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Susceptibility of Citrus Varieties to Leaf-Curl Virus

A DISEASE of citrus trees in Brazil causing curling of the leaves, dieback of branches, and general decline was described by the author in 1959 (3, 4). The virus nature of the disease was proved by transmission tests and it was named leaf-curl disease of citrus, because its most striking symptom is curling of the leaves in a manner similar to that on young sprouts affected by heavy infestations of aphids (Fig. 1). The disease is locally called "crespeira dos citros," which also means curling of leaves of citrus trees.

This paper reports additional studies on this disease to determine the susceptibility of different citrus varieties to the leaf-curl virus, and some attempts at mechanical transmission.

Transmission to Citrus Varieties and Species

In the spring of 1961, a series of transmission tests was carried out by inoculating 13 citrus varieties and species with the leaf-curl virus. One-year-old nursery trees were selected for this experiment. They were all from nucellar lines, except the Vermelha shaddock, which is monoembryonic. Five of ten trees of each variety or species were inoculated below the bud-union with a bud from a diseased tree. Twenty days later all trees were severely pruned and sprouts were allowed to grow. The source of inoculum was a diseased Caipira sweet orange seedling previously infected with the leaf-curl virus.

Symptoms of the disease appeared two to five months later in the new growth of inoculated trees. None of the non-inoculated trees, kept as controls, showed any leaf-curl symptoms. In the following list, the

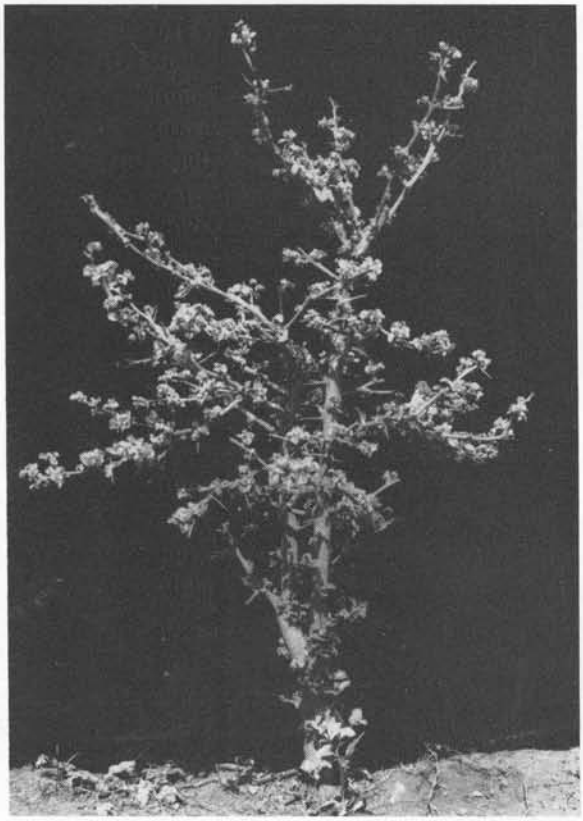

FIGURE 1. *Symptoms of leaf-curl virus on an inoculated Caipira sweet orange seedling.*

numeral after the variety name represents the number of seedlings of five inoculated that developed symptoms:

Baianinha sweet orange [*C. sinensis* (L.) Osbeck]	5
Hamlin sweet orange	3
Pera sweet orange	5
Dancy tangerine (*C. tangerina* Hort. ex Tanaka)	0
Mexirica tangerine	4
Marsh seedless grapefruit (*C. paradisi* Macf.)	4
Doce citron (*C. medica* L.)	2
Comprida citron	3
Eureka lemon [*C. limon* (L.) Burm. f.]	4
Siciliana lemon	5

Galego lime [*C. aurantifolia* (Christm.) Swing.]	5
Lima da Persia sweet lime (*C. limettioides* Tanaka)	1
Vermelha shaddock (*C. grandis* Osbeck)	3

In another test, five young trees of nucellar Baianinha sweet orange on Rangpur lime, Caipira sweet orange, and Cleopatra tangerine, respectively, were similarly inoculated with the leaf-curl virus by budding 3-5 bark pieces into the main trunk. The trees were subsequently severely pruned. All trees developed symptoms of the disease regardless of the rootstock. Five non-budded seedlings of Rangpur lime, Caipira sweet orange, Cleopatra tangerine, and sour orange were inoculated with the leaf-curl virus. Many inoculating buds were used. All five seedlings of the Caipira sweet orange and all those of sour orange showed symptoms of disease. They were all dead one year after inoculation. None of the Rangpur lime or Cleopatra mandarin seedlings showed any symptoms.

One 25-year-old Baianinha sweet orange tree on Caipira sweet orange rootstock, of an old line, known to be carrying at least the exocortis, psorosis, and tristeza viruses was inoculated with many infected buds. Two years later some branches were showing symptoms of the leaf-curl disease. At that time, this tree was severely pruned. The new growth was very weak and exhibited the characteristic leaf curling of leaves, followed by a heavy bloom.

Mechanical Transmission

An attempt was conducted to transmit the leaf-curl virus by mechanical means. The technique used was that recently described by Grant and Corbett (1, 2). Seedlings of Caipira sweet orange at the 5-leaf stage were used. Extracted juice from young leaves taken from diseased trees was used as a source of inoculum, and juice from young leaves of a healthy tree was used for control. The experiment was repeated many times, varying the dilution of the extract but no positive infection was obtained.

Discussion and Conclusions

It was shown that the leaf-curl virus can affect a large number of citrus varieties and species including: 4 varieties of orange, 2 varieties of tangerine, 2 varieties of citron, 2 varieties of lemon, 1 acid lime, 1 grapefruit, 1 sweet lime, 1 shaddock, and 1 sour orange. Apparently, Rangpur lime (*C. limonia* Osbeck) and Cleopatra tangerine (*C. reshni* Hort. ex Tanaka) are resistant to the virus or tolerate it. Thus, it is apparent that

most citrus varieties grown commercially in Brazil are susceptible to the leaf-curl virus. The failure of some inoculated trees to show symptoms seems to indicate an uneven distribution of the virus in the sweet orange tree used as a source of inoculum. Uneven distribution of a virus in a citrus tree has been reported to occur with the exocortis and xyloporosis viruses in Brazil, where tristeza virus is present in practically all citrus trees (5, 6). The very small number of diseased trees found in the field suggested that its insect vector, if one exists in Brazil, is inefficient.

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