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*Proc. Fla. State Hort. Soc.* 103:78-82. 1990.

## OBSERVATIONS ON THE SPREAD OF BLIGHT IN MATURE ORANGE GROVES ON THE RIDGE

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**Abstract.** A series of aerial photographs taken by the Florida Agricultural Statistics Service graphically shows the pattern of the spread for blight in two groves over a 12-year period. The groves are located on extremely sandy ridge soil, planted to very few trees per acre, by today's standards. They received regular grove care but were essentially non-irrigated. Zinc analysis from the wood of blighted and healthy trees confirmed that blight was the problem in these groves.

At Frostproof, blight first developed in two areas on opposite edges of the grove. In a period of 12 years, blight spread from these two areas to encompass approximately 90% of the grove. At DeSoto City, blight first developed in scattered trees along opposite sides of the grove and rapidly spread toward the center.

In Florida, citrus blight is the most serious disease that we have at this time. Blight was reported in Florida 100

years ago (11) and it was the primary reason Dr. W. T. Swingle and Dr. H. J. Webber established a U.S.D.A. laboratory in Eustis in 1892 (13). In the past decade, blight or a blight-like disease has been reported in Brazil, Argentina, Australia, Uruguay, Cuba and South Africa (18).

### General Observations on Citrus Blight

It is my belief that the individual tree symptoms of blight have not changed over the years, but the pattern of spread was much easier to see in the 1960's than it is today. In the early days before diagnostic tests for blight were developed, such as water flow (4), zinc accumulation in the wood (12), water-soluble phenolics (16) and xylem amorphous plugs (2, 6, 15, 17), visual symptoms were used. This is not ideal from a scientific point of view, but few scientists who have worked with blight have trouble identifying it by visual symptoms (8, 11, 18).

During the late 1960's and 1970's the problem was referred to as sandhill decline, young tree decline or rough lemon decline, to name a few. Eventually, it was agreed that the problems had already been described and called blight in the late 1890's (11).

*Proc. Fla. State Hort. Soc.* 103: 1990.

The first time blight was called to my attention was in 1965, by our Groves Production Manager. The most unusual thing about the problem was that it was occurring in our first registered scion grove, planted in July 1955, which was the fourth scion block registered by D.P.I. The trees for the scion block had actually been grown by the Dr. Phillips organization at Sand Lake southwest of Orlando by Dr. Rubert Prevatt, who is now Director of the Citrus Institute of Florida Southern College (R. Prevatt, F.S.C., personal communication). The Dr. Phillips organization was essentially a self-contained operation utilizing seed from their own rough lemon trees at Sand Lake and selecting budwood from outstanding trees in their fine groves. The old Minute Maid Company bought Dr. Phillips in the early 1950's. The registered nursery trees were used to establish the scion block in the Swann Grove, which is between Avon Park and Wauchula. A small scion block was also established at the old nursery site at Sand Lake. After showing the problem to several pathologists with no one knowing what the problem was, we contacted D.P.I. I visited all of the parent trees with Charles Youtsey and Don Bridges, who was head of the Budwood Certification Program, and those trees showed no signs of blight.

In late 1966, blight showed up in the Sand Lake scion block; therefore, I made a survey of other old Dr. Phillips groves we had obtained. Blighted trees were found in many of the groves that had received trees from the Sand Lake nursery. They included Emma Jane Grove and Seaboard Grove in Pasco County, Cee Bee Grove and Lake Nursery Grove in Lake County and Del Ora Grove in Pinellas County. The other Company grove in which blight developed during this time was the Cloud Grove at Ft. Pierce, where we had used many thousands of budeyes from the Swann Grove scion block. All of this information certainly indicated to me that trees could carry the problem with them when they were moved. From the scattered resets the disease spread to surrounding trees. Resets, I believe, could account for many of the seemingly random locations of blight in mature groves. This was definitely the case in a 55 year old family-owned Hamlin grove on rough lemon in Seminole County.

The other location in groves where blight often started was on the perimeter, often next to a wooded area or next to roads or canals. Often, wild grapevines with Pierce's disease grew near the perimeter of these groves (7, 9). Another observation made by the author during this period was that the first occurrence of blight usually developed in the most vigorous and fastest growing block in the grove. This often was a young block, which probably led to the name 'young tree decline'. This observation was valid in the two center rows on the four row beds of East Coast groves where the center rows grew faster than the side rows (3).

