

COMMON BEAN GENOTYPES RESISTANT TO ANGULAR LEAF SPOT, RUST AND ANTHRACNOSE

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Introduction

Angular leaf spot, anthracnose and rust, caused by the fungus *Phaeoisariopsis griseola*, *Colletotrichum lindemuthianum* and *Uromyces appendiculatus*, respectively, are the three most important air borne diseases of bean in Brazil. There are several ways to control these diseases including cultural practices, chemical control and genetic resistance. Although cultural practices are mentioned in the literature as a method of controlling these diseases, they are effective only against anthracnose. Chemical control is, nowadays, the most effective way to control most of air borne bean diseases. Nevertheless, the fungicide cost makes it a very expensive control practice to small farmers. As a result, genetic resistance becomes the less expensive and more practical way of controlling these diseases. However, their control by this method has been complicated by the fact that their causal agents present different pathotypes what makes the development of new resistant cultivars more difficult.

The objective of this paper is to report results obtained in the pre-breeding program of Embrapa Rice and Beans, mainly for bean angular leaf spot resistance.

Materials and Methods

A total of 78 bean genotypes were tested to 8 (Table 1), 4 and 15 isolates of *P. griseola*, *U. appendiculatus* and *Colletotrichum lindemuthianum*, respectively. For all experiments, plants were sown in aluminum pots, containing approximately 2,0 kg of soil, at a rate of 5 seeds per pot. *P. griseola* spores for inoculation were obtained by culturing the fungus on bean leaf-dextrose-agar medium in a BOD chamber at $24 \pm 2^\circ\text{C}$. *U. appendiculatus* spores, of each isolate, were obtained by inoculating the cultivar Rosinha G-2. *C. lindemuthianum* spores were obtained culturing the fungus in a sterilized bean pod in a test tube for 10 days. The spore suspension for *P. griseola* and *U. appendiculatus* was adjusted to 2×10^4 conidia/mL and for *C. lindemuthianum* the spore suspension was adjusted to $1,2 \times 10^6$ conidia/mL. For *P. griseola* and *U. appendiculatus*, bean plants were inoculated 14 days after planting and for *C. lindemuthianum* 8 days after planting. The inoculated plants were incubated in a moist chamber (>95% RH) for 36 h. *P. griseola* inoculated plants were transferred to greenhouse benches for another 14-18 days and evaluated for symptoms according to the 1-9 descriptive scale. Plants rating from 1 to 3 (non-sporulating lesions) were considered resistant and 4 to 9 (sporulating lesions) as susceptible (CIAT, Cali, 1987, 54pp.; Sartorato, A., J. Phytopathology 152:385-390, 2004). *U. appendiculatus* and *C. lindemuthianum* inoculated plants were transferred to a temperature controlled chamber (22°C). Symptoms evaluation, in a 1 to 9 scale, occurred 14 and 10 days after inoculation for *U. appendiculatus* (Stavelly et al., Ann. Rep. Bean Improv. Coop. 26:4-6, 1983) and *C. lindemuthianum* (Rava, et al., Fitopatol. bras. 18:388-391, 1993), respectively. For both diseases plants rating 1 to 3 were considered resistant and 4 to 9, susceptible.

Results and Discussion

The overall results of the test showed that 36 (46,0%), 17 (21,8%), 12 (15,4%) and 8 (10,3%) genotypes were susceptible to 8, 7, 6 and 5 isolates of *P. griseola*, respectively. Cultivars CNFC 10432 and CNFM 08080 (2,6%), CNFE 10815 and IPA 6 (2,6%) and BRSMG Majestoso (OPNS 0331) (1,3%) were resistant to 4, 5 and 8 isolates of *P. griseola*, respectively (Table 1).

The genotype OP-NS 0331, the most resistant cultivar tested, was recently released as BRSMG Majestoso. It was selected from a cross between Ouro Negro, a ALS resistant black bean cultivar and Perola, a ALS susceptible carioca grain type cultivar. Crosses were performed at the Biology Department of the University of Lavras, state of Minas Gerais.

Besides of being resistant to bean angular leaf spot, the cultivar BRSMG Majestoso is also resistant do 4 *Uromyces appendiculatus* isolates (2.1.3.1, 2.2.3.1, 1.1.1.1 and 4.1.1.4). To 3 of these isolates cultivar Majestoso has shown resistant/susceptible plants. In relation to antracnose, this cultivar was tested to 15 isolates showing complete resistance to 8 of them. For five isolates it showed some resistant and some susceptible plants and was completely susceptible to 2 isolates.

The fact that cultivar Majestoso had shown plants with resistant/susceptible reactions to some specific isolates of *U. appendiculatus* and *Colletotrichum lindemuthianum* was expected since this cultivar had never been exposed to bean rust or bean anthracnose.

Table 1. Bean genotypes resistant to 3, 4, 5 and 8 isolates of *Phaeoisariopsis griseola*.

| Genotype | ISOLATE (Ig CNF#) | | | | | | | |
|------------------------|-------------------------|-------|------------------|-----|-----|-----|-----------------|-----|
| | 60.4 | 525.4 | 584.3 | 709 | 784 | 786 | 809 | 874 |
| | Resistant to 3 isolates | | | | | | | |
| CNFC 07812 | S | R | S | R | S | S | R | S |
| PONTAL | S | R | S | R | S | S | R | S |
| CNFC 08013 | S | S | S | S | R | R | S | R |
| GRAFITE | S | R | S | R | S | S | R | S |
| CNFR 07858 | S | R | S | R | S | S | R | S |
| CNFR 10522 | S | R | S | R | S | R | ND ¹ | S |
| | Resistant to 4 isolates | | | | | | | |
| CNFC 10432 | R | S | R/S ² | S | R | S | R | S |
| CNFM 08080 | S | R | S/R ³ | R | S | S | R | S |
| | Resistant to 5 isolates | | | | | | | |
| CNFE 10815 | S | S | S | R | R | R | R | R |
| IPA 6 | S | R | S | R | R | R | R | S |
| | Resistant to 8 isolates | | | | | | | |
| Majestoso (OP-NS 0331) | R | R | R | R | R | R | R | R |

¹ND = no data available.

²R/S = mixture of disease reaction with more resistant than susceptible plants.

³S/R = mixture of disease reaction with more susceptible than resistant plants.