



## **Influence of shrub species and biological soil crust cover on nutrient distribution in a semiarid sand dune area (Negev, Israel)**

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Deserts are expanding and the restoration of barren lands is of great importance. To achieve this goal the understanding of soil-plant interactions is necessary. In semiarid systems the biogeochemical cycles are strongly linked to "fertile islands" which are surrounded by bare interspaces, areas mostly covered by biological soil crusts. These microbiological communities have great influence runoff, nutrient fixation and soil stability. This spatial horizontal pattern on the surface leads to vertical distribution patterns of nutrients. For a re-established sand dune system in the Negev (Israel) this pattern is highly depending on surface cover. Here unconsolidated sand dunes have been stabilised by the growth of biological soil crust leading to an establishment of perennial shrubs. After 15 years of landuse exclusion a clear spatial pattern in the amount of different soil cations and anions can be proofed. Our results show significant difference for potassium, manganese, calcium, sodium and chloride under biological soil crusts, the chenopod *Anabasis articulata* and the legume *Retama raetam*. This redistribution on behalf of biological processes can be shown for 3 study sites along a sharp precipitation gradient (90 mm per year up to 170 mm per year). The comparison of the study sites shows changes in the distribution patterns with increasing precipitation not only due to higher leaching or differences in dust input but changes in plant activity. The plant essential potassium proofs to be the best indicator for redistribution processes. The not plant essential sodium is non-normally distributed as *Anabasis articulata* and the biological soil crust accumulate this cation. Perennial shrubs and biological soil crusts are important ecosystem engineers. They have the ability to enrich ecosystems with cations and anions. The mechanisms of redistribution depend on soil cover and amount of precipitation and are, contradictory to earlier results, not independent from shrub species.