INHERITANCE OF ANTHRACNOSE RESISTANCE IN THE ANDEAN COMMON BEAN CULTIVAR BRSMG REALCE

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INTRODUCTION

Anthracnose, caused by the fungus *Colletotrichum lindemuthianum* (Sacc. and Magn.), is one of the most important diseases affecting the common bean (*Phaseolus vulgaris* L.) in Brazil. Based on the level of susceptibility shown by the cultivars, the occurrence of environmental conditions favorable to the development of the disease, and the amount of initial inoculum present, losses in the seed yield and quality can range from 80 to 100% (Singh & Schwartz, 2010). Anthracnose resistance in common bean is mainly controlled by major dominant genes from *P. vulgaris* Mesoamerica gene pool (List of Genes – *Phaseolus vulgaris* L; http://www.bic.uprm.edu). The "rajado" seeded Andean cultivar BRSMG Realce has shown wide and durable resistance in Brazil, including resistance to the *C. lindemuthianum* pathotypes 65, 73, 81, 91, 475, and 479 (Melo *et al.*, 2014). The pathotypes 65, 73, and 81 are currently the most prevalent in Brazilian bean fields. The main goal of the present work was to identify the inheritance of anthracnose resistance in the Andean cultivar BRSMG Realce.

MATERIALS AND METHODS

Controlled crosses were carried out at Embrapa Arroz e Feijão between the Andean resistance source BRSMG Realce and the Mesoamerican carioca seeded cultivars BRS Notável and BRS FC104. BRSMG Realce was always used as female parent. All F_1 plants were tested with SSR markers, in addition to the parents, to confirm them as hybrids. The checked hybrids were advanced up to the F_2 generation. Approximately 150 and 300 F_2 seeds from the crosses BRSMG Realce × BRS Notável and BRSMG Realce × BRS FC104, respectively, were sown in polystyrene trays containing commercial soil substrate (Plantmax®), resulting in 128 and 275 F_2 plants, respectively. The *C. lindemuthianum* isolates Cl 1988 (pathotypes 81) and Cl 1322 (pathotype 475) were used to inoculate the F_2 populations from crosses BRSMG Realce × BRS Notável and BRSMG Realce × BRS FC104, respectively. In addition to the parents, IPA 7419 was also tested and used as a susceptible control. All plants screened were inoculated with a conidial suspension at seven days after sowing, in the V2 stage (Pastor-Corrales et al., 1992). The conidial suspension (1.2×10^6 conidia mL^{-1}) was obtained as described by Cárdenas et al. (1964). The conidial suspension was applied to the abaxial and adaxial surfaces of primary leaves with a hand sprayer until runoff. After the inoculation, all plants were kept in a moist chamber for 45 h, with a photoperiod of 12 h light/dark and temperature adjusted to 20 ± 2ºC. The humidity was controlled by nebulization and maintained at approximately 95%. After that, nebulization was turned off and the inoculated plants were kept in a controlled environment with the same temperature and photoperiod described above. The symptoms were evaluated at seven days after the inoculation, following the score scale of 1-to-9, where plants that showed scores 1-to-3 were considered resistant and plants with scores 4-to-9 were considered as susceptible (Pastor-Corrales & Tu, 1989).

RESULTS AND DISCUSSION

The observed symptoms in the susceptible genotypes were fully attributed to the infection caused by the fungus *C. lindemuthianum*, showing the effectiveness of the inoculation procedure. BRSMG Realce showed an average score of 1 when tested with both pathotypes 81 and 475, while BRS Notável, BRS FC104, and IPA 7419 presented average scores of 9. The results from the screening of the two F_2 populations tested in this work indicated that a single dominant gene governs inheritance of anthracnose resistance in the Andean cultivar BRSMG Realce – *Co-Realce* (Table 1). The population BRSMG Realce × BRS FC104 is currently being genotyped with SNP markers for genetically mapping the resistance locus *Co-Realce*.

Table 1. Inheritance of anthracnose resistance in the Andean "rajado" seeded common bean cultivar BRSMG Realce.

Pathotype[a]	Crosses	Ratio	No. Observed		No. Expected		χ^2	p-value
			R	S	R	S		
81	BRSMG Realce[b]	1:0	12	0	12	0	-	-
	BRS Notável[c]	0:1	0	12	0	12	-	-
	IPA 7419[d]	0:1	0	12	0	12	-	-
	F_2 (BRSMG Realce x BRS Notável)	3:1	101	27	96	32	1.04	0.31
475	BRSMG Realce[b]	1:0	12	0	12	0	-	-
	BRS FC104[c]	0:1	0	12	0	12	-	-
	IPA 7419[d]	0:1	0	12	0	12	-	-
	F_2 (BRSMG Realce x BRS FC104)	3:1	215	60	206	69	1.48	0.22

[a]Races of *Colletotrichum lindemuthianum*; [b]Resistant parent; [c]Susceptible parent; [d]Susceptible control; R – Resistant; S – Susceptible.

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