

A wood-associated transcription factor affects lignin biosynthesis and composition in *Populus*

Background

- Plant secondary cell wall are a renewable resource for biofuels and biomaterials production. Understanding the regulation of plant secondary cell wall biosynthesis is critical for effective conversion of plant biomass into biofuels and biomaterials.
- Arabidopsis* VASCULAR-RELATED NAC DOMAIN (VND) has been demonstrated to be a key transcription factor regulating secondary cell wall biosynthesis. However, less is known about its role in the woody species.

Approach

- A transgenic approach was used to functionally characterize one member of VND transcription factor, PdWND3A, in the regulation of lignin biosynthesis and composition in the bioenergy crop *Populus*.

Outcome

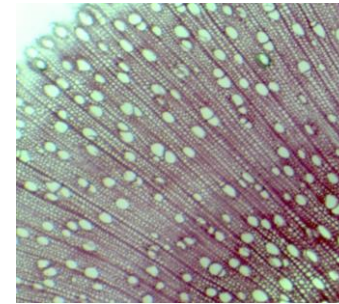
- Lignin content and lignin monomer syringyl and guaiacyl (S/G) ratio were increased in *Populus* transgenic plants overexpressing PdWND3A.
- PdWND3A overexpression resulted in reduced sugar release and reduced biomass production.

Significance

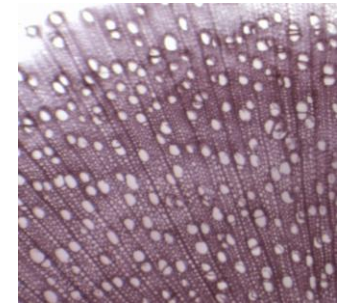
- This study identifies PdWND3A as a negative regulator of saccharification efficiency and biomass production, and provides a molecular target for genetic engineering to improve biomass feedstocks characteristics.

Yang Y, Yoo CG, Rottmann W, Winkeler KA, Collins CM, Gunter LE, Jawdy SS, Yang X, Pu Y, Ragauskas AJ, Tuskan GA, Chen JG (2019) PdWND3A, a wood-associated NAC domain-containing protein, affects lignin biosynthesis and composition in *Populus*. *BMC Plant Biology* 19: 486.
doi: 10.1186/s12870-019-2111-5

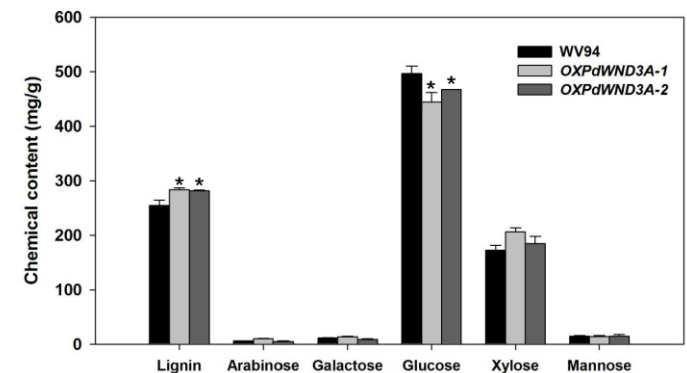
Wild type



Transgenic plant



Overexpression of PdWND3A in *Populus* increases vessel formation in the xylem tissue. Shown are Phloroglucinol-HCl staining images of stem cross-section of 6-month-old wild type and transgenic plants.



Overexpression of PdWND3A in *Populus* increases lignin content and reduces glucose content. Shown are chemical composition analysis using debarked stem tissues of 6-month-old wild type (WV94) and two transgenic poplar plants (OXPdWND3A-1 and OXPdWND3A-2). * indicates a statistically significant change.