

How does your garden grow? Study identifies instigators of plant growth

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In the BioEnergy Science Center, researcher examines a tray of Arabidopsis.
Credit: Oak Ridge National Laboratory

A major component of wood, grain, and forage, xylan provides a strong,

flexible molecular scaffolding; however, if xylan synthesis is disrupted, plants do not grow normally. Despite this key role, the complex molecules, called enzymes, responsible for forming xylan have not been clearly identified. Until now. Researchers have identified two key enzymes that synthesize xylan and confirmed their function biochemically.

These findings will advance development of renewable feedstocks by accelerating the understanding of and ability to manipulate plant cell wall structures for conversion into sugars and fuels or valuable products, such as biomaterials.

In this study, researchers from the U.S. Department of Energy BioEnergy Science Center at Oak Ridge National Laboratory identified [key enzymes](#) responsible for elongation of the xylan backbone. Mutations that impair synthesis of this backbone give rise to plants with collapsed xylem cells and poor growth. Phenotypic analysis of mutant traits has implicated many possible proteins in xylan biosynthesis. To further investigate the role of the mutant genes, recombinant tagged proteins encoded by Arabidopsis thaliana genes, IRX10-L and ESK1/TBL29, were expressed in vitro and purified.

Enzymatic activity of these proteins was inferred from the similarity of their primary amino acid sequence to enzymes of known function and was analyzed in vitro by mass spectroscopy and nuclear magnetic resonance. This direct biochemical evidence confirmed the A. thaliana protein IRX10-L enzyme as the xylan synthase and ESK1/TBL29 as the archetypal plant polysaccharide O-acetyltransferase. Thus, two key enzymes for two critical processes in xylan (and secondary plant cell wall) synthesis have now been identified, purified, and confirmed.

More information: Breeanna R. Urbanowicz et al. Two Arabidopsis proteins synthesize acetylated xylan, *The Plant Journal* (2014). [DOI:](#)

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