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Catena 60 (2005) 255–266

CATENA

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Laboratory methods for the estimation of infiltration rate of soil crusts in the Tabernas Desert badlands

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Received 7 August 2003; received in revised form 30 November 2004; accepted 20 December 2004

Abstract

Soil crusting is a crucial factor for runoff generation in the Tabernas Desert badlands; however, very few methods have been developed for the measurement of infiltration in crusts, which are often distributed on steep slopes where experimental devices are very difficult to install, making measurement difficult. We have used the trickle irrigation (TI) method and mini-disk infiltrometers (MDI) in the laboratory to measure steady infiltration rate under nearly saturated condition and tensions, respectively, in soil crust samples removed from the field. Steady infiltration rate under tensions were performed at three water pressure heads ($h = -0.5$, -2.0 , and -6.0 cm).

Steady infiltration rate of soil crusts in the Tabernas Desert badlands ranged from 21.3 to 30.7 mm h^{-1} measured by TI method. Steady infiltration rate under tensions decreased with increasing tensions; it was 9.9–18.4 mm h^{-1} , 0.4–5.7 mm h^{-1} , and 0.2–3.3 mm h^{-1} at -0.5 -, -2.0 -, and -6.0 -cm pressure heads, respectively. Steady infiltration rate measured by TI method and that at a tension of 0.5 cm by the MDI is consistent with the results from the previous simulated rainfall studies in the same soil crust surfaces, suggesting that the TI and MDI methods may be potentially a useful lab measurement for approximating field infiltration rate.

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Keywords: Mini-disk infiltrometer; Trickle irrigation method; Physical crust; Microphytic crust; Badlands

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