

Citrus Decline Virus

vein clearing and stem pitting as diagnostic symptoms shorten tests

J. M. Wallace and R. J. Drake

Consistent, diagnostic symptoms of citrus quick decline in California have been identified as leaf vein clearing and stem pitting. The symptoms can be induced in a relatively short time, and on seedling plants.

Lime seedlings developed these symptoms within four to seven weeks after inoculation, in contrast to a period of several months usually required for the appearance on budded trees of symptoms similar to those of severely girdled trees.

Studies of quick decline have been slowed by the absence of a specific top symptom, and the necessity of using budded or grafted trees of susceptible stock-scion combinations. Now, lime seedlings will be available for short-time tests and be of particular value as indicator plants in insect vector studies.

Leaf Symptoms

In the search for a leaf symptom of quick decline, seedlings of many different citrus species and varieties were inoculated by the insertion of buds from sweet orange trees known to be infected with quick decline.

The young leaves of some of the inoculated seedlings of certain varieties showed faint vein-clearing at times, but it was not established with certainty that such symptoms had been induced by the quick-decline virus.

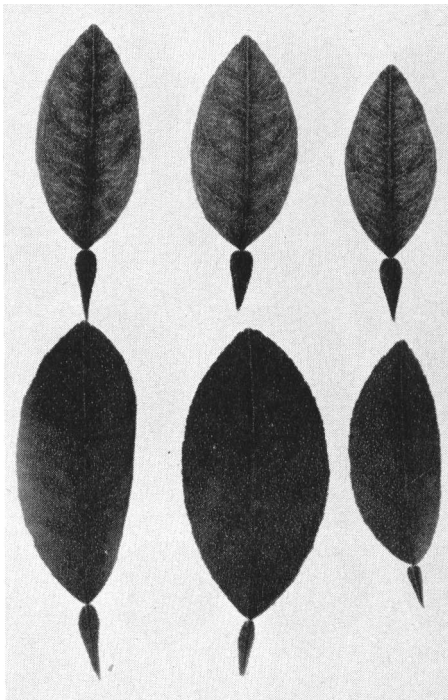
Later, large numbers of young seedlings of West Indian—the Mexican—lime were inoculated by means of tissue grafts from quick-decline-affected trees in southern California. At the time of inoculation the tops of the lime seedlings were cut off, to force new leaf growth from axillary buds. On many plants the first leaves that developed after the top was removed were small, chlorotic, and slightly cupped. As these leaves aged they became somewhat mottled and frequently showed slight vein clearing. Leaves that formed later were usually only slightly paler than normal, but many manifested a conspicuous vein clearing typical of certain other virus diseases and similar in many respects to the young-leaf symptoms of psorosis on citrus.

Inoculations of lime were made from several different quick decline sources to eliminate the possibility that the trees furnishing inoculum in the first tests had

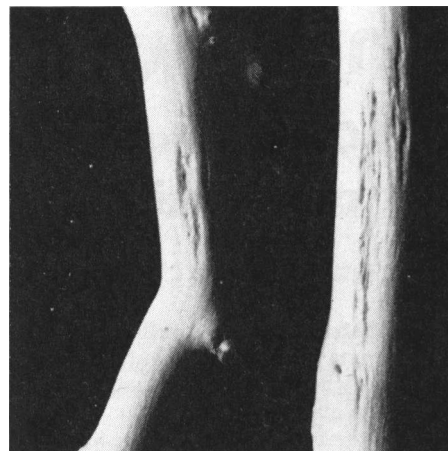
been infected also with one of the strains of psorosis, or some other unknown virus. At the same time other lime seedlings were inoculated with the psorosis virus to compare the leaf symptoms of the two diseases. Results of these tests showed that the symptoms developing on lime after inoculation from quick-decline trees differed from those induced by the psorosis virus.

Lime seedlings inoculated by means of tissue grafts from several symptomless and supposedly virus-free citrus sources outside the quick decline area failed to reveal the presence of any latent or undetected viruses in any of the sources tested.

Transmission tests were made with the melon aphid—*Aphis gossypii* Glover—a vector of the quick-decline virus. About 80 aphids that had fed for two days on diseased limes were caged on a group of 30 young lime seedlings which averaged two inches in height. After four weeks some of the seedlings appeared to be diseased. At seven weeks from the time of inoculation, nine of the plants showed symptoms of disease and as the plants



Upper. Vein clearing on young leaves of Mexican lime seedlings inoculated with the virus of quick decline. Lower. Symptomless leaves from healthy plants.



Slightly enlarged view of main stems of Mexican lime seedlings with bark removed to show stem-pitting symptoms resulting from infection with the virus of quick decline.

became larger, the symptoms were indistinguishable from those obtained earlier on somewhat older plants that had been infected by tissue grafting. Transfers were made from the lime seedlings that had been infected either by tissue grafts or by aphid to sweet orange on sour root-stock trees and these test trees inoculated from both sources developed quick-decline symptoms typical of the sweet on sour combination.

Stem Pitting

Many of the lime seedlings that had shown leaf symptoms after inoculation from quick-decline sources were examined for pitting of the trunks and branches. Externally, the small plants showed no abnormal bark conditions, but when bark was stripped from the trunks of the diseased plants nearly all of them showed numerous small pits or longitudinal depressions in the outer wood.

Recent independent investigations in California and other citrus producing areas seem to demonstrate conclusively that stem-pitting of grapefruit in South Africa, the lime disease in West Africa, tristeza in South America and quick decline in California are caused by the same virus, though the strains of the virus may vary in different localities.

Earlier observations indicated that quick decline affected only budded trees of certain combinations of scion and root-stock. Later research demonstrated that the same virus can also induce specific symptoms on seedlings of certain citrus species which differ widely from the reactions of susceptible budded combinations. It now seems established that what were thought to be three distinct diseases are merely variations in reaction of different hosts or host combinations—scion and stock—to infection with the same virus.

Previously established ideas of control or prevention must be revised. It was be-

Continued on page 16

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VIRUS

Continued from page 7

lieved that seedling trees of commercial
varieties would not be affected—and that
injury could be avoided in new plantings
of budded citrus trees—by the use of
scion-stock combinations that were not
susceptible to the breakdown of the
phloem sieve tubes in the vicinity of the
bud union which caused the girdling-like
effect of diseased trees. The threatened
destruction of the lime industry in West
Africa which consists largely of seedling
trees, and the decline of grapefruit trees
in South Africa from the stem-pitting
form of the disease disproved these
earlier ideas.

Preventive control of citrus quick de-
cline is much more complicated than was
formerly believed.

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*The above progress report is based on Re-
search Project No. 1376.*

CORRECTION

In the article, *Apricot Harvest Predictable*,
published on page 3 of the March, 1951 issue
of CALIFORNIA AGRICULTURE, the first
formula used in the harvest prediction method
should read:

$$r = \frac{\sum xy}{\sqrt{\sum x^2 \sum y^2}}$$

Example, using data from the table in the
original article:

$$\frac{-9,840.76}{\sqrt{117,344,385.6576}} = -0.908.$$

In the second formula,

$$E = \bar{y} + \frac{\sum xy}{\sum x^2} (X - \bar{x}),$$

E is the predicted number of days between full
bloom and harvesting time.



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