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Effects of soil water repellency on microbial community structure and functions in Mediterranean pine forests

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Soil water repellency (SWR) is a property commonly observed in forest areas showing wettable and water repellent patches with high spatial variability. SWR can greatly influence the hydrology and the ecology of forest soils. The capacity of soil microorganisms to degrade different organic compounds depends upon species composition, so this may affect changes in SWR on the microsite scale (such as the presence of soil water repellent patches; Mülleret al., 2010). In the Mediterranean forest context, SWR has been found to be related to microbial community composition. The accumulation of different hydrophobic compounds might be causing the shifts in microbial community structure (Lozano et al., 2014). In this study we investigated the effects of SWR persistence on soil microbial community structure and enzyme activity under Pinus halepensis forest in three different sites: Petrer, Gorga and Jávea (Alicante, E Spain). Soil samples were classified into three different water repellency classes (wettable, slight or strongly water repellent samples) depending on the SWR persistence. The soil microbial community was determined through phospholipid fatty acids (PLFAs). Enzyme activities chosen for this study were cellulase, β-glucosidase and N-acetyl-β-glucosaminide (NAG). The relationships between microbiological community structure and some soil properties such as pH, Glomalin Related Soil Protein, soil organic matter content and soil respiration were also studied. Redundancy analyses and decomposition of the variances were performed to clarify how microbial community composition and enzyme activities are affected by SWR and soil properties. The effect of SWR on microbial community composition differed between locations. This effect was clearer in the Petrer site. Enzyme activity varied considerably depending on SWR persistence. The highest activities were found in slightly SWR samples and the lowest mostly in the strongly water repellent ones. These preliminary results suggest a possible influence of SWR on microbial structure and its activity in soils.

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