CITRUS TRISTEZA HEATS UP IN SOUTHWEST FLORIDA

By Phil Stansly, Bob Rouse and Pam Roberts

Many citrus growers in Southwest Florida noticed dramatic increases in decline of trees on sour orange rootstock in spring and early summer of 1998. Decline was most evident during April through June when little or no rainfall combined with temperatures in the 90s. To these stresses were added those associated with picking, hedging and topping, and growth demands of a new crop of fruit. The combined effect of these stress factors on trees whose food transport system (phloem) was already compromised by citrus tristeza virus (CTV) led in many cases to rapid and total collapse. The presence of quick decline strains of CTV was found in sampled trees confirmed by enzyme-linked immunosorbent assay (ELISA), which utilizes MCA-13 (monoclonal antibody 13). Why should so much sour orange decline show up at this particular time in the area?

CTV can be moved with infected budwood and is naturally spread by aphids. The brown citrus aphid (BCA) Toxoptera citricida is the most efficient vector of CTV, and probably responsible for the destruction of millions of trees on sour orange in Brazil and Argentina during the 1940s and 1950s. CTV was first reported in Florida in 1952 and the first serious outbreak of quick decline was reported in 1975. The incidence of quick decline continued to increase throughout the state, spread through use of infected budwood and by the melon aphid, Aphis gossypii. Incidence was highest in the flatwoods, due in part to the prevalence of sour orange rootstock there. Most nurseries had discontinued use of sour orange rootstock by 1986 due to CTV.

The brown citrus aphid was first detected in Dade and Broward counties in the fall of 1995 and quickly spread the following spring and summer throughout coastal and south-central citrus growing regions. Given recent experiences with the aphid in Venezuela and Puerto Rico, it was predicted by some that widespread quick decline of trees on sour orange could be expected within 4 to 5 years. However, this prediction did not take into account the high levels of CTV already present in Florida. According to a Department of Plant Industry survey in 1994, severe strains of CTV were present in 23 percent of a random sample of trees in the Gulf region, the highest in the state. Most of the infected trees were on tolerant rootstocks and therefore showed no disease symptoms.
Innokalee also had the highest number of BCA captures in its 26-foot-high suction trap compared to four other locations throughout the citrus belt. So the stage was set to unleash a firestorm of virus on the 20+ percent of trees budded to sour orange.

Our observations of increased CTV last spring were confirmed by polls taken during grower meetings. More than 80 percent of Gulf and Indian River growers reported a sharp upswing of quick decline on sour orange whereas less than 15 percent of growers in Central and North Central Florida areas responded positively. Probably within its first full season here (1996), the BCA was able to move the virus around to uninoculated trees. It took another year for the inoculum to distribute within the trees, and a third year before the first noticeable symptoms appeared. With this scenario we could expect more losses in Southwest Florida in spring of 1999 and perhaps begin to see some losses in more northern locations of the state.

None of this would be a surprise to savvy growers except possibly the rapidity with which quick decline has come upon us. Most had already written off their citrus on sour orange to the tune of about $500 million statewide. Fortunately, there has been ample warning and steps have been taken to protect the industry from the aftermath of quick decline, historically followed by a rash of graft-transmitable diseases like psorosis and exocortis in the rush to replace dead trees. A mandatory budwood certification program has been put in place through the combined efforts of the Florida Department of Agriculture, Florida Citrus Nurserymen's Association, and concerned growers and scientists. The program mandates regular testing of all budwood sources for disease-causing viruses and viroids, including CTV.

Even though quick decline is widespread, it is necessary to prevent still rare “stem-pitting” strains of CTV from entering the budwood stream. Stem-pitting can cause debilitation and reduced yields regardless of budwood variety and represents a long-term

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CIRCLE NO 3
February 1999 / CITRUS & VEGETABLE MAGAZINE 9
threat to the industry. Unfortunately, the current MCA-13 ELISA test for severe CTV does not distinguish between quick decline and stem-pitting strains. The Citrus Budwood Technical Advisory Committee Scientific Working Group met on Dec. 10, 1998 to discuss emerging diagnostic testing technology that may eventually replace the MCA-13-based testing. Several new methods of testing for stem pitting strains of CTV have been developed, but require extensive trials before being considered as replacements for MCA-13. Hopes are for a new test by the year 2000.

