

Least Limiting Water Range of a Typic Rhodudalf in Sao Paulo State

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Abstract

Agricultural management may cause degradation, mainly with regard to soil compaction. The “least limiting water range” (LLWR) is an indicator for evaluating soil structural quality that integrates the key attributes required for roots growth. In this work we determined the LLWR for a Typic Rhodudalf, using disturbed soil samples, packed in cylinders at crescent levels of soil bulk density (Ds). This represents a modification in the original methodology. For validating purposes we employed a LLWR built for the same soil, but using undisturbed soil samples (natural structure), which was adopted as standard. The LLWR determined in this work is quite similar in shape and parameters with that adopted as standard. These results validate the introduced variation in methodology, which has the advantage of promoting an effective control over the variation of the soil bulk density.

Key words: Soil quality, Soil water, Soil penetrability.

Introduction

The least limiting water range (LLWR) is an indicator of structural soil quality for crop growth, which accounts the water range in which limitations due to lack or excess of water and to soil penetrability are minimal (Silva et al., 1994). In this work, we determined the LLWR for a *Typic Rhodudalf*. But, rather than using soil samples with natural structure (undisturbed structure), we employed instead disturbed soil samples packed in cylinders at crescent levels of soil bulk density (Ds). The theoretical assumption for this procedure is that the resulting structures (inner the cylinders) represent particle arrangements possible to be found in nature. For validation purposes, a LLWR built by Calonego et al. (2011) from undisturbed soil samples was adopted as standard.

Results and Discussion

The range of variation of the soil bulk density (Ds) for the *Typic Rhodudalf* was established between 1.01 kg dm⁻³ (minimal Ds under preserved forest) and 1.5 kg dm⁻³ (maximum Ds as determined by the Proctor test). Six levels of Ds were defined to pack soil in the cylinders: 1.0, 1.1, 1.2, 1.3, 1.4 e 1.5 kg dm⁻³. The results show that the lower limit of the LLWR is given by the soil penetrability curve (RP) throughout the range of variation of the Ds (figure 1A), as well as it occurs in the standard LLWR (Calonego et al., 2011; figure 1B). Until Ds=1.30 kg dm⁻³, the upper limit of the LLWR is given by the curve of volumetric moisture at field capacity (FC). Above Ds=1.30 kg dm⁻³, the curve of volumetric moisture at aeration porosity borderline (AP) becomes the limitation. Such results are also similar to those found by Calonego et al. (2011). In this work, the critical soil bulk density (D_{sc}), or the one where the LLWR is equal to zero, was determined as being of 1.36 kg dm⁻³, very similar to the D_{sc} in the standard LLWR, of 1.35 kg dm⁻³. These great similarities in shape and parameters give support to consider valid the introduced modification in methodology, which has the advantage of an effective control over the variation of the soil bulk density.

Conclusions

We conclude that a valid LLWR can be built from disturbed soil samples. Such result encourages us to test this approach with other soil types.

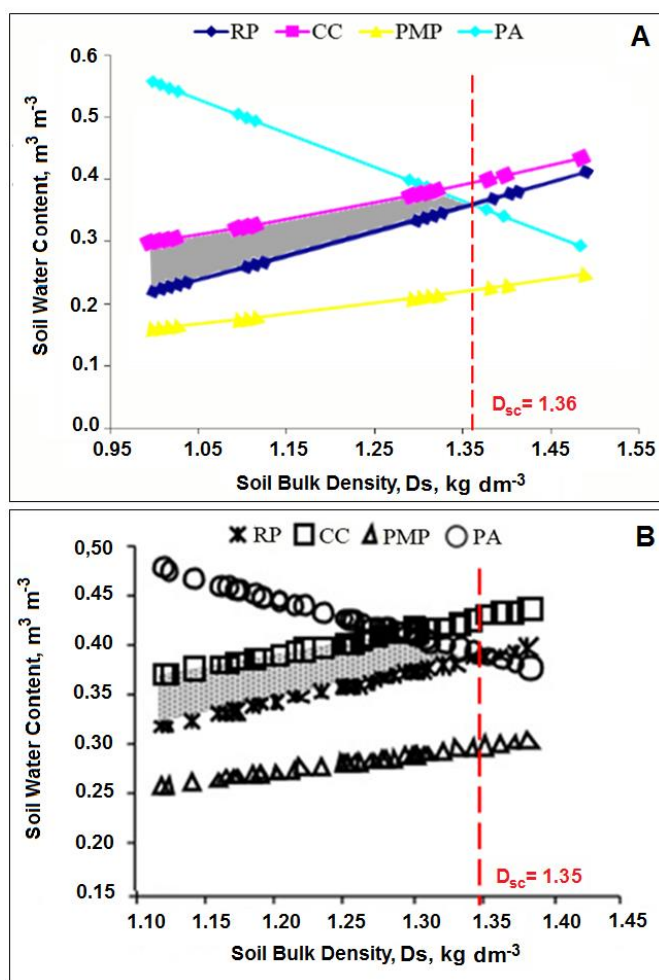


Figure 1. In A, LLWR employing disturbed soil samples; in B, LLWR adopted as standard (Calonego et al., 2011).

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