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Is topsoil water repellency a mechanism for improving water conservation in depth?

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Soil water repellency (WR) is widespread in forest soils under different climatic conditions, soil types and vegetation covers (Doerr *et al*., 2000). It is normally characterized by a high spatial variability in persistence, showing wettable and water repellent patches. This phenomenon has a special interest in semiarid areas, such as the Mediterranean ecosystems, where water resources are limited. For that reason, it is thought to be a possible mechanism for improving water conservation in soil profile, which would minimize evaporation losses from the soil surface (Doerr *et al*., 2000; Robinson *et al*. 2010). The ecological function of having a patchy hydrophobic surface might be the means of transporting water deeper into the soil profile and away from surface evaporation. In addition, it may also inhibit the growth of other vegetal species. This could increase the resistance of plants to drought by increasing water availability through reducing losses to surface evaporation or other plants.

Our aim was to test the hypothesis that soil WR improves the water conservation within the soil. We have compared the temporal evolution of soil moisture between samples with repellent and wettable layers. Repellent and wettable soil samples were collected from an agricultural area in Biar (Alicante, Spain). Samples were put in 100ml plastic pots (n=30). Each one had two layers (WR and wettable or both wettable) with depth around 2.5cm for superficial and 3.5cm for deeper wettable horizon. We measured the evolution under different initial conditions of soil water content (around 20% and 9%) and soil superficial WR persistence (wettable, slight, strong and severe soil (n=5 per treatment)). Pots were kept under laboratory conditions (between 30-50% of relative air humidity and $\approx$ 20ºC). Soil water content was controlled daily by weight measurement.

Our results showed a clear significant difference in evaporation rates, which were higher in samples with a wettable superficial layer. However, differences in evaporation rates were not significant between samples with different WR levels of persistence nor between samples with different initial water content. Our preliminary results indicated that soil WR is a mechanism which clearly contributes to the conservation of moisture in depth, making more sense of the hypothesis of a possible ecological strategy for plants.

Keywords: Soil water repellency, hydrophobicity.

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