Sucrose trafficking and water use in poplar is modulated by a key transporter

Background
• The tonoplast sucrose transporter, PtaSUT4 is highly expressed in leaves of *Populus tremula x alba* (INRA 717-IB4) and its inhibition by RNA-interference (RNAi) alters sucrose homeostasis.
• The role of PtaSUT4 is unexplored in modulating sucrose partitioning between the vacuole and the cytosol for specific physiological outcomes such as modulating carbon accrual and water use.

Conclusions
• *SUT4*-RNAi in poplar increased leaf bulk modulus of elasticity and decreased leaf storage water capacitance relevant to turgor control and ability to make osmotic adjustments, respectively.
• Leaf mesophyll cell volume and packing was altered in *SUT4*-RNAi plants (TEM images).
• The ability of *SUT4*-RNAi source leaves to increase their transpiration rates, a common response to partial defoliation, was reduced compared to wild type.
• Photosynthesis and utilization of non-structural carbon reserves based on dry mass reductions after partial defoliation were similar in wild type and *SUT4*-RNAi plants.
• Stem growth reduction after partial defoliation was greater in *SUT4*-RNAi plants and was comparable to the reduction in plant water uptake.

Significance
• *PtaSUT4* expression modulates carbon utilization for nutrition in growth and for leaf hydraulics. This occurs along a leaf expansion gradient or in response to an acute drought treatment. These results provide another genetic tool for control of poplar sustainability.

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