DE LOS REYES, BENILDO G.*, and J. MITCHELL M^{C}GRATH, USDA-ARS, Sugar Beet and Bean Research Unit, 494 PSSB, Michigan State University, East Lansing MI 48824-1325.

Stress and germination: A molecular basis of seed vigor in *Beta vulgaris*.

Poor emergence or low seed vigor in sugar beet is related to stress tolerance. This problem is a manifestation of abiotic stresses during the first several days after planting when the germinating seeds are most vulnerable to changes in moisture condition. Field emergence counts and laboratory germination in solutions that mimic environmental stress conditions (salt-150mM NaCl; osmotic -200mM mannitol; excess moisture/water soaking) indicated genetic differences in seed vigor among commercial cultivars. We used the cultivars USH20 (good stress-emerger) and ACH185 (poor stress-emerger) and the solution germination method to dissect the molecular basis of seed vigor in *Beta vulgaris*, through the discovery of differential gene action in response to stress during germination. Gene expression analyses by differential display, northern hybridization and RT-PCR showed that stress induced the expression of germin or oxalate oxidase in USH20 but not in ACH185. Germin expression was down-regulated to developmental levels by 88mM H_2O_2, which also caused cultivar-independent enhancement of germination under stress. In USH20, the stress-mediated increase and H_2O_2-mediated decrease in germin transcripts were paralleled by corresponding changes in oxalate oxidase activity. Since H_2O_2 is a product of oxalate metabolism by oxalate oxidase, the results from this study imply that the stress-induced germin expression is a mechanism of H_2O_2 production during germination, which may be required for the expression of stress tolerance. A collection of Expressed Sequence Tags (EST) from subtracted cDNA libraries is currently being used for semi-global analysis of stress- and H_2O_2-regulated gene activity in order to identify the genetic and biochemical determinants of seed vigor.