

Research Note

RESISTANCE AND SUSCEPTIBILITY OF BEANS, *PHASEOLUS VULGARIS* L., TO ASHY STEM BLIGHT, *MACROPHOMINA PHASEOLINA* (TASSI) GOID¹

Ashy stem blight (ASB), a widespread root and stem disease of the dry bean (*Phaseolus vulgaris* L.), is incited by the fungus *Macrophomina phaseolina* (Tassi) Goid. In recent years the disease has caused severe losses in experimental plantings of beans in Puerto Rico,² particularly when plants are under stress from moisture deficit. Severe symptoms are observed in the field when bean plants are in the seedling stage, and frequently in adult plants approaching physiological maturity (R. Echávez-Badel, unpublished). Screening of dry bean germplasm for resistance to ASB requires an efficient inoculation method, in which disease escapes are eliminated. Soil inoculation techniques using sclerotia or mycelia are reported for root rot,^{3,4} but these are not adapted for screening adult bean genotypes for resistance to ASB. A toothpick inoculation was suggested as a uniform severe method allowing both disease incidence and severity readings (P. Hepperly, personal communication). To test this method, a greenhouse experiment was conducted from June to August of 1986. Three dry bean genotypes, UPR/TARS B-190, TARS 8437-22, and RIZ 44 from CIAT were planted in 15 cm diameter plastic pots containing promix and sandy-loam sterile soil (1:1). Seeds were previously selected and treated with dicarboximide fungicide (Captan). Plants were watered three times

per week, fertilized with NPK 20 days after planting, and insects were controlled with methomyl (Lannate) in the seedling stage. *M. phaseolina* pure cultures were isolated from seeds and stems with potato dextrose agar (PDA) supplemented with streptomycin sulphate as medium. Plant tissues and seeds were planted (9-cm petri dish) after a superficial disinfection. The inoculum was applied on toothpicks soaked with sterile maize meal-dextrose broth. We inoculated the bean plants by inserting the infected toothpick into the stem just below the cotyledonary node. Sterile toothpicks were used as checks. Inoculations were made 30 days after planting. A split plot design with 5 replications was used. The disease severity was measured from the number of infected nodes and mean of the stem discoloration lengths.

Disease reaction was different among dry bean genotypes (tables 1 and 2). The 8437-22 bean line showed high levels of resistance to ASB. B-190 had an intermediate mean value, and RIZ 44 was most susceptible. Differences in incidence and severity were found. Distinct host variation existed among dry bean genotypes for level of susceptibility or relative resistance. This finding agrees with varietal differences in charcoal rot in soybeans.⁵ Disease readings at 10, 20, and 30 days after inoculations indicated that the rate of disease increase was

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²Zapata, M., 1984. Production of bacterial blight (*Xanthomonas* spp.) resistant bush bean germplasm. Progress Report TAD Project Agric. Exp. Stn. Univ. P. R.

³Dhingra, O. D. and J. B. Sinclair, 1985. Basic plant pathology methods. CRC Press, Inc., Boca Ratón, Florida.

⁴Anonymous, 1985. Annual Technical Report Dominican Republic/University of Puerto Rico Bean/Cowpea CRSP Project.

⁵Gangopodhyay, S. and T. D. Willie, 1974. Biochemical comparison of nine soybean varieties in relation to their susceptibility to *Macrophomina phaseolina*. *Indian J. Mycol. Plant Pathol.* 3: 131.



FIG. 1.—Ashy stem blight (*M. phaseolina*) in adult bean plants under artificial inoculation by the toothpick method. The toothpick and picnidia on stem.

TABLE 1.—Disease reaction of 3 dry bean genotypes to ashy stem blight, *Macrophomina phaseolina* (Tassi) Goid

Genotype	Origin ¹	Stem length ²	No. of infected ² nodes
		infected	
		cm	
B-190	UPR/TARS	10.33	1.33
8437-22	TARS (USDA)	0.00	0.00
RIZ 44	CIAT	24.23	3.33

¹UPR = University of Puerto Rico.

TARS = Tropical Agriculture Research Station.

USDA = United States Department of Agriculture.

CIAT = Centro Internacional de Agricultura Tropical.

²Means of 5 values rated at 10, 20 and 30 days after inoculation.



FIG. 2.—Ashy stem blight (*M. phaseolina*) in adult bean plants under artificial inoculation by the toothpick method. RIZ 44 bean variety 30 days after inoculation. Healthy plant (left) and infected plant (right).

TABLE 2.—Incidence of ashy stem blight, *Macrophomina phaseolina* (Tassi) Goid, on 3 dry bean genotypes

Genotype	No. of plants infected	No. of total plants	Incidence
			%
B-190	2	5	40.0
8437-22	0	5	0.0
RIZ 44	3	5	60.0

Reading	Disease reaction	
	Stem length	Infected nodes
	infected	
	<i>cm</i>	
10 days	1.97	0.47
20 days	8.47	1.27
30 days	24.13	2.93

stems (fig. 1) without symptoms on subepidermal tissue of the main root, typical for soybean charcoal root rot.⁶ No ASB symptoms were observed on plant checks (fig. 2). Toothpick inoculation is an effective, rapid, and economical technique for greenhouse screening of bean germplasm for resistance to ASB.

highest between 20 and 30 days as shown below. Infected plants died at 30 days.

Numerous tiny picnidia on the gray background were observed on infected

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⁶Sinclair, J. B. and M. C. Shurtleff (Eds), 1975. Compendium of Soybean Diseases. APS, Inc., St. Paul, Mn.