Through June, 1998 nearly 3 percent of the state's foundation budwood was cut from the Immokalee Budwood Foundation Grove. Every tree has been tested annually for CTV since the grove was planted in 1989. Those testing positive have been removed, 1.2 to 1.4 percent from 1990 to 1996. Because of the imminent threat, testing frequency was increased and the infection rate in fall 1997 was found to be 4.2 percent. By spring of 1998, trees infected with severe CTV had increased to 5.5 percent, and now in fall 1998 the percentage has increased to a whopping 66 percent on the first 20 percent of trees tested. It is not known if some of the trees testing positive for MCA-13 are infected with stem-pitting strains of CTV, so the Southwest Florida Research & Education Foundation that administers the grove has imposed a moratorium on budwood cutting, at least until new testing procedures are in place. Indeed, there are some that think all foundation budwood should be grown tristeza-free, since this is the only way to guarantee no stem-pitting. Tests to distinguish among CTV strains could be applied to commercial budwood from nursery increase blocks, which at present can be grown for only 24 months.

CTV-free foundation budwood would have to be physically protected from aphids, either in a screenhouse, by removal from the commercial citrus growing region or both. The Southwest Florida Research & Education Foundation has already taken steps to do this by building a 6,336-square-foot screenhouse in Immokalee. The screenhouse has been planted with 63 trees of the most popular citrus varieties and should be producing CTV-free budwood by mid-1999 for nursery increase blocks. Other public and private screened facilities in the state are already producing clean budwood. However, there's probably no way to avoid a budwood crunch the next few years unless new CTV detection techniques are approved. Nevertheless, the industry will survive this crisis, as it has many others, and probably be stronger for it in the long run.
Tristeza Threatens Florida's Budwood Supply
Citrus Industry, April 1999

By Phil Stansly, Bob Rouse, Richard E. Lee and Michael C. Kesinger

Florida's citrus industry could be headed for a critical shortage of registered budwood due to citrus tristeza virus (CTV). High incidence has already resulted in a moratorium on budwood cutting from the foundation grove in Immokalee. It is likely that the same fate awaits all outdoor registered budwood source trees in the state within the next few years, especially in areas where CTV is prevalent.

Partly in anticipation of the aphid's arrival, nurserymen approved a mandatory certification program in 1997 that requires all budwood sources to be tested annually for strains of CTV causing decline on sour orange (CTV-D). The virus is spread by movement of infected trees or budwood and by aphids, especially the brown citrus aphid (BCA) Toxoptera citricida. BCA was first detected in Dade and Broward counties in the fall of 1995 and is now present throughout the state. Insecticidal control of aphids would provide insufficient protection to guarantee CTV-free budwood, so screenhouse or greenhouse facilities would be required. Screenhouses for aphid exclusion could also protect against other vector-borne pathogens such as CVC and greening that may someday occur in Florida.

Less than one million buds are currently provided annually from screenhouses in private and public hands. More screenhouse space dedicated to budwood production is urgently needed to supply the present demand of six million nursery trees annually, plus an expected 20 million over the next five years to replace losses from quick decline. A severe freeze could raise annual demand as high as 20 million trees.

NATURE OF CTV

CTV occurs in many strains that produce a multitude of effects to citrus. CTV-D results in decline and death of trees on sour orange rootstock by causing girdling at the bud union. The most severe strains (CTV-SP) cause stem-pitting on sweet orange and/or grapefruit, regardless of rootstock. Trees become weak with poor fruit set and small fruit. Damage cannot be controlled by use of tolerant rootstocks because the scion is affected. Some strains of CTV are mild (CTV-M) and cause no noticeable effects on citrus, or may even prevent expression of symptoms from CTV-SP or CTV-D.

HISTORY OF CTV IN FLORIDA

CTV-D was first reported in Florida in 1952 after surveys were spurred by news of devastation in Brazil and Argentina. However, few outbreaks of CTV decline were reported during the 1950s and 1960s, although incidence increased steadily. Lacking a discriminating test for CTV-D and fearing a budwood shortage, the Florida budwood program discontinued removal of CTV-infected trees from registered status. High demand during the expansion years of the 1970s and freeze years of the 1980s was often met with sub-standard budwood. A third of registered budwood source trees surveyed in 1984 were found infected with CTV-D.

CTV decline spread by movement of infected nursery stock and aphids then present in Florida became increasingly frequent. Propagation on sour orange was
largely discontinued by 1986, although an estimated 20 percent of citrus trees in the state are still on this rootstock. New regulations in 1990 allowed use of high density increase blocks of one or two-year old trees grown expressly for rapid production of budwood. With onset of mandatory registration, all budwood used legally in the state must come from sources tested regularly for graft transmissible pathogens.

Sharp increases in quick decline were noted last year during the stress periods of late spring and early summer, especially in southern and coastal regions. Warm winters favor BCA survival in these areas, and incidence of decline strains was already 20 percent or more in trees sampled at random in 1994 by the state's Division of Plant Industry (DPI). Widespread losses might be anticipated this year, and ultimately, all citrus on sour orange in the state is expected to die.

