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The field measurement of surface soil hydraulic properties in artificial revegetated sand area established at different years, Northwest China

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Water condition is a key factor improving the ecological environment in desert area, the redistribution processes of precipitation can be precisely delineated with proper sets of soil hydraulic properties derived from in situ experiments. The establishment of artificial revegetation especially the colonization of biological soil crusts would change the soil surface hydraulic properties, further would influence the water condition this area. Hence, the objective of this study was to investigate the effect of artificial revegetation establishment time on soil surface infiltration characteristics, sorptivity, hydraulic conductivity and soil pore contribution rate in northwest China. The experiment was performed at four artificial revegetation sample plots of Shapotou desert area established in 1956, 1964, 1981 and 1987 year, respectively. Correlated hydraulic properties were measured in May of 2009 with tension infiltrometers. The results indicated that thirty years later after artificial revegetation was planted, the soil cumulative infiltration amount, initial infiltration rate, stability infiltration rate, saturated hydraulic conductivity, α value, soil sorptivity all reduced gradually with the continue increase of sand-fixation time, while the time achieving stable infiltration increased with increasing sandfixation time due to the colonization and development of biological soil crusts. Compared to the reference values, Philip formula was the most appropriate calculation methods of soil sorptivity in experiment area. The soil surface porosity distribution is more homogeneous with further increase of sand-fixation time thirty years later after artificially revegetation established. Revegetation changed the contribution rate distribution of different class pore to water flow, which was more uneven with the increase of sand-fixation time. The contribution rate of macropore to water flow is significant greater in 1956 year revegetation area than other revegetation areas ($p<0.01$). This study may provide valuable information for the effective management of water resources at wide artificial revegetation desert area.

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