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MYCORRHIZAL AND EPICHLOË FUNGAL SYMBIONTS CORRELATE WITH ECO-PHYSIOLOGY OF THEIR HOST ACROSS A HUMID-ARID GRADIENT

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Hordeum comosum growing in one of the sampled sites. The site corresponds to a semiarid environment with 390 mm of mean annual precipitation and mild grazing. In this site all the sampled *H. comosum* plants hosted *Epichloë* sp. fungal endophytes in their aerial tissues and had 41% of their roots colonized by arbuscular mycorrhizal fungi on average (taken by Cecilia Casas).

Symbiotic associations with non-pathogenic fungi are widely recognized as a plant strategy helpful to face certain stressful environmental conditions. However, even for beneficial symbionts, stressful environments may also constrain the ability of host plants to sustain their symbionts with necessary resources. Considering plant symbioses with two obligate microorganisms, we addressed the following questions: (i) Is host plant symbiotic status related to environmental aridity and grazing severity? and (ii) What is the relationship between host symbiotic status and plant nutrition, intrinsic water-use efficiency, and its components? We examined the relation of two symbionts: *Epichloë* fungal endophytes (that grow within aerial tissues) and arbuscular mycorrhizal fungi (AMF, that colonize the roots) with the eco-physiology of the Patagonian perennial grass *Hordeum comosum* along a longitudinal humid-arid gradient, in sites with mild and severe grazing. We focused on humid-arid gradient and grazing severity since they are common features of the host's habitat and may play a key role in modulating the plant interaction with AMF and with *Epichloë* endophytes individually. Thus, we collected H. *comosum* plants throughout the entire natural arid-to-humid distribution range of the species in the northwest Patagonia steppe (Argentina). The main results showed that both symbionts, *Epichloë* and AMF, prevail especially under more humid and mildly grazed conditions and were lost towards arid environments that are commonly severely grazed. *Epichloë* symbiotic plants presented both a higher level of root colonization by AMF and a better nutritional status than *Epichloë*-free plants. Also, AMF colonization appeared to enhance stomatal sensitivity towards aridity, as determined by enrichment of host shoot cellulose with the oxygen isotope 18O. This work shows that under natural field conditions, the symbionts trigger eco-physiological mechanisms tuned by the humid-arid gradient, potentially interacting with grazing pressure. The clear alignment of the investigated response variables at plant and site level suggests a great potential for more targeted experimental approaches investigating the specific resource eco-physiological mechanisms underlying the interaction between AMF, *Epichloë* and their host. Such knowledge is key to understanding the functional roles of fungal symbionts in the ecology of *H. comosum*.