USE OF RAPD MARKERS TO UNDERSTAND THE DOMINANT NATURE OF ANTHRACNOSE RESISTANCE GENES PRESENT IN COMMON BEAN CULTIVAR AB 136.

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RAPD markers can be used in plant breeding programs for assisting the selection of disease resistant plants and as a source of genetic information (Kelly, 1995). RAPD markers are also being used as a practical tool to develop common bean varieties resistant to diseases which are determined by major genes (Haley *et al.*, 1994; Johnson *et al.*, 1995; Young & Kelly, 1996). Markers linked to various disease resistance genes would facilitate the simultaneous breeding for different diseases, allowing pyramidation of these genes into the same genetic background. This is possible because these markers are not affected by environmental and epistatic interactions. As a consequence, selection for resistance can be performed in the absence of the pathogen (Kelly, 1995).

In this work, RAPD markers were used to understand the nature of anthracnose resistance genes to races 73 and 81 of *Colletotrichum lindemuthianum*, present in the common bean differential variety AB 136.

Two sets of F_2 plants, derived from a cross between Michelite and AB 136 were inoculated separately with spores from races 73 or 81. In both cases the disease phenotypic ratio was 3:1, indicating that one single gene governs resistance to both races. RAPD marker Z04, which is linked to a resistance gene to races 64 and 89 present in AB 136, was tested in the two groups of plants (Figures 1 and 2). In the plants inoculated with race 73, Z04 mapped at 2.9 cM from the resistance gene (Table 1). In the plants inoculated with race 81, Z04 mapped at 2.8 cM from the resistance gene (Table 1).

Our data suggest that one single dominant gene (or gene block) confers resistance to *C. lindemuthianum* races 64, 73, 81, and 89. This gene is most probably the same one discovered by Schwartz et al. In 1982 and named *Co-6* by Young & Kelly in 1996 (List of Genes - BIC, 1996).

Table 1 - Linkage analysis between RAPD marker Z04 and resistance gene present in cultivar AB 136.

Population	Locus Tested	Expected ratio	Observed ratio	χ^2	Probability	cM**
Michelite x AB136 race 73	RAB136*	3:1	66:17	0.89	0.50	-
	RAB136/Z04	9:3:3:1	64:17:2:0	23.18	0.00	2.9
Michelite x AB136 race 81	RAB136	3:1	63:18	0.33	0.50	-
	RAB136/Z04	9:3:3:1	63:16:2:0	56.88	0.00	2.8

* Resistance gene present in AB 136 variety
** Distance, in centimorgans, between marker Z04 and RAB 136.

