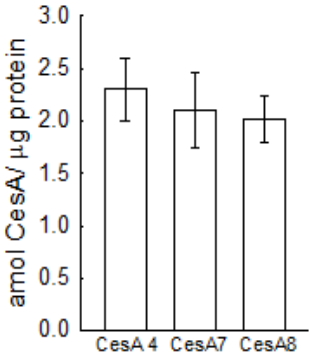
The Cellulose Synthesis Complex (CSC) is made of Three Cellulose Synthases (CesAs) in a 1:1:1 ratio

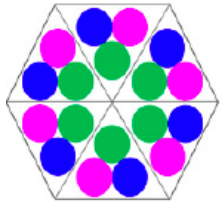
Scientific Achievement

The CSC in *Arabidopsis* 2º cell walls has a fixed and equimolar stoichiometry of 3 CesAs, indicating a non-fluid structure based on a hetero-trimeric CesA building block.

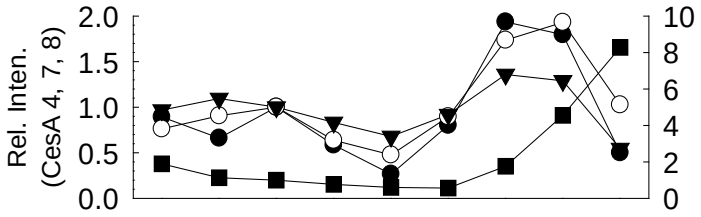


LEFT: Quantitative immunoblotting determines average molar ratio of CesA4, 7, and 8 in a protein sample from Arabidopsis stems. Comparison shows a 1:1:1 stoichiometry.

BELOW: Our current model for the CSC as a hexamer of CesA hetero-trimers



RIGHT: Analysis of CesA protein levels from the base (left) to the tip (right) of the *Arabidopsis* stem.



Hill Jr., J. L., Hammudi, M. B., & Tien, M. (2014). The Arabidopsis Cellulose Synthase Complex: A Proposed Hexamer of CESA Trimers in an Equimolar Stoichiometry. *The Plant Cell*, *25*(12). doi:10.1105/tpc.114.131193

Significance and Impact

The arrangement of cellulose synthase proteins is one key factor controlling the final structure of the cellulose microfibril. Plants utilize a hexameric rosette composed of an unknown number of CesAs in an unidentified stoichiometry. Our results show CesAs exist in an equimolar stoichiometry, supporting a 18-CesA model of the complex. This information is essential for understanding how CesAs assemble into CSCs.

Research Details

- *Quantitative immunoblotting to determine molar amount of CesAs 4, 7, and 8, which shows a 1:1:1 stoichiometry;*
- *Analysis of protein levels along the axis of the stem shows that this equimolar stoichiometry is fixed throughout development;*
- *This equimolar stoichiometry, and recent literature on cellulose microfibril size, argue for a cellulose synthesis complex model of 18 active CesAs as a hexamer of trimers;*

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