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Melons infected with *Cucurbit yellow stunting disorder virus* (CYSDV)

Tracking a Whitefly-transmitted Cucurbit Virus in Melons

Tools include real-time PCR

By Susan McGinley

A plant virus that first attacked melon and squash crops in Arizona, California and Sonora, Mexico in 2006 has now been identified in an expanded range of wild and cultivated host plants. Found in Arizona and California, the plants may serve as reservoirs where the virus can survive and multiply after the melon crop has been harvested.

The whitefly-transmitted *Cucurbit yellow stunting disorder virus* (CYSDV) was originally thought to infect only members of the plant family Cucurbitaceae, including melons, summer and winter squash, pumpkins, gourds and cucumbers. The virus originated in the Middle East and spread through Spain, South and Central America before arriving in Mexico and the United States.

“We previously thought CYSDV was confined to the Cucurbitaceae and we knew of no prospective wild hosts,” says Judith K. Brown, virologist and whitefly vector biologist in the Department of Plant Sciences at The University of Arizona. “What we’ve learned is that in addition to cucurbits, the virus is now established in other native and naturalized flora that are abundant in the desert.”

So far the new hosts include common bean (Fabaceae), alkali mallow and *Malva parviflora* (Malvaceae), and buffalo gourd, a wild member of the Cucurbitaceae, according to tests conducted in Brown’s lab in Tucson and also in the USDA lab of William Wintermantel in Salinas, California.

“The broader the host range for any pathogen, the more difficult it is to manage,” Brown says. More studies are under way on the host range in native and naturalized uncultivated plants in the region. At stake locally are spring and fall melons produced across the Sonoran Desert, including four counties in southwest/central Arizona, California’s Imperial Valley and the northwest coastal states of Mexico.

Cucurbits infected with CYSDV develop a characteristic yellowing and brittleness on the older leaves, followed by a breakdown in the plant’s internal transport system, loss of vigor and a failure to produce sweet fruit.

To assist producers in handling the virus, Brown is working on the diagnostic side of a regional CYSDV management approach that includes research faculty and extension specialists from the UA in Yuma, Maricopa, Pinal and Pima counties, from the University of California and the University of Sonora, and scientists from the USDA. The current centerpiece of Brown’s efforts is a powerful new quantitative real-time PCR (polymerase chain reaction) assay she has designed and used to identify the virus in both wild and crop plants quickly and with great accuracy.

“It’s a rapid, sensitive diagnostic procedure that we are applying to turn around samples in a couple of hours; it allows us to detect viruses even in very low concentrations from field samples even when there are no disease symptoms,” she says. An Arizona Specialty Crops block grant enabled Brown to



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The whitefly *Bemisia tabaci*

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Melons infected with CYSDV. In Arizona alone, the spring melon crops for 2005 and 2006 were valued at \$117 million and \$121 million respectively. The fall 2007 melon (cantaloupe, honeydew and others) and watermelon crops totaled 35,000 acres with an estimated value of more than \$64 million.

develop and validate the test for the real-time PCR machine. The machine purchase itself was funded by the National Plant Diagnostic Network (USDA-CSREES).

Last summer Brown's group performed a fast diagnosis on samples sent from a watermelon field in Yuma, at the request of a grower who wanted to plant fall melons nearby. He was concerned that the melons were infected with CYSDV, and most of the other growers in the area had already harvested and plowed their fields. The watermelon grower said he would plow his field the following Monday if he got proof by close of business on Friday that the field was infected.

"We got the call on Thursday evening and received the samples by FedEx® Friday morning," Brown notes. "We ground up the leaves, diluted the extracts and analyzed them using real-time PCR. Then we watched the fluorescent curve plotting over time on the monitor: the more fluorescence emitted, the more virus present in the sample. After the test ran for just an hour and 40 minutes we were able to call Yuma by 4:30 to report a positive test result."

Concurrent with the virus assays, Brown is looking for the important whitefly feeding reservoirs in the CYSDV-linked disease cycle.

"Right now we know that the whitefly has a host range of 500 plant species spanning 20 families, while the CYSDV host range is more narrow: just several families and far fewer species," she says. "We're trying to exercise some precision regarding where the potential wild plant reservoirs are and whether the whiteflies like these hosts and are feeding on them. By finding out where the whitefly and virus reservoirs intersect, we can be more selective in managing the disease."

Other plans include geospatial mapping of CYSDV not only in crop fields, but in adjacent noncropped areas as well.

"It's a big job and it's not the only virus out there," Brown says, "so we're hoping for some producer support to fund this effort. In the meantime, we're continuing to monitor and disseminate our findings to growers through our on-site county agents and researchers. It's been a fantastic partnership." 🌱

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