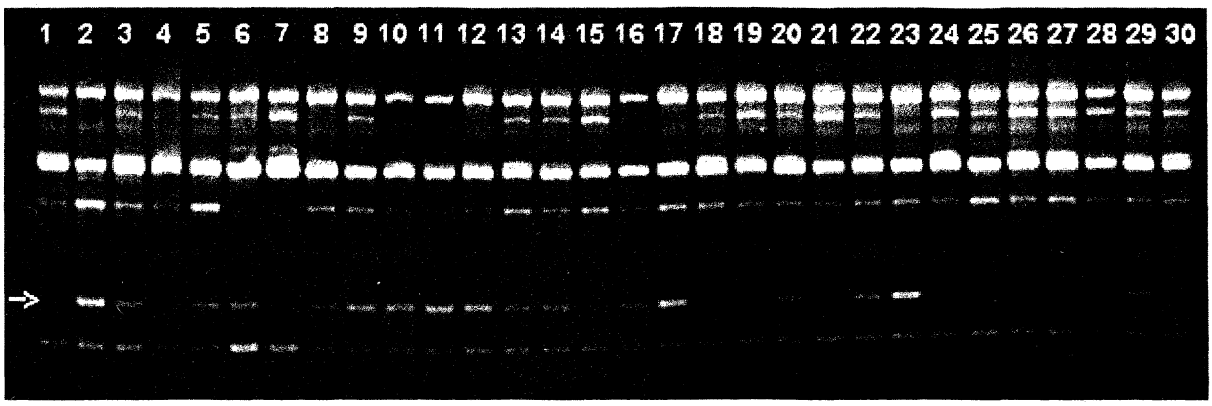

Figure 1. Electrophoretic analysis of DNA amplification products from progenitors Michelite and AB 136 (lanes 1 e 2) and F_2 plants, inoculated with race 73 of *C. lindemuthianum*. Amplifications were performed with primer Z04. Lanes 3-6, 8-14, 16, 17, 20, 22, 23, and 29 correspond to resistant plants and lanes 7, 15, 18, 19, 21, 24-28, and 30 correspond to susceptible plants. Arrow indicates the RAPD marker Z04 which is linked in coupling to the resistance gene.

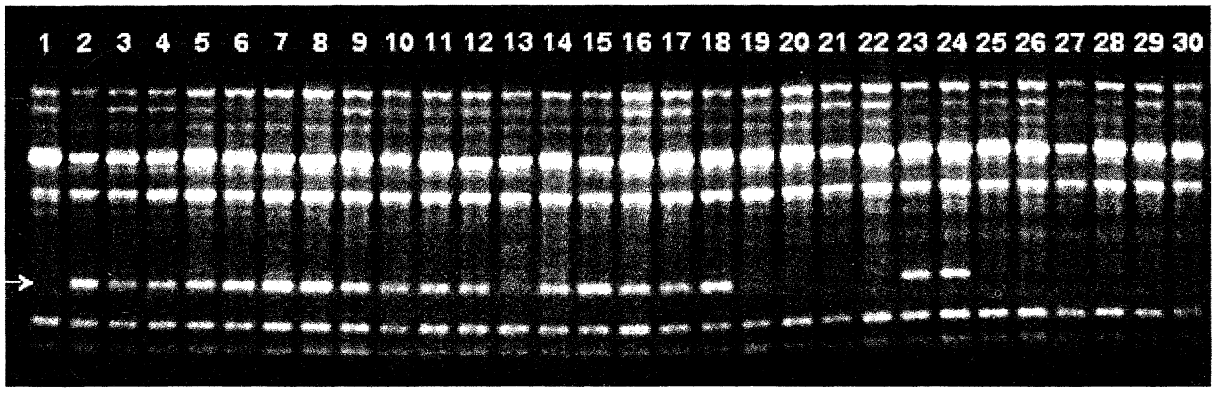

Figure 2. Electrophoretic analysis of DNA amplification products from progenitors Michelite and AB 136 (lanes 1 e 2) and F_2 plants, inoculated with race 81 of *C. lindemuthianum*. Amplifications were performed with primer Z04. Lanes 3-18, 23, and 24 correspond to resistant plants. Lanes 19-22, and 25-30 correspond to susceptible plants. Lane13 is a recombinant plant. Arrow indicates the RAPD marker Z04 which is linked in coupling to the resistance gene.

Acknowledgement: This work was supported by grant no. 64.93.0430.00 from PADCT/FINEP and no. 854/92 from FAPEMIG.

REFERENCES

Haley S D, Afanador L K, Kelly J D 1994. Selection for monogeneic resistance traits with coupling and repulsion-phase RAPD markers. Crop Sci. 34:1061-1066.

Johnson E, Miklas P N, Stavely J R, Martinez-Cruzado J C 1995. Coupling- and repulsion-phase RAPDs for marker-assisted selection of PI 181996 rust resistance in commom bean. Theor. Appl. Genet. 90:659-664.

Kelly J D 1995. Use of random amplified polymorphic DNA markers in breeding for major gene resistance to plant pathogens. HortScience 30:461-465.

List of Genes. *Phaseolus vulgaris*. - BIC 1996. Ann. Rep. Bean Imp. Coop. 39:1-19.

Young R, Kelly J D (1996) RAPD Markers flanking the Are gene for anthracnose resistance in common bean. J. Amer. Soc. Hort. Sci. 121:37-41.