

Investigation of a protein family that generates plant cell walls

Scientific Achievement

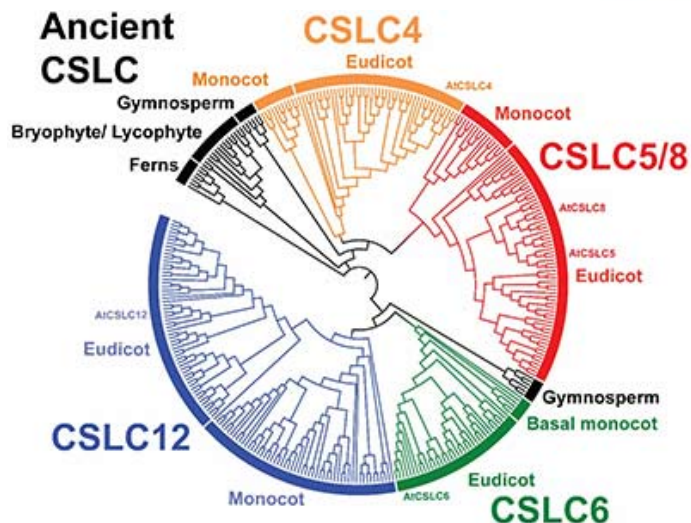
Reverse genetic studies on *Arabidopsis* cellulose synthase like-C (CSLC) genes show that these genes synthesize the xyloglucan (XyG) glucan backbone.

Significance and Impact

Plant cells have complex cell walls that are important for maintaining their structural and functional integrity. XyG is one of the most common polysaccharides in the primary cell wall. Although XyG's structure is well known, its biosynthesis is poorly understood. This study identifies the enzymes responsible for XyG synthesis by demonstrating that all 5 members of the CSLC family synthesize the XyG backbone. The evidence provided in the work that deletion of CSLC-function leads to cell walls devoid of XyG raises important questions regarding cell wall reorganization and the role of XyG during plant development. Addressing these questions will provide fruitful means for plant cell wall engineering.

Research Details

- Researchers have generated a variety of mutant combinations to investigate XyG synthesis.
- Biochemical analyses using high-performance anion exchange chromatography (HPAEC) and linkage analysis using GC/MS indicated that the mutant lacking all CSLC genes cannot produce XyG.
- Phenotypic analyses using XyG mutants indicated the organ/tissue specific roles for some of the CSLC genes.
- By generating complementation lines with each CSLC member, the researchers demonstrated that all CSLC members are XyG backbone synthases.
- Phylogenetic analyses support an increased diversification of CSLC genes, including the recent evolution of CSLC4 genes in eudicots, most likely from an ancestral CSLC group.



Phylogenetic analysis of CSLC protein family: A total of 325 CSLC sequences from various plant groups were used (Bryophytes/ Lycophytes, Ferns, Gymnosperms, Basal angiosperms, Monocots, and Eudicots). Orange, CSLC4 lineage; Red, CSLC5/ 8 lineage; Blue, CSLC12 lineage; Green, CSLC6 lineage; Black, ancient CSLC.

Kim SJ, Chandrasekar B, Rea AC, Danhof L, Zemelis-Durfee S, Thrower N, Shepard ZS, Pauly M, Brandizzi F, Keegstra K. *PNAS*, July 2020. doi:

[10.1073/pnas.2007245117](https://doi.org/10.1073/pnas.2007245117)

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