MEI-YEH JADE LU[2] and DANIEL R. BUSH[1,2,*] [1]Photosynthesis Research Unit, USDA-ARS and [2]Department of Plant Biology, University of Illinois, Urbana IL 61801. Cloning and molecular analysis of the sucrose transporter from sugar beet.

Sucrose transporters are fundamental components of the assimilate partitioning pathway in many plants. In sugar beet, the key sucrose carrier in assimilate partitioning is the proton-sucrose symporter that mediates phloem loading. Our lab has described the transport properties of this carrier using purified plasma membranes and imposed proton electrochemcial potential differences. More recently, we have cloned this transporter using RT-PCR and sequence information derived from conserved regions of previously cloned symporters. Two PCR fragments showed good sequence identity to the previously cloned sucrose symporters. A full-length clone was isolated for one of these from a sugar beet cDNA library. The clone contains 1939 nt that include an open reading frame that encodes a protein consisting of 539 amino acids. This carrier is 84% identical to the spinach clone at the protein level. Northern analyses showed that the gene is primarily expressed in leaves, petioles, and hypocotyls. We are exploring the structure of sucrose symporters using functional expression in yeast. We have used site-directed mutagenesis to identify an essential histidine residue in the protein, and showed that a unique substitution of this amino acid increases sucrose transport activity two-fold. We believe this gene has enormous potential for transgenic modification of sugar beet yield.