GENETIC RESISTANCE TO *Colletotrichum lindemuthianum* RACE 2047
In G 2333

Lucas Silvério, M.C. Gonçalves-Vidigal, Pedro S. Vidigal Filho, Marco A. A. Barelli, Cláudia Thomazella, and William M. C. Nunes

Departamento de Agronomía, Univ. Estadual de Maringá, Av. Colombo, 5790, 87020-900, Maringá, Paraná, Brasil.

Introduction

Anthracnose, caused by *Colletotrichum lindemuthianum* (Sacc. et Magn.) Scrib., is one of the most important diseases of the common bean (*Phaseolus vulgaris* L.). The use of resistant cultivars is considered to be the most efficient and economic control method for the disease. Pastor-Corrales et al. (1994) showed that only the G 2333 line was resistant to 380 isolates of *C. lindemuthianum*. This line was resistant to all the Brazilian isolates and all the European and North American races (Pastor-Corrales and Tu, 1989; Balardin and Pastor-Corrales, 1990; Balardin et al., 1990). Resistance in G 2333 is controlled by two independent dominant genes with equivalent effects (Pastor-Corrales et al. 1994). In addition, Young et al., 1998, detected in G 2333, three different dominant resistance genes, *Co-4*, *Co-5* and *Co-7*, the *Co-4* allele, at the *Co-4* locus.

In the present study, the inheritance of resistance in G 2333 to race 2047 of *C. lindemuthianum*, is described.

Material and Methods

Genetic Plant Material: Parental genotypes, G 2333 (resistant to race 2047) and TU (susceptible the race) were crossed to study the genetic characterization of the resistance. Race 2047 was used to determine the inheritance of resistance in G 2333, in the cross G 2333 x TU. One F2 population derived from the cross between G 2333 x TU consisted of 151 plants and backcrosses were obtained.

Inoculation and incubation: Parental, F1, F2 and backcross plants were inoculated with a spore suspension (1.2 x 10^6 spores ml^-1) of the pathogen. The protocol for spore inoculation was as follows: 14 to 18-day-old parental, F1, F2 and backcross plants with their first trifoliolate leaf completely developed were inoculated by the use of a paint brush previously moistened in a spore suspension, from an adaptation of the method used by Cárdenas et al. (1964).

After inoculation, the seedlings were kept in a humid chamber for 96 hours at 20°C ± 2°C, controlled light (12 hours with 680 lux illumination alternated with 12 hours of darkness) and approximately 100% relative humidity.

Results and Discussion

Table 1 shows the parental (G 2333 and TU), F1, F2 and backcross phenotypes in their reaction to race 2047.

Characterization of the genetic resistance in G 2333 to race 2047 was determined after analyzing the data observed segregating ratios obtained from the disease phenotypic of the F2 population and backcross generations (BC resistant and BC susceptible). Chi-square values revealed that fit was obtained for the segregation in the F2 at a ratio of 3:1, the expected ratio of resistant to susceptible plants (R:-rr), respectively. Segregating in the 1R:1S when the F1 was backcrossed to TU, and 1R:0S when the F1 was backcrossed to G 2333, suggesting that a single
dominant gene conferred resistance to race 2047. This result indicated that the dominant gene in G 2333 is located at the different locus as the Co-5 gene in TU and in G 2333. According by Young and Kelly (1996), none of the races tested (7, 23, 64, 73, 1545, and 2047) were pathogenic on G 2333 and its derived line SEL 1308. In addition, according Young et al. (1998), the SEL 1308 carries a single dominant gene, named Co-4^2 that confers resistance to races 73, 64, 521, and 1545. Since SEL 1308 was derived from G 2333 and both are resistant to race 2047 (Young and Kelly, 1996), in this study, it is assumed that the Co-4^2 allele, at the Co-4 locus, confers resistance to race 2047.

Table 1. Segregation for resistance to race 2047 of Colletotrichum lindemuthianum (*) in common bean G 2333 cultivar

<table>
<thead>
<tr>
<th>Pedigree</th>
<th>Generatio n</th>
<th>Reaction</th>
<th>Observed</th>
<th>Expected ratio</th>
<th>X^2</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>TU</td>
<td>P_1</td>
<td>S</td>
<td>0</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G 2333</td>
<td>P_2</td>
<td>R</td>
<td>20</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G 2333 x TU</td>
<td>F_1</td>
<td>(R x S)</td>
<td>32</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>G 2333 x TU</td>
<td>F_2</td>
<td>(R x S)</td>
<td>115</td>
<td>3:1</td>
<td>0.10</td>
<td>0.74</td>
</tr>
<tr>
<td>F_1 x TU</td>
<td>B_CS</td>
<td>(R x S)</td>
<td>29</td>
<td>1:1</td>
<td>0.02</td>
<td>0,89</td>
</tr>
<tr>
<td>F_1 x G 2333</td>
<td>B_CR</td>
<td>(R x R)</td>
<td>52</td>
<td>All R</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

* R = Resistant S = Susceptible.

References


