Research May Help Plants, Humans Survive Stress, Disease

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David Galbraith

(PhysOrg.com) -- New technology to analyze gene expression at the level of different cell types offers new insights in the ways that plants and animals react to the environment and how they change when they are diseased.

A University of Arizona researcher's work on gene expression could help protect plants from stresses like heat and drought, and even help people survive diseases like cancer.

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cell types offers new insights in the ways that plants and animals react to the environment and how they change when they are diseased, said David W. Galbraith, a UA plant sciences professor and member of the BIO5 Institute.

Galbraith is a co-author of a paper on the topic that will appear in the Proceedings of the National Academy of Sciences.
"What we recognize as a specific part of a plant, such as a leaf or a root, in fact is made up from many different types of cells," Galbraith said.

In leaves, some cells are for photosynthesis, some are for transporting sugar and some are to externally protect the plant, he said. The techniques Galbraith and his collaborator, Julia Bailey-Serres at the University of California, Riverside, developed allow researchers to find out how these different cell types function.

"When you apply stress to a plant, the numbers and identities of proteins being produced change dramatically. Stress can be drought, salt or heat," Galbraith said. "Now we can tell within specific cell types how the plants react.
"In this paper, we focus on the core machinery of the cells, called ribosomes, that manufacture proteins. We now can tell you exactly which proteins are being made in different cell types," he said.

"It is important to have the right scientific measurement tools to understand what is going on. Using these tools will allow us to have a greater understanding of how these cell types are different from one another. Our goal has been to develop these tools, and this paper describes one of them."

This could help plant life survive challenges like drought or diseases by allowing researchers to monitor the cell types most responsible for handling stress.

"This gives a better understanding of how plants react to the environment," Galbraith said. "This is not just that if they are dry they wilt.

"If you had an attack by pathogens, or something like that, looking at cell type specific responses is crucial, since the first response will be from the external cells," he said. "The more we understand the subtleties of how genes are expressed, the more we can go in and start to modulate or change that capability."

This could offer researchers the ability to develop hardier plants that continue to be productive under challenging conditions, he said, including climate change.

"There is a chance you can devise ways to protect from stresses like drought," Galbraith said. "One way is genetic engineering, or you could find chemicals that would induce the plant to produce proteins that protect itself. But in either case you need our methods to understand the best way to proceed."

In addition to improving agricultural food supplies, the research could offer a better handle on how to recognize and treat human diseases, he said.

"It allows you to look at how stresses and diseases impact humans," Galbraith said. "In cancer you can take a sample, see what is going on in the different cancer cell types and this should provide clues as to the best treatment."

Provided by University of Arizona (news : web)