

EVALUATION AND IDENTIFICATION OF NEW COMMON BEAN BRIDGE CULTIVARS

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During the domestication of the common bean (*Phaseolus vulgaris* L.) two gene pools, Middle American and Andean, were established. Due to the co-evolution host-pathogen, disease resistance genes of Middle American origin are usually effective against pathogens of Andean origin and vice-versa. For this reason, bean breeders have a unique opportunity to pyramid resistance genes derived from the two gene pools in the same background and develop cultivars with complementary resistance to several races of different pathogens. However, upon the establishment of the two gene pools a reproductive barrier was also formed and this may lead to hybrid lethality in several crosses (Vieira et al., 1999).

Singh et al. (1984) detected two genes involved with the control of bean incompatibility, DL₁ and DL₂. Small seeds of Middle American origin usually present the genotype DL₁DL₁dl₂dl₂, which is incompatible with the genotype dl₁dl₁DL₂DL₂ present in medium and large seed cultivars of Andean origin. Incompatibility would be due to the presence of a dominant allele (DL₁ and DL₂) in the two loci governing this trait. In other words, plants with genotype DL₁_DL₂_ would be abnormal. However, cultivars with genotype dl₁dl₁dl₂dl₂ always produce normal hybrids.

The main goal of this work was to evaluate the efficiency of bean cultivars mentioned in the literature as good bridge cultivars. These cultivars were used to bridge the cross between the Andean cultivar Jalo EEP558 and Middle American cultivar Rudá. New cultivars were also tested for their ability to bridge that same cross.

Material and methods

The cultivars evaluated were: G2858, Diacol Calima and Ica Pijal, cited by Singh et al. (1984); CNF10, Millionario, Rio Vermelho, CNF261 and Small White, cited by Vieira et al. (1989); and the new cultivars tested were KW765, KW780, GGWax, Novo Jalo, AND277 and BAT 93.

The Andean cultivars were crossed with Rudá, and the Middle American cultivars were crossed with Jalo EEP558. The crosses were done in March 2002, in a greenhouse of the Biotechnology Research Institute (BIOAGRO) of the Federal University of Viçosa (UFV), Minas Gerais, Brazil. All hybrids derived from cultivar Jalo EEP558 were crossed with cultivar Rudá and vice-versa.

To confirm the Andean or Middle American origin of the cultivars we used a RAPD primer which is able to distinguish between individuals belonging to the two gene pools (Dr. Ana Lilia Alzate-Marin, personal communication).

Results and Discussion

All bean cultivars involved in this study were initially tested by the RAPD technique with a primer which is able to distinguish between plants from the two gene pools, Middle American or Andean, and their classification was confirmed (Figure 1).

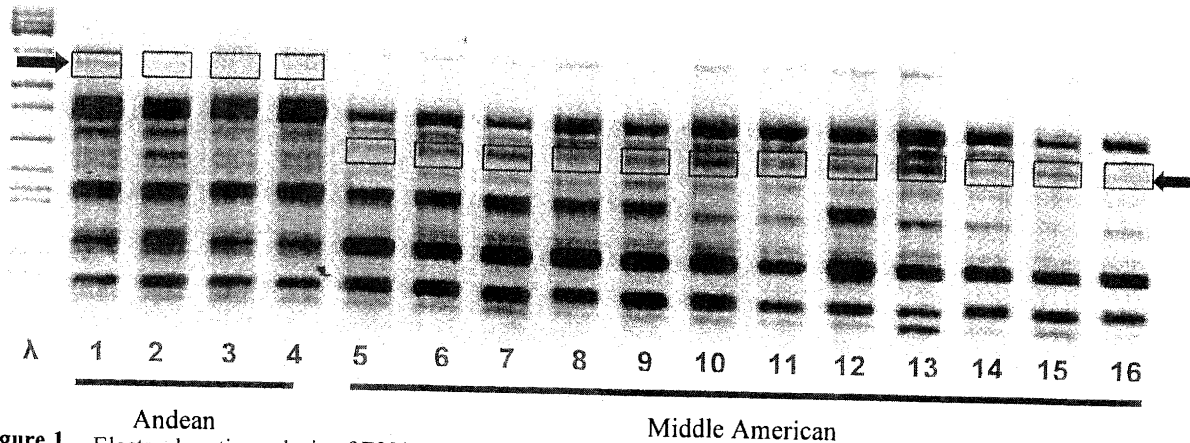


Figure 1 – Electrophoretic analysis of DNA amplification products obtained by the RAPD technique. The lanes are as follows: λ , lambda phage DNA cut with enzymes *EcoRI*, *HindIII* and *BamHI* (size markers); 1, Jalo EEP558; 2, Diacol Calima; 3, AND 277; 4, Novo Jalo; 5, Rudá; 6, Milionário; 7, Rio Vermelho; 8, BAT 93; 9, Ica Pijal; 10, KW780; 11, CNF261; 12, CNF10; 13, G2858; 14, GGWax; 15, Small White; 16, KW765. The upper arrow indicates a DNA band typical of Andean cultivars; the lower arrow indicates a DNA typical of Middle American cultivars. These bands were delimited by a rectangle for clarity reasons.

The crosses of the Andean cultivars with cv. Rudá showed that cv. Diacol Calima, AND 277 and Novo Jalo were compatible with Rudá. The hybrids were crossed with Jalo EEP558 and the populations obtained segregated 1:1 (viable:non-viable plants). These results are in accordance with the model, which proposes that two dominant and complementary genes govern incompatibility in common, beans (Singh et al., 1984). The crosses of the Middle American cultivars with Jalo EEP558 showed that cv. Rudá, Milionário, Rio Vermelho, BAT 93, Ica Pijal, GGWax and G2858 were incompatible with that cultivar and that CNF10, CNF261, Small White, KW765 and KW780 were compatible. The viable hybrids were crossed with Rudá and the populations obtained also segregated 1:1. Cultivars G2858, Ica Pijal, Milionário and Rio Vermelho which are cited in the literature as good bridge cultivars were not effective in the crosses we tested. Among the new bridge cultivars tested AND277, Novo Jalo, KW765 and KW780 were effective to bridge the cross between Rudá and Jalo EEP558.

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