**WHY WORRY?**

Stem pitting poses an even worse long-term threat to the industry than quick decline. CTV-SP could become common within 10-15 years as it did in the wake of BCA in South Africa, Australia and Latin America unless movement of infected budwood is controlled. CTV-SP strains appear to be rare in Florida but may be masked by mild strains. An infected budwood tree could spread CTV-SP inadvertently throughout the citrus growing region. The mandatory budwood registration program attempts to reduce this risk by requiring all commercial budwood sources to test free of severe CTV annually. Unfortunately, the current MCA-13 ELISA test does not differentiate between CTV-D and CTV-SP strains and may not catch all stem-pitters. However, most outdoor budwood sources will probably test out the program before CTV-SP becomes prevalent.

**BUDWOOD PRODUCTION**

The current demand of six million buds depends on source trees maintained by commercial nurseries and, to a lesser extent, state agencies. Most are field trees (68 percent) or outdoor increase blocks (25 percent) and subject to inoculation of CTV by aphid feeding. Although some increase blocks are propagated from screenhouse-grown trees, approximately six percent of the budwood being used for new nursery trees is protected from aphids in screenhouses. It is illegal to propagate from any tree found positive to the annual MCA-13 test to restrict the entry of severe strains of CTV into the budwood supply. Therefore, movement of CTV by BCA could soon render most of the field budwood source trees unusable. The challenge is to find a suitable means to supply present and future budwood needs without scrapping the current program or encouraging indiscriminate use of questionable budwood sources.

**OPTIONS AND ALTERNATIVES**

One solution to the budwood dilemma might be to develop and/or adopt other new tests that screen for only stem-pitting CTV since we are no longer trying to save trees on sour orange. Such a test would need to be inexpensive, rapid and catch all stem-pitting CTV. Improved tests are being developed but should never be judged 100 percent reliable.

Another resolution would require all source budwood to be CTV-free. Source trees would be maintained in screenhouses and tested regularly to verify absence of all
CTV, the simplest of all tests. The problem is insufficient greenhouse capacity, presently about two acres among five commercial nurseries and two agencies (DPI & the Foundation in Immokalee). Existing sources could generate about two million buds annually, assuming 5,000 buds per mature tree per year, 105 ft²/tree and 50 percent space devoted to high use trees. This scenario would leave us four million buds short in a low demand year and eight million buds short of expected demand to replace trees lost to quick decline. Furthermore, it would take eight to 10 years to produce even two million buds since most of these screenhouses are presently occupied with young trees.

A modification of this plan might be to augment screenhouse production from mature trees with screened increase blocks. The 1997-98 annual report of the Bureau of Citrus Budwood Registration cites 18 buds and 67 buds being cut the first and second year, respectively, from increase block trees. An acre of screenhouse could potentially produce 1.5 million buds within two years. The existing budwood rule does not allow use of screenhouse increase trees to establish additional increase block trees. The rule could be amended to produce nursery trees from a secondary increase block or the trees propagated from the secondary increase block could only be sold as validated. With this scenario, supplies of CTV-free budwood could be normalized within the next few years with more screenhouses to supply source material.

Stansly and Rouse work at the University of Florida/IFAS Southwest Florida Research and Education Center in Immokalee, Lee at the UF/IFAS Citrus Research and Education Center in Lake Alfred, and Kesinger at the Division of Plant Industry in Winter Haven.
Questionnaire: Scale Incidence in Florida Citrus During 1998
Polk County, 18 Mar. 1999
In order to assist you and reduce scale problems in Florida, please answer all the
questions to the best of your ability and return to Phil Stansly on 18 Mar. or Tom Oswalt
ASAP.

Name: _________________ Phone Number __________ Company __________

Circle or check appropriate answers.

Occupation: Grove Owner Grove Manager Consultant
Salesperson Other ________________

Did you see any scale problems in citrus during 1998? Yes No

If so, how did these problems compare to the previous year?
Much worse worse same not as bad not sure

Which scales did you see most of?
Purple Black
Florida Red Green
Chaff Brown
California Red Not sure
Yellow Other ________________
Snow

On which varieties did you note problems?
Murcott Red Grapefruit Hamlin
Sunburst White Grapefruit Midsweet
Fallglo Valencia
Other Mandarin Other orange ________________

Name & location, including the County, of affected groves or blocks: ________________________________

Which chemicals were included in spray programs used in affected blocks?

AgriMek Lorsban Temik Copper
Vendex Ethion Oil Benlate
Nexter Supracide Aliette
Kelthane Sevin Other fungicide
Comite Other insecticide
Carzol ________________
Other miticide ________________