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Mitigation of water repellency in burned soils applying hydrophillic polymers

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In this study, the effect of fire on water repellency was analyzed in soils from different parent materials, as well as the suitability of anionic polyacrylamide (PAM) to reduce water repellency in these soils. Samples were collected in four different sites where wildfires took place: two in the Canary Islands, with soils developed on volcanic materials, and two in Galicia (NW Spain), with soils developed on plutonic rocks. In Galicia, two soil samples were collected in each site, one in the burnt area and one in an adjacent unburnt area. In the Canary Islands, four samples were collected from each site, three inside the burnt area where the soils were affected by different fire intensities, and one in an unburnt adjacent area. Samples were air-dried and sieved by a 2-mm mesh sieve. Water repellency was measured using the Water Drop Penetration Time test. An amount of 10 g of soil was placed in a tray. Five drops of deionized water were place on the soil surface with a pipette, and the time for each drop to fully penetrate into the soil was recorded. PAM solution was applied to the burnt soils simulating a field application rate of 1gm-2. The polymer used was Superfloc A-110 (Kemira Water Solutions BV, Holland) with 1x107 Da molecular weigth and 15% hydrolysis. PAM was sprayed on the soil surface as solution with a concentration 0.2 g/L. After the application, the samples were dried and the WDPT test was performed. Three replicates for each treatment and soil were used, and the treatments included: dry soil, dry soil after a wetting treatment, dry PAM-treated soil. The results showed that water repellency was modified by fire differently in the various soils. In hydrophilic soils and soils with low water repellency, water repellency was increased after the action of fire. In soils with noticeable initial water repellency, this was reduced or eliminated after the fire. Wetting repellent soils caused a decrease in water repellency most probably because of the spatial redistribution of hydrophobic organic compounds that caused water repellency. The addition of PAM further reduced in all of the cases. The application of PAM could be an effective method for mitigation of water repellency in burnt soils.