# Critical Review of Plant Cell Wall Matrix Polysaccharide Glycosyltransferase Activities Verified by Heterologous Protein Expression

## *Background*

- The coordinated activities of hundreds of biosynthetic glycosyltransferases are required to catalyze the formation of the cell wall polysaccharides.
- They participate in crosslinking interactions and contribute to the functional complexity of cell walls.
- The non-cellulosic matrix polysaccharides are synthesized by Golgi-localized glycosyltransferases that have been difficult to study in native plant sources, making them critical targets for research to increase the understanding of plant cell wall structure and function.

## *Approach*

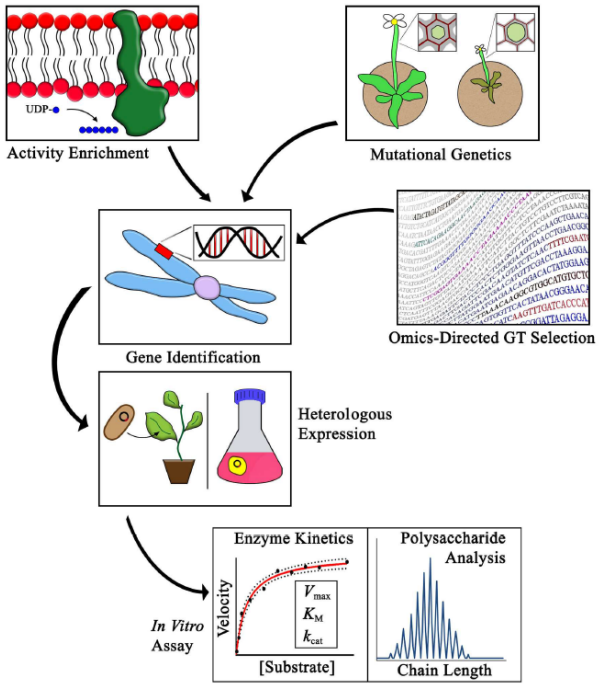
Reviewed the progress in the development of heterologous protein expression systems that has enabled the expression and discovery of plant cell wall glycosyltransferases and the characterization of their enzyme activities, enzyme structures and biosynthetic mechanisms.

## *Outcome*

- A summary of three strategies used to identify genes that encode putative plant cell wall glycosyltransferases is presented: purification of enzyme activity, analysis of mutants, selections using Omics data.
- The putative glycosyltransferases that have been unambiguously shown to have enzyme activity via heterologous expression were compared for enzyme activity, products synthesized, product length, acceptor specificity, roles in enzyme complexes, and homologous genes/enzymes.
- A comparison of the utility of bacterial and eukaryotic systems for heterologous expression of plant glycosyltransferases is presented. Progress in understanding elongation mechanisms of cell wall polysaccharides is presented.

## *Significance*

- This review represents the most comprehensive summary of the enzymatic properties of plant cell wall biosynthetic glycosyltransferases whose activity has been confirmed by heterologous expression.
- It presents for the first time a critical comparison of the catalytic constants and polymer size of products synthesized by *in vitro*-produced pure enzymes, thus providing a foundation for associating enzymatic properties with *in planta* polymer structure and function.
- Discovery of the functions of cell wall biosynthetic enzymes and the genes that encode them expands the possible targets for mutational genetic studies directed at breeding plants with favorable commercial properties for a sustainable society.

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[4]Amos, R.A. and Mohnen, D. (2019) Critical Review of Plant Cell Wall Matrix Polysaccharide Glycosyltransferase Activities Verified by Heterologous Protein Expression. *Frontiers Plant Science* 10:915.