Carbon and nitrogen metabolism in mycorrhizal networks and mycoheterotrophic plants of tropical forests: A stable isotope analysis

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Author(s) Courty, Pierre-Emmanuel; Walder, Florian; Boller, Thomas; Ineichen, Kurt; Wiemken, Andres; Rousteau, Alain; Selosse, Marc-André
Author(s) at UniBasel Boller, Thomas ; Courty, Pierre-Emmanuel ; Wiemken, Andres M. ; Ineichen, Kurt ; Walder, Florian ;
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Most achlorophyllous mycoheterotrophic (MH) plants obtain carbon (C) from mycorrhizal networks and indirectly exploit nearby autotrophic plants. We compared overlooked tropical rainforest MH plants associating with arbuscular mycorrhizal fungi (AMF) to well-reported temperate MH plants associating with ectomycorrhizal basidiomycetes. We investigated (13)C and (15)N abundances of MH plants, green plants, and AMF spores in Caribbean rainforests. Whereas temperate MH plants and fungi have higher delta(13)C than canopy trees, these organisms displayed similar delta(13)C values in rainforests, suggesting differences in C exchanges. Although temperate green and MH plants differ in delta(15)N, they display similar (15)N abundances, and likely nitrogen (N) sources, in rainforests. Contrasting with the high N concentrations shared by temperate MH plants and their fungi, rainforest MH plants had lower N concentrations than AMF, suggesting differences in C/N of exchanged nutrients. We provide a framework for isotopic studies on AMF networks and suggest that MH plants in tropical and temperate regions evolved different physiologies to adapt in diverging environments.

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