Fast Breaking Papers - 2010

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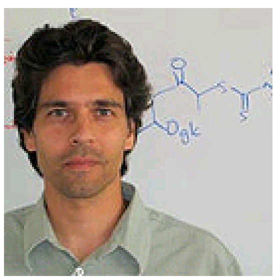
Sean Cutler talks with *ScienceWatch.com* and answers a few questions about this month's Fast Breaking Paper Paper in the field of Plant & Animal Science.



Article Title: Abscisic Acid Inhibits Type 2C Protein Phosphatases via the PYR/PYL Family of START Proteins

Authors: Park, SY;Fung, P;Nishimura, N;Jensen, DR;Fujii, H;Zhao, Y;Lumba, S;Santiago, J;Rodrigues, A;Chow, TFF;Alfred, SE;Bonetta, D;Finkelstein, R;Provart, NJ;Desveaux, D;Rodriguez, PL;McCourt, P;Zhu, JK;Schroeder, JI;Volkman, BF;**Cutler, SR**

Journal: SCIENCE, Volume: 324, Issue: 5930, Page: 1068-1071, Year: MAY 22 2009

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(addresses have been truncated.)

SW: Why do you think your paper is highly cited?

At the moment, there is tremendous interest in understanding how plants cope with drought and other environmental stresses so that this basic understanding can be leveraged to improve agriculture.

The hormone abscisic acid (ABA) is a key regulator of stress signal transduction and has been validated as a target for improving stress tolerance and yield. Because of this, many labs have been actively searching for its elusive receptor for many years.

The field was really primed for the discovery of soluble receptors—that is a big part of the paper's rapid citation rate.

SW: Does it describe a new discovery, methodology, or synthesis of knowledge?

The paper describes a new discovery—soluble ABA receptor proteins. It also proposed a new model for how ABA signaling works, and this involved some synthesizing of prior knowledge.

SW: Would you summarize the significance of your paper in layman's terms?

I think they are two-fold. By figuring out how ABA signaling works, we are now in a better position to alter it and our work suggests new strategies for engineering drought tolerance in crop plants. Secondly, we showed that a synthetic chemical can activate ABA receptors—this opens new doors for agrochemical development.

> *"I think the improvement of crop yield using chemicals that modulate ABA signaling is an exciting prospect that has great potential."*

Historically, the main focus in crop protection has been on herbicides, fungicides, and insecticides, but it is clear that there are other ways to improve crop yield by modulating plant physiology.

What I think was nice about our *Science* paper is that it simultaneously suggested new approaches for both the chemical and genetic improvement of agriculture.

SW: How did you become involved in this research, and were there any problems along the way?

My lab is interested in combining both chemical and genetic approaches to understanding plant growth and identifying new "druggable" targets. That is, we are working to systematically define the proteins in plants that can be controlled by small molecules. This led to the isolation of pyrabactin, the ABA agonist we described in the *Science* paper, which we used to isolate the new receptor proteins.

There were many problems along the way. We tried to publish a paper about pyrabactin before we knew its precise mechanism of action, and the response was not positive. As a result, I decided to hold out for a more complete story, which involved a good deal of knuckle-biting, but I think it was worth the wait.

SW: Where do you see your research leading in the future?

Personally, I think the improvement of crop yield using chemicals that modulate ABA signaling is an exciting prospect that has great potential. One hitch though, is that the registration costs for new active ingredients are very high.

As a parallel approach, we have been examining if we can coax our ABA receptors to be activated by existing agrochemicals. This strategy is interesting because it will allow "off-the-shelf" chemistry to be redeployed for new uses. I am quite excited about this idea.

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