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Abstract

The importance of natural or induced (fire) water repellence in terms of water redistribution in the soil profile, reduction in soil infiltration capacity and thus, in runoff magnification, is well established. Hydrophobicity has been identified around the world in different climatic conditions, land covers, soil and vegetation types. Regarding soil and vegetation, many studies are based on coarse acidic soils with pine forest, eucalyptus, deciduous trees, grassland, cropland, chaparral vegetation type, and lately in shrublands. However, few studies are related to shrubland in wet Mediterranean carbonated environments.
This work is oriented to the study of soil water repellence in these environments by means of WDPT. The study was carried out in Podentes (Coimbra), central Portugal, on 4 ha of shrubland (mainly Quercus coccifera, Pistacia lentiscus and Arbutus unedo), developed on Umbric leptosol and Calcaric cambisol soil types (WRB). The WDPT was assessed depending on the shrubland type, slope orientation, soil depth (0-2 cm and 2-5 cm) and on different soil fractions (<2 mm, 2-1 mm, 1-0.25 mm and <0.25 mm). Soil organic matter, pH and carbonate content were also determined.
The largest hydrophobicity (56% strong persistence and 44% slight persistence) was measured on the soil fraction of <0.25 mm of the soil surface layer under A. unedo. Soil water repellence decreased with depth. The studied shrubland species showed an increasing trend on the soil hydrophobicity persistence: A. unedo > Q. coccifera ≈ P. lentiscus; and depending on the orientation: NE > SW.
Direct relationships were obtained between the soil organic matter content and the log WDPT on almost all the surface soil samples. The soil pH and carbonate content did not display correlation with soil water repellence.
The different hydrophobic compounds generated by waxes and resins of the different shrubland types, which could be incorporated to the soil as binding agents, seem to be the explanation for the differences of the WDPT data. The patchy distribution of the vegetation rules the persistence of the natural soil water repellence, restraining water infiltration mainly by micropore flow, being then the soil hydrology controlled by the macropore flow, cracks and root system. Further research into soil organic matter quality in the finer soil aggregates could be necessary to confirm this link between the components supplied by the different shrub species and the trends on soil water dynamics.