Osmotic Adjustment

John S. Boyer
University of Delaware
Lewes, DE 19958
Osmotic adjustment is defined as a change in solute content per cell. While change in water content per cell also can occur, this is not osmotic adjustment.
Osmotic Adjustment In Soybean Elongating Region After Transplant

Kramer and Boyer. 1995. Water Relations of Plants and Soils. Pg. 74
Osmotic Adjustment Caused by Solute Delivery Exceeding Use

Meyer and Boyer. 1981. Planta 151, 482-489
Fig. 3. Relationship between leaf osmotic potential and relative water content during rapid drying for (a): ‘RS 610’, and (b): ‘Shallu’ sorghum prestressed to predawn values of leaf water potential of −0.4 MPa (■) and −1.6 MPa (▲) and rewatered the previous day, or unstressed (○). Unstressed controls were similar on both dates of sampling. Lines are fitted linear regressions.
Osmotic adjustment “turned on” in ovary by feeding sucrose to stem

Osmotic Adjustment In an Alga After Transfer to High Salt

Osmotic Adjustment in Barley Two Weeks After Transfer to High Salt

Boyer, James, Munns. Unpublished data. Standard error = 0.04 MPa or less (n = 3)
Contribution of NaCl to Osmotic Adjustment In Barley Two Weeks After Transfer to High Salt

Boyer, James, Munns. Unpublished data. Standard error = 0.057 MPa or less (n = 3)
Summary

Osmotic adjustment occurs in saline and dehydrating soils

Osmotic adjustment results from solute accumulating faster than it is used

Growth is inhibited first, decreasing solute use, but remaining growth is more rapid than in absence of osmotic adjustment

Solute may be obtained from inorganic salts in soil and from products of photosynthesis

Solute accumulates in vacuole and cytosol

Osmotic adjustment maintains ability to absorb water from environment thus maintaining water volume and turgor