

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

Agronomy & Horticulture -- Faculty Publications

Agronomy and Horticulture Department

1992

Field Reaction of Landrace Components of Red Mottled Common Bacterial Blight

James S. Beaver

University of Puerto Rico - Mayaguez, james.beaver@upr.edu

James R. Steadman

University of Nebraska- Lincoln, jsteadman1@unl.edu

Dermot P. Coyne

University of Nebraska-Lincoln, dcoyne1@unl.edu

Follow this and additional works at: <https://digitalcommons.unl.edu/agronomyfacpub>



Part of the [Plant Sciences Commons](#)

Beaver, James S.; Steadman, James R.; and Coyne, Dermot P., "Field Reaction of Landrace Components of Red Mottled Common Bacterial Blight" (1992). *Agronomy & Horticulture -- Faculty Publications*. 633.

<https://digitalcommons.unl.edu/agronomyfacpub/633>

This Article is brought to you for free and open access by the Agronomy and Horticulture Department at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in Agronomy & Horticulture -- Faculty Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Field Reaction of Landrace Components of Red Mottled Beans to Common Bacterial Blight

James S. Beaver

Department of Agronomy, University of Puerto Rico, Mayaguez, PR 00709

James R. Steadman

Department of Plant Pathology, University of Nebraska, Lincoln, NE 68583

Dermot P. Coyne

Department of Horticulture, University of Nebraska, Lincoln, NE 68583

Additional index words. *Phaseolus vulgaris*, *Xanthomonas campestris* pv. *phaseoli*, germplasm, disease resistance

Abstract. Field reaction of 25 red mottled bean (*Phaseolus vulgaris* L.) genotypes to common bacterial blight [*Xanthomonas campestris* pv. *phaseoli* (Smith) Dye] was evaluated in Puerto Rico over 2 years. The average disease severity (percent leaf area with symptoms) was similar over years. The determinate red mottled genotypes had almost twice as much disease as indeterminate genotypes. Eight of the indeterminate genotypes had significantly less disease than the mean of the field experiments. These genotypes may serve as useful sources of resistance to common bacterial blight. The size of the chlorotic zone around necrotic lesions varied between growing seasons, showing that environment can influence the expression of common bacterial blight symptoms.

Common bacterial blight (Cbb) is a serious disease in tropical and temperate bean

growing regions (Beaver et al., 1985; Coyne and Schuster, 1974; Schieber, 1970). Most red mottled beans grown in the Dominican Republic are susceptible to common bacterial blight, but the characteristic chlorotic border around the necrotic leaf lesions often has not been observed on certain 'Pompador'-type red mottled genotypes. The red mottled landrace cultivars, mostly grown by small-scale farmers, have been found to vary

for several important traits, including growth habit, leaf pubescence, and biological N fixation capacity (Catano, 1990; Oviedo et al., 1990). The possibility that disease reaction could also vary led to the objective of this research: to evaluate a group of selections from the Dominican red mottled bean landrace for necrotic and chlorotic field reaction to common bacterial blight.

Twenty-five determinate and indeterminate red mottled bean genotypes were evaluated in Puerto Rico for field reaction to common bacterial blight in 1988 and 1989. Two red kidney genotypes, 27R and 3M-152, were also planted as susceptible controls. The experiments were planted at the Isabela Substation on 31 Oct. 1988 and 11 Oct. 1989. A randomized complete block design with five replications was used. Experimental units consisted of one 1.5-m row planted with 15 seed. Plots were evaluated for disease severity 46 days after planting in 1988 and 58 days after planting in 1989. All genotypes were at the early to mid-pod-fill stage of development when visually evaluated for percentage of leaf area showing necrosis and water-soaking due to Cbb. In addition, the size of the chlorotic zones surrounding the Cbb lesions was rated using a scale where 1 = no chlorotic zone and 5 = a chlorotic zone surrounding and nearly as large as the necrotic lesion. Rainfall and temperatures were normal and, therefore, favorable for disease development. Natural infection on the susceptible genotypes became prominent shortly after flowering. The average disease severity was similar between years. The disease severity on the susceptible controls ranged from 24% to 34% (Table 1). The small plots with five replications provided an adequate level of precision to detect significant disease severity differences among genotypes. Moreover, the disease se-

Received for publication 19 Feb. 1991. Research supported in part by USAID/BIFAD Bean/Cowpea CRSP grant no. AID/DSAN-XII-G-0261. The cost of publishing this paper was defrayed in part by the payment of page charges. Under postal regulations, this paper therefore must be hereby marked advertisement solely to indicate this fact.

Table 1. Common blight severity and chlorotic zone scores of 27 bean genotypes evaluated at Isabela, Puerto Rico, during 1988 and 1989.

