

Plant Aspirin, Classic Science, Wheat Rust, Engagement

Posted by steven.reynolds | January 7, 2009

Calcium Helps Plants Make Their Own Aspirin

Calcium builds strong bones, good teeth—and healthy plants, according to a new study from WSU forthcoming in *Nature*.

Experiments show that calcium, when bound to a protein called calmodulin, prompts plants to make salicylic acid (SA) when threatened by infection or other danger. SA is a close chemical relative of aspirin. In plants, SA acts as a signal molecule that kicks off a series of reactions that help defend against external threats.

That plants make salicylic acid has been known for more than 100 years, said B.W. Poovaiah, Regents Professor and director of the study, but the role of calcium in signaling a plant to make SA has not been known before.

“We are now beginning to understand the molecular mechanism connecting the calcium/calmodulin signaling to plant immunity,” said Poovaiah.

Poovaiah said that in controlling salicylic acid level, calcium acts like a gatekeeper within the cells of a plant, directing incoming information and helping the plant respond to such dangers as pathogen attacks. Normal, healthy plants have a low level of SA in their cells. That level rises when the plant is threatened by infection or environmental stress.

“When we expect danger, we try to take precautions,” said Poovaiah. “Plants

cannot run away. Plants have to turn on their built-in system to protect themselves. The plant has to produce different signal molecules. One of them is salicylic acid.”

But a rise in SA levels also causes the plant to slow its growth, perhaps saving its strength for the battle against the pathogen. That sets up a challenging situation for both the plant—grow faster or protect myself better?—and farmers, who might view SA as a tool to protect their plants from disease. A plant that makes high levels of SA all the time will be safe from infection but will grow slowly. A plant that makes little or no SA will grow like gangbusters but be very susceptible to infection.

“It’s a fine balance,” said Liqun Du, lead author and assistant research professor. “Too much is bad; too little is bad.”

To read the paper online, please visit: <http://dx.doi.org/10.1038/nature07612>.



Plants make salicylic acid when threatened by infection or other danger; salicylic acid is a close chemical relative of aspirin.

Classic Science Lab Exercise Germinated

A journal article authored by Michael Neff, assistant professor of crop biotechnology, and two Washington State University undergraduate students, may revive interest in a classic high school and college science laboratory exercise.

The how-to-do-it article has been accepted for publication in the journal *American Biology Teacher*.

Agriculture education majors Dan Tedor, a junior from Spirit Lake, Idaho, and Lori Sanderson, who graduated last May, conducted research for the project. Sanderson is now teaching high school ag science in Onalaska.

“Plants use light as a source of information in addition to using it as energy for photosynthesis,” said Neff. “Plants have a group of photoreceptors that read the light environment and then regulate growth and development based on that environment.”

Proof that a specific wavelength of red light induces germination in lettuce seed, and that far-red light inhibits germination, was demonstrated in 1952.

“That experiment demonstrated there was a molecular switch that could be turned on by red light and be turned off by far-red light,” Neff said.

The experiment became a science lab exercise taught until the early 1990s. “The main reason it was discontinued was because lettuce seeds obtained from growers and seed supply companies had lost the ability genetically to respond to light to control germination,” Neff said. “Most likely that’s because breeders had been breeding out that response. Farmers want lettuce seed to germinate all the time.”

Neff and the students tested 14 varieties of lettuce seed derived from the Grand Rapids lettuce variety used in the original experiment to see if any of them retained a red and far-red control of seed germination.

“We found that one variety did. Waldman’s Dark Green is the only variety that maintains a strong red, far-red control of seed germination.”

The research was funded by a grant from the College of Agricultural, Human, and Natural Resource Sciences to support undergraduate research, as well as grants from the National Science Foundation and the Department of Energy.



A classic science experiment teaches plant-light interactions.

Wheat Disease Recovery Plan in the Works

A destructive race of wheat stem rust, referred to as Ug99, could threaten the U.S. wheat crop in the near future. The name, Ug99, comes from Uganda where it was first described and shown to seriously impact wheat production.

Tim Murray, professor of plant pathology in Pullman and an expert on wheat diseases, will be leading a multi-state and multi-agency effort to prepare a recovery plan should Ug99 be introduced to the U.S. To address the threat, an international conference, The Borlaug Global Rust Initiative, will be held in Mexico in March. The conference was organized by Nobel laureate Norman Borlaug.

Murray has been invited to participate in the conference. The conference brings together the world's experts on wheat rusts to discuss all aspects of the current state of knowledge of Ug99.

Scot Hulbert, R. James Cook Endowed Chair in Cropping Systems Pathology and a world-renowned researcher on plant-pathogen interactions, and Xianming Chen, research geneticist with USDA-ARS and an adjunct professor in the WSU plant pathology department, will also be representing WSU at the conference.

To learn more about Ug99, please visit: <http://tinyurl.com/7qsa9x>.



Rust symptoms on wheat

Carnegie Recognizes WSU's Engagement

WSU today was named among 119 national university and college recipients of the 2008 "Community Engagement Certificate" from The Carnegie Foundation for the Advancement of Teaching.

The Washington D.C.-based foundation selection recognizes higher education

institutions that demonstrate excellence in “alignment between mission, culture, leadership, resources and practices that support dynamic and noteworthy community engagement.” The award is issued by the foundation as part of an effort “to encourage more higher education institutions to reach out to the world around them.”

WSU was selected for the honor in the dual categories of curricular engagement and outreach and partnerships and lauded as a university that engages faculty, students and community in mutually beneficial and respectful collaboration.

“WSU is integrated throughout all 39 Washington counties with hands-on programs that make a difference to the citizens all around the state,” said WSU President Elson S. Floyd. “This award acknowledges that WSU is engaged in cooperative enterprises, educational experiences and cutting-edge research that is changing lives, not just throughout the state of Washington but also in communities around the world.”

For more information, please visit: <http://ext.wsu.edu/>.



WSU is widely recognized for its cooperative enterprises, educational experiences and cutting-edge research that changes lives.

One thought on "Plant Aspirin, Classic Science, Wheat Rust, Engagement"

1. Zoey Diaz says:

June 20, 2010 at 10:28 am

aspirin is a good anti-inflammatory still in use today.

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