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Effects of two *Glomus* species on the growth and physiological performance of *Sophora davidii* seedlings under water stress

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Abstract *Sophora davidii* is an important leguminous scrub that is widely used for revegetation in the semiarid Loess Plateau and other arid valley areas of China, where it usually suffers drought stress. This study investigated the effects of arbuscular mycorrhizal (AM) fungi (*Glomus mosseae* and *Glomus constrictum*) and water stress on the growth and physiological performance of *S. davidii* seedlings under greenhouse pot conditions. Two soil water availability treatments (well-watered (WW) −0.10 MPa; water-stressed (WS) −0.86 MPa) were applied for 61 days. At the end of this experiment, *G. mosseae* and *G. constrictum* had colonized the roots of *S. davidii* seedlings. Water stress inhibited AM colonization, plant growth, chlorophyll concentration, gas exchange and chlorophyll fluorescence of *S. davidii* seedlings. Mycorrhizal seedlings had greater shoot dry weight, root dry weight, plant height, root length, instantaneous water use efficiency (iWUE), net photosynthetic rate (Pn), stomatal conductance (g_s), maximal photochemical efficiency of PSII photochemistry (Fv/Fm), lower intercellular CO_2 concentration and photochemical quenching values (qP), when compared with non-mycorrhizal seedlings under both WW and WS conditions. Furthermore, *G. constrictum* was found to be more efficient at improving the shoot and root mass, plant height, iWUE, Pn, g_s, qP, and ΦPSII of *S. davidii* seedlings, when compared with *G. mosseae* under both WW and WS conditions. Our results demonstrate that AM *Glomus* symbiosis enhanced *S. davidii* seedling resistance by improving its growth and physiological performance under water stress conditions. This suggests that *Glomus* inoculation is a potential tool for enhancing outplanting performance of *S. davidii* in semiarid areas of China.

Keywords Arbuscular mycorrhizal fungi · Chlorophyll fluorescence · Photosynthesis · *Sophora davidii* · Water stress

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