

Soil water repellency under stones, forest residue mulch and bare soil following wildfire.

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Soil water repellency (SWR) is a physical property that is commonly defined as the aptitude of soil to resist wetting. It has been documented for a wide range of soil and vegetation types, and can vary with soil organic matter (SOM) content and type, soil texture, soil moisture content (SMC) and soil temperature. Fire can induce, enhance or destroy SWR and, therefore, lead to considerable changes in soil water infiltration and storage and increase soil erosion by water, thereby weakening soil quality.

In Portugal, wildfires occur frequently and affect large areas, on average some 100000 ha per year, but over 300000 ha in extreme years such as 2003 and 2005. This can have important implications in geomorphological and hydrological processes, as evidenced by the strong and sometimes extreme responses in post-fire runoff and erosion reported from various parts of the world, including Portugal. Thereby, the application of mulches from various materials to cover burned areas has been found to be an efficient stabilization treatment. However, little is known about possible side effects on SWR, especially long term effects. Forest SWR is very heterogeneous, as a result of variation in proximity to trees/shrubs, litter type and thickness, cracks, roots, and stones.

This study targeted the spatial heterogeneity of soil water repellency under eucalypt plantation, five years after a wildfire and forest residue mulching application. The main objectives of this work were: 1) to assess the long-term effect of mulching application on the strength and spatial heterogeneity of topsoil SWR, by comparing SWR on bare soil, under stones, and under mulching remains; 2) to assess SWR at 1 cm depth between O and Ah horizons. The soil surface results showed that untreated bare soil areas were slightly more water repellent than mulched areas. However, under stones there were no SWR differences between mulched and control areas. At 1 cm depth, there was a marked mulching effect on SWR, even 5 years after application.