Selection of Forage Pigeon-Pea (*Cajanus cajan* (L.) Millsp) Lines for Soil Decompaction

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Introduction According to Camargo & Alleoni (1997), pigeon-pea plays an important role among species fit to promote soil decompaction, due to the capacity of its roots to penetrate highly compacted soil layers. Since differences not only among species but also within species have been observed for this character, selection within a species like *Cajanus cajan* seems to be an excellent aid to help solving the problem of soil compaction. This work had the purpose of selecting, among forty pigeon pea pure lines, the most efficient genotypes to promote soil decompaction.

Materials and methods In a series of five experiments, seeds of forty pure forage pigeon-pea lines were planted in PVC tubes containing an upper 30 mm layer of vermiculite, compacted clayey soil (to a density of 1.6 g/cm^3) and a lower vermiculite layer, in a randomized block design with four replications, in a greenhouse. Nine pre germinated seeds were planted in each 143 mm diameter tube. Around two weeks after planting, the plants were harvested and dry mass of their parts was determined. In all experiments, the cultivar Fava Larga served as the control and the main measured characteristic was the amount of roots produced in the compacted soil layer. Three lines were selected and went though a series of three experiments where, besides pigeon-pea root and shoot dry mass, root development of Tanz nia grass plants (*Panicum maximum* Jacq.) seeded after pigeon-pea harvest was evaluated. The experiments had ten blocks, half of which had the pigeon-pea plants completely harvested after approximately two weeks. In the other half, the aerial part of the pigeon-pea plants was removed; Tanz nia seeds were planted and after about two weeks the plants were harvested and the same type of data were collected. Sample compacted blocks went through computerized tomography to check their soil bulk density uniformity.

Results In the series of five experiments, three lines were selected since they yielded significantly more roots in the compacted soil blocks: g5～94, g8～95 and g124～95, although high variation coefficients were found. These lines went trough new experiments: in the first one, sand was used in the place of the upper vermiculite and that caused, due to water infiltration, soil penetration resistance to fall from 3.8 MPa to 1.6 MPa, in two weeks. For that reason, the second part was not performed and Tanzânia grass seeds were not planted. Also in this case, g5～94 had significantly higher amount of roots in the compacted layer than the control. A second experiment was performed, using again vermiculite in the upper layer. When the pigeon-pea plants were harvested, average penetration resistance of the soil blocks was 14.6 MPa and the tubes that had received the Fava Larga plants had significantly (Duncan $p < 0.05$) higher resistance than those that received the g8～95 plants. Dunnett test ($p < 0.05$) revealed superiority of g5～94 and g8～95 over the control, in quantity of roots in the compact layer, but no difference was found among the Tanzânia plants, when the variation coefficient went up to 49%. In the third experiment, the same scheme was performed but only the g5～94 and g8～95 lines were used. When the pigeon-pea plants were harvested the average penetration resistance was 12.6 MPa and the variation coefficient, 20.7%. When the Tanzânia plants were harvested, penetration resistance ranged from 1.7 to 24.8 MPa and the variation coefficient was 68.5%, demonstrating that the longer staying of the plants in the greenhouse tends to cause problems in the soil properties, confirming observations by De Maria (1999) about problems to evaluate roots under these conditions. Root dry mass of the two lines were significantly higher than that of the control (Dunnett $p < 0.05$). Roots of the Tanzânia grass grown where those lines had been grown were only numerically higher than those of the control, probably due to the high variation coefficients. Tomographical images revealed that the blocks were uniformly compacted and horizontallly the soil bulk densities ranged from 1.41 to 1.52 g/cm^3.

Conclusions There is genetic variability in the *Cajanus cajan* species to penetrate compacted soil layers and two genotypes, g5～94 and g8～95 were the most efficient. The artificially compacted soil blocks used were adequate for the purpose of these experiments, since tomographical images revealed their soil bulk density uniformity.

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