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Osmoprotectant-Mediated Abiotic Stress Tolerance in Plants

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In nature, plants are constantly challenged by various abiotic and biotic stresses that can restrict their growth, development and yields. In the course of their evolution, plants have evolved a variety of sophisticated and efficient mechanisms to sense, respond to, and adapt to changes in the surrounding environment. A common defensive mechanism activated by plants in response to abiotic stress is the production and accumulation of compatible solutes (also called osmolytes). This include amino acids (mainly proline), amines (such as glycinebetaine and polyamines), and sugars (such as trehalose and sugar alcohols), all of which are readily soluble in water and non-toxic at high concentrations. The metabolic pathways involved in the biosynthesis and catabolism of compatible solutes, and the mechanisms that regulate their cellular concentrations and compartmentalization are well characterized in many important plant species. Numerous studies have provided evidence that enhanced accumulation of compatible solutes in plants correlates with increased resistance to abiotic stresses. New insights into the mechanisms associated with osmolyte accumulation in transgenic plants and the responses of plants to exogenous application of osmolyte, will further enhance our understanding of the mechanisms by which compatible solutes help to protect plants from damage due to abiotic stress and the potential roles compatible solutes could play in improving plants growth and development under optimal conditions for growth.

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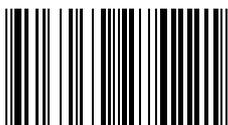
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