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Kern/Tulare

GWSS Update

A project of the Glassy-winged Sharpshooter Task Force of Kern and Tulare Counties. Participants: Agricultural Commissioner's Offices of Kern and Tulare Counties, California Department of Food and Agriculture, University of California-Cooperative Extension, U.S. Department of Agriculture (APHIS and ARS Divisions).

Contact:
Don Luvisi
Project coordinator
(661) 868-6226
dluvisi@bak.rr.com

Catherine Merlo, Editor
(661) 588-0561
cmm55@aol.com

Web site:
http://cekern.ucdavis.edu/Custom_Program444/

On the trail of strains of *Xylella fastidiosa* — an essential part of the Pierce's disease cycle

The glassy-winged sharpshooter (GWSS) invasion of California demonstrated how introducing a new element can drastically worsen a long-existing problem such as Pierce's disease (PD). Different strains of the bacterium, *Xylella fastidiosa,* may also change the status quo.

For example, a reasonable guess is that the oleander strain of *X. fastidiosa* entered California, possibly the Palm Springs area, more than 10 years ago. Existing native sharpshooter vectors were probably involved in the initial spread of the resulting oleander leaf scorch disease, but this oleander disease spread more rapidly in coastal southern California than it would have otherwise as a result of the GWSS's presence. Oleanders were largely eliminated from some urban areas of Orange County where GWSS was abundant, and this now seems to be the fate of parts of Riverside County where GWSS also occurs in large numbers.

Various *X. fastidiosa* strains have different plant host ranges, although all strains seem to systemically infect a variety of plants. For example, oleander strains do not infect grape, and PD strains do not infect oleander.

On the other hand, all PD strains tested so far cause almond leaf scorch, but the reverse is not true. Strains that cause almond leaf scorch and that fit into an identifiable genetic group, based on molecular analyses, can weakly infect grape but do not cause PD. Phony peach disease strains do not cause disease in grape, and grape strains do not infect peach.

Researchers in Brazil have shown that strains of *X. fastidiosa* that cause the CVC (citrus variegated chlorosis) disease of orange can also cause disease in coffee. On the other hand, coffee leaf scorch strains infect orange and coffee but do not cause disease in orange.

A coffee tree grove in Sao Paulo state in Brazil includes a coffee plant (in the foreground) with the reduced growth and die-back symptoms of coffee leaf scorch disease. (Photo courtesy of Alexander Purcell)

Spread of "rare" Xf strains. Added to the threat of new strains entering California, the invasion of California by GWSS may already have greatly magnified the spread of strains of *X. fastidiosa* that were previously rare and thus not noticed. This may be happening where GWSS is abundant and feeding on plants not preferred by other long-established vectors. An example of this is the rapid emergence of PD strains from being "rare" in southern Kern County since the 1950s to becoming a severe problem after GWSS became abundant.

We can expect to see future "new" diseases of crops in California other than those currently affected by *X. fastidiosa* as a result not only of invasions (introductions) of new strains but also increases in the incidence of currently rare strains driven by the feeding patterns of newly-established vectors. Currently Don Cooksey's lab and Frank Wong in Riverside are investigating the possible role of *X. fastidiosa* in leaf scorch diseases of numerous ornamentals in southern California.

Of course, we hope to prevent CVC or

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—Alexander Purcell, University of California, Berkeley

Kern-Tulare GWSS Update

Strains of *Xylella fastidiosa*

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any other strains of *X. fastidiosa* from entering the United States. The impacts of the CVC disease on orange crops could be very damaging. In California orange groves where GWSS is established, the spread of CVC disease could be rapid.

Danger of citrus-infecting strains. But, in addition, research findings by Brazilian researchers indicate that the invasion of the United States by citrus or coffee strains may also have major impacts on viticulture. The researchers at the Brazilian grower-funded organization, Fundecitrus, inoculated citrus and coffee strains of *X. fastidiosa* into grape seedlings in a greenhouse. The plants developed typical PD symptoms. There were no data on field symptoms, and PD has not been reported from Brazil.

This means that the invasion of California by citrus-infecting strains of *X. fastidiosa* would not only threaten to damage sweet orange but might also increase the incidence of PD in vineyards near orange groves because the natural infectivity of GWSS coming from citrus would be increased.

Graduate researchers in our lab tested more than 4,000 GWSS collected from the orange groves in the General Beale area in 2000 and 2001 for their natural infectivity with PD strains of *X. fastidiosa*. We found no infective GWSS in 2000, and only one pool of GWSS transmitted in 2001, indicating that a very small number, most likely only one to three per thousand, of GWSS were naturally infective. We have repeatedly tested citrus —Valencia, Washington navel, Lisbon lemon, grapefruit— and have not found that PD strains can infect citrus.

The non-host status of citrus for PD strains of *X. fastidiosa* would explain the low natural infectivity of GWSS coming from citrus. It would also explain why the rapid spread of PD in vineyards near citrus usually appears to be patchy at first, without readily identifiable gradients of PD that decline steeply with distance away from citrus groves. The explanation for the "patchy" patterns may be that GWSS must pick up the bacterium from infected vines or vineyard weeds, making the vine-to-vine movement of *X. fastidiosa* the most important method for PD spread.

A major concern about citrus strains entering the United States now has to address their threat to viticulture as well as to citrus. The current level of GWSS control in citrus that has lowered the continuing spread of PD to manageable levels may not be adequate if new strains of *X. fastidiosa* can infect citrus.

GWSS threat potential looms. If citrus strains become established in California in the future, then we can expect much higher levels of natural infectivity of GWSS from citrus groves because GWSS will be able to acquire the bacterium from orange trees, something they apparently do not do at present. The prospect of perhaps hundreds-fold increases in natural infectivity of GWSS breeding in citrus would be a serious threat requiring much higher levels of control of GWSS to maintain the current level of disease control.

The CVC strain of *X. fastidiosa* spread rapidly throughout Brazil, from only three recognized diseased trees in 1987 to more than 2 million in 1992. Currently about 40 percent (roughly 80 million) of the orange trees in Brazil's main citrus region, São Paulo state, have CVC symptoms, despite intensive, and expensive, control efforts.

In retrospect, human movements of citrus nursery stock accounted for the incredible speed with which the disease moved throughout Brazil, where it now affects every orange-growing area of this large country.

More sobering for U.S. growers was the finding, reported in 2000, of a citrus strain of *X. fastidiosa* discovered in a diseased coffee plant in Costa Rica. Increased and proactive efforts to prevent the northward movement of this new strain from Central America are needed.

— Alexander Purcell, University of California, Berkeley, Division of Insect Biology

Leaf and stem symptoms of citrus variegated chlorosis (CVC). (Photo courtesy of Alexander Purcell)

CVC on the Web

A good Internet link to information about the CVC disease is at: http://aeg.lbi.ic.unicamp.br/xf/home/mmachado.html

Online GWSS maps

For online maps showing GWSS finds, go to http://www.cdfa.ca.gov/phpps/pdcp/gwMaps/gwMgmtMaps.htm