Techniques for Determining the Function of Unknown Proteins in the O-Methylation of Plant Polysaccharides

U.S. DEPARTMENT OF ENERGY | Office of Science

Background

- Matrix polysaccharides are major contributors to biomass complexity, due to the heterogeneity of sidechain branching and decoration.
- Domain-of-Unknown Function 579 (DUF579) enzymes have recently been shown to catalyze the addition of methyl-etherified decorations on some cell wall matrix polysaccharides, including xylan and arabinogalactans, however these structures are difficult to analyze and their roles in plant cell wall biology are poorly understood.

Approach

- We combined multiple techniques (i.e., GC-MS, NMR and MALDI-TOF MS) to detect and analyze methyl-etherified cell wall carbohydrate structures for individual unknown (i.e., DUF579) proteins.
- These included the introduction of a novel approach to analyze *O*-methyl ether decorations by GC-MS.

Outcome

- The methods described allow for the detection and identification of methyl etherified sugars by GC-MS analysis and integrates with conventional carbohydrate analytical techniques, streamlining comprehensive compositional studies.
- This work provides a valuable resource to the plant cell wall research community in the form of NMR assignments for the methyl etherified structures present on arabinogalactan proteins – which are commercial products and regulators of plant biology and fitness.

Significance

- These improved workflows for compositional analysis of biomass will help uncover the important and subtle roles of cell wall methyl-etherification in plant biology and biomass utilization.

Summary of a novel GC-MS based method for the detection of *O*-methyl ether decorations on plant polysaccharides

cbi — THE CENTER FOR BIOENERGY INNOVATION