EGU22-3431
https://doi.org/10.5194/egusphere-egu22-3431
EGU General Assembly 2022

Arbuscular mycorrhiza symbiosis improves plant water status and soil-root hydraulic conductance under drought

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Recent studies have identified soil drying as a dominant driver of transpiration reduction at the global scale. Although Arbuscular Mycorrhiza Fungi (AMF) are assumed to play a pivotal role in plant response to soil drying, studies investigating the impact of AMF on plant water status and soil-plant hydraulic conductance are lacking. Thus, the main objective of this study was to investigate the influence of AMF on soil-plant conductance and plant water status of tomato under drought. We hypothesized that AMF limit the drop in matric potential across the rhizosphere, especially in drying soil. The underlying mechanism is that AMF extend the effective root radius and hence reduce the water fluxes at the root-soil interface. The follow-up hypothesis is that AMF enhance soil-plant hydraulic conductance and plant water status during soil drying. To test these hypotheses, we measured the relation between transpiration, soil and leaf water potential of tomato with reduced mycorrhiza colonization (RMC) and the corresponding wild-type (WT). We inoculated the soil of the WT with *Rhizophagus irregularis* spores to potentially upsurge symbiosis initiation. During soil drying, leaf water potential of the WT did not drop below -0.8 MPa during the first six days after withholding irrigation, while leaf water potential of RMC dropped below -1 MPa already after four days. Furthermore, AMF enhanced the soil-plant hydraulic conductance of the WT during soil drying. In contrast, soil-plant hydraulic conductance of the RMC declined more abruptly as soil dried. We conclude that AMF maintained the hydraulic continuity between root and soil in drying soils, hereby reducing the drop in matric potential at the root-soil interface and enhancing soil-plant hydraulic conductance of tomato under edaphic stress. Future studies will investigate the role of AMF on soil-plant hydraulic conductance and plant water status among diverse plant species growing in contrasting soil textures.