#### Spread Within Two Mature Groves on the Ridge

The Florida Agricultural Statistics Service flies the citrus area of the state every 2 years on clear days in the winter and photographs the citrus groves in the state. I used these photographs to study the spread of blight in two groves. The Hickory Lake Grove of 44 acres was located in south Polk County near Frostproof on sandy soil and was 50 to 60 years old. The trees were 'Hamlin' and 'Valencia' sweet orange (*Citrus sinensis* (L.) Osb.) on rough

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lemon (*C. jambhiri* Lush) rootstock planted on a 25 ft. x 30 ft. spacing (58 trees/acre). It had received normal grove care with minimal irrigation. Blight was diagnosed as the cause of tree loss in this grove, and in the Tyree Grove, by analysis of zinc in the wood. Company records show that prior to blight, production in the Hamlin block averaged 600 boxes per acre.

In 1965, there was no blight in the grove (Fig. 1). The 'Valencias' in the south portion of the grove were smaller than the 'Hamlins' in the north. In Dec. 1969, blight was developing along the clay road on the east side where the 'Valencias' and 'Hamlins' meet. By Nov. 1971, this area had expanded and a second area had started on the west side next to the woods. A general loss of trees had also started along the north side next to the woods. Over the next six years these three areas of blight continued to expand and by Nov. 1977, there were only two areas of producing trees left. In 12 years after blight was first observed, there were very few original trees left in the grove. The spread had been primarily from two areas on the grove margin, which continued to expand in a uniform pattern.

The second grove of 90 acres was the Tyree Grove located in Highland County near DeSoto City. It was approximately 35 years old. The trees were 'Valencia' and 'Pineapple' sweet orange on rough lemon rootstock planted on a 30 ft. x 30 ft. spacing (48 trees/acre) on very sandy soil. It received normal grove care with minimal irrigation and was severely damaged in the 1962 freeze.

In Nov. 1969, blight had begun to develop in the northeast and southeast corners of the Tyree Grove (Fig. 2). During the next two years, these two areas became larger and quite distinct. A few smaller areas of missing trees due to blight were also visible along the east side of the grove. In the Dec. 1973 photograph, the blight areas on the east side had expanded considerably and blight hotspots were also developing along the west side of the grove, especially in the southwest portion where 15 acres of 'Pineapple' oranges were located. Two years later, tree loss from blight was severe all along the east side and the blight area along the west side had become quite large. By Dec. 1977, blight had begun to develop in the northwest and continued in the southwest corner of the grove and only a few healthy trees were left along the east side (Fig. 2 - continued). The interior part of the grove still consisted of mostly healthy trees. Finally, by Nov. 1981 blight had moved in from the east, north and west, leaving little of the original grove. From the preceding photos, one can see the uniform spread of this disease through the grove (5, 18). Whether the spread was primarily through root grafts (14) or through vectors such as sharpshooters (7, 10) is unknown.

In another study, reduction in the rate of spread of blight has been achieved when sharpshooters were controlled during two peak periods that the bacterium *Xylella fastidiosa*, was present in the above ground portions of the tree (1). While this is helpful, it is not effective enough to keep the production of the grove profitable. The only method a grower has available to keep his production up is to pull the blighted tree and replant, many times with two trees instead of one. This method of keeping the grove in production has been extremely difficult during the past decade because of frequent freezes. A satisfactory method of blight control is yet to be developed even though the problem has plagued the citrus industry in Florida for 100 years.

