

Characterization of Rhizobia Isolated from Soil and Legume Root Nodule Cultivated Between Coffee Tree Rows

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Abstract:

Aiming to study the diversity of rhizobia symbionts of common bean (*Phaseolus vulgaris*) thirty-four strains were isolated from a field experiment of coffee trees (*Coffea arabica*), without history of inoculation with rhizobia. The following treatments between coffee rows were evaluated: (1) leucaena (*Leucaena leucocephala*); (2) crotalaria spectabilis (*Crotalaria spectabilis*); (3) crotalaria breviflora (*C. breviflora*); (4) gray mucuna (*Mucuna pruriens* sin *Stizolobium cinereum*); (5) dwarf mucuna (*M. deeringiana* sin *S. deeringianum*); (6) horse peanut (*Arachis hypogaea*); (7) cowpea (*Vigna unguiculata*), and (8) native vegetation (*Digitaria horizontalis* and *Bidens pilosa*). These rhizobial strains were characterized using a polyphasic approach, including nodulation pattern, phenotypic traits, and genetic diversity based on BOX-PCR (Polymerase Chain Reaction) with BOX-A1R primer and amplified ribosomal DNA-restriction analysis (ARDRA) of both 16S and 23S rDNA. The abundance of indigenous rhizobia nodulating common bean in the soil varied with the legume cultivated as cover crops. In the green house experiment, common bean nodulation was higher in the soil from area cultivated with *S. deeringianum* (dwarf mucuna), however, nodules with red color it were observed only from soil cultivated with leucaena. Analysis of nodulation revealed that several strains isolated from mucunas (dwarf and gray), horse peanuts, crotalaria spectabilis and cowpea formed nodules on common bean. The hierarchal multivariate variance and cluster analysis of 34 strains from six host plants, according to matrix and Euclidean distance of morpho-physiological traits, showed variation of 74.25% due to strains and 24.75% to host plants. Based on dissimilarity coefficient four distinct groups of these strains were identified. Seven strains belonging to group IV, which was composed with 43% of strains from soil cultivated with leucaena were closely related to *Rhizobium tropici* strains CIAT899 and PRF81 (SEMIA4070 and 4080), which are officially recommend for common bean in Brazil. The inoculation of strain IPRAh-0217, isolated from horse peanut nodulated effectively common bean resulting in a significant enhancement of plant growth. Genotypic characterization analysis showed high diversity among the rhizobial strains but, the host specificity was not related to 16S rRNA gene.

Key words: Biological Nitrogen fixation, Phenotypic traits, ARDRA, 16S and 23S rDNA gene, BOX-PCR