ASSESSMENT OF MESOAMERICAN AND ANDEAN COMMON BEAN GENOTYPES FOR HIGH-NODULATION EFFICIENCY

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INTRODUCTION

Nitrogen is a key limiting nutrient for agriculture. The association among diazotrophic bacteria and legumes is an important technology to supply nitrogen to the plant without major environmental impacts, and encourages the development of sustainable agriculture. However, is widely known that biological nitrogen fixation (BNF) in common bean is a controversy issue triggered by low efficiency results caused by several factors (GRAHAM, 1981; 2000). Considering the importance of this crop as protein source in developing countries, alternatives that increase the BNF have strategic importance. Therefore, there is a growing interest by the common bean breeding programs for improved cultivars with high BNF efficiency. Thus, the screening of genotypes for nodulation response is an important part of pre-breeding of common bean.

MATERIAL AND METHODS

Aiming to evaluate the nodulation of 882 Mesoamerican and Andean 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 the genotypes 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 genotype were planted in 3 L pots filled with sterile sand and vermiculite (2:1). Seven days after emergence (DAE), plants were inoculated with a mixture of three strains of *Rhizibium tropici* (SEMIA 4077, SEMIA 4080; SEMIA 4088), on a final concentration of 10^9 C.F.U. mL^{-1}. Ouro Negro was also inoculated with the rhizobial mixture and used as a reference. Once a week, 200 mL per pot of a Norris' solution were added until harvest. Common bean plants were harvested 30 DAE and it were determined the relative number of nodules (NN), relative nodule weight (RNW) and total nodule dry weight (TNDW). These data were used to generate a Relative Nodulation Index (RNI) (FERREIRA et al., 2010). Data of nodulation were submitted to a variance analysis and the averages were compared by the Scott-Knott´s test at 5% of significance.

RESULTS AND DISCUSSION

In this first step, all genotypes were characterized compared to Ouro Negro, a commercial bean cultivar developed for high nitrogen fixation efficiency (HENSON et al., 1993). Among the 882 genotypes tested, 687 of them were able to show nodulation. The analysis of variance had been shown differences among genotypes of common bean for NN, RNW, TNDW and RNI (Fig. 1). About 21%, 32% and 54% of the genotypes showed greater NN, RNW and TNDW, respectively than the reference cultivar (Figs. 1A, B and C). Regarding IRN about 43% of the genotypes presented greater values then the reference genotype, while about 30% showedsimilar values of RNI and other 30% showed lower values of RNI as compared to the reference genotype (Fig. 1D). The 43% with greatest RNI were divided into four classes with an extreme group comprising 0.44% of the genotypes (Fig. 1D). This extreme group is represented by three genotypes, which will take part on a field experiment as a promising source for high BNF efficiency.

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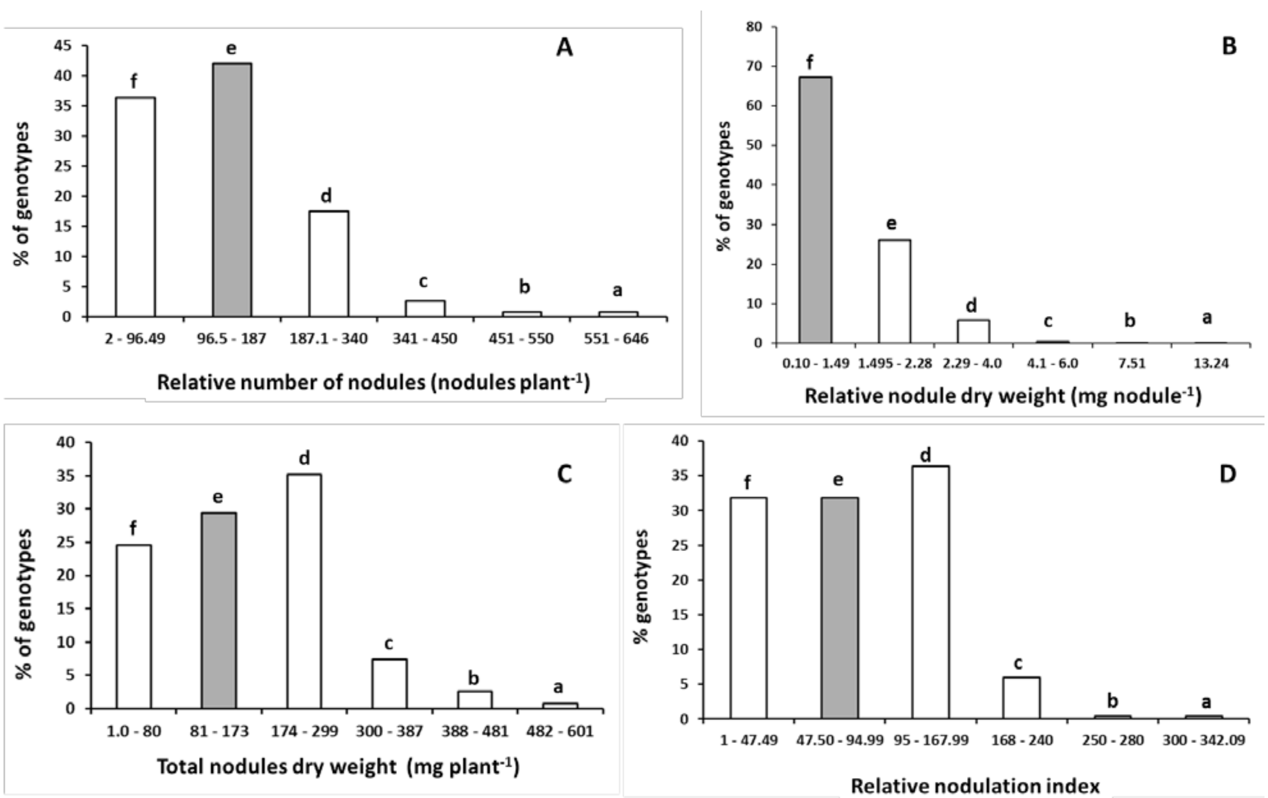

Figure 1 – Percent distribution of the genotypes of common bean according to the different classes: A) relative number of nodules; B) relative dry weight (mg $nodule^{-1}$); C) nodule dry weight (mg $plant^{-1}$); D) relative nodulation index. Hachured columns indicate the classes which comprise the reference cultivar (Ouro Negro).