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Osmotic and Turgor Adjustment in Rosa Foliage Drought-stressed under Varying Irradiance

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Abstract. **The influence of irradiance and drought on osmotic and turgor adjustment was examined in leaves of rose *(Rosa hybrida* L. 'Samantha'). Plants cultured under full ambient light in the greenhouse were placed in shade chambers and, after 2 weeks of acclimation, exposed to drought for 21 days. Treatments consisted of a water stress factor (well-watered and drought-stressed) and an irradiance factor (100%, 70%, and 30% of ambient irradiance). Pressure-volume analyses of leaves indicated that osmotic potentials at full turgor were decreased 0.42, 0.36, and 0.23 MPa by drought in the 100%, 70%, and 30% irradiance treatments, respectively. Plants stressed under 100% and 70% irradiance exhibited similar osmotic adjustments. Plants under 30% irradiance had higher osmotic potentials at full turgor under well-watered conditions than plants in the other two irradiance treatments and showed only 55% as much adjustment to drought. In each irradiance treatment, drought induced an increase in elastic modulus and a decrease in relative water content at zero turgor. Turgor pressures were higher across a range of relative water contents in plants in the two higher irradiance treatments under both soil moisture treatments. Turgor also was higher at any particular water potential at 100% and 70% irradiance than 30% irradiance, within each soil moisture treatment. Heavy, but not mild, shading inhibited osmotic and turgor adjustments in leaves during drought.**

Although environmental effects are usually studied individually, plants in the field are often subjected to more than one form of environmental stress at a time. Exposure to one stress commonly alters a plant's reaction to another (Levitt, 1980).

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Abbreviations: A, apoplastic water percentage; ϵ^{avg}, average elastic modulus; ϵ^{max}, maximum value of elastic modulus; PV, pressure-volume; RDW, relative dry weight; ROWC, relative osmotic (or symplastic) water content; $ROWC^0$, relative osmotic water content at the turgor loss point; RWC, relative water content; RWC^0, relative water content at the turgor loss point; Ψ, water potential; Ψ_π, osmotic potential; Ψ_π^{100}, osmotic potential at full turgor; Ψ_π^0, osmotic potential at the turgor loss point; Ψ_p, turgor or pressure potential