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Impact of post-wildfire stabilization treatments on major and minor topsoil elements in a Mediterranean environment (Croatia): first-year study

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In the Mediterranean part of Croatia, wildfires have increased in recent decades raising concerns about soil degradation. Post-wildfire stabilization treatments are used in fire affected areas due to their easy application and possible beneficial effects on soil quality. On 28 July 2019, a moderate to high severity wildfire affected about 900 ha in the central part of Mediterranean, Croatia (43°45'N 15°56'E; 105 m a.s.l.). Wildfire mostly affected abandoned grassing with a dominant culture Aleppo pine (*Pinus halepensis*), and olive groves (*Olea europaea*). The effects of wildfire (control (C); uncovered burned soil), and two post-wildfire stabilization treatments (mulches); pine needles (PM) and olive leaves (OM) were evaluated on soil samples (0–5 cm depth) taken during 5 sampling campaigns; 25 days after fire (DAF), 3 months after fire (MAF), 6 MAF, 9 MAF, and 12 MAF. One treatment covered 10 m², and mulches were applied in 0.5 kg m⁻². The non-destructive analytic method, X-ray fluorescence (pXRF), was used to determine the behavior of total concentrations of nutrients and pollutants in all soil samples. The results showed that Al and P were significantly lowest at PM 12 MAF compared to other dates. The P was also significantly lowest at C 3 MAF than other dates. The Ti was significantly lowest at PM 12 MAF then C treatment, while the Zn was significantly different between PM and OM treatments 12 MAF, with highest values at PM. The Si didn't vary significantly under mulch treatments, but in C was significantly highest 12 MAF in regard to 25 DAF. The K was significantly highest at both mulch treatments 3 MAF, regard to other dates and C treatment. The Pb showed significant changes only in PM between 3 and 12 MAF, with highest concentrations 12 MAF. The S showed significant difference in C between 25 DAF and 12 MAF with the highest 25 DAF. The effects of fire and mulches during the first post-fire year didn't show significant change of Ca, V, Cr, Mn, Fe, Co, Ni, Cu, As, Rb, Sr, Y, Zr, Nb, and Th concentrations. These results show that PM had a more notable impact on the concentrations of major and minor topsoil elements in comparison to OM. However, it is concluded that more time is required to complete mulch decomposition and possible increment in soil quality.

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