Coping with Herbivores and Pathogens: A Model of Optimal Root Turnover. (S07-yanai121525-Oral)

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Abstract:

Factors controlling the lifespan of fine roots are poorly understood, in spite of their importance to nutrient cycling, carbon budgets, and plant competition. Theoretically, the optimal root lifespan is that which maximizes root efficiency, or the ratio of resource acquisition to carbon cost. According to this theory, plants should cease to maintain roots and invest instead in new root construction whenever lifetime root efficiency begins to decline. This approach, however, assumes that plants control root lifespan; instead, herbivores and pathogens are often the proximate cause of root death, and survivorship curves are commonly exponential. We propose a cohort approach to the analysis of root lifespan, with carbon allocation to defense reducing the probability of root death and extending median lifespans. The optimal allocation to defense to maximize root efficiency could be predicted, if the costs and benefits of defending roots could be quantified.

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