A DELVE INTO THE UNKNOWN OF SULFATE TRANPORTERS' ROLE IN ELEMENTAL MOVEMENT AND STRESS RESPONSE IN POPLAR

Samantha Surber [1], William P. Bewg [2], Margot Chen [2], and Chung-Jui Tsai [1,2,3]

[1] Department of Plant Biology, University of Georgia, Athens, GA, USA 30602 (sms07287@uga.edu);
[2] Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA, USA 30602;
[3] Department of Genetics, University of Georgia, Athens, GA, USA 30602

Sulfur is one of the top six macronutrients essential for plant survival. Lacking this element, plants develop a yellow appearance and declines in biomass. Sulfate is the inorganic form of sulfur that is taken up by the roots and moved throughout the plant to the leaves where it is then assimilated into amino acids, lipids, and other metabolites. Sulfate movement throughout the plant is facilitated by transmembrane proteins known as sulfate transporters (SULTRs). The *SULTR* gene family is split into four groups. Group 1 are high affinity transporters involved in uptake of sulfate from the soil, group 2 are low affinity transporters that interact with group 1 and move the sulfate from the roots to the shoots, group 4 are tonoplast SULTRs for vacuolar efflux, and finally group 3 are the most diverse and lack a cohesive localization and function. Group 3 is made up of five genes, *SULTR3;1, SULTR3;2, SULTR3;3, SULTR3;4,* and *SULTR3;5. SULTR3;1* and *SULTR3;5* have been well studied. SULTR3;1 interacts with the chloroplast and is integral for assimilation of compounds. SULTR3;5 acts much like groups 1 and 2 in the movement of sulfur from roots to shoots. The other three proteins have conflicting subcellular localizations to the chloroplast or the plasma membrane in the literature. SULTR3;4 was recently recategorized to be a phosphate transporter in *Arabidopsis* and is phylogenetically related to SULTR3;3. This could indicate functional divergence within this subgroup of the SULTR family. In *Populus, SULTR3;2* and *SULTR3;4* are highly expressed in the xylem but had opposite sensitivities to development and stressors. CRISPR/Cas9 technology was employed to produce genetic knockouts of both *SULTR3;2* and *SULTR3;4.* These will be subjected to media stress experiments and observed for phenotypic changes such as yellowing. They will also be sent for elemental analysis to see metabolic shifts.