Karen Zelle, Biochemistry

Year in School: Senior
Hometown: St. Louis, MO
Faculty Mentor: Dr. Robert Sharp, Plant Sciences
Funding Source: MU Monsanto Undergraduate Research Fellowships

Inhibition of β-glucosidase by D-Gluconic acid δ-lactone in water deficient maize

Karen Zelle, Rachel Maltman, Mary Bondra, & Robert Sharp

The effects of β-glucosidase inhibitor D-Gluconic acid δ-lactone were measured under water deficit and well watered conditions in maize. Kinematic analysis had previously shown root growth maintenance in the apical 3mm of seedlings under water deficits (Zhu, *et al.,* 2006). Distinct region-specific responses of cell wall proteins to water stress were analyzed and showed up-regulation of β-glucosidase. ß-glucosidase, a common hydrolase, has been found to cleave inactive ABA-conjugates in barley leaves, hence freeing ABA to its biologically active state (Dietz *et al.,* 2000). Furthermore, Sauter and Hartung (2000) found that when lateral water flow increased in root systems, the ABA-conjugate concentration in the xylem decreased while the ABA concentration increased. This implies that something in the medium caused cleavage of the ABA-conjugate. The medium used to perform this experiment contained ß-glucosidases. D-Gluconic acid δ-lactone has been used as a ß-glucosidase inhibitor in maize coleoptiles (Jabben, *et al.,* 2006). A hydroponic growth system using polyethylene glycol to impose water deficit was used to incorporate this inhibitor. Primary root elongation under water deficit conditions and exposed to D-Gluconic acid δ-lactone was inhibited by 28%. When inhibitor was added to well-watered roots there was no effect. These results suggest that ABA is present in a conjugated form and ß-glucosidase frees ABA to its active form under water deficit conditions. Experiments to add back and quantify ABA are in progress.