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Water Stability of Aggregates as Affected by Heating Temperature and Duration of Exposure in a Water Repellent *Eucalyptus* Surface Soil

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ABSTRACT

Water repellency (WR) in soils is a phenomenon caused by organic compounds that prevents the spontaneous penetration of water into soils. It is common under plant species such as Eucalyptus, Casuarina, and Pine that are containing high amounts of waxes and resins in their litter materials. These species are also known to be highly prone to wildfires. Depending on heating dynamics, fire-generated heat may alter soil properties. WR and aggregate stability (AS) are two of the properties that are reported as affected by heat. Furthermore, WR in soils and AS are reported mostly as positively related. This study aimed to examine the effects of different heating temperatures (T_H) and exposure durations (D_E) on WR, AS, and their interrelation, using a water-repellent *Eucalyptus grandis* forest soil. Water-repellent aggregates (diameter: 3-5 mm) collected from the surface (0-5 cm) soil were exposed to four temperatures (150, 200, 250, 300°C) separately for three durations (30, 60, and 120 min). The WR was determined using the molarity of an ethanol droplet test up to its minimum measurement of 90° contact angle, and water drop penetration time test for samples with contact angles <90°. The percentage of water-stable aggregates (%WSA) was determined using wet sieving apparatus. The WR decreased with increasing T_H and D_E up to 200°C. Samples became non-repellent at temperatures ≥250°C under all D_E levels. The %WSA increased up to T_H of 250°C, while decreased at 300°C under all D_E levels. The change in %WSA under shortest D_E (30 min) was lower than that at longer D_E (60, 120 min). With increasing T_H, the relation between SWR and the % change in WSA increased up to 200°C, then slightly decreased up to 250°C, and became negative beyond that for all D_E levels. Results revealed that although WR of aggregates decreased with heating, AS did not always decreased, where the relation was not essentially positive as claimed in previous reports. The D_E did not show significant impact on WR, AS, or their interrelation. Further studies are necessary with more D_E and T_H levels to verify these impacts and exact interrelations.

Keywords: Aggergate stability, Exposure duration, Heating temperature, Water repellency