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Effect of Fire Treatment on Aggregate Stability and Splash Components in Laboratory Condition

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Abstract

The present study was planned with the aim of investigating the effect of fire on soil aggregates stability and splash erosion components in laboratory conditions on the rangeland soil in Kajur watershed located in the north of Iran. The corresponding experiments were done in three control plots and 12 plots covered with dry residues of rangeland species with four densities (250, 500, 750 and 1000 g m-2) based on the mass of plant residue per unit area and cpnsequently with four different fire intensities in three replications. Then, splash cups were placed on the soil surface and rainfall with an intensity of 60 mm h-1 and a duration of 30 minutes was simulated, and the splash erosion components including upward, downward, total and net splash were measured. The soil aggregate stability was also investigated by comparing the mean weighted diameter of the soil aggregates before and after the rainfall simulation in all plots. The results showed that the effect of fire treatment on reducing total and net splash variables and increasing soil aggregate stability was significant at 95% and 99% confidence levels, respectively. With the increase in the intensity of the fire treatment, in general, the trend of changes in soil aggregate stability and splash components was increasing and decreasing, respectively. The fire treatment with a intensity of 250 g m-2 of the dry residues of the rangeland species reduced total and net splash by 35 and 44%, respectively, while the treatment of fire with the intensities of 500, 750 and 1000 g m-2 of the dry residues of the rangeland species reduced total and net splash more than 95%. Although the soil aggregate stability increased significantly with increasing the intensity of the fire treatment, the reduction of the total and net splash in the fire treatments with an amount of >500 g m-2 of the dry residues of the rangeland species was no longer significant. The significant participation of small particles of the soil surface without aggregation in the splash changed the intensity of the effect of fire treatment. The percentage of reduction of total and net splash due to the fire treatment with different intensities was not the same, which shows that the splash in the upstream and downstream directions did not decrease in the same proportion. The soil aggregate diameter from the control treatment to fire treatments with low to high intensities had a decreasing trend, generally.

Keywords: Aggregate Diameter, Fire Management, Hydrophobicity, Rain Erosion, Soil Conservation.