

Ecophysiological niche segregation among coexisting C₃ and C₄ desert shrubs in a gypsum-calcareous formation (NW Iran)

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Xerophilic desert shrubs belong to multiple functional types and frequently show hydrological niche segregation. The understanding of water use in such co-occurring species is crucial to predict climate aridification impacts on desert ecosystems. This is in particular the case for the Irano–Turanian gypsum deserts - highly biodiverse but at the same time vulnerable and poorly studied ecosystems.

We aimed to unravel the ecophysiological strategies of five co-existing desert shrubs growing in gypsum deserts in NW Iran.

Soil and xylem sampling for isotope analyses was performed in spring and summer. Xylem and soil water extraction was performed by cryogenic vacuum distillation. Oxygen and hydrogen isotope composition were determined. Statistical analyses were run to determine the ecophysiological strategies of the investigated species.

Species-season interactions could explain differences in xylem sap isotopic composition. Plant gypsum affinity and photosynthetic pathways did not have a significant effect on the water use strategies. Three basic water use strategies relying on contrasting utilization of free topsoil moisture and deep soil water have been revealed in the different species.

Water use strategies in Iranian desert shrubs may vary dramatically even in closely related congeneric species. Further studies on the poorly studied xerophilic Irano–Turanian eudicots are necessary to fully understand their ecophysiological strategies.

Keywords

Caryophyllales, desert shrubs, gypsum, Iran, niche segregation, stable isotopes, water use.