

Hydraulic Traits and Non-Structural Carbon Responses to Drought Stress in *Reaumuria soongorica* (Pall.) Maxim. and *Salsola passerina* Bunge

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Drought-induced plant mortality, resulting from either hydraulic failure or carbon starvation, is hypothesized to be modulated by the drought intensity. However, there is a paucity of research investigating the response strategies in desert shrubs under drought stress with different intensities. We transplanted potted *Reaumuria soongorica* (Pall.) Maxim. and *Salsola passerina* Bunge seedlings in the rain-out shelter, and implemented three water treatments: a control (well-watered, CK), a chronic drought (gradually less watered, CD), and a flash drought (not watered, FD). We then quantified plant physiological traits associated with water use and carbon assimilation. Both *R. soongorica* and *S. passerina* showed similar changes in water use and carbon characteristics under different drought treatments. Water use efficiency was not significantly changed, but embolism resistance was significantly lower in CD, and leaf specific conductivity and embolism resistance were significantly lower in FD compared to CK. Under the drought treatment, both shrubs had significantly lower hydraulic safety margins than CK, with FD being significantly lower than CD. Notably, FD had lower carbon assimilation and a lower leaf non-structural carbon concentration, but higher stem non-structural carbon concentration. The results of a principal component analysis showed that net photosynthetic rate, sapwood specific conductivity, embolism resistance, midday water potential, and leaf and stem soluble sugar concentration were the main axes of variation for *R. soongorica* traits. CK had the highest water use efficiency, net photosynthetic rate, and gas exchange rate, while FD had the lowest embolism resistance and highest osmoregulation. Midday water potential, leaf and stem soluble sugar concentration were the main axes of variation for *S. passerina* traits, and individual distribution under three water treatments was associated with drought tolerance traits. The findings suggest that species exhibit different response strategies for resistance to drought stress, with *R. soongorica* being drought-avoidant and *S. passerina* being drought-tolerant. These findings highlight the adaptive capacity of desert shrubs to water deficit and provide insights for assessing hydraulic failure and carbon starvation in desert shrubs.