

## NOTE

# Evaluation of the Milionário bean cultivar as bridge-crossing between 'Rudá' and 'Jalo EEP 558'

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**ABSTRACT** - This study evaluated the efficiency of the cultivar Milionário as bridge to incorporate alleles of resistance to angular leaf spot of the Andean cultivar Jalo EEP 558 into the Mesoamerican cultivar Rudá. According to the observed results, 'Milionário' cannot be used as bridge in this cross since the resultant hybrid of the cross with 'Jalo EEP 558' presents a characteristic incompatibility reaction. This result is not in line with previously published results, which had suggested the Milionário cultivar as bridge.

**Key-words:** Incompatibility, bean breeding, gene pool

## INTRODUCTION

In the genetic improvement of bean, the accumulation of Andean and Mesoamerican resistance alleles in a single genotype of interest has been suggested as an efficient strategy to obtain broad and stable resistance (Young and Kelly 1996, Pastor-Corrales et al. 1998). Due to the pathogen/host co-evolution, resistance alleles of Mesoamerican origin are more efficient against pathogens of Andean origin and resistance alleles of Andean origin are more efficient against pathogens of Mesoamerican origin (Guzmán et al. 1995). This fact gives bean breeders the unique opportunity to accumulate

resistance alleles of both groups and develop complementary resistance against a large number of races (Kelly and Miklas 1998).

However, many crosses involving Andean and Mesoamerican cultivars manifested dwarfism or weakness in the F<sub>1</sub> hybrid (Singh and Gutiérrez 1984, Gepts 1988, Vieira et al. 1989). This abnormality causes death or weak growth of the F<sub>1</sub> plants, including alterations such as sterility or reduced root growth, chlorotic leaves, absence of roots, or roots growing out from the hypocotyl, among others (Vieira et al. 1999).

The weakness of the F<sub>1</sub> hybrid is controlled by two complementary genes, and determined by dominant alleles,

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which present double recessive epistasis and were designated DL1 and DL2 by Shii et al. (1980). Therefore, only the F<sub>1</sub> plants of the DL1\_DL2 constitution are abnormal. Cultivars of the dl1dl1dl2dl2 genotype, such as the Milionário and Rio Vermelho, produce normal F<sub>1</sub> hybrids (Vieira et al. 1989, Vieira et al. 1999). For this reason, a compatible line of the genotype dl1dl1dl2dl2 should be used as bridge to achieve a combination of desirable alleles between two incompatible parents.

The present study had the objective to evaluate the efficiency of the Milionário cultivar as bridge in the incorporation of angular leaf spot resistance alleles of the Andean cultivar Jalo EEP 558 into the Mesoamerican cultivar Rudá.

## MATERIAL AND METHODS

Plants of the 'Jalo EEP 558' (Andean), 'Rudá' (Mesoamerican), and 'Milionário' (Mesoamerican) were crossed in a diallel scheme. The crosses were carried out in March 2001 in a greenhouse of the Instituto de Biotecnologia Aplicada a Agropecuária (BIOAGRO) at the Universidade Federal de Viçosa (UFV). To observe the temperature effect on the manifestation of incompatibility, the F<sub>1</sub> seeds and the respective parents were sown in four different periods: July, September, November 2001, and January 2002.

## RESULTS AND DISCUSSION

Shii et al. (1980, 1981) pointed out that the effect of the allele incompatibility, mainly of DL1, is most apparent in the roots. Consequently, the seeds were submitted to two different treatments in the third evaluation period (November 2001). In the first treatment, the seeds were chlorinated and scattered on culture medium with agar and IBA (Indole

Butyric Acid) rooting hormone to germinate and thereafter taken to a growth chamber. Two weeks after, the plants were transplanted to a vase with autoclaved soil and, after three days, moved to a greenhouse. In the second treatment, the seeds were planted directly into vases in the greenhouse. Besides the cultural treatments recommended for the culture, both treatments were irrigated weekly with IBA rooting hormone.

