DROUGHT STRESS EFFECTS ON CHARCOAL ROT SEVERITY AND GRAIN YIELD OF COMMON BEANS[1]

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The fungus *Macrophomina phaseolina* (Mp) causes charcoal rot on common beans, under drought and high temperature stresses and both tropical and arid regions of México. A high variability on genotype and pathogenicity in Mexican Mp isolates have been found and populations from tropical lands are more aggressive than those from arid lands. A 12 common bean differential cultivar set have been proposed to improve the characterization of pathogenic variability and clarify the biology of populations and host specialization of Mp (3). This work was conducted in order to characterize the response to drought stress of differential cultivars set under field conditions.

Four experiments were conducted at Isla (18°06' N, 95°53' W, 25 masl) and Cotaxtla, Veracruz, México (18°44' N, 95°58' W, 16 masl). Trials were planted on October 19, 2000 and February 14, 2001 (Isla) and October 20, 2000 and January 30, 2001 (Cotaxtla). The differential set includes twelve common bean cultivars, six classified as resistants and six classified as susceptibles to Mp (Table 1) (3). At each trial, a RCB design with six replications was used, and germplasm was established under two soil moisture levels: irrigation and drought stress (irrigation was stopped when 50 % of the germplasm was flowering until harvest). Plots of all experiments were infested at sowing using 5 g row^{-1} of rice seeds colonized by local isolates of Mp. Plots were one row 3 m length and 0.61 m wide (30 seeds row^{-1}). Data of charcoal rot disease severity (DS) were registered at 21, 42, and 63 days after sowing (das). At maturity , seed yield was determined by harvesting all plants present in each plot. Data of each experiment were subjected to ANOVA and means compared using LSD test (P=0.05). The effect of drought stress on grain yield was estimated as suggested Fischer and Maurer (1).

Drought stress was greater in 2001 than 2000, due Drought Intensity Indexes (DII) were 0.12 (2000) and 0.37 (2001) at Isla, while DII were 0.18 (2000) and 0.26 (2001) at Cotaxtla. Charcoal rot resistant germplasm showed lower Mp severity and Drought Susceptibility Index (DSI) than susceptible genotypes, while resistant germplasm showed the highest grain yield. Mesoamerican germplasm had lower charcoal rot severity than other gene pools. Thus, the most-yielded genotypes showed the lowest Mp infection rates and the lowest DSI, such as TLP 19, BAT 477, SEQ 12, and Negro 8025. The exception was Pinto Villa that showed intermediate reaction to charcoal rot and intermediate grain yield, but its DSI was similar to resistant germplasm (Table 1). Pinto Villa was identified as resistant to drought stress under highlands of México previously (7), but susceptible to Mp at tropical lowlands (4). Negro 8025 and TLP 19 showed lower Mp severity than BAT 477 as been found previously at Honduras (2). Our data confirmed the resistance to Mp and high grain yield in Mesoamerican germplasm (4, 6) and the relationship between resistance both charcoal rot and drought stress (5).

Literature Cited.

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Table 1. Average Mp severity, grain yield and drought susceptibility index of 12 common bean cultivars.

Genotype	Mp severity	Grain yield ($kg\ h^{-1}$)	DSI	Genotype	Mp severity	Grain yield ($kg\ h^{-1}$)	DSI
Resistants				**Susceptibles**			
BAT 477	3.6	1031	0.91	B. Mecentral	6.2	358	1.77
TLP 19	3.5	1114	0.97	B. Durango	4.6	780	1.60
G 4523	5.7	653	1.74	A. Tapatío	4.5	828	1.16
SEQ 12	3.8	990	0.99	P. Villa	4.1	633	0.92
N. 8025	3.3	1020	0.93	P. UI-114	5.7	490	1.53
G 19428	5.1	155	1.73	R. Tibagí	4.4	935	1.23
Mean	**4.2**	**827**	**1.21**		**4.9**	**671**	**1.37**
LSD (P=0.05)					0.9	202	0.22

Figure 1. Relationship between charcoal rot severity and grain yield in 12 bean genotypes. (X-axis=Charcoal rot severity; Y-axis=Grain yield ($kg\ h^{-1}$).