SECONDARY CELL WALL

Shared linker

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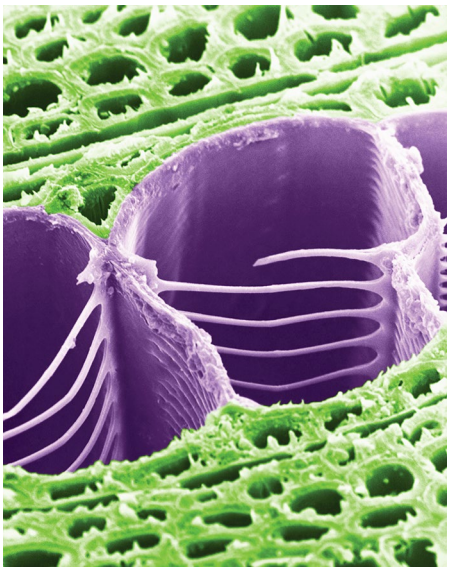

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Plant cell walls serve as the 'exoskeleton' of every single plant cell. To ensure normal cell growth and development, synthesis of plant cell walls involves the fine-tuned deposition of different cell wall components, including load-bearing elements known as cellulose. In the primary cell wall, cellulose patterning follows a microtubule-guided mechanism that requires a direct molecular linker between cellulose synthase complexes (CSCs) and cortical microtubules. However, whether a similar mechanism is involved in synthesis of the secondary cell wall is not clear. A recent study from Staffan Persson's group at the University of Melbourne, Australia, and their collaborators reported that secondary cell wall patterning not only occurs via a similar mechanism but recruits the same linker protein, CELLULOSE SYNTHASE INTERACTING 1 (CSI1), to guide cellulose deposition during the early stage of the process.

Using an inducible xylem transdifferentiating *Arabidopsis* cell culture system, Schneider et al. characterized the altered secondary cell wall patterning in knockout lines of CSI1. Colocalization analyses suggested that CSI1 is closely associated with both secondary CSCs and microtubules during different stages of secondary cell wall synthesis. The absence of CSI1 led to misalignment between CSCs and microtubules during the early stage, but not in the middle and late stages of xylem vessel development. This interesting observation led the researchers to hypothesize that a different mechanism regulates secondary cell wall patterning during later stages. They further observed that the spatially specific delivery and patterning of the secondary cell wall were maintained after the depolymerization of microtubules, suggesting that microtubules are playing a minimal role in secondary cell wall deposition during later stages. However, more details of this distinct mechanism remain to be determined.

The researchers also showed that knocking down a CSI1 homologue in rice caused stunted growth as well as defects in secondary cell wall synthesis, indicating a ubiquitous role of the shared linker in different plant systems.

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