Genotype	Growth habit ^z	Common blight severity ^y			Chlorotic zone score ^x		
		1988	1989	Mean	1988	1989	Mean
Pompadour G	I	10	13	12	2.9	1.6	2.3
V	I	12	6	9*	3.0	1.2	2.1
U	I	46	16	30	4.5*	1.4	3.0
M	I	8	8	8*	2.9	2.0	2.5
H	I	9	8	9*	3.0	1.6	2.3
R	I	11	21	16	2.8	1.4	2.1
XB	I	10	16	13	3.1	1.8	2.5
L	I	13	9	11*	3.2	1.2	2.2
JN	I	19	20	20	3.2	3.0*	3.1
T	I	12	7	9*	2.8	2.0	2.4
P	I	13	12	13	3.2	1.6	2.5
K	I	9	10	10*	3.1	2.6	2.9
Rocio A	I	11	10	11*	2.7	2.4	2.6
Pompadour AE	I	5	16	11*	3.0	2.0	2.5
Mean				12	3.1	1.8	
8738-01B	D	19	23	21	1.9	1.8	1.9
8738-03B	D	23	17	20	1.8*	1.6	1.7
8738-04B	D	21	15	18	1.9	1.8	1.9
8738-05B	D	24	22	23	1.5*	1.4	1.5
8738-07B	D	22	26	24	1.4*	1.8	1.6
8738-08B	D	27	24	25	2.4	2.8	2.6
8738-12B	D	25	29	27	2.3	3.2*	2.7
Pompadour N	D	37	33	35	1.8*	2.6	2.2
Indiana Roja	D	19	23	21	2.7	2.2	2.5
Pompadour F	D	18	13	15	2.0	1.6	1.8
Pomp. Checa	D	16	12	14	2.4	2.0	2.2
Mean				20	2.0	2.0	
27R	D	33	26	30	3.6*	2.6	3.1
3M-152	D	34	24	29	3.5	1.8	2.7
Mean				30	3.6	2.2	
Overall mean		19	17	18	2.7	2.0	
LSD _{0.05}				6	0.8		

^zGrowth habit score, where D = determinate and I = indeterminate.

^yPercent of leaf area with necrosis and/or water-soaking.

^xScore for chlorotic zones around lesions, where 1 = no chlorotic zone and 5 = chlorotic zone as large as lesion.

*Significantly different ($P = 0.05$) from the overall mean.

verity of the individual red mottled landrace components was similar between years (Table 1).

As a group, the determinate genotypes had almost twice the disease severity as the indeterminate genotypes (Table 1). Eight of the indeterminate genotypes had significantly less disease than the mean of the test, whereas the disease severity of the determinate lines was equal to or greater than the mean of the test. The difference in disease

severity between growth habits could not be attributed to differences in maturity, as most of the determinate and indeterminate lines in the experiment flowered and matured within a few days of each other. The indeterminate lines with low Cbb severity may serve as useful sources of resistance to not only Cbb but also to rust [*Uromyces appendiculatus* (Pers.) Unger pv. *appendiculatus*] since all of these genotypes have also been selected for dense abaxial leaf pubescence, a trait as-

sociated with rust resistance (Oviedo et al., 1990). Greater resistance to Cbb and rust would be needed to allow the greater yield potential of indeterminate genotypes to be realized (Beaver et al., 1985).

In 1988, the red kidney control genotypes, 27R and 3M-152, produced typical chlorotic zones around the lesions, and the chlorotic zone around lesions on indeterminate genotypes was larger than that on determinate genotypes (Table 1). In 1989, however, the chlorotic zones were smaller than those in 1988, and there was no significant difference between growth habits or among genotypes. The environment may have affected the degree of expression of the chlorotic zone around the lesions. The halo in the blight of beans caused by *Pseudomonas syringae* pv. *phaseolicola* (Burkholder) is expressed more at 20C than at higher temperatures (Coyne and Schuster, 1974). Researchers familiar with Cbb symptoms on beans in temperate or higher-altitude tropical environments should know that chlorotic zones around lesions are often not expressed on beans grown in the lowland tropics. The size of the chlorotic zone around necrotic lesions can vary between growing seasons and among bean genotypes in field evaluations.

Literature Cited

- Beaver, J.S., C. Paniagua, D. Coyne, and G. Freytag. 1985. Yield stability of dry bean genotypes in the Dominican Republic. *Crop Sci.* 25:923-926.
- Beaver, J.S., C.V. Paniagua, J.R. Steadman, and R. Echavez-Badcl. 1985. Reaction of dry bean genotypes to natural infection of foliar diseases in the Dominican Republic. *J. Agr. Univ. of Puerto Rico* 69:283-290.
- Cataño, H. 1990. Selection of *Phaseolus vulgaris* L. genotypes able to nodulate in the presence of nitrogen. MS Thesis, Univ. of Puerto Rico, Mayaguez.
- Coyne, D.P. and M.L. Schuster. 1974. Breeding studies of tolerance to several bean (*Phaseolus vulgaris* L.) bacterial pathogens. *Euphytica* 23:651-666.
- Oviedo, F., J.S. Beaver, and J.R. Steadman. 1990. Caracterización de la pubescencia acicular en las hojas de genotipos de habichuela. *J. Agr. Univ. of Puerto Rico*. 74:111-119.
- Schieber, E. 1970. Enfermedades del frijol (*Phaseolus vulgaris*) en la República Dominicana. *Turrialba* 20:20-23.