Decoding corn defenses for improved pest resistance

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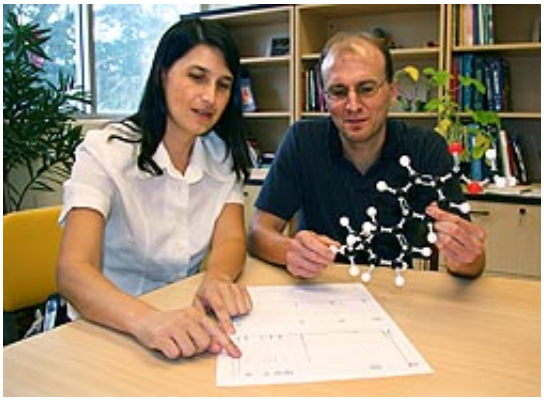

Plant physiologist Eric Schmelz (right), postdoctoral chemist Fatma Kaplan and a team of other ARS researchers have discovered new compounds that corn uses to defend against insect and fungal attack. Credit: Hans Alborn.

(PhysOrg.com) -- A clearer picture of corn's biochemical responses to insect and fungal attacks is emerging, thanks to U.S. Department of Agriculture (USDA) studies in Gainesville, Fla.

On one front, researchers identified defensive compounds, known as zealexins and kauralexins, which rapidly accumulate at fungal infection sites, impeding the microbes' continued spread.

On another front, the researchers discovered a new protein signal in corn, called ZmPep1, which alerts the plant to fungal intruders and helps

mobilize a timely counterattack.

Taken together, these discoveries add significantly to the existing body of knowledge on corn's stress-coping mechanisms, and set the stage for novel approaches to improving the grain crop's insect and disease resistance.

The findings were recently reported in the journals Plant Physiology and The Proceedings of the National Academy of Sciences by Alisa Huffaker, Eric Schmelz, Fatma Kaplan, Martha Vaughan, Nicole Dafoe, Xinzhi Ni, Hans T. Alborn, and Peter E.A. Teal. They are with the USDA Agricultural Research Service (ARS) Center for Medical, Agricultural and Veterinary Entomology in Gainesville. They worked on the research with colleagues at the University of Florida (UF). ARS is USDA's principal intramural scientific research agency.

Zealexins and kauralexins are derived from volatile organic compound precursors known as sesquiterpenes and diterpenes. Terpenes have been widely studied in plants, including crops such as cotton and tomatoes. However, many scientists have focused on the terpenes' production and function in response to insect-leaf feeding, rather than on what happens following stalk attack, according to Schmelz.

The ARS scientists teamed with UF chemist James Rocca to identify the compounds using nuclear magnetic resonance imaging techniques.

In experiments, physiologically relevant amounts of the newly discovered kauralexin class of phytoalexins inhibited the growth of anthracnose stalk rot (Colletotrichum graminicola) by 90 percent. Similarly, zealexins inhibited the growth of the aflatoxin-producing fungus Aspergillus flavus by 80 percent. These maize pathogens cause significant yield loss and fungal-derived toxin contamination issues for U.S. farmers.

Lab experiments also showed that European corn borer larvae avoided feeding on stalk tissues where kauralexins had accumulated.

More information: Read more about this research in the January 2012 issue of *Agricultural Research* magazine.

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