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Seedling Interference and Niche Differentiation Between Crested Wheatgrass and Contrasting Native Great Basin Species

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Abstract

Interference from crested wheatgrass (*Agropyron cristatum* [L.] Gaertn.) seedlings is considered a major obstacle to native species establishment in rangeland ecosystems; however, estimates of interference at variable seedling densities have not been defined fully. We conducted greenhouse experiments using an addition-series design to characterize interference between crested wheatgrass and four key native species. Crested wheatgrass strongly interfered with the aboveground growth of Wyoming big sagebrush (*Artemisia tridentata* Nutt. subsp. *wyomingensis* Beetle & Young), rubber rabbitbrush (*Ericameria nauseosa* [Pall. ex Pursh] G. L. Nesom & Baird subsp. *consimilis* [Greene] G. L. Nesom & Baird), and to a lesser extent with bluebunch wheatgrass (*Pseudoroegneria spicata* [Pursh] A. Löve). Alternatively, bottlebrush squirreltail (*Elymus elymoides* [Raf.] Swezey subsp. *californicus* [J. G. Sm.] Barkworth) and crested wheatgrass had similar effects on each other's growth, and interference ratios were near 1.0. Results indicate that the native grasses more readily establish in synchrony with crested wheatgrass than these native shrubs, but that once established, the native shrubs are more likely to coexist and persist with crested wheatgrass because of high niche differentiation (e.g., not limited by the same resource). Results also suggest that developing strategies to minimize interference from crested wheatgrass seedlings emerging from seed banks will enhance the establishment of native species seeded into crested wheatgrass–dominated communities.

Resumen

La interferencia por parte de plántulas de agropiro crestado (*Agropyron cristatum* [L.] Gaertn.) se considera un obstáculo mayor para el establecimiento de especies nativas en ecosistemas de pastizal natural; sin embargo, las estimaciones de interferencia con densidades variables de plántulas no han sido definidas con precisión. Se condujo un experimento de invernáculo utilizando un diseño de series de adición para caracterizar la interferencia entre agropiro crestado y cuatro especies nativas clave. Se observó una interferencia marcada del agropiro crestado sobre el crecimiento aéreo de *Artemisia tridentata* Nutt. subsp. *wyomingensis* Beetle & Young, *Ericameria nauseosa* (Pall. ex Pursh) G. L. Nesom & Baird subsp. *consimilis* (Greene) G. L. Nesom & Baird, y en menor medida con *Pseudoroegneria spicata* (Pursh) A. Löve. Por otra parte, *Elymus elymoides* (Raf.) Swezey subsp. *californicus* (J. G. Sm.) Barkworth y el agropiro crestado tuvieron efectos recíprocos similares sobre el crecimiento de cada uno, y la proporción de interferencia fue cercana a 1.0. Los resultados indican que los pastos nativos se establecen con mayor facilidad que los arbustos nativos en sincronía con el agropiro crestado, pero que una vez establecidos, hay mayor probabilidad de que los arbustos nativos coexistan y persistan con el agropiro crestado debido a la diferenciación de nichos (ej., no están limitados por el mismo recurso). Los resultados también sugieren que el desarrollo de estrategias para minimizar la interferencia por parte de plántulas de agropiro crestado provenientes de bancos de semillas mejorará el establecimiento de especies nativas inter-sembradas en comunidades dominadas por el agropiro crestado.

Key Words: addition series, assisted succession, competitive ability, native species, Wyoming big sagebrush communities

INTRODUCTION

Native vegetation in numerous North American ecosystems has been converted to managed grazing systems by planting exotic perennial grasses to remediate the impacts of pervasive disturbances and improve forage potential. The ecological impact of these conversions is beginning to be understood for buffelgrass (*Pennisetum ciliare* [L.] Link) in the Sonoran Desert (Morales-Romero and Molina-Freaner 2008), Lehmann lovegrass (*Eragrostis lehmanniana* Nees) in the Chihuahuan desert (Bock et al. 2007), Old World bluestems (*Bothriochloa* spp.) in the southern Great Plains (Schmidt et al. 2008), and crested wheatgrass in the northern Great Plains and the Great Basin (Henderson and Naeth 2005). Each of these examples shares a common thread in that the exotic grasses are more grazing tolerant and competitive than native species. Consequently, understanding the outcome of interactions between exotic grasses and the displaced native species is an important consideration for ecosystem management.

Big sagebrush–dominated (*Artemisia tridentata* Nutt.) ecosystems that have been seeded with crested wheatgrass (*Agropyron cristatum* [L.] Gaertn.) can develop low plant diversity when disturbance regimes and soil attributes are

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