FUGATE, KAREN K.*[1], JOHN D. EIDE[1], and FERNANDO L. FINGER[2], [1]USDA-ARS, Edward T. Schafer Agricultural Research Center, Fargo, ND 58102; [2]Universidade Federal de Viçosa, Departamento de Agronomia, Viçosa, Brazil.

Storage conditions and plant genetics affect sugar transporter gene expression with likely effects on postharvest sucrose losses.

Sugar transporters effect movement of sugars across cellular membranes and play a critical role in relocalizing carbon substrates within cells, tissues, and organs to support their metabolism. Sugar transporters are especially important for postharvest sugarbeet roots since the export of sucrose from the vacuole of parenchymal storage cells not only fuels root metabolism but also drives sucrose loss during storage. Despite the obvious importance of sugar transporters to sugarbeet root postharvest metabolism, the identity and expression of sugarbeet root sugar transporters during storage have never been examined. Therefore, the expression of sugar transporters in harvested and stored sugarbeet roots was determined with respect to storage duration and temperature and in genotypes that likely differed in rates of postharvest sucrose utilization due to differences in respiration rate. Highly and differentially expressed sugar transporters largely belonged to the SWEET (sugars will eventually be exported transporters) and TST (tonoplast sugar transporters) classes of sugar transporters. Eight SWEET genes and two TST genes were expressed in postharvest sugarbeet roots with expression of SWEET and TST genes generally increasing with time in storage, but only minimally affected by storage temperature. SWEET N3 and TST 1 were the most highly expressed and upregulated sugar transporter genes during storage and were also differentially expressed in lines with genetic differences in storage respiration rate. Overall, these results highlight the likely importance of SWEET and TST genes for postharvest sugarbeet root metabolism and identify gene candidates that may have roles in storage sucrose loss.