Plant cell wall development revealed in space and time for the first time

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Growing *Arabidopsis*. Credit: Kelsey Picard, University of Melbourne

Scientists have mapped changes in composition of plant cell walls over space and time, providing new insights into the development and growth of all plants.

The work is a first step towards precision-breeding to enhance the properties of plant-based products such as timber and biofuels.

Conducted by an international research team using the model laboratory plant *Arabidposis*, the study is published today in the journal *Current Biology*.

The cell wall is a defining feature of plant cells, providing essential functions like strength and mechanical support to plant tissues.

The cell wall is also associated with cellular function, including enabling the plant to grow and to sense and respond to developmental cues and environmental stresses such as pathogen invasion.

Plant cell walls are also the main component of plant biomass, our only renewable bioenergy resource, and are consumed by humans as a component of food - dietary fibre.

"Despite their importance to society, we currently know very little about how these walls are built and refined during plant development" said study co-author Dr Monika Doblin from the ARC Centre of Excellence in Plant Cell Walls situated within the School of Biosciences at the University of Melbourne.

"We used three sophisticated techniques to generate a spatiotemporal map of plant cell wall development in the shoot apical meristem (SAM), the structure that gives rise to all above-ground tissues in plants," added Dr Doblin.

This area is rich in plant stem cells, a pool of cells from which other cells are derived that go on and form the organs of plants such as leaves and flowers.

The team found that the highly localised and coordinated expression of the cell wall synthesis enzymes in the shoot apex suggests stem cells have a particular wall composition, and that specific differences occur

between newly forming walls and their mature descendants.

"We demonstrated that a subset of genes related to those encoding the enzymes involved in making cellulose, a key fibrillar component of walls, are essential for proper growth and maintenance of cell number in the shoot apical meristem," Dr Doblin said.

"These findings point towards the key role of walls in plant developmental pathways and a guide towards the selective breeding of plants to improve the raw ingredients for plant-based products."

The study also included researchers from the University of Cambridge, Mahidol University in Bangkok, Institute Jean-Pierre Bourgin in France and the California Institute of Technology.

Provided by University of Melbourne