Linking physiochemical properties of *Populus* to recalcitrance in natural variants

U.S. DEPARTMENT OF ENERGY | Office of Science

Background

- *Populus* is one of the key biofuel feedstock candidates growing in the United States.
- Natural characteristics of biomass from its structural heterogeneity and complexity of cell-wall constituents were directly and/or indirectly related to the biomass recalcitrance.

Approach

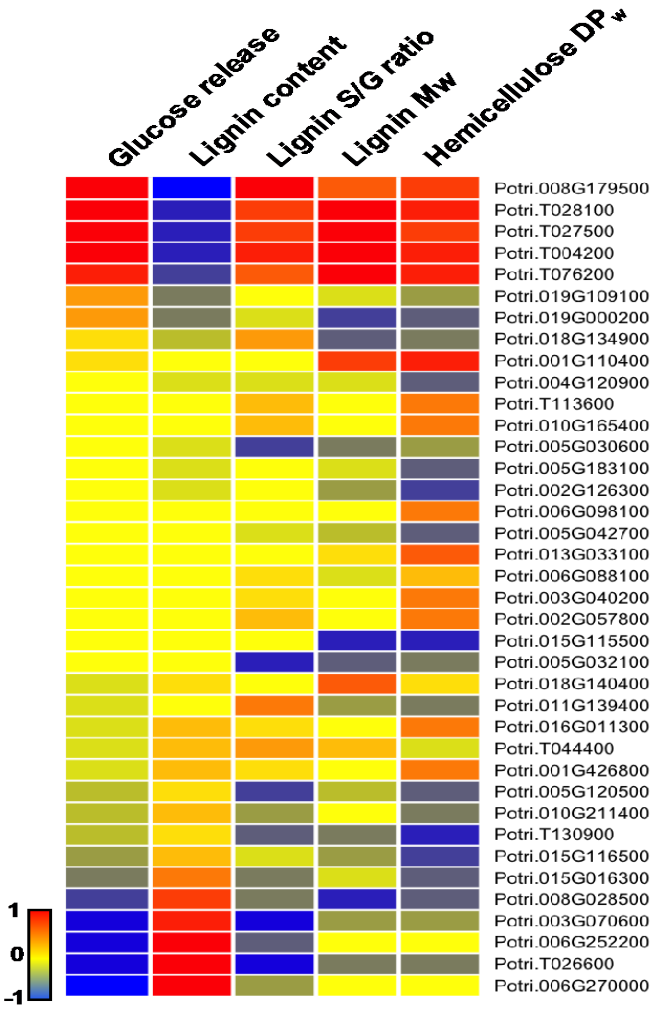
- The sugar release of *Populus* variants were assessed in terms of diverse physicochemical properties.
- The major biomass recalcitrance-related properties of *Populus* natural variants were investigated in a correlation with transcriptome RNA-seq analysis.

Outcome

- Lignin content negatively affected the sugar release of *Populus*, whereas lignin S/G ratio, lignin M_w, cellulose content, and cellulose accessibility were positively correlated with the conversion performance.
- The trend of differential gene expression in variants supports the characterization results and their effects on biomass conversion.

Significance

- This study integrated the cell wall structural components together along with the plant genetics and presented the associations between physicochemical properties, sugar release and differential gene expression.
- The presented results provide valuable information for the future biomass studies to understand the novel genes and its regulatory mechanism in forest genetics and apply to tree breeding for enhancing biomass utilization.



Correlation heat map of differentially expressed genes with selected biomass properties and glucose release of *P. trichocarpa* natural variants.

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Yoo et al., "Insights of biomass recalcitrance in *Populus trichocarpa* natural variants for biomass conversion," *Green Chem.,* 2017, DOI: 10.1039/C7GC02219K