

Disease-resistant tomatoes fight lethal pests

April 3 2013, by Stacey Shackford



Unique tomato lines with double pest and virus resistance are being developed by Cornell breeder Martha Mutschler-Chu. Credit: Stacey Shackford

In the battle against thrips, Cornell breeder Martha Mutschler-Chu has developed a new weapon: a tomato that packs a powerful one-two punch to deter the pests and counter the killer viruses they transmit.

The "dual resistant" insect and virus varieties may reduce or even eliminate the need for pesticides in several regions.

[Thrips](#) are tiny insects that pierce and suck fluids from hundreds of

species of plants, including tomatoes, grapes, strawberries and soybeans. They also transmit such diseases as the tomato spotted wilt virus, causing millions of dollars in damage to U.S. [agricultural crops](#) each year.

Adapting a novel form of [insect resistance](#) discovered in a wild plant native to Peru, Mutschler-Chu, professor of [plant breeding](#) and genetics, first isolated the resistance. She found that it was mediated by droplets of sugar esters, called acylsugars, that are produced and exuded from hairs (trichomes) that cover the plants. The acylsugars don't kill the insects, but deter them from feeding or laying eggs on the plants. The process does not require [genetic modification](#) and is completely safe.



The wild Peruvian tomato plant with "hairy" sugar-producing trichome leaves.
Credit: Stacey Shackford

After successfully transferring the resistance into new lines and breeding out undesirable traits, her team added a second layer of protection: one or both of two natural genes known to resist the so-called TOSPO viruses, which include [tomato spotted wilt virus](#).

"If some thrips get through with the virus, the virus [resistance genes](#) are there to mop it up," Mutschler-Chu said.

The Cornell thrips-resistant tomato lines, with and without the [virus resistance](#) genes, will be used by Mutschler-Chu and an interdisciplinary team of eight other scientists from seven other institutions nationwide as part of a new five-year, \$3.75 million project to control thrips and TOSPO viruses in tomatoes. The project is funded by the U.S. [Department of Agriculture](#)'s Agriculture and [Food Research](#) Initiative and is led by entomologist Diane Ullman of the University of California, Davis, and plant pathologist John Sherwood of the University of Georgia.

Mutschler-Chu said the collaboration will allow her to test her varieties in different regions and use the feedback to further refine her lines and create new, improved ones. Whether it be altering sugar levels to suit different environments, or tweaking virus resistance, Mutschler-Chu wants to discover the best package for insect and virus control. Her discoveries will be shared with seed companies so they can transfer the traits into their varieties.

"It brings us closer and closer to something that can be used commercially to essentially eliminate the need for pesticides in many growing regions," Mutschler-Chu said.

The project rests on a foundation that was built over 20 years, supported

by college-level funding and federal HATCH grants. During that time, new tools of molecular biology were developed, from PCR-based markers and SNP markers to the sequencing of the tomato genome. Using the new methods, it took Mutschler-Chu 10 years to develop the first tomato line with enough acylsugar, then four years to create a better series of 30 lines.

The impact could be far-reaching, she said. Not only would it be a boon to the U.S agricultural economy, it could also have significant impact in the developing world, where tomatoes are one of the most popular vegetable cash crops, especially for small subsistence farmers.

"This is even more critical, because they don't have the resources to buy pesticides, and there is often misuse of pesticides," Mutschler-Chu said.

Provided by Cornell University

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