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Short-term hydrological response of soil after wildfire in a semi-arid landscape covered by Macrochloa tenacissima (L.) Kunth

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Abstract

A proper management of semi-arid landscapes affected by wildfire is needed to reduce its effects on the soil hydrological response in the wet season. Despite ample literature on the post-fire forest hydrology, it is not well documented how the hydrologic processes respond to changes in vegetation cover and soil properties of semi-arid lands after wildfire. To fill this gap, this study evaluates soil hydrology in a semi-arid soil of Central Eastern Spain dominated by *Macrochloa tenacissima* (a widely-spread species in Northern Africa and Iberian Peninsula) after a wildfire. Rainfall simulations were carried out under three soil conditions (bare soil, and burned or soils with unburned vegetation) and low-to-high slopes, and infiltration, surface runoff and erosion were measured. Infiltration rates did not noticeably vary among the three soil conditions (maximum variability equal to 20%). Compared to the bare soil, the burned area (previously vegetated with *M. tenacissima*) produced a runoff volume lower by 27%, while, in the area covered by the same species but not burned, the runoff was lower by 58%. The burned areas with *M. tenacissima* produced soil losses that were similar as those measured in bare soils, and, in steeper slopes, even higher. Erosion was instead much lower (-83%) in the sites with unburned vegetation. Overall, the control of erosion in these semi-arid lands is beneficial, to reduce the possible hydrological effects downstream of these fire-prone areas, and, in this direction, the establishment of vegetation strips of *M. tenacissima* in large and steep drylands with bare soil left by fire may be suggested to land managers.

Keywords: water infiltration; bare soil; runoff; soil loss; rainfall simulator.