FIELD RESISTANCE TO *Macrophomina phaseolina* IN BLACK BEAN POPULATIONS

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Introduction

Charcoal rot or Ashy Stem Blight (ASB) is caused by the fungal pathogen, *Macrophomina phaseolina* (Tassi) Goid. and is particularly severe in drought stressed plants. Symptoms include wilting, chlorosis, premature defoliation, and early maturity or death (Pastor-Corrales and Abawi, 1988). Advanced breeding line, TLP 19 has ASB resistance similar to BAT 477, where resistance was controlled by two pairs of dominant genes exhibiting dominant recessive epistasis (Mayek-Pérez et al., 2001). One of the two populations in this study was segregating for ASB resistance derived from TLP 19.

In Honduras, a field experiment conducted under moisture stress conditions experienced a severe infestation of ASB. Although control measures were implemented, limited effect was observed for ASB symptoms. The genetic material under investigation was segregating for drought resistance. Drought tolerant lines have also shown ASB resistance (CIAT 1983). The objective of this study was to compare two populations segregating for drought resistance to known checks for their reactions to ASB.

Materials and Methods

On January 23, 2001, two populations, three parents and seven checks were planted in a completely randomized design in Zamorano, Honduras. The two recombinant inbred line (RIL) populations, L88 and L91, were derived from crosses B98311/TLP 19 and B98311/VAX 5, respectively. The seven checks included locally adapted material, Mexican cultivars and drought resistant genotypes (Table 1).

Moisture stress and non-stress treatments were maintained through furrow irrigation. Plots were five meters long and 0.7 meters wide. Rows were thinned to 50 plants per row at 15 days after planting (dap) to ensure adequate stands. Disease incidence (DI) was recorded at 75 dap in the stressed plots as the number of dead plants per row. During harvest, 30 plants per row were recorded for plant stand and yield. Analysis of variance was calculated to adjust yield to plant stand as the covariate.

Results

The severe infestation of ASB was characterized by 99% of the plots having at least one dead plant due to Macrophomina. DI ranged from 0.05 to 0.54 in the 160 genotypes (Figure 1). Plant stand was significantly affected by DI (R^2 =16.8****), while yield was less affected by both, DI (R^2 =6.9****) and plant stand (R^2 =6.6****).

Population L88 had a 6% higher DI than L91 yet averaged 113 kg/ha more in yield (Table 1). Both populations show the combination of yield potential and drought resistance from B98311 and disease resistance traits from TLP 19 and VAX 5. In the moisture stress and non-stress treatments, B98311 yielded more, yet had a two-fold higher DI in comparison to the two other parents. TLP 19 and VAX 5 had moderately low DI values at 0.15 and 0.20. Two RILs, L91-45 and L88-76, had the lowest DI in each population. Two other RILs, L91-30 and L88-69, had moderately low DI values and were selected as drought resistant based on yield.

The ASB resistant genotypes, BAT 477 and TLP 19 (Mayek-Pérez et al., 2001), showed more susceptibility to ASB than other genotypes. Possibly BAT 477 and TLP 19 are susceptible to the isolates of Macrophomina in Honduras. V8025, SEA 5 and Tío Canela 75 had lower DI values than BAT 477 and TLP 19. Even though TLP 19 is resistant to ASB, its progeny had a higher DI value than the progeny from VAX 5. VAX 5 was derived from tepary bean, which has resistance to common bacterial blight and ASB (Thomas et al., 1983). VAX 5 may carry ASB resistance and should be tested as a possible new source of resistance to Macrophomina.

Figure 1. Field incidence of ASB compared to yield under stress in 160 genotypes.

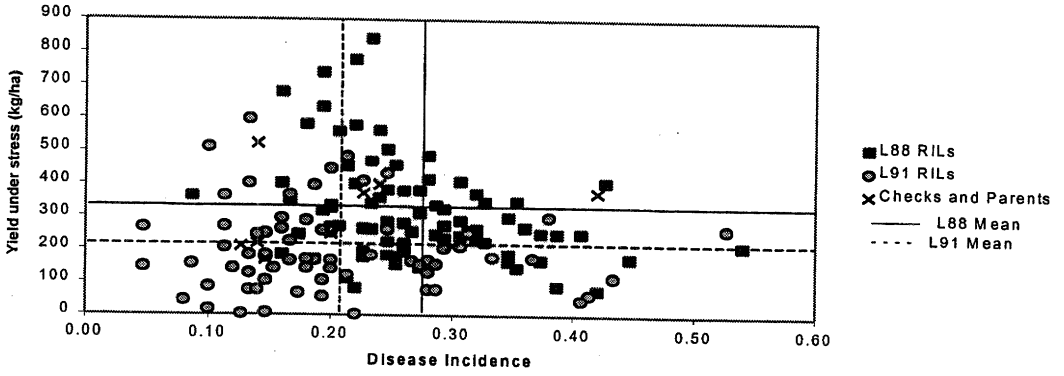

Table 1. Selected genotypes and means compared for their disease incidence (DI), plant stand, yield under stress (Yd), yield under non-stress (Yp), and geometric mean (GM).

Genotype	DI (Rank)	Stand	Yd	Yp	GM
			—— $kg \cdot ha^{-1}$ ——		
L91-45	0.05 (1)	29	266	2468	810
L88-76	0.09 (4)	27	363	1862	822
V8025	0.13 (13)	28	210	1783	612
L91-30	0.13 (15)	27	599	1922	1073
SEA 5	0.14 (20)	23	524	1521	893
Tío Canela 75	0.14 (22)	27	218	1657	602
TLP 19	0.15 (24)	30	169	2399	637
L88-69	0.16 (31)	27	680	2432	1286
VAX 5	0.20 (61)	27	249	1765	663
Rio Tibagi	0.23 (75)	27	372	2108	886
BAT 477	0.24 (88)	27	400	1536	784
EAP 9510-77	0.29 (120)	27	232	2112	699
Tacana	0.30 (125)	28	213	2097	667
B98311	0.42 (154)	27	375	2411	951
Mean, L88	0.27		320	2057	791
Mean, L91	0.21		207	1858	591

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