

RESEARCH ARTICLE

The structure of plant spatial association networks is linked to plant diversity in global drylands

Hugo Saiz¹  | Jesús Gómez-Gardeñes^{2,3} | Juan Pablo Borda² | Fernando T. Maestre¹

¹Departamento de Biología y Geología, Física y Química Inorgánica, Escuela Superior de Ciencias Experimentales y Tecnología, Universidad Rey Juan Carlos, Móstoles, Spain

²Departamento de Física de la Materia Condensada, Universidad de Zaragoza, Zaragoza, Spain

³GOTHAM Lab, Institute for Biocomputation and Physics of Complex Systems (BIFI), Universidad de Zaragoza, Zaragoza, Spain

Correspondence

Hugo Saiz
Email: saizhugo@gmail.com

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Abstract

1. Despite commonly used to unveil the complex structure of interactions within ecological communities and their value to assess their resilience against external disturbances, network analyses have seldom been applied in plant communities. We evaluated how plant–plant spatial association networks vary in global drylands and assessed whether network structure was related to plant diversity in these ecosystems.
2. We surveyed 185 dryland ecosystems from all continents except Antarctica and built networks using the local spatial association between all the perennial plants species present in the communities studied. Then, for each network, we calculated four descriptors of network structure (link density, link weight mean and heterogeneity, and structural balance) and evaluated their significance with null models. Finally, we used structural equation models to evaluate how abiotic factors (including geography, topography, climate and soil conditions) and network descriptors influenced plant species richness and evenness.
3. Plant networks were highly variable world-wide, but at most study sites (72%) presented common structures such as a higher link density than expected. We also find evidence of the presence of high structural balance in the networks studied. Moreover, all network descriptors considered had a positive and significant effect on plant diversity and on species richness in particular.
4. *Synthesis.* Our results constitute the first empirical evidence showing the existence of common network architectures structuring dryland plant communities at the global scale and suggest a relationship between the structure of spatial networks and plant diversity. They also highlight the importance of system-level approaches to explain the diversity and structure of interactions in plant communities, two major drivers of terrestrial ecosystem functioning.

KEYWORDS

competition, determinants of community structure and diversity, drylands, ecological networks, facilitation, plant diversity, signed networks, spatial patterns

1 | INTRODUCTION

Network analyses are being increasingly used in ecology to unveil the complexity of species interactions and to study their effects on

the functioning and stability of ecosystems (Heleno et al., 2014). Theoretical studies have linked network topologies with the stability of ecological communities (Allesina et al., 2015; Rohr, Saavedra, & Bascompte, 2014), and it has been hypothesized that ecological

sets vary widely in sensitivity and precision. *The ISME Journal*, 10, 1669. <https://doi.org/10.1038/ismej.2015.235>
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SUPPORTING INFORMATION

Additional Supporting Information may be found online in the supporting information tab for this article.

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