Fungal colonization of plant roots is resistant to nitrogen addition and resilient to dominant species losses

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Abstract

Global change drivers, such as nitrogen (N) deposition and non-random species extinctions, may shift interactions among aboveground and belowground communities. However, tightly coupled interactions between aboveground and belowground organisms may buffer ecosystems to global change. Here, we test how four years of organic and inorganic N addition and removal of a dominant plant species, Festuca thurberi, independently and interactively influences fungal colonization patterns and performance in a co-dominant plant species, Helianthella quinquenervis. Surprisingly, we found N addition and Festuca removal had no measurable effects on the colonization of arbuscular mycorrhizal fungi (AMF) and dark septate endophyte (DSE) or the performance of Helianthella seedlings grown with field-collected inoculum in a companion greenhouse experiment. However, the proximity of Helianthella to Festuca predicted fungal colonization: DSE colonization decreased by 1% for each cm of distance Helianthella was from Festuca, although the differences in fungal inoculum potential had no effect on Helianthella seedling survival or biomass. Our results suggest that plant–fungal interactions can be resistant to N addition and resilient to the loss of dominant plant species. Additionally, our results suggest that soil legacies, mediated through surviving symbiont communities or changes in soil properties, can shape ecosystem resistance and resilience to disturbance and perturbations.

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