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Root hydraulic conductivity of *Larrea tridentata* and *Helianthus annuus* under elevated CO_2

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Abstract While investigations into shoot responses to elevated atmospheric CO_2 are extensive, few studies have focused on how an elevated atmospheric CO_2 environment might impact root functions such as water uptake and transport. Knowledge of functional root responses may be particularly important in ecosystems where water is limiting if predictions about global climate change are true. In this study we investigated the effect of elevated CO_2 on the root hydraulic conductivity (L_p) of a C_3 perennial, *Larrea tridentata*, and a C_3 annual, *Helianthus annuus*. The plants were grown in a glasshouse under ambient (360 μmol mol^{-1}) and elevated (700 μmol mol^{-1}) CO_2. The L_p through intact root systems was measured using a hydrostatic pressure-induced flow system. Leaf gas exchange was also determined for both species and leaf water potential (ψ_{leaf}) was determined in *L. tridentata*. The L_p of *L. tridentata* roots was unchanged by an elevated CO_2 growth environment. Stomatal conductance (g_s) and transpiration (E) decreased and photosynthetic rate (A_{net}) and ψ_{leaf} increased in *L. tridentata*. There were no changes in biomass, leaf area, stem diameter or root : shoot (R : S) ratio for *L. tridentata*. In *H. annuus,* elevated CO_2 induced a nearly two-fold decrease in root L_p. There was no effect of growth under elevated CO_2 on A_{net}, g_s, E, above- and below-ground dry mass, R : S ratio, leaf area, root length or stem diameter in this species. The results demonstrate that rising atmospheric CO_2 can impact water uptake and transport in roots in a species-specific manner. Possible mechanisms for the observed decrease in root L_p in *H. annuus* under elevated CO_2 are currently under investigation and may relate to either axial or radial components of root L_p.