

Analysis of biodiversity attributes for extensive vegetated roofs in a semiarid region of central Argentina

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Resumen

Vegetated roofs (VRs) contribute to the resilience of cities by providing multiple ecosystem functions. A wide range of these benefits depends on the plant layer. Here, we hypothesized that increasing biodiversity attributes (i.e., composition, structural, and functional) in VRs will improve their performance under the climate conditions of semiarid regions. We aimed to (i) characterize functional groups of eight species assessed from key functional traits, (ii) evaluate species performance through survival and coverage, comparing biodiversity attributes from mono to polyculture treatments, (iii) analyze the relationship between performance with biodiversity attributes, and (iv) systematize and rank the treatments using an index to select those with the best performance and to recommend them for VRs in semiarid regions. We expect those treatments with higher biodiversity attributes will show better performances than simpler ones.

Functional traits as indicators of ecosystem functions of eight species and four life-forms (succulents: *Sedum acre*, *S. lineare*, *S. reflexum*, creeping herbs: *Phyla nodiflora*, *Glandularia x hybrida*, tall forb: *Grindelia cabrerae*, and grasses: *Eustachys distichophylla*, and *Nassella tenuissima*) were evaluated through a trial using 22 microcosms during a 12-month experimental study. A principal component analysis and a cluster analysis were used to detect functional groups according to leaf and plant height traits. We used the Kaplan-Meier analysis to assess species survival among the treatments. Final coverage and growth increment (and their coefficients of variation) were used to construct the performance index. The PCA and CA determined five functional groups: I) succulents; II) creeping herbs; III) *N. tenuissima*; IV) *E. distichophylla*, and V) *G. cabrerae*. Four species showed significant differences in survival rates among the treatments ($p < 0.05$), and six treatments were characterized as the best ones: with the highest coverage (>93%) and growth increment (81%), and with low CVs. Although some monoculture (*Sedum* spp., *P. nodiflora* and, *E. distichophylla*) reached comparable index values with respect to mixed microcosms, for VRs we recommend those plant mixtures combining biodiversity attributes because they provide both more ecosystem services and higher chances of survival and phenological complementarity in the long term.

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