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Plant species affect soil water repellency differently, in semi-arid south-east Spain

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Water repellency (WR) of soils is a widespread phenomenon that can lead to decreased infiltration rates, fingered flow infiltration, increased runoff and leaching of nutrients to the groundwater. This research investigated the effect of different plant species on the WR of the surface horizon in a natural semi-arid ecosystem. In the field this was investigated spatially, in the laboratory it was investigated in a wetting range. Infiltration into deeper soil horizons and organic C levels were also investigated. The plant species are *Stipa tenacissima*, *Anthyllis cytisoides* and *Rosmarinus officinalis* and have not been investigated in prior WR research.

In the field WR was strictly limited to the surface soil underneath the ectorganic profile. Using the Water Drop Penetration Time (WDPT) test, the soil surface underneath *Stipa* was found to be hardly hydrophobic, under *Anthyllis* moderately and under *Rosmarinus* very hydrophobic. It appears that the thickness of the ectorganic profile is related to the WR of the surface soil. Deeper, fingered infiltration underneath the ectorganic profile of *Anthyllis* and *Rosmarinus* – in respect to bare soil – was found, but infiltration depth did not significantly differ between plant species and bare soil.

In the laboratory WR was found to display a two-peak distribution in a wetting range. The first peak ranged from 22 to 26% gravimetric soil moisture content, the second peak from 45 to 47%. As a new indicator of WR, the area in a WDPT – Soil Moisture Content graph was calculated. *Stipa*, *Anthyllis* and *Rosmarinus* were found to be hydrophobic in the ratios 1: 2.3: 4.5. A possible third peak by oven drying at 105˚C was not investigated. Total soil organic carbon levels correlate with WR (r^2= 0.74, α = 0.01). Reproducibility of the WDPT test in a wetting range averages 85% (74%

minimum), when using the stable area indicator.

The different plant species were found to influence soil WR to different extents. The area in a WDPT – Soil Moisture Content graph was found to be the most robust indicator of soil water repellency.