Effects of two contrasted arbuscular mycorrhizal fungal isolates on nutrient uptake by Sorghum bicolor under drought

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Drought is a limiting factor for crop production, especially in arid and semi-arid climates. In this study, Sorghum bicolor plants were inoculated, or not, with Rhizophagus irregularis, an arbuscular mycorrhizal (AM) strain typical for temperate climates, or Rhizophagus arabicus, a strain endemic to hyper-arid ecosystems. Plants were grown under well-watered or drought conditions in compartmented microcosms. Transpiration rates, plant growth, and nutrient uptake (using; 15; N as a tracer) were determined to assess the impact of drought stress on sorghum plants in AM symbiosis. Although AM colonization did not affect the bulk biomass of host plants, R. arabicus improved their transpiration efficiency and drought tolerance more than R. irregularis. Moreover, R. arabicus was able to extract more; 15; N from the soil under both water regimes, and AM-driven enhancement of the nitrogen and phosphorus content of sorghum, especially when water was limiting, was greater for R. arabicus-inoculated plants than for R. irregularis-inoculated plants. Our work demonstrates close links between AM hyphal phosphorus and nitrogen transport and uptake by AM plants for both AM fungal species. It also underscores that, under the drought stress conditions we applied, R. arabicus transfers significantly more nitrogen to sorghum than R. irregularis.
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