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Response of soil microbial community to different wildfire history in Pinus pinaster forests: fire recurrence, fire return interval and time since the last fire.

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Abstract

A modification of the natural fire regime of an ecosystem, implies a direct and indirect selective pressure on the soil biological community. During the last decades, changes in land use and climate are altering fire regime characteristics across Mediterranean ecosystems, increasing fire frequency or severity. We hypothesise that increasing fire recurrence might select microbial phyla with fire-adapted traits. The main objective of this work was to discern whether an increasing fire recurrence alters the post-fire recovery capacity of the soil microbial community of *P. pinaster* stands in the Central-West of the Iberian Peninsula. We characterized the soil fungal, bacterial and archaea communities at the phylum level across a 43-year fire chronosequence with high fire recurrence (up to 3 fires) by Illumina MiSeq sequencing. Study sites were chosen to differ in the number of fires (1 to 3), in the time elapsed since the last fire and the interval between the last two fires. In burned sites, fungal community showed a dominance of *Ascomycota* at the expense of *Basidiomycota* phyla. In parallel, bacterial community reported a higher relative abundance of Actinobacteria, *Gemmatimonadetes* and *Patescibacteria* phyla in burned soils, and a decrease of *Proteobacteria*, *Acidobacteria* and *Verrucomicrobia* phyla. However, fire did not affect archaea community composition, at least at the phylum level. Despite these changes observed in the relative abundance of some phyla shortly after fire, the overall fungal and bacterial communities showed high capacity to recover after fire, regardless the previous fire history (recurrence or time between the last two fires). Thus, fungal and bacterial community structures showed a clear phyla re-assemblage related to the time since the last fire, indicating that fire had a significant effect on soil microbial structure during about four decades after fire. The differences between burned and unburned forests and the post-fire succession in fungal, bacterial and, to a lesser extent, archaeal community structure seen to be driven by variables related to carbon and nutrients pools and mineralization rates.

Keywords: bacteria, fungi, fire regime, ecological succession

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