Expression of major intrinsic protein genes in Sorghum bicolor roots under water deficit depends on arbuscular mycorrhizal fungal species

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Drought is a limiting factor for crop plant production, especially in arid and semi-arid climates. In this study, sorghum (Sorghum bicolor) was inoculated with two arbuscular mycorrhizal fungi, either the standard Rhizophagus irregularis or the desert-adapted Rhizophagus arabicus, and grown in experimental microcosms under well-watered or drought conditions. We investigated gene expression of selected major intrinsic proteins (MIPs) of sorghum in these mycorrhizal plants, compared to non-inoculated, well-watered sorghum (control). Colonization with R. irregularis induced the MIPs SbPIP2.2 and SbPIP2.5, regardless of whether sorghum plants were well watered or not. Root colonization with R. arabicus, however, caused an exclusive, strong reduction in the transcript levels of three MIP genes (SbTIP2.1, SbNIP1.2, SbNIP2.2) under drought conditions. We also studied water transport properties of mycorrhiza-regulated MIPs. One particular MIP, SbPIP2.8, was associated with high water permeability of roots. Expression of this gene was strongly repressed in all sorghum plants (mycorrhizal and non-inoculated) that experienced drought conditions.

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