

EVIDENCE FOR A DOMINANT GENE FOR RESISTANCE ON LEAVES OF COMMON BEAN TO THE COMMON BACTERIAL BLIGHT PATHOGEN, *XANTHOMONAS AXONOPODIS* PV. *PHASEOLI*

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The common bean blight pathogen [*Xanthomonas axonopodis* pv. *phaseoli* (Xap)] remains a limiting factor for common (*Phaseolus vulgaris* L.) bean production worldwide and resistance to the pathogen in most commercial bean varieties is inadequate. Variability of the bacterial pathogen has been observed in strains isolated from Puerto Rico and Central America indicating the presence of pathogenic races (Zapata, 1996, Zapata and Beaver, 2005). In previous research, bean lines were identified that had a differential reaction when inoculated with different Xap strains. In an attempt to identify specific genes for resistance to common bacterial blight in common bean, a breeding line that showed a differential reaction on the foliage to Xap strains was crossed with a susceptible parent.

MATERIALS AND METHODS

Two Xap strains (3353 and 1934) that in previous experiments behaved as pathogenic races were selected for the inheritance study. When inoculated with the Xap strains, both PR0313-58 and Rosada Nativa were susceptible to Xap strain 1934. PR0313-58 was resistant and Rosada Nativa was susceptible to strain 3353. A cross between the bean breeding line PR0313-58 x 'Rosada Nativa' was made and advanced a generation to develop a F₂ population. Sixty F₂ plants and 20 plants of each parent were planted in the greenhouse on the University of Puerto Rico, Mayaguez Campus for their response to the selected Xap strains using reactions on two leaflets on the same plant as replications. The method for inoculation has been previously described (Zapata, 2006). Responses were recorded at 14, 21 and 28 days after inoculation and evaluated on a scale from 1 to 10 where 1 = no symptoms, and 10 highly susceptible with systemic infection. For the Chi square analysis two set of data were prepared: Group 1 in which resistant plants were 1-4 and susceptible 5-10 and Group 2 in which 1-3 were resistant and 3.5 to 10 were susceptible. Chi squares tests were used to measure the fit of the results of each group to the expected ratio of 3 Resistant:1 Susceptible plants for a dominant gene in a F₂ population.

RESULTS AND DISCUSSION

The reactions of the F₂ plants using the Xap 3353 strain fit the 3R:1S model for a single dominant gene for resistance to common bacterial blight (Table 1). Both groups of F₂ plants inoculated with Xap 3353 at 14 and 21 days after inoculation had an adequate fit for the 3R:1S model. At 28 days after inoculation, only the F₂ plants in Group 1 fit the 3R:1S model. It should be noted, however, that common bacterial blight readings tend to be less reliable at 28 days after inoculation. When inoculated with the Xap strain 1934, most of the F₂ plants (> 85%) had susceptible reactions at 21 and 28 days after inoculation.

CONCLUSIONS

The resistance derived from the cross PR0313-58 x Rosada Nativa fit the expected ratio of 3 resistant to 1 susceptible plants in the F₂ generation. These results support the hypothesis that resistance to Xap strain 3353 is conferred by a single dominant gene. This suggest the presence of a

corresponding single specific and dominant avirulence gene in Xap 3353 which does not appear to be present in Xap strain 1934. These results represent the first evidence of gene specificity to Xap. We plan to continue to evaluate the reaction to Xap 3353 in the F₃ generation to determine if the patterns of segregation follow the expected distribution for a single dominant resistance gene. If the hypothesis is confirmed we will attempt to identify a molecular marker for the resistant gene. This is the first report of a specific gene for resistance to common bacterial blight in common bean.

Table 1. Leaf reaction of F₂ plants from the cross PR0313-58 / ‘Rosada Nativa’ to two strains of *Xanthomonas axonopodis* pv. *phaseoli*.

Group 1

1-4 Resistant (R) Number of plants 3R:1S plants
5-10 Susceptible (S)

Strain	Days after inoculation	Resistant Mean \leq 4.0	Susceptible Mean $>$ 4.0	Expected resistant	Expected susceptible	X ²	P
3353	14	48	9	42.75	14.25	2.58	0.108
	21	43	14	42.75	14.25	0.0058	0.939
	28	41	15	42.00	14.00	0.0952	0.758
1934	14	36	22				
	21	8	50				
	28	3	55				

Group 2

1-3 Resistant (R) Number of plants 3R:1S plants
3.5-10 Susceptible (S)

Strain	Days after inoculation	Resistant Mean \leq 3.0	Susceptible Mean $>$ 3.5	Expected resistant	Expected susceptible	X ²	P
3353	14	41	17	43.50	14.50	0.58	0.45
	21	44	13	42.75	14.25	0.15	0.70
	28	31	26	42.75	14.25	12.9*	0.00
1934	14	13	45				
	21	2	56				
	28	1	58				

REFERENCES

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