

Determining Rill Erodibility in Some Soils in Zanjan Province Under Simulated Rainfall

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Abstract

Rill erosion is the detachment and transport of soil particles by concentrated flow of runoff. It is the most common form of water erosion in the hill slopes. Rill erodibility is the rate at which soil particle is detached and transported by shear force of the concentrated flow. The study was conducted to determine the rill erodibility in different soil textures in Zanjan province using a rainfall simulator. To this end, samples of eight soil textures consisting of clay, clay loam, silty loam, sandy clay loam, sandy loam, loamy sand, and sandy were collected from land surface and transported to small plots (120 cm × 100 cm) on a sloped uniform land (10%). The plots were exposed to five simulated rainfalls with a constant intensity of 60 mm h⁻¹ for one hour. Based on the results, there was a significant difference among the soil textures in the rill erodibility ($p < 0.01$). Rill erodibility of the soils significantly correlated with mineral fraction (sand, clay, gravel) and exchangeable sodium percentage (ESP). With an increase in sand and gravel percentage, soil infiltration rate strongly increased and consequently production of the concentrated flow steadily decreased. Multiple regression analysis indicated that the rill erodibility in the soils was remarkably related to ESP ($R^2 = 0.85$, $P < 0.01$). Clay soil showed to have the highest rill erodibility among the soil textures due to higher exchangeable sodium percentage (ESP= 13).

Keywords: Soil texture, Concentrated flow, Exchangeable sodium percentage, Soil infiltration.

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