The evaluations of plant abnormality were carried out 10, 20, 30, and 40 days after plantation. In all four evaluated periods, the F<sub>1</sub> plants of the cross between 'Jalo EEP 558' and 'Rudá' presented the expected typical incompatibility between Andean and Mesoamerican. The cultivar Milionário, in literature cited as bridge, proved incompatible when crossed with 'Jalo EEP 558'. The F<sub>1</sub> plants of the cross between two Mesoamerican cultivars, Rudá and Milionário, were incompatible when crossed with 'Jalo EEP 558'. Twenty days after germination, the F<sub>1</sub> plants did not present a visible reaction of incompatibility; however, growth was slowing down. After thirty days, the hybrids ceased to grow completely and day after day chlorosis spread out further over the leaves, culminating in the plants' death.

In all planting periods, the incompatibility reaction was repeated with the same intensity; the incompatibility phenotype was the same for all crosses. Plants treated with a rooting hormone died 10 to 15 days after the control plants.

Based on the observed results, the conclusion was drawn that the Milionário cultivar cannot be used as bridge in this cross, in view of the characteristic incompatibility reaction observed in the hybrid from the cross with 'Jalo EEP 558'. This finding is not in agreement with previously published results, which indicated the cultivar Milionário as bridge (Vieira et al. 1989, Vieira et al. 1999).

# Avaliação do cultivar de feijão Milionário como ponte no cruzamento entre os cultivares Rudá e Jalo EEP 558

**RESUMO** - Neste trabalho avaliou-se a eficiência do cultivar Milionário como ponte na incorporação de alelos de resistência à mancha-angular do cultivar andino Jalo EEP 558 para o cultivar mesoamericano Rudá. De acordo com os resultados observados, conclui-se que o cultivar Milionário não pode ser utilizado como ponte neste cruzamento, visto que, quando cruzado com o Jalo EEP 558, o híbrido resultante apresentou uma reação característica de incompatibilidade. Este resultado está em desacordo com resultados previamente publicados, que sugerem o cultivar Milionário como ponte.

**Palavras-chave:** Incompatibilidade, melhoramento do feijoeiro, conjuntos gênicos.

REFERENCES

- Gepts P (1988) Phaseolin as an evolutionary marker. In: Gepts P (ed.) **Genetic resources of Phaseolus beans**. Kluwer Academic Publishers, Dordrecht, p. 215-241.
- Guzmán P, Gilbertson RL, Nodari R, Johnson WC, Temple SR, Mandala D, Mkandawire ABC and Gepts P (1995) Characterization of variability in the fungus *Phaeoisariopsis griseola* suggests coevolution with the common bean (*Phaseolus vulgaris*). **Phytopathology** **85**: 600-607.
- Kelly JD and Miklas PN (1998) The role of RAPD markers in breeding for disease resistance in common bean. **Molecular Breeding** **4**: 1-11.
- Pastor-Corrales MA, Jara C and Singh SP (1998) Pathogenic variation in, sources of, and breeding for resistance to *Phaeoisariopsis griseola* causing angular leaf spot in common bean. **Euphytica** **103**: 161-171.
- Shii CT, Mok MC and Mok DW (1981) Developmental controls of morphological mutants of *Phaseolus vulgaris* L.: Differential expression of mutant loci in plant organs. **Develop Genetics** **2**: 279-290.
- Shii CT, Temple SR and Mok DW (1980) Expression of developmental abnormalities in hybrids of *Phaseolus vulgaris* L.: Interaction between temperature and allelic dosage. **Journal of Heredity** **71**: 219- 222.
- Singh P and Gutiérrez JA (1984) Geographical distribution of the DL<sub>1</sub> and DL<sub>2</sub> genes causing hybrid dwarfism in *Phaseolus vulgaris* L., their association with seed size and their significance to breeding. **Euphytica** **33**: 337-345.
- Vieira AL, Ramalho MAP and Santos JB (1989) Crossing incompatibility in some bean cultivars utilized in Brazil. **Revista Brasileira de Genética** **12**: 169-171.
- Vieira C, Borém A and Ramalho MAP (1999) Melhoramento do feijão. In: Borém A (ed.) **Melhoramento de espécies cultivadas**. Editora UFV, Viçosa, p. 273-349.
- Young RA and Kelly JD (1996) Characterization of the genetic resistance to *Colletotrichum lindemuthianum* in common bean differential cultivars. **Plant Disease** **80**: 650-654.