IDENTIFICATION OF HIGH NODULATION EFFICIENCY AMONG WILD GENOTYPES OF COMMON BEANS

Enderson Petrônio de Brito Ferreira[1*], Luis Henrique Antunes Barbosa[2], Adriano Moreira Knupp[1], Wagner Mendanha da Mata[3], Adriane Wendland[1], Agostinho Dirceu Didonet[1], Leonardo Cunha Melo[1] and Maria José Del Peloso[1]

[1]Embrapa Arroz e Feijão, PO Box 179, 73375-000, Santo Antônio de Goiás, Goiás, Brazil; and [2]Universidade Federal de Goiás, 74001-970, Goiânia, Goiás, Brazil; and [3] Universidade Uni-Anhanguera, 74423-165, Goiânia, Goiás, Brazil, E-mail: enderson@cnpaf.embrapa.br

INTRODUCTION

Common bean (*Phaseolus vulgaris* L.) is widely grown in Brazil and used by the poorer population as an important protein source. This crop establishes symbiotic association resulting in spherical determinate nodules where N_2 fixation process takes place. However, many studies have shown a relative low efficiency of the N_2 fixation on common bean due to an easy association of this crop with indigenous rhizobia species (MOAWADE et al., 2004), which result in some difficulty to the introduction of more efficient species (VIEIRA et al., 1998). The screening for high N_2-fixing ability among wild genotype of common bean could provide genetic material of great interest for the common bean breeding programs.

MATERIAL AND METHODS

Aiming to evaluate the nodulation of 377 wild genotype of common bean, a greenhouse experiment was carried out at the National Rice and Beans Research Center of Embrapa, located in the county of Santo Antônio de Goiás, Goiás, Brazil. The experiment was performed on a randomized block design, in which 377 wild genotype of common bean, obtained from the active bank of genotype of the Embrapa Rice and Beans, were evaluated under sterile conditions. Two seeds of each wild genotype were planted in 3 L pots containing sterile sand and vermiculite (3:1). Seven days after emergence (DAE), plants were inoculated with a mixture of three strains of *Rhizibium tropici* (SEMIA 4077, SEMIA 4080 and SEMIA 4088), on a final concentration of 10^8 colony forming unit mL^{-1}. Ouro Negro was also inoculated with the *Rhizobial* mixture and used as a reference of good nodulating cultivar (BLISS et al., 1989). Once a week, 200 mL of Norris' solution were added per pot until harvest. Common bean plants were harvested 30 DAE and it were determined the number of nodules (NN) per plant, total nodule dry weight (TNDW) and relative nodule weight (RNW) as a relation of NDW/NN. These data were used to generate a Relative Nodulation Index (RNI=(RNW*1.3)+(TNDW*1.1)+(NN*0.6)/3). The parameters used to determine the RNI were multiplied by different factors due to the fact that there is a positive correlation between nodule mass and the amount of N accumulated by legumes (DOBEREINER, 1966), however, not necessarily the greatest number of nodules implies in high N_2-fixing ability (CARVALHO, 2002). Data of nodulation were submitted to a variance analysis and the means were compared by the Tukey´s test at 5% of significance.

RESULTS AND DISCUSSION

The analysis of variance had been shown differences among the wild genotypes of common bean regarding RNW, TNDW, NN and RNI (Figure 1). About 70%, 33% and 13% of the wild genotypes of common bean (blue columns) showed greater RNW, TNDW and NN, respectively than the reference cultivar (Figure 1A, B and C). Nevertheless, RNI (Figure 1D) indicates that about 45% of the wild genotypes of common bean have been shown great potential to be used as high N_2-fixing source for the EMBRAPA's common bean breeding program. Among of then, 4 wild genotypes showed the best results since they figured among the greatest values of RNW, TNDW and NN.

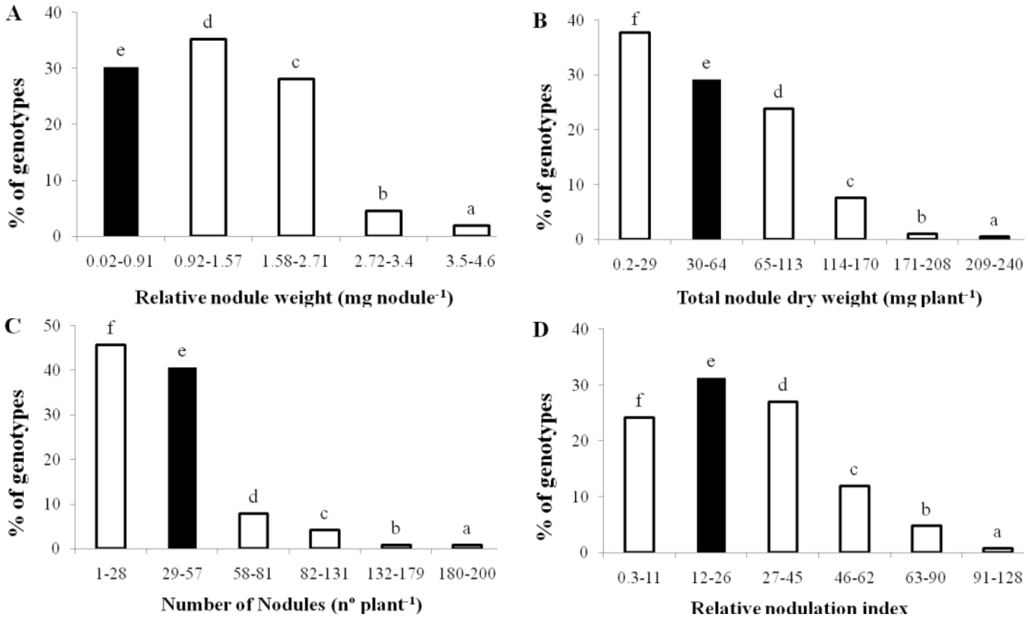

Figure 1 – Percent distribution of the wild genotypes of common bean according to the different classes of Relative nodule weight (A), Total nodule weight (B), Number of nodules (C) and Relative nodulation index (D). Black columns indicate the classes which comprise the reference cultivar (Ouro Negro).

Columns followed by the same letter are not different by the Scott-Knott test (*p>0.05*).

REFERENCES

BLISS, F.A.; PEREIRA, P.A.A.; ARAÚJO, R.S.; HENSON, R.A.; KINIECK, K.A.; McFERSON, J.R.; TEIXEIRA, M.G.; SILVA, C.C. da. Registration of five high nitrogen fixing common bean germplasm lines. Crop Science, Madison, v.29, p.240-241, 1989.

CARVALHO, E.A. Avaliação agronômica da disponibilização de nitrogênio à cultura de feijão sob sistema de semeadura direta. Tese de Doutorado, Escola Superior de Agricultura "Luiz de Queiroz", Piracicaba, São Paulo, 2002. 80pp.

DOBEREINER, J. Evaluation of nitrogen fixation in legumes by the regression of total plant nitrogen with nodule weight. Nature, v.210, p.850-852, 1966.

MOAWAD, H.; EL-RAHIM, W.M.A.; EL-HALEEM, D.A. Performance of phaseolus bean rhizobia in soils from the major production sites in the Nile Delta. Comptes Rendus Biologies, v. 327, p 445-453, 2004.

VIEIRA, C.; PAÚLA JUNIOR, T.J.; BORÉM, A. *Feijão: aspectos gerais e cultura no estado de Minas Gerais*. Universidade Federal de Viçosa: Minas Gerais, 1998, 596 pp.