

Researchers find nature's shut-off switch for cellulose production

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Purdue researcher Nick Carpita said plants may be able to produce more biofuel mass if the means of shutting down cellulose production is disrupted. His research team learned that small RNAs are key in determining the duration of cellulose production. Purdue Agricultural Communication photo/Tom Campbell

Purdue University researchers found a mechanism that naturally shuts down cellulose production in plants, and learning how to keep that switch turned on may be key to enhancing biomass production for plant-based biofuels.

Nicholas Carpita, a professor of botany and plant pathology, said that small-interfering RNAs (siRNAs) play a normal role in plant development by shutting off genes involved in primary cell wall growth in order to begin development of thicker, secondary cell walls.

"These small RNAs were known to play a role in fending off disease-causing pathogens, but we are only now beginning to understand their involvement in normal plant development," he said.

Carpita's research team reported its findings in Monday's (Dec. 15) early online issue of the *Proceedings of the National Academy of Sciences*.

"If we can learn to interfere with the down-regulation of cellulose synthesis, then plants may be able to produce more cellulose, which is key to biofuels production," Carpita said.

Mick Held, a postdoctoral researcher in Carpita's lab, virologist Steve Scofield, a U.S. Department of Agriculture research scientist and adjunct assistant professor of agronomy at Purdue, and Carpita made the discovery in barley after introducing a virus as a way to "silence" specific genes and study their functions. The researchers noticed that the virus had more effect than anticipated.

"The virus hijacked a whole suite of genes, and when we compared the targeted plant to our control plants we found that the small RNAs were responsible and already in the controls even without adding the virus," Held said.

Carpita said this let researchers see that the siRNAs - among other things - regulate and shut down primary cell wall development to begin secondary wall growth.

"These secondary stages result in characteristics such as tough rinds of corn stalks, vascular elements to conduct water and fibers for strength," he said.

The researchers said that delaying or preventing the shutdown of both primary and secondary cellulose production might enhance total plant

biomass.

"Most biofuel researchers believe that cellulose utilization offers the best path to sustainable ethanol production," Scofield said. "Our work uncovered a previously unknown mechanism that suggests a way to increase the amount of cellulose produced in plants."

The research paper is available at
www.pnas.org/cgi/doi/10.1073/pnas.0809408105 .

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