The Nature of the Progression of Drought Stress Drives Differential Metabolomic Responses in *Populus deltoides*

Background

- Drought stress is the greatest limitation to *Populus sp*. productivity. *P. deltoides* is one of the most drought tolerant poplar species given its capacity for maintaining low osmotic potential and osmotic adjustment (i.e., solute accumulation).

Approach

- The aim of this study was to determine the metabolomic responses of a *P. deltoides* clone to cyclic drought contrasted with those observed in response to acute drought.

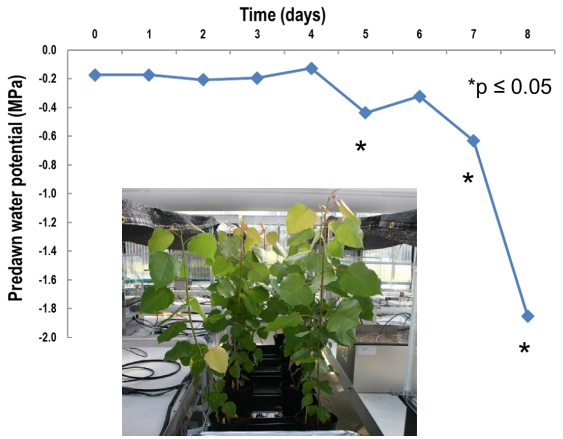
Outcome

- Whereas cyclic drought induced the largest responses in primary metabolism (soluble sugars, organic acids, amino acids), acute onset of drought induced the greatest osmotic adjustment in secondary metabolism, especially populosides.

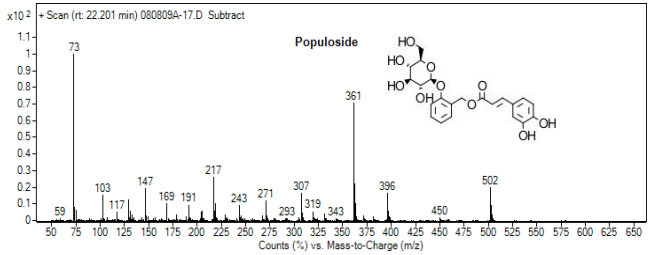
Significance

- The study establishes the basis of drought tolerance in *P. deltoides,* involving diversion of hydroxycinnamates of the lignin pathway that conjugate with salicin of the defense pathway, that can be exploited to enhance *Populus* sp. sustainability as a biofeedstock for biofuels and bioproducts.

Cyclic vs acute drought assessed by gas chromatography-mass spectrometry based metabolomics



Largest *Populus* drought-related metabolome resource details differential response to two contrasting drought treatments



Populosides (hydroxycinnamate conjugates of salicin) increase ~60-fold under acute drought

Tschaplinski, T.J., S.S. Jawdy, L.E. Gunter, M.Z. Martin, N.L. Engle, X. Yang, and G.A. Tuskan. 2019. The nature of the progression of drought stress drives differential metabolomic responses in *Populus deltoides*. *Ann. Bot*. 1-10. https://doi.org/10.1093/aob/mcz002

PMI

cbi THE CENTER FOR BIOENERGY INNOVATION