The effects of mycorrhizal symbiosis on growth and drought resistance of Argan plants

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In many regions of the world, one of the major challenges for food security is drought. In fact, in the wake of global warming, drought events have become frequent, severe, and longer, intensifying the degradation of arable land, and impeding the plant survival and development, especially in arid and semi-arid regions. Although *Argania spinosa*, an endemic Moroccan tree, is listed among the drought-tolerant plant species, its full potential is limited under extreme drought. This phenomenon affects young plants to a greater extent than established trees, making the reforestation of degraded argan forests very difficult. In order to improve the success rates of the reforestation and rehabilitation of argan forests, the use of arbuscular mycorrhizal fungi (AMF) as a sustainable biotechnological tool could help the plants in mitigating drought. The present study provides insights into the mechanisms used by argan to cope with drought stress and highlights the potential of arbuscular mycorrhizal symbiosis in enhancing the growth and the endogenous drought tolerance of argan plants. In this study, argan seedlings were inoculated with *Rhizoglomus irregulare* (*Ri*) or a native inoculum (Ni) collected from Morocco and subjected to severe drought (20% field capacity (FC)), mild drought (40% FC), and optimal irrigation (80% FC). The results showed that both mycorrhizal inocula increased the growth parameters of argan plants under all water treatments. The application of AMF also ameliorated relative water content, water uptake, water-use efficiency, stomatal conductance, photosynthetic activity, as well as chlorophyll and carotenoid content in plants subjected to 20% FC. However, unexpectedly, these protective effects appeared not to involve osmotic adjustment. Our findings also point out that drought only increased the level of salicylic acid but not of other phytohormones (abscisic acid and jasmonic acid), nor did it induce markers of oxidative stress in argan seedlings. Altogether, our results highlight the greater performance of the indigenous inoculum over *R. irregulare* at 80% FC, and the role of AMF as a promising strategic tool to mitigate drought in argan plants.

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