

EGU21-4564

<https://doi.org/10.5194/egusphere-egu21-4564>

EGU General Assembly 2021

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## Hyphal colonization of *Rhizophagus irregularis* increases unsaturated hydraulic conductivity of a loamy sand distant from roots

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Hydraulic properties of mycorrhizal soils have rarely been reported and difficulties in directly assigning potential effects to hyphae of arbuscular mycorrhizal fungi (AMF) arise from other consequences of AMF being present, i.e. their influence on growth and water consumption rates of their host plants that both also influence soil hydraulic properties.

We assumed that the typical nylon meshes used for root-exclusion experiments in mycorrhizal research can provide a dynamic hydraulic barrier. It is expected that the uniform pore size of the rigid meshes causes a sudden hydraulic decoupling of the enmeshed inner volume from the surrounding soil as soon as the mesh pores become air-filled. Growing plants below the soil moisture threshold for hydraulic decoupling would minimize plant-size effects on root-exclusion compartments and allow for a more direct assignment of hyphal presence to modulations in soil hydraulic properties.

We carried out water retention and hydraulic conductivity measurements with two tensiometers introduced in two different heights in a cylindrical compartment (250 cm<sup>3</sup>) containing a loamy sand, either with or without the introduction of a 20 µm nylon mesh equidistantly between the tensiometers. Introduction of a mesh reduced hydraulic conductivity across the soil volumes by two orders of magnitude from 471 to 6 µm d<sup>-1</sup> at 20% volumetric water content.

We grew maize plants inoculated or not with *Rhizophagus irregularis* in the same soil in pots that contained root-exclusion compartments while maintaining 20% volumetric water content. When hyphae were present in the compartments, water potential and unsaturated hydraulic conductivity increased for a given water content compared to compartments free of hyphae. These differences increased with progressive soil drying.

We conclude that water extractability from soils distant to roots can be facilitated under dry conditions when AMF hyphae are present.