Comprehensive assessment of glycosyl residue composition analysis methods

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Background

- The effective use of plant biomass for biofuel and bioproduct production requires a comprehensive glycosyl residue composition analysis to understand the different cell wall polysaccharides present in the different biomass sources.
- Four different glycosyl residue composition analysis methods exist, but have never been compared side-by-side to determine the most suitable for cell wall composition analysis.

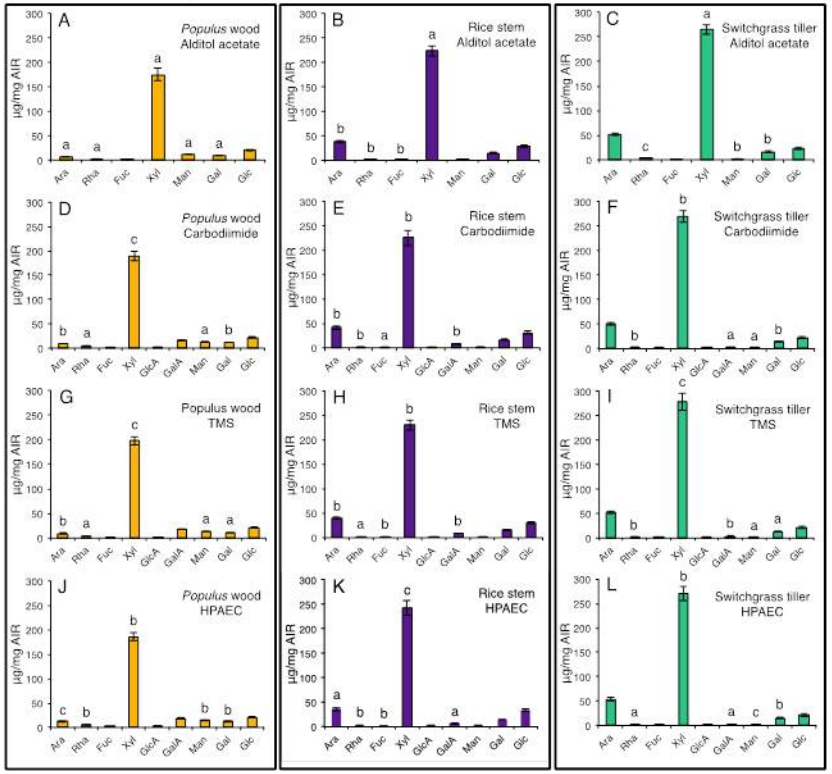
Approach

- The four methods were investigated for their ability to measure neutral and acidic sugar composition of cell walls: (1) gas chromatography–mass spectrometry (GC–MS) of alditol acetates combined with a total uronic acid assay; (2) carbodiimide reduction of uronic acids followed by GC–MS of alditol acetates; (3) GC–MS of trimethylsilyl (TMS) derivatives; and (4) high-pressure, anion-exchange chromatography (HPAEC).
- Two groups of biomass samples were tested: primary wall-enriched leaf cell walls from Arabidopsis, *Populus*, rice, and switchgrass, and secondary wall-enriched cell walls from *Populus* wood, rice stems, and switchgrass tillers.

Outcomes

- The TMS, HPAEC, and carbodiimide methods were shown to provide comparable quantitative data on the nine neutral and acidic sugars present in all plant cell walls.

Sugar composition of three different biomass source



Significance

- This is the first paper that provides side-by-side comparison of the efficacy of four different established methods in the analysis of glycosyl residue composition of cell walls from both primary wall-enriched leaf tissues and secondary wall-enriched wood/stem tissues of both dicot (Arabidopsis, *Populus*) and grass (rice, switchgrass) species.

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Biswal AK, et al., "Comparison and ranking of four sugar composition analysis methods to study biomass structure and recalcitrance in dicots and grasses," *Biotechnol Biofuels* 10:182, 2017. DOI 10.1186/s13068-017-0866-1. http://rdcu.be/ub5M.