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Biological soil crust succession impact on soil moisture and temperature in the sub-surface along a rainfall gradient

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Biological soil crusts produce mucilage sheets of polysaccharides that cover the soil surface. This hydrophobic coating can seal the soil micro-pores and thus cause reduction of water permeability and may influence soil temperature. This study evaluates the impact of crust composition on sub-surface water and temperature over time. We hypothesized that the successional stages of biological soil crusts, affect soil moisture and temperature differently along a rainfall gradient throughout the year. Four experimental sites were established along a rainfall gradient in the western Negev Desert. At each site three treatments; crust removal, pure sand (moving dune) and natural crusted were monitored. Crust successional stage was measured by biophysiological and physical measurements, soil water permeability by field mini-Infiltrometer, soil moisture by neutron scattering probe and temperature by sensors, at different depths. Our main interim conclusions from the ongoing study along the rainfall gradient are: 1. the biogenic crust controls water infiltration into the soil in sand dunes, 2. infiltration was dependent on the composition of the biogenic crust. It was low for higher successional stage crusts composed of lichens and mosses and high with cyanobacterial crust. Thus, infiltration rate controlled by the crust is inverse to the rainfall gradient. Continuous disturbances to the crust increase infiltration rates, 3. despite the different rainfall amounts at the sites, soil moisture content below 50 cm is almost the same. We therefore predict that climate change in areas that are becoming dryer (desertification) will have a positive effect on soil water content and vice versa.