

# CHARACTERIZATION OF THE ANTHRACNOSE RESISTANCE GENE PRESENT IN THE ANDEAN CULTIVAR PERLA

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## INTRODUCTION

Biotic stress is a major cause of yield losses in common bean production worldwide. Anthracnose (ANT), caused by the fungus *Colletotrichum lindemuthianum* (Sacc & Magnus) Briosi & Cavara is among the diseases that affect beans and can cause yield losses of up to 100%, especially when environmental conditions are favorable for the development of the disease (Singh and Schwartz, 2010). The use of disease resistance genes is the most economical and ecological strategy for disease control. Finding and characterization of ANT resistance genes in different materials and available cultivars is important (Mahuku and Riascos, 2004). To date different anthracnose resistance genes were identified in common bean, most of them in Mesoamerican germplasm. Thus, characterization of new Andean sources of resistance is important for bean breeding. In the present work the resistance gene present in the Andean cultivar Perla was studied.

## MATERIALS AND METHODS

Inheritance test was carried out to characterize the resistance of Perla cultivar to races 65 and 73 of *C. lindemuthianum*. F<sub>2</sub> populations from the crosses between Perla (resistant) × Mexico 222 (susceptible) and Perla × Cornell 49-242 (susceptible) were inoculated with races 65 and 73, respectively. Allelism tests were conducted in F<sub>2</sub> populations derived from independent crosses between Perla and other resistant cultivars that have genes previously characterized (Table 1). After the emergence of the first trifoliolate leaf, seedlings of the parents, F<sub>1</sub> and F<sub>2</sub> populations from each cross were inoculated with races 65, 73 and 2047 independently. Inoculum was prepared adjusting the spore concentration to  $1.2 \times 10^6$  spores.mL<sup>-1</sup> for each race. After inoculation, plants were placed in a  $20 \pm 2^\circ\text{C}$  growth chamber with high relative humidity (>95%). Ten days after inoculation, the disease severity index (DSI) was rated using the 1-9 scale proposed by Pastor-Corrales *et al.* (1995) and plants with scores of 1-3 were considered as resistant. Statistical analyses for the inheritance and allelism tests were performed through Chi-square test.

## RESULTS AND DISCUSSION

Inheritance and allelism tests results are shown in Table 2. Inheritance test performed with the F<sub>2</sub> population derived from the cross Perla × Mexico 222 showed a 3R:1S ratio ( $p = 0.67$ ), indicating the presence of a single dominant resistance gene in Perla cultivar to race 65. Also, a 3R:1S ratio was observed in the F<sub>2</sub> population from the cross Perla × Cornell 49-242 ( $p = 0.86$ ), suggesting the presence of a single dominant resistance gene in Perla cultivar to race 73. Allelism tests showed 15R: 1S ratios for the F<sub>2</sub> populations from each cross (R × R). These results indicate the action of two dominant independent resistance genes, one of them present in Perla cultivar and the other in the remaining cultivars. From these results we conclude that the

Andean cultivar Perla possess a new gene that confers resistance to races 65, 73 and 2047 of *C. lindemuthianum* and it is an important source of resistance to be use in bean breeding programs.

**Table 1.** Disease reaction in F2 populations from Inheritance tests (R × S) and allelism tests (R × R) for the genetic characterization anthracnose resistance in Perla cultivar

Crosses with Perla	Resistance Gene <sup>a</sup>	Race	Expected ratio <sup>b</sup>		Observed ratio		$\chi^2$	p value
			R	S	R	S		
<i>Inheritance tests</i>								
Mexico 222 (M)	<i>Co-3</i>	65	3	1	92	28	0.1777	0.6733
Cornell 49-242 (M)	<i>Co-2</i>	73	3	1	81	28	0.0275	0.8682
<i>Allelism tests</i>								
Paloma (A)	NI	65	15	1	111	9	0,3200	0.5716
Kaboon (A)	<i>Co-1</i> <sup>2</sup>	65	15	1	117	9	0,1714	0.6788
MDRK <sup>c</sup> (A)	<i>Co-1</i>	65	15	1	110	8	0,0564	0.8121
TU (M)	<i>Co-5</i>	65	15	1	82	6	0,0484	0.8257
Pitanga (A)	<i>Co-14</i>	65	15	1	78	5	0,0071	0.9322
AB-136 (M)	<i>Co-6, Co-8</i>	65	15	1	91	6	0,0006	0.9791
PI 207262 (M)	<i>Co-4</i> <sup>3</sup>	73	15	1	105	7	0.0000	0.1000
Ouro Negro (M)	<i>Co-3</i> <sup>4</sup>	73	15	1	97	6	0.0006	0.9804
AC <sup>d</sup> (A)	NI	2047	15	1	73	6	0.2440	0.6210
Jalo Pintado 2 (A)	NI	2047	15	1	97	6	0.0310	0.8580

<sup>a</sup> NI: not identified gene; <sup>b</sup> R: resistant; S: susceptible; <sup>c</sup>MDRK: Michigan Dark Red Kidney; <sup>d</sup>AC: Amendoim Cavallo; (A): Andean gene pool, (M): Mesoamerican gene pool.

## REFERENCES

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