

The relative importance of soil crust and slope angle in runoff and soil loss: a case study in the hilly areas of the Loess Plateau, North China

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Soil crust and slope angle are of important factors affecting runoff production and sediment yield. In the hilly areas of the Loess Plateau, North China, slope lands are distributed extensively and subjected to soil crusting; therefore, the research on the responses of runoff and soil loss to soil crust and slope angle is essential to soil and water conservation. In the study, five pairs of 1 m 9 5 m plots with slope angles of 5°, 10°, 15°, 20° and 25° respectively, were established in Wangjiagou watershed, which was located at the Loess Plateau, China. Based on the two simulated rainfall events, uncrusted surface prior to the first simulated rainfall event, and crusted surface prior to the second rainfall event were distinguished. The runoff production and soil loss were measured at intervals of 5 min during the simulated events. It indicated that both soil crust and slope angle played an important role in runoff production and soil loss. With the reference slope angle of 5°, the relative importance of soil crust and slope angle in runoff production was calculated. It showed that soil crust effect on the total runoff volume decreased from 100 to 40%, while slope angle effect increased from 0 to 60% with increasing slope angle because soil crust less developed on the steeper slopes. Furthermore, soil crust effect was associated with rainfall duration. At the same slope angle, the relative importance of soil crust decreased with rainfall duration because new crust was formed on the uncrusted surface. The critical slope of erosion was also discussed. Soil loss increased with slope angle when the slope angle was less than 20°. Generally speaking, soil crust effect decreased with slope angle and/or rainfall duration.

Keywords: China, Loess soil, research, simulated rainfall, soil and water conservation, soil erosion

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