

Subtle differences in cellulose microfibril packing result in large differences in cotton fiber cell walls



Scientific Achievement

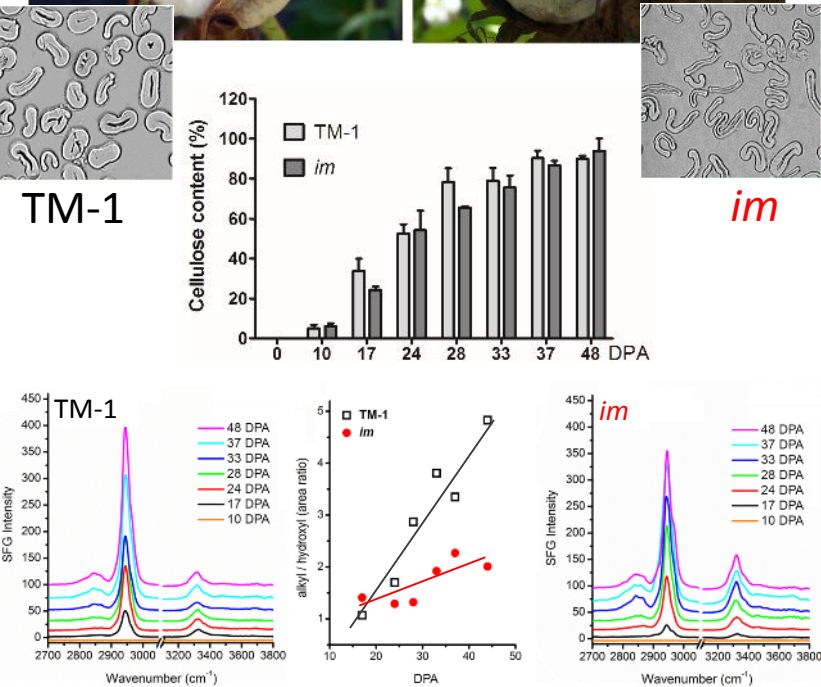
Cotton fibers consist of nearly pure cellulose. Two near-isogenic lines of cotton (TM-1, *im*) vary greatly in fiber properties and cell wall thickness, yet contain nearly the same cellulose content and crystallinity. Analysis by sum frequency generation (SFG) spectroscopy revealed that this phenotypic difference correlates with differences in cellulose microfibril (CMF) packing during wall maturation.

Significance and Impact

Plant cells have genetically-regulated mechanisms that modulate packing of cellulose in secondary cell walls. This process can influence cell wall properties, with potentially large consequences for material properties and biofuel conversion.

Research Details

- No significant differences were observed in ATR-IR, Raman, and XRD analyses of the *im* and TM-1 fibers.
- But the difference in the CH/OH SFG intensity ratio indicated that the meso-scale packing of CMFs is disrupted in the *im* mutant, compared to the TM-1 wild type.



Work was carried out at Penn State and USDA-ARS; H. J. Kim, [C. M. Lee](#), [K. Dazen](#), [C. D. Delhom](#), [Y. Liu](#), [J. E. Rodgers](#), [A. D. French](#), [S. H. Kim](#), *Cellulose* (2017) 24:2385–2401.