Root Development of Three Commercial Forage Pigeon-Pea Cultivars in Artificially Compacted Soil

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Root development of three commercial forage pigeon-pea cultivars in artificially compacted soil

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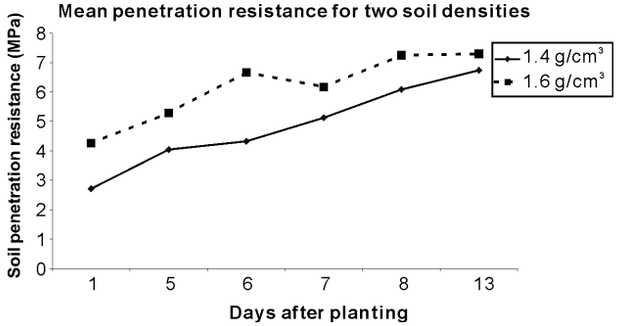
Introduction Soil compaction is an increasing problem in Brazil and the use of appropriate species for soil decompaction is the most practical and economical way to face this problem. Among these species, pigeon-pea plays an important role due to the capacity of its roots to penetrate highly compacted soil layers (Camargo & Alleoni, 1997). Observations in a pigeon-pea line collection showed that there are differences among them in that capacity. To test pigeon-pea lines to this characteristic, it is necessary to select a control, among the available commercial cultivars. The purpose of this work was to select the most efficient commercial forage pigeon-pea cultivar to penetrate compacted soil layers, to serve as a control in the process of selecting pure lines.

Materials and methods Seeds of three commercial forage pigeon-pea cultivars, Anão, Caqui and Fava Larga, were planted in PVC tubes containing 30 mm layers of vermiculite, compacted clay and vermiculite, in two randomized block design with four replications experiments in a greenhouse. Nine pre germinated seeds were planted in each 143 mm diameter tube. The soil was compacted to three calculated density levels: 1.0, 1.4 and 1.5 g/dm^3 in the first experiment and in the second experiment, to two levels, 1.4 and 1.5 g/cm^3. Plants were irrigated according to the average water loss. After three weeks in the first experiment and two in the second, it was determined the dry mass of the aerial parts of the plans, of the roots in the upper vermiculite layer, in the compacted soil layer and in the lower vermiculite layer. Sample tubes without plants were prepared and had their weight periodically determined to estimate the water loss. Soil resistance to penetration in the compacted layer was also determined, in the second experiment, using a digital laboratory penetrometer.

Results Root dry mass in the compacted soil layer was the main used criteria. In the first experiment, no significant interaction was found between cultivars and soil density. The average root dry mass found was 72.5 mg, 73.8 mg and 69.7 mg for cultivars Anão, Caqui and Fava Larga, respectively, without any statistically significant difference. A root mass significant reduction (Duncan, $p<0.05$) was found for the 1.5 g/cm^3 density (52.0 mg) against the 1.0 g/cm^3 density (88.8 mg) and the 1.4 g/cm^3 density (75.3 mg).

In the second experiment, monitoring soil penetration resistance showed an increasing tendency for both soil densities (Figure 1), indicating that probably the soil water content was reducing. No statistical difference was found for the soil densities or for the root dry mass in the compacted layer. However, in this case, the Fava Larga cultivar (30.4 mg) yielded 19% more than Caqui (25.5 mg) and 27% more than Anão (20.0 mg).



Conclusions The three forage commercial pigeon-pea cultivars had potential for soil decompaction, since all of them were able to produce roots in the compacted soil layer. Cultivar Fava Larga was selected for its performance in the second experiment and for the fact that presently is the most used pigeon-pea cultivar.

Reference

Camargo, OC., ALLEONI, LRF (1997) Compactação do solo e o desenvolvimento das plantas. Piracicaba. 132 p.