Geophysical Research Abstracts
Vol. 19, EGU2017-4521, 2017
EGU General Assembly 2017

The gypsophyte Gypsophila struthium as nurse plant for vegetation recovery in degraded gypsum substrates

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Degraded areas such as quarries or dumps are devoid of vegetation where the spontaneous vegetation recovery is a very slow process that requires restoration actions, especially under harsh environmental conditions such as arid conditions and special substrates. Specifically, gypsum substrates have physical and chemical limitations such as surface crusts, poor water availability or high concentrations of SO4 and Ca. Some plants, the so called gypsophytes, are adapted to tolerate such limitations and thus, might be able to establish in gypsum bare soils. Thus, well adapted gypsophytes might play an important role in vegetation recovery by acting as ecosystem engineers, improving the environmental conditions under their canopy and facilitating the establishment of other species. Facilitation is being recently considered as a key process in restoration practices because it might enhance restoration effectiveness by favoring the plant establishment and therefore, plant succession. The aim of this study was to test the effectiveness of a gypsophyte (Gypsophila struthium) in facilitating the establishment and development of other species and thus in vegetation recovery of degraded gypsum substrates. To address this objective, a sowing and planting experiment was set in November 2014 in a gypsum dump located in Andorra municipality (Teruel, NE Spain). Forty well-established adults of G. struthium previously planted in that dump were employed as nurse plants in the experiment. Two species were used as test species in the experiment: Helianthemum squamatum (gypsophyte) and Stipa lagascae (non-gypsophyte). Seeds and seedlings of those test species were sowed and planted in two different microsites: under the canopy and in the surrounding bare soil of each G. struthium individual (n=80 per test species). Germination, survival and growth of test species were surveyed twice a year during two years. Soil compaction and soil temperature were seasonally measured at both microsites during two years to test the role of G. struthium plants as ecosystem engineers by changing abiotic conditions under their canopy. Preliminary results showed that planted seedlings of H. squamatum grew in volume and seedlings of S.lagascae grew in height significantly more under the canopy of G. struthium than in bare soil, while germination and survival rates were similar at both microsites. Additionally, abiotic data showed that soil compaction decreased and extreme temperatures were softened under the canopy of G. struthium plants. Our study suggests that G. struthium can play an important role in restoration effectiveness of areas degraded by quarrying because it improves micro-environmental conditions under its canopy, favoring the development of other species in gypsum substrates.