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Warming and drought effects on C turnover and microbial activities in a semiarid agricultural soil amended with biochar

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An environmental manipulation experiment was performed to determine the consequences of soil degradation processes associated to climate warming and its effects on C turnover and microbial activities. The objective of this research was focused on assessing the impacts of a climate change scenario for the Mediterranean region on labile organic C pools, enzyme activities, microbial biomass content and soil respiration rates in a Typic Xerofluvent soil amended with biochar (BC) at a rate of 20 h ha-1 during two consecutive years and cropped with a barley-camelina-fallow rotation. Unamended plots were used as control. Experimental manipulation of drought and precipitation events and warming were performed by means of rain-out shelters and open-top warming chambers to assess the combined effects of a 30 per cent reduction of annual rainfall and an average 2 ºC temperature increase in soil.
The results of warming and altering precipitation-drought events for two years, in both BC and control plots under rainfall reduction and warming (RW) treatments showed significant decreases in microbial biomass-C (MBC) contents and enzymes activities such as β-glucosidase, phosphatase and N-Benzoyl-L-arginine amide (BAA) protease that are involved, in the C, P and N cycling, respectively. Both BC-RW and control-RW exhibited an increase in water-soluble organic C (WSOC) contents and soil respiration rates, which was correlated with greater dehydrogenase activity (involved in microbial metabolic processes). Unaltered BC and control plots exhibited smaller respiration rates and WSOC, and greater MBC contents than BC-RW and control-RW treatments. These results support the assumption that warming and altering precipitation-drought patterns are affecting soil microbial communities composition and its role in the global C turnover.

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