards BLSB. None of genotypes were susceptible towards BLSB (Table 2). Similar results were earlier reported by Devi *et al*. (2015); Meena *et al*. (2021).The resistant lines against MLB, TLB and BLSB are a valuable source and can be utilized in resistance

Table 2. Disease reaction to Maydis leaf blight, Turcicum leaf blight and banded leaf and sheath blight under natural epiphytotic conditions

Disease Reaction	Disease	Parents	Crosses	Checks
Resistant = 3.0	TLB	L_3, L_4, L_5, L_6, L_8, L_9, L_{10}, L_{12}, L_{15}, L_{17}, L_{18}, L_{19}, L_{21}, L_{24}, L_{25}[15]	$L_2 \times T_1$, $L_2 \times T_2$, $L_3 \times T_1$, $L_3 \times T_2$, $L_4 \times T_1$, $L_4 \times T_2$, $L_5 \times T_1$, $L_5 \times T_2$, $L_6 \times T_1$, $L_6 \times T_2$, $L_7 \times T_1$, $L_7 \times T_2$, $L_8 \times T_1$, $L_8 \times T_2$, $L_9 \times T_1$, $L_9 \times T_2$, $L_{10} \times T_1$, $L_{10} \times T_2$, $L_{11} \times T_1$, $L_{11} \times T_2$, $L_{12} \times T_1$, $L_{12} \times T_2$, $L_{14} \times T_2$, $L_{15} \times T_1$, $L_{15} \times T_2$, $L_{16} \times T_1$, $L_{16} \times T_2$, $L_{17} \times T_1$. $L_{17} \times T_2$, $L_{18} \times T_1$, $L_{18} \times T_2$, $L_{19} \times T_1$, $L_{19} \times T_2$, $L_{20} \times T_1$, $L_{20} \times T_2$, $L_{21} \times T_1$, $L_{21} \times T_2$, $L_{22} \times T_2$, $L_{23} \times T_1$, $L_{24} \times T_1$, $L_{24} \times T_2$, $L_{25} \times T_1$, $L_{25} \times T_2$ [42]	Palam Sankar Makka-2, PSCL 4640
	MLB	-	$L_3 \times T_1$, $L_{24} \times T_2$, $L_{25} \times T_1$ [3]	-
	BLSB	L_1, L_2, L_3, L_5, L_6, L_{11}, L_{14}, L_{16}, L_{19}, L_{21}, L_{22}, L_{23}, L_{24}, L_{25}[14]	$L_3 \times T_1$, $L_4 \times T_1$, $L_5 \times T_1$, $L_6 \times T_1$, $L_7 \times T_1$, $L_{17} \times T_1$, $L_{13} \times T_1$, $L_{20} \times T_1$, $L_{24} \times T_2$, $L_{25} \times T_1$, $L_{25} \times T_2$ [10]	Palam Sankar Makka-2
Moderately Resistant 3.1-5.0	TLB	L_1, L_2, L_7, L_{11}, L_{13}, L_{14}, L_{16}, L_{20}, L_{22}, L_{23}, T_1, T_2[12]	$L_1 \times T_1$, $L_1 \times T_2$, $L_{13} \times T_1$, $L_{13} \times T_2$, $L_{14} \times T_1$, $L_{22} \times T_1$, $L_{23} \times T_2$[8]	-
	MLB	L_3, L_4, L_5, L_6, L_8, L_9, L_{10}, L_{12}, L_{13}, L_{14}, L_{16}, L_{17}, L_{18}, L_{19}, L_{21}, L_{23}, L_{24}, L_{25}, T_1[19]	$L_3 \times T_2$, $L_4 \times T_1$, $L_5 \times T_1$, $L_6 \times T_1$, $L_{17} \times T_1$[5]	Palam Sankar Makka-2, PSCL 4640
	BLSB	L_4, L_7, L_8, L_9, L_{12}, L_{13}, L_{15}, L_{17}, L_{18}, L_{20}, L_{22}[11]	$L_1 \times T_1$, $L_1 \times T_2$, $L_2 \times T_1$, $L_2 \times T_2$, $L_3 \times T_2$, $L_4 \times T_2$, $L_5 \times T_2$, $L_6 \times T_2$, , $L_7 \times T_2$, $L_8 \times T_1$, $L_8 \times T_2$, $L_9 \times T_1$, $L_9 \times T_2$, $L_{11} \times T_1$, $L_{11} \times T_2$, $L_{12} \times T_1$, $L_{12} \times T_2$, $L_{13} \times T_2$, $L_{14} \times T_1$, $L_{14} \times T_2$, $L_{15} \times T_1$, $L_{15} \times T_2$, $L_{16} \times T_1$, $L_{16} \times T_2$, $L_{17} \times T_2$, $L_{18} \times T_1$, $L_{18} \times T_2$, $L_{19} \times T_1$, $L_{19} \times T_2$, $L_{20} \times T_2$, $L_{21} \times T_1$, $L_{21} \times T_2$, $L_{22} \times T_1$, $L_{22} \times T_2$, $L_{23} \times T_1$, $L_{23} \times T_2$, $L_{24} \times T_1$[38]	PSCL 4640
Moderately Susceptible 5.1-7.0	TLB	-	-	-
	MLB	L_1, L_2, L_{11}, L_{15}, T_2[5]	$L_2 \times T_1$, $L_2 \times T_2$, $L_4 \times T_2$, $L_5 \times T_2$, $L_6 \times T_2$, $L_7 \times T_1$, $L_7 \times T_2$, $L_8 \times T_1$, $L_8 \times T_2$, $L_9 \times T_1$, $L_9 \times T_2$, $L_{10} \times T_1$, $L_{10} \times T_2$, $L_{11} \times T_1$, $L_{11} \times T_2$, $L_{12} \times T_1$, $L_{12} \times T_2$, $L_{13} \times T_1$, $L_{14} \times T_1$, $L_{14} \times T_2$, $L_{15} \times T_1$, $L_{15} \times T_2$, $L_{16} \times T_1$, $L_{16} \times T_2$,. $L_{17} \times T_2$, $L_{18} \times T_1$, $L_{18} \times T_2$, $L_{19} \times T_1$, $L_{19} \times T_2$, $L_{20} \times T_1$, $L_{20} \times T_2$, $L_{21} \times T_1$, $L_{21} \times T_2$, $L_{22} \times T_1$, $L_{22} \times T_2$, $L_{23} \times T_1$, $L_{23} \times T_2$, $L_{24} \times T_1$, $L_{25} \times T_2$[39]	-
	BLSB	L_{10}, T_1, T_2[3]	$L_{10} \times T_1$, $L_{10} \times T_2$[2]	-
Susceptible > 7.0-9.0	TLB	-	-	-
	MLB	L_7, L_{20}, L_{22}[3]	$L_1 \times T_1$, $L_1 \times T_2$, $L_{13} \times T_2$[3]	-
	BLSB	-	-	-

breeding programmes. The cross combinations can be further evaluated for yield and other characters and released as promising hybrids resistant to TLB and MLB.

Conflict of Interest: Authors declare that there is no conflict of interests.

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