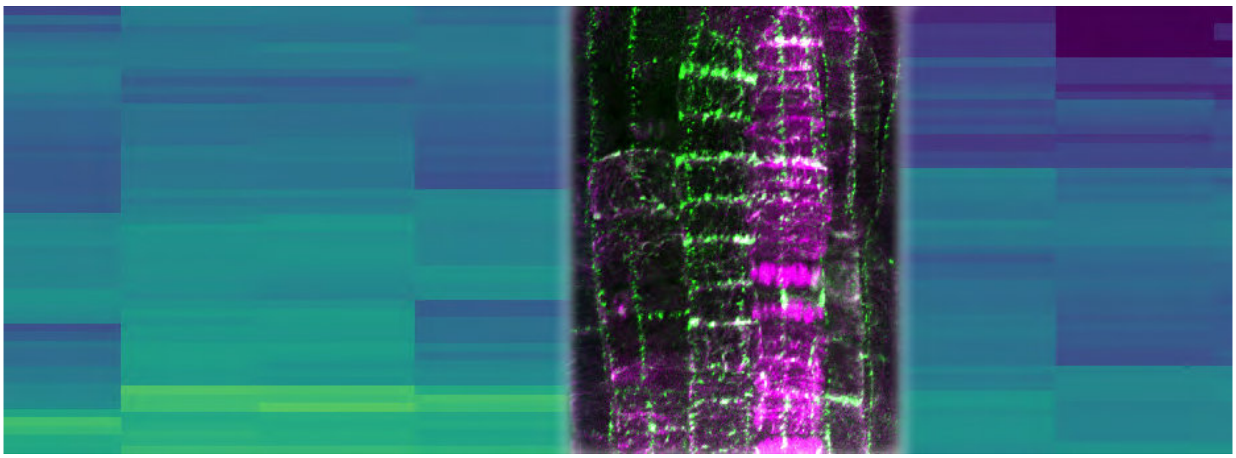
# Researchers unlock secrets of plant development

August 23 2018, by Erik Rolfsen



The CLASP protein helps cells divide within the roots and shoots of the thale cress plant. Credit: Geoffrey Wasteneys/UBC

University of British Columbia researchers have discovered an internal messaging system that plants use to manage the growth and division of their cells. These growth-management processes are critical for all organisms, because without them, cells can proliferate out of control—as they do in cancers and bacterial infections.

Plants use this messaging system to survive under harsh conditions or to compete successfully when conditions are favourable. It tells them when to grow, when to stagnate, when to flower, and when to store resources—all based on the prevailing conditions. Understanding how it all works could enable innovations in agriculture, forestry and conservation as climate change takes hold.

UBC botany professor Geoffrey Wasteneys and his colleagues discovered that the system is driven by a protein called CLASP. The protein, found in plants, animals and fungi, plays an essential role in cell growth and division by coordinating the assembly of filaments within cells. Its gene in plants was first identified by Wasteneys in 2007.

Their study published today in *Current Biology* reveals that production of CLASP is reduced by a plant-growth hormone called brassinosteroid. The researchers established this by exposing thale cress—a small flowering plant native to Eurasia and Africa—to brassinosteroid. This exposure stunted the plants in a way that closely resembled mutant versions of the plant that lacked the CLASP protein altogether. This observation led the team to conduct experiments that proved CLASP is indeed a direct target of brassinosteroid.

However, the researchers were puzzled because limiting growth through exposure to brassinosteroid is a one-way process that merely shuts down cell division. In a surprise twist, the researchers discovered that CLASP prevents the degradation of brassinosteroid receptors, so when CLASP is scarce, brassinosteroid becomes less effective, which results in CLASP levels rising again. Essentially, the protein and the hormone affect each other in a negative-feedback loop.

"You can liken it to the predator-prey feedback loop," said Wasteneys. "We know that fox populations plummet if they over-consume rabbits. In the absence of foxes, rabbit populations explode, causing the eventual collapse of their ecosystem.

"These findings are unique because they show, for the first time, that

CLASP is governing its own destiny by directly sustaining the hormone pathway that regulates its expression."

These new insights are of particular interest to agriculture as the industry looks for new ways manage the effects of climate change, Wasteneys said.

"One of the aims of the future is to be able to have smart plants that can sense their environment and adjust their development, so that they will reliably produce crops under increasingly adverse conditions. This mechanism is pivotal to that."

**More information:** Yuan Ruan et al, The Microtubule-Associated Protein CLASP Sustains Cell Proliferation through a Brassinosteroid Signaling Negative Feedback Loop, *Current Biology* (2018). DOI: 10.1016/j.cub.2018.06.048

Provided by University of British Columbia