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+++ News Ticker Science #16 +++ Synthetic Biology +++

The Suitability of Orthogonal Hosts to Study Plant Cell Wall Biosynthesis

Abstract

Plant cells are surrounded by an extracellular matrix that consists mainly of polysaccharides. Many molecular components involved in plant cell wall polymer synthesis have been identified, but it remains largely unknown how these molecular players function together to define the length and decoration pattern of a polysaccharide. Synthetic biology can be applied to answer questions beyond individual glycosyltransferases by reconstructing entire biosynthetic machineries required to produce a complete wall polysaccharide. Recently, this approach was successful in establishing the production of heteromannan from several plant species in an orthogonal host—a yeast—illuminating the role of an auxiliary protein in the biosynthetic process. In this review we evaluate to what extent a selection of organisms from three kingdoms of life (Bacteria, Fungi and Animalia) might be suitable for the synthesis of plant cell wall polysaccharides. By identifying their key attributes for glycoengineering as well as analyzing the glycosidic linkages of their native polymers, we present a valuable comparison of their key advantages and limitations for the production of different classes of plant polysaccharides. View Full-Text

Comparative review on synthesis of cell wall polysaccharides in orthogonal hosts.
Plant cells are surrounded by an extracellular matrix that consists mainly of polysaccharides. Many molecular components involved in plant cell wall polymer synthesis have been identified, but it remains largely unknown how these molecular players function together to define the length and decoration pattern of a polysaccharide. By applying synthetic biology, entire biosynthetic machineries of the polysaccharide production were reconstructed successfully in yeast as an orthogonal host.
IPB scientist Dr. Cătălin Voiniciuc and researchers from Düsseldorf, Germany, recently published a review to evaluate the suitability of different hosts – Bacteria, Fungi and Animalia – for the synthesis of plant cell wall polysaccharides. The review compares methods, cost and time requirements as well as benefits and limitations of potential host organisms. Identification of suitable organisms could be useful for the production of polysaccharides and could significantly facilitate research in this field, in particular as single polysaccharides classes are challenging to study in only a single species.

Original publication:
Markus Pauly, Niklas Gawenda, Christine Wagner, Patrick Fischbach, Vicente Ramírez, Ilka M. Axmann and Cătălin Voiniciuc. The Suitability of Orthogonal Hosts to Study Plant Cell Wall Biosynthesis. *Plants*, 2019.