

NEW SOURCES OF RESISTANCE, RACE IDENTIFICATION AND VIRULENCE AND RESISTANCE INDEXES IN ANTHRACNOSE RESEARCH.

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Introduction

Anthracoze, caused by the fungus *Colletotrichum lindemuthianum*, is the most important disease of common bean (*Phaseolus vulgaris* L.) in the state of Rio Grande do Sul, Brazil. The state is an important dry bean producer, with a farmer's contingent of about 200.000 growers. Fluctuation on race prevalence is a common phenomenon which reflects the permanent adaptation of the fungus population to the cultivars under use, on its struggle for survival. The result from this scenery, is the eventual appearance of novel recombinants which turn out to be characterized as new pathotypes, which eventually may cause serious losses in production. Breeding programs should monitor these possible occurrences in order to prevent diseases to reach epidemic character, through the identification of resistance sources that could be incorporated to the production systems. In search for anthracnose resistance sources, race identification from samples collected in common bean growing areas, and the correspondent reaction of bean germoplasm under controlled conditions are described in the present paper.

Material and Methods

Anthracoze samples were collected in production areas of the state of Rio Grande do Sul in cropping years 2000/01 and 2001/02. The germplasm tested comprised the international anthracnose common bean differential cultivar set (twelve cultivars), a susceptible check (the cv. IPA 7419), eleven black-seeded cultivars released by official research programs, four local cultivars and eight promising breeding lines. Twelve seeds of each genotype were placed in trays and subjected to greenhouse conditions. The methodology used for anthracnose resistance determination, follows Rava et al (1993). The genotype reaction was evaluated 7 days after inoculation by using a 0 - 9 scale, where 1, 2 and 3 were considered an incompatible reaction (resistant); 4, 5 and 6 intermediate and 7, 8 and 9, compatible (susceptible). A second evaluation was based on McKinney disease index (EMBRAPA, 1976).

Results and Discussion

It can be observed in Table 1 that nine of the twelve differential genotypes showed resistant reaction to all isolates. Resistance to all isolates was also displayed by the cultivar Soberano, among the black seed cultivars; by one of the four local cultivars, none of the other-seed-coat-color cultivars and, a very important finding, by four of the eight promising breeding lines. The isolates presented a maximum virulence percentage index (VI) of 25.0 for the differential cultivars, indicating that the genes for resistance present in these cultivars could be effective. In relationship to the already released black bean cultivars, VI's ranged from 45.4 to 90.9, indicating a high compatibility of the anthracnose races to the available cultivars. For the breeding lines, the VI's were 37.5 for all isolates indicating a great progress of the breeding program for anthracnose resistance. For other-seed-coat-color cultivars the VI ranged for 42.8 to 85.7, whereas for local cultivars from 50.0 to 75.0. As an overall VI, the isolates 01/01 and 11/02, showed the highest values, 58.13%.

It can be concluded that for the studied anthracnose sampling, resistance in the available cultivars is low, whereas, based on the assumption that some of the breeding lines will be released as a new cultivar, a significant progress in anthracnose resistance can be expected, since four of these lines are resistant to all isolates.

References

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Table 1. Bean germplasm reaction to five *Colletotrichum lindemuthianum* isolates, collected in Rio Grande do Sul state, Brazil, 2003.

