

EGU22-4653

<https://doi.org/10.5194/egusphere-egu22-4653>

EGU General Assembly 2022

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Arbuscular mycorrhizal hyphosphere as a soil nutrient turnover hotspot

Jan Jansa, Petra Bukovská, and Martin Rozmoš

Institute of Microbiology, Academy of Sciences, Dpt. Ecology, Praha, Czechia (jansa@biomed.cas.cz)

Arbuscular mycorrhizal fungi (AMF) efficiently take up mineral nutrients such as phosphorus and nitrogen (N) from the soil solution, and trade them for organic carbon with their host plants. Acquisition of nutrients bound in organic forms by the AMF under unsterile soil conditions has previously been reported, assuming an important role of soil prokaryotes, yet mostly without proper mechanistic understanding. Here we present a synthetic approach to study involvement of such inter-kingdom interactions in utilization of organic nitrogen by a mycorrhizal plant. We employ ^{15}N -labelled chitin (as an organic N source) added to AM fungal (*Rhizophagus irregularis*) hyphosphere under *in vitro* conditions, with or without other microorganisms. Upon presence of *Paenibacillus* sp., the AMF and their associated host plant obtained several-fold larger quantities of N from the chitin than they did with other bacteria, whether chitinolytic or not. Moreover, upon adding a protist *Polysphondylium pallidum* to the hyphosphere with *Paenibacillus* sp., the gain of N from the chitin by the AMF and their associated plant further and significantly increased by another 60+%, pointing to soil microbial loop as the underlying mechanism.

This work will appear shortly in the ISME Journal.

Reference: Rozmoš M, Bukovská P, Hršelová H, Kotianová M, Dudáš M, Gančarčíková K, Jansa J (2022) Organic nitrogen utilization by an arbuscular mycorrhizal fungus is mediated by specific soil bacteria and a protist. ISME Journal, in press. doi 10.1038/s41396-021-01112-8 .