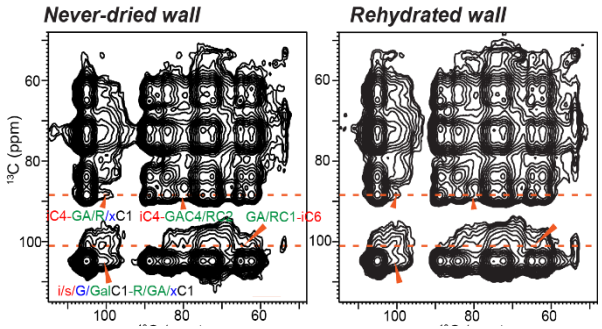
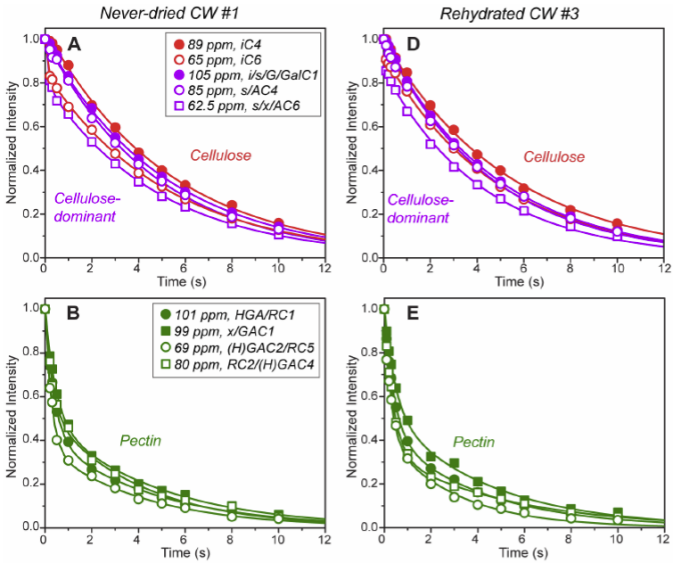
Cellulose-Pectin Spatial Contacts in Never-Dried Plant Primary Cell Walls



ABOVE: 2D 13C-13C correlation spectra of Arabidopsis 1° cell walls, never-dried versus rehydrated. The same cellulose-pectin cross peaks are observed in both samples.



^{13}C T_1 relaxation curves of polysaccharides in Arabidopsis cell walls.

Scientific Achievement

Sub-nanometer cellulose-pectin contacts are observed in never-dried *Arabidopsis* primary cell walls using ^{13}C solid-state NMR. The intermolecular contacts are not caused by dehydration, low temperature, or molecular crowding, thus they are an inherent structural feature of the plant cell wall.

Significance and Impact

The cellulose-pectin interactions detected here by ssNMR are an important feature missing in current models of 1° cell walls. Dehydration does not irreversibly change these interactions.

Research Details

- *1D ^{13}C SSNMR spectra are indistinguishable between never-dried and rehydrated walls.*
- *2D ^{13}C-^{13}C correlation spectra show extensive cellulose-pectin cross peaks, in both never-dried & rehydrated walls and at low and high temperatures, indicating that hydration history and freezing do not affect intermolecular contacts.*
- *Partial extraction of homogalacturoan did not remove ^{13}C cellulose cross peaks with rhamnogalacturonan, thus intermolecular contacts are not due to molecular crowding.*
- *^{13}C T_1 relaxation curves show fast and slow pectin domains.*

Wang T; Park YB; Cosgrove DJ; and Hong M (2015) Cellulose-Pectin Spatial Contacts Are Inherent to Never-Dried *Arabidopsis thaliana* Primary Cell Walls: Evidence from Solid-State NMR . Plant Physiology, 168: 871-884 (2015). Work carried out at MIT and PSU.

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