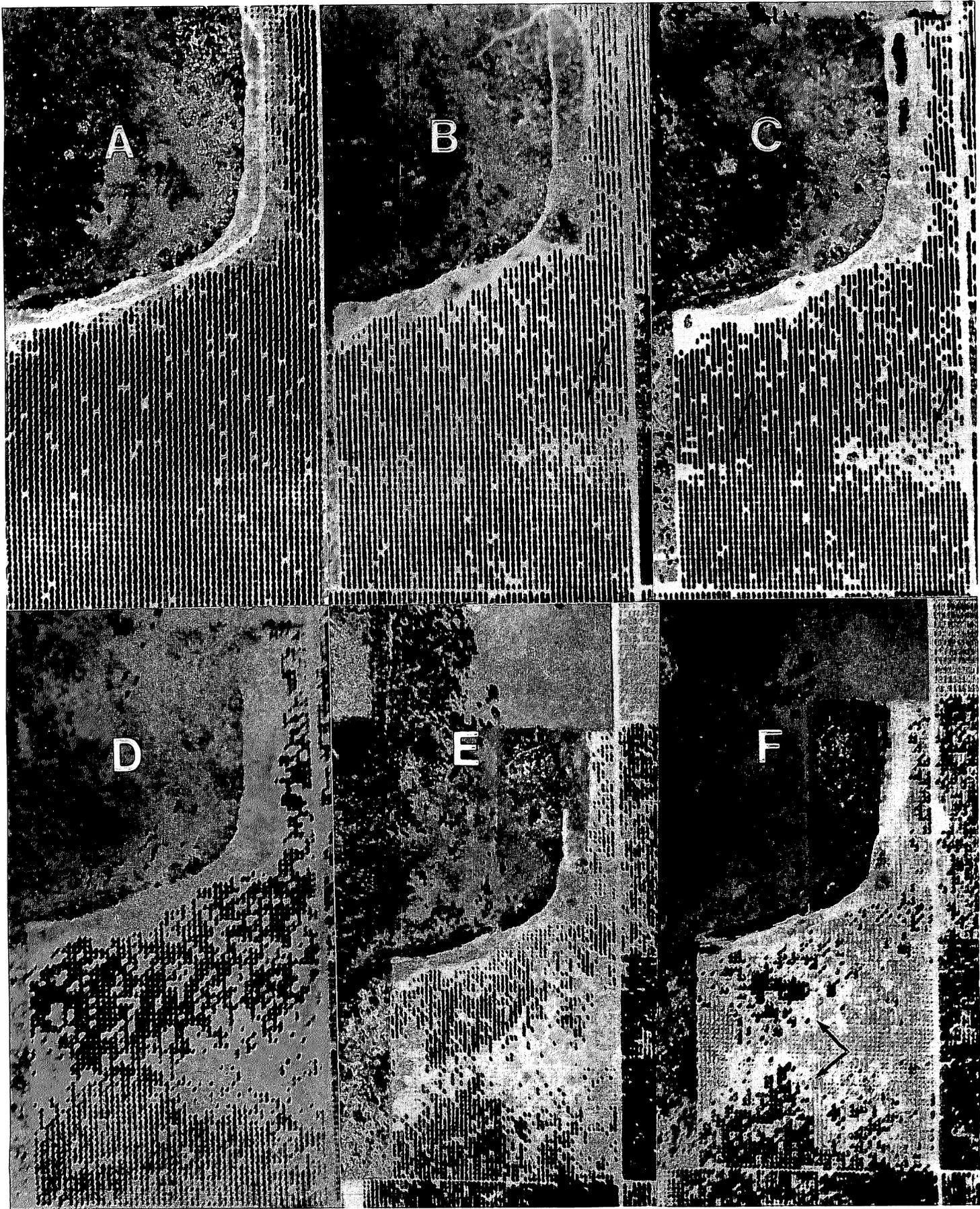


Fig. 1. Hickory Lake Grove A) Aerial photo of Hickory Lake Grove in Dec. 1965 before blight. Scattered missing trees primarily due to footrot. B) Dec. 1969 blight has started. C) Nov. 1971. D) Nov. 1973. E) Nov. 1977, 4 years later. F) Nov. 1981. The blight has spread unrandomly from a few trees in 1969 to loss of grove by 1981. A) Nov. 1969 aerial photo. Freeze effects from 1962 still visible but blight started in northeast and southeast corner of grove. B) Feb. 1972. C) Dec. 1973, new area starting in southwest corner of grove. D) Nov. 1975.