Genotype	01/01		23/01		53/01		11/02		44/01		RI ² (%)
	R ¹	Imk	R	Imk	R	Imk	R	Imk	R	Imk	
Differential cultivar											
MICHELITE	S	1,00	S	1,00	S	1,00	S/I	0,78 (4-8)	S/I	0,68 (4-9)	0
MDR KIDNEY	R	0,12 (1,2)	R	0,11	R	0,11	R	0,14 (1,2)	R/I	0,28 (1-6)	100
PERRY MARROW	R/I	0,38 (1,5)	R	0,11	R	0,11	R	0,11	R	0,11	100
CORNELL 49-242	S	1,00	R	0,27 (1-3)	R	0,22 (1,2)	S/I	0,85 (6-8)	S	1,00	60
WIDUSA	R	0,11	R	0,11	R	0,11	R	0,11	R	0,11	100
KABOON	R	0,16 (1,2)	R	0,11	R	0,11	R/I	0,18 (1-6)	R	0,11	100
MÉXICO 222	S	1,00	S	1,00	S	1,00	S	1,00	R	0,11	0
PI 207 262	R	0,11	R	0,11	R	0,11	R	0,11	R	0,11	100
TO	R	0,13 (1,2)	R	0,25 (2,3)	R	0,11	R	0,11	R	0,11	100
TU	R	0,11	R	0,11	R	0,11	R	0,11	R	0,11	100
AB 136	R	0,11	R	0,11	R	0,11	R	0,11	R	0,11	100
G 2333	R	0,11	R	0,11	R	0,11	R	0,11	R	0,11	100
IPA 7419	S	1,00	S	1,00	S	1,00	S	0,99 (8,9)	S	1,00	0
Race No	73 (α-Brazil)		65 (alfa)		65 (alfa)		73 (α-Brazil)		9 (α-Brazil)		
VI ² - Differential Cvs.	25		16,7		16,7		16,7		16,7		80,0
Black-seeded cultivar											
RIO TIBAGI	S	1,00	S	1,00	S	1,00	S	1,00	S	1,00	0
GUATELAN 6662	S	1,00	S	0,98 (7,9)	S	1,00	S	1,00	S	1,00	0
MACANUDO	S	1,00	S/R	0,88 (2,9)	S/I	0,72 (5-9)	S	1,00	R	0,11	20
MINUANO	S	1,00	S	1,00	S/I	0,78 (6-9)	S	1,00	R	0,11	20
JAPAR 44	S	1,00	R	0,12 (1-3)	R	0,12 (1,2)	S	1,00	S	1,00	40
MACOTAÇO	S	1,00	S	1,00	S/I	0,81 (6-8)	S	1,00	R	0,11	20
GUAPO BRILHANTE	S	0,93 (7-9)	S	0,89 (7,9)	S/R	0,55 (1-9)	S/R	0,91 (1,9)	R/S	0,33 (1,9)	20
FT NOBRE	S	1,00	S	0,89 (7-9)	S	1,00	S	0,98 (7,9)	S	1,00	0
DIAMANTE NEGRO	S/I	0,67 (5-9)	S/I	0,67 (4-8)	S/I	0,83 (6-9)	S/R	0,66 (1-4)	S	1,00	0
VALENTE	S	1,00	S	1,00	R/I	0,21 (1-5)	S	1,00	R	0,11	40
SOBERANO	R	0,12 (1,2)	R	0,11	R	0,13 (1,2)	R	0,11	R	0,11	100
VI - Black-seeded cvs.	90,9		81,8		72,7		90,9		45,4		23,6
Breeding line											
TB 94-01	R/S	0,23 (1-9)	R	0,11	R/I	0,19 (1-4)	R	0,11	R	0,11	100
TB 96-11	R/I	0,22 (1-5)	I/R/S	0,43 (2-9)	R/S	0,34 (1-9)	R	0,11	R/I	0,18 (1-5)	100
TB 96-13	R/I	0,34 (2-5)	R/S	0,23 (1-9)	R/I	0,14 (1-4)	R	0,11	R	0,11	100
TB 97-13	R/S	0,33 (2-8)	R	0,11	R	0,11	R	0,17 (1-6)	R	0,15 (1,2)	100
CNEP 8104	S/R	0,89 (1-9)	S/I	0,80 (4-9)	S	1,00	S	0,83 (1,9)	S/R	0,88 (1-9)	0
TB 98-20	S	1,00	S	1,00	S/I/R	0,77 (2-9)	S	1,00	R/I	0,37 (2-5)	20
TB 99-13	R/S	0,28 (1-9)	R/I	0,19 (1,4)	R	0,15 (1,2)	R	0,11	S/R	0,61 (1,9)	80
TB 00-10	S	1,00	S	1,00	S	0,95 (7-9)	S	1,00	S	1,00	0
VI - Breeding lines	37,5		37,5		37,5		37,5		37,5		62,50
Other-seed-coat-color cultivar											
CAROÇA	S	1,00	S	1,00	S	1,00	S	1,00	R	0,11	20
CARIOÇA MG	S	1,00	R/I	0,39 (1-4)	R	0,27 (1-3)	S	1,00	I/S/R	0,54 (1-7)	40
JAPAR 31	S	1,00	I/S	0,36 (4,9)	R	0,22	S	1,00	R	0,11	60
PÉROLA	I/S	0,69 (5-7)	S	0,94 (8,9)	S	1,00	S/I	0,72 (2-9)	R	0,24 (2,3)	20
MAGNÍFICO	S/R	0,88 (3-9)	S/R/I	0,81 (1-9)	S	0,70 (7-9)	S/R/I	0,71 (3-9)	S/I/R	0,63 (2-9)	0
IRAÍ	R/I	0,20 (1-4)	S	0,92 (7-9)	S	0,86 (7,8)	R	0,12	R	0,11	60
RADIANTE	S	0,87 (7,8)	S	0,95 (8,9)	S	0,91 (8,9)	S	0,86 (7,8)	S/R	0,79 (1-9)	0
VI - Oth. seed-coat-col cv	85,7		71,4		71,4		85,7		42,8		28,57
Local cultivar											
PRETO COMPRIDO	S	1,00	S	1,00	S	1,00	S	1,00	S	1,00	0
GUABIJU	S	0,98 (7,9)	S	1,00	S	1,00	S	1,00	S	1,00	0
VERMELHO ITAJAÍ	R/S	0,22 (1,9)	R/S	0,29 (1-9)	R/S	0,29 (8,9)	R/S	0,19 (1-7)	R	0,11	100
C. SOBRADINHO	R/S	0,26 (1-9)	S	0,91 (7-9)	S	0,93 (7-9)	R/S	0,18 (1,8)	R	0,11	60
VI - Local cultivars	50,0		75		75		50		50		
VI - Overall	58,13		53,49		51,16		58,13		34,78		

1: R: Genotype reaction based on a 0-9 scale, where 1,2 and 3 represent resistance (R); 4,5 and 6 intermediate (I); 7,8 and 9, susceptibility (S); Imk: McKinney disease index where values above 0.5 represent susceptibility and below, resistance. Numbers within parenthesis represent the grades displayed by individual seedling, when separated by commas, and the range of grades when separated by hyphen. 2: VI: Virulence index; RI: Resistance Index.