The allometry of plant height explains species loss under nitrogen addition

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Abstract

Light asymmetry, with a higher light acquisition per unit biomass for larger plants, has been proposed as a major mechanism of species loss after nitrogen addition. However, solid evidence for this has been scarce. We measured the allometric size-height relationships of 25 plant species along a nitrogen addition gradient manipulated annually for eight years in a speciose alpine meadow and found that the rare species advantage of light acquisition (i.e., low height scaling exponent) in natural conditions disappeared after nitrogen addition. Those species failing to lower their height scaling exponents decreased in relative abundance after nitrogen addition, thereby decreasing the community weighted mean and dispersion of the height scaling exponent and ultimately the species richness. Our results provided some unique evidence for light asymmetry induced species loss after nitrogen addition and a new insight from the perspective of allometric growth to explain biodiversity maintenance in the face of global changes.

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