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Long-term prescribed fires effects on biological properties of an Eutric Cambisol (Tella-Sin, Central Pyrenees)

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Livestock density reduction, together with climate change, is facilitating the substitution of grasslands by shrublands (Komac et al., 2013; Nadal-Romero et al., 2016), which leads to a higher fire risk (Vélez, 2012) and a loss of soil biodiversity (Caballero et al., 2009). Fire Service performs prescribed fires in different shrublands of the alpine environments with two objectives: preventing large forest fires, reducing fuel load and breaking its continuity, and recovering pasturelands. However, these prescribed fires could affect the soil properties, especially the biological ones, as these are affected even at low temperatures (Santín & Doerr, 2016).

To find out, a study to determine the short-, mid- and long-term evolution of prescribed fires effects on soil properties has been conducted in Tella-Sin (Central Pyrenees), with dense canopy cover *Echinopartum horridum* shrublands and Eutric Cambisol soils. In a cross-sectional study, plots recently burned (B0), in the mid-term (6 years before, B6) and long-term (10 years before, B10) have been selected to be compared with a non-burned plot (UB). Soil samples were collected up to 3 cm of depth, based on Girona et al. (2019). Soil biological properties were analyzed: Microbial carbon (Cmic), soil respiration (SR) and soil enzymatic β -glucosidase activity (β -G). Some physical (soil water repellency (SWR), soil aggregate stability (SAS)) and chemical (pH, electrical conductivity (EC), soil total organic carbon (SOC)) properties were also measured.

Results obtained from this study showed non-significant interactions between post-fire time and depth for all the studied properties. Permanent short-term effects were found only for β -G activity, which suffered a significant decrease that persisted even in B10 plot. SR and SOC were highly correlated and both suffered a mid-term significant decrease that did not reach back UB values even in B10 plot. SOC and SWR showed a high correlation as well. No significant effects were found for Cmic, although a mid- a long-term decrease, with a p-value of 0.0534, was found.

In conclusion, even though prescribed fires do not usually have immediate effects on most soil properties, mid- and long-term effects, especially in those properties related to the SOC content, can be found. One of the most sensible biological properties of the soil is β -G activity, which was the only one, out of all the studied properties, that suffered a significant permanent short-term negative impact.

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