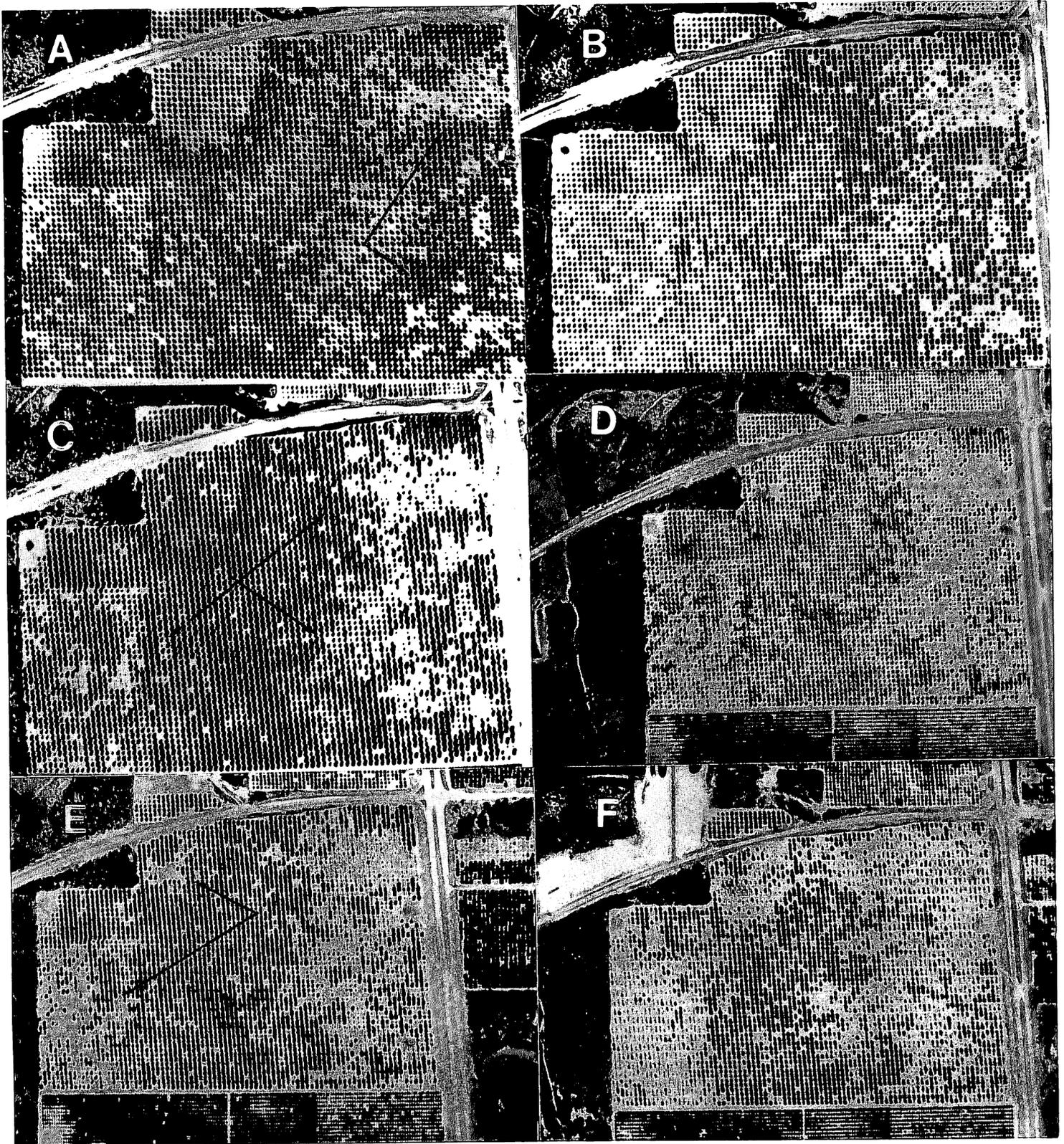


Fig. 2. Tyree Grove. A) Nov. 1969 aerial photo. Freeze effects from 1962 still visible but blight started in northeast and southeast corner of grove. B) Feb. 1972. C) Dec. 1973, new are starting in southwest corner of grove. D) Nov. 1975. E) Dec. 1977 aerial photo. F) Nov. 1981, only a small area in middle of grove left with good trees in it. Grove lost to blight in 12 years.

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*Proc. Fla. State Hort. Soc.* 103:82. 1990.

## BIOLOGICAL PROPERTIES AND APHID TRANSMISSION OF SOME SEVERE CITRUS TRISTEZA VIRUS ISOLATES FROM DECLINING CITRUS TREES ON SOUR ORANGE ROOTSTOCK.

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*Additional index words.* virus indexing, ELISA

*Abstract.* Citrus tristeza virus (CTV) isolates were collected from groves severely affected by quick decline or dwarfing on sour orange rootstock and were biologically indexed by graft inoculation to five indicator citrus hosts. Most of isolates showed severe stunting and leaf flecking on Mexican lime. Typical seedling yellows reactions on Duncan grapefruit and sour orange, and stunting on Valencia on sour orange and Madam Vinous indicator plants were observed. Stempitting symptoms were not observed on Duncan grapefruit or Madam Vinous. All the isolates were readily transmitted by *Aphis gossypii*.

*Proc. Fla. State Hort. Soc.* 103:82. 1990.

## EVALUATION OF THE USE OF MILD STRAINS OF CITRUS TRISTEZA VIRUS TO MAINTAIN MATURE CITRUS TREES ON SOUR ORANGE ROOTSTOCK

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*Additional index words.* cross protection, tristeza decline

*Abstract.* An experiment was established to evaluate the condition of 15 year old trees on sour orange rootstocks located in an area undergoing tristeza quick decline after inoculation with two mild strains of citrus tristeza virus (CTV). Seven trees were graft inoculated using blind buds with each mild CTV strain (strains T30 and T26), and seven control trees left

noninoculated. All trees were infected with endemic CTV at the time of inoculation with the mild strains but appeared healthy. Using the double standard RNA analysis, it was found that mild strain T30 had become distributed in the inoculated trees after six months. Trees were evaluated 18 months after inoculation using a scale whereby 0 = healthy to 4 = dead tree. The average rating of control trees was 3.25 with 2 trees dead; T30 inoculated trees averaged 2.32 with 1 tree dead; and T26 inoculated trees averaged 1.78 with no trees dead. While the results are suggestive that some benefit may have been realized by the inoculation of these mild CTV strains into mature trees, further testing of this control method is needed.