LEAST LIMITING WATER RANGE AND SOIL COMPACTIBILITY IN IRRIGATED ORGANIC AGROECOSYSTEMS

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INTRODUCTION

The physical quality of the soil is essential to the sustainability of irrigated agricultural production systems.

OBJECTIVE

The aim of this study was to evaluate the least limiting water range (*LLWR*), the load-bearing capacity (σ_p) and the degree of compactness (*DC*) of the soil in and between rows of irrigated acerola after different periods of cultivation.

MATERIAL AND METHODS

The study was carried out on the Ibiapaba Plateau, in the town of Ubajara, CE, Brazil. Three areas were selected which had been cultivated with acerola (*Malpighia punicifoilia* L.) under a biodynamic production system for one (A1), six (A6) and ten (A10) years from when the orchards were planted. We evaluated at depths of 0.00-0.10 m and 0.20-0.30 m, in and between the rows of crops: *DC*, *LLWR*, σ_p, maximum bulk density, critical water content, compression index, total organic carbon, and stocks of light organic matter and of light organic matter carbon.

RESULTS AND DISCUSSION

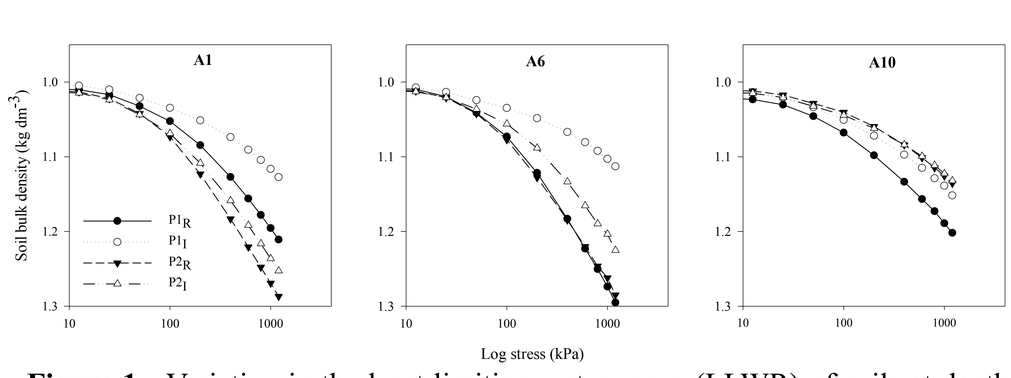

Figure 1 - Variation in the least limiting water range (LLWR) of soils at depths of 0.00 to 0.10 m (P1) and 0.20 to 0.30 m (P2) in the rows (R) and inter-row spaces (I) of acerola plants after one (A1), six (A6) and ten (A10) years cultivation.

- σ_p was similar in and between the rows of crops.
- In the upper layer, A1 showed higher values for *DC* than the longer-established areas, A6 and A10 ($p<0.15$).

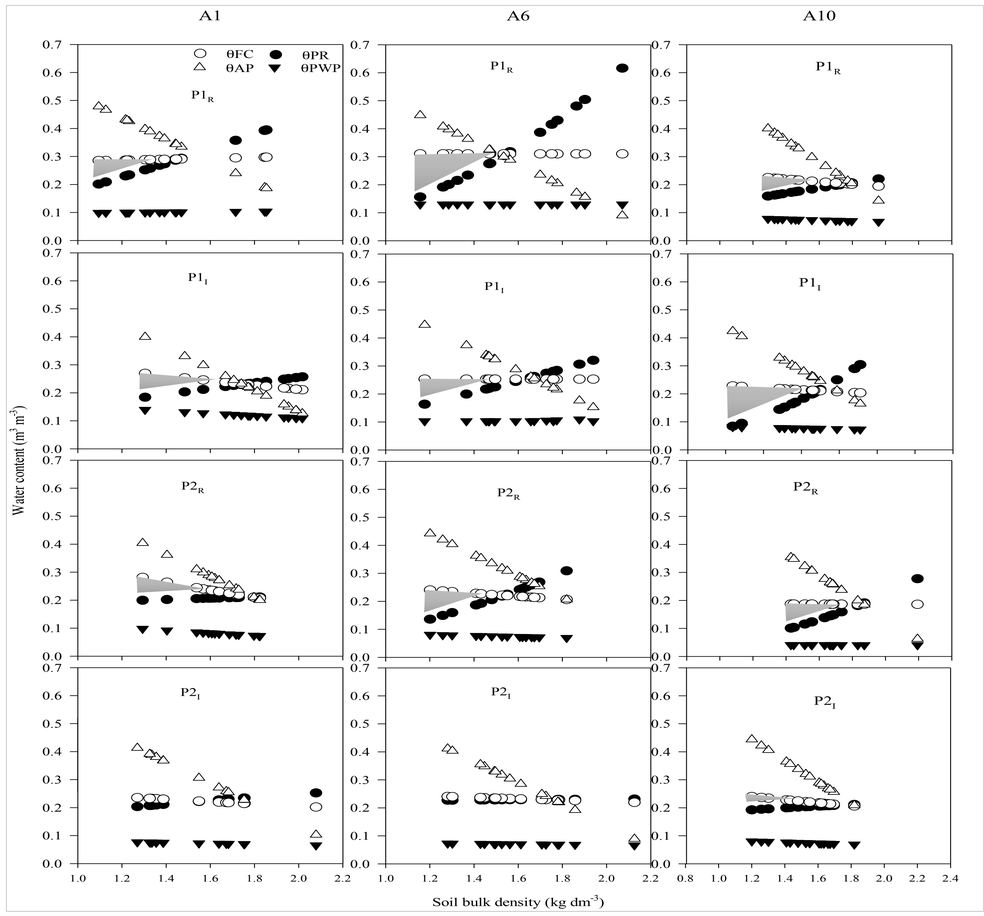

Figure 2 - Variation in water content at field capacity (θ_{FC}), permanent wilting point (θ_{PWP}), aeration porosity (θ_{AP}) and penetration resistance (θ_{PR}), as a function of soil density in the 0.0 to 0.10 m (P1) and 0.20 to 0.30 m (P2) layers, in the rows (R) and inter-row spaces (I) of a Yellow Latosol after one (A1), six (A6) and ten (A10) years cultivation with acerola. (The greyed-out areas correspond to the least limiting water range).

- Crop rows in the areas irrigated by centre pivot (A1 and A6) showed higher values for *LLWR* and *Cc* ($p<0.05$) than the inter-row spaces, which may be linked to higher values for *TOC* (A1 $p<0.10$, A6 $p<0.05$).
- The inter-row areas irrigated by localised micro sprinkler (A10) showed higher values for *LLWR* than those irrigated by centre pivot (A1 and A6).
- Under drier soil conditions, plant growth was limited mainly by the resistance of the soil to penetration.

CONCLUSIONS

- The LLWR was more sensitive in describing the effects of management on the structural quality of the soil than were σ_p or the DC.
- In irrigated orchards, the adoption of systems irrigated by micro sprinkler can contribute to a reduction in the degradation of soil structure.

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