Invasion-induced root-fungal disruptions alter plant water and nitrogen economies

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Abstract

Despite widespread evidence that biological invasion influences both the biotic and abiotic soil environments, the extent to which these two pathways underpin the effects of invasion on plant traits and performance is unknown. Leveraging a long-term (14-yr) field experiment, we show that an allelochemical-producing invader affects plants through biotic mechanisms, altering the soil fungal community composition, with no apparent shifts in soil nutrient availability. Changes in belowground fungal communities result in high costs of nutrient uptake for native perennials and a shift in functional traits linked to their water and nutrient use efficiencies. Some species in the invaded community compensate for high nutrient costs by reducing nutrient uptake and maintaining photosynthesis by expending more water, which demonstrates a trade-off in trait investment. For the first time, we show that the disruption of belowground nutritional symbionts can drive native plants toward novel regions in order to maintain their water and nutrient economics.

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