D. C. GIACOMETTI

Reaction of Sweet Lime to Seedling Yellows, Exocortis, and Xyloporosis Viruses

THE SUSCEPTIBILITY of sweet lime (*C. limettioides* Tanaka) to xyloporosis was first reported by Reichert and Perlberger (9) in 1934 in Palestine and subsequently in 1938 by Moreira (6) in Brazil. Grant, Costa, and Moreira (4) included sweet lime among the rootstocks that are susceptible to tristeza. Weathers and Calavan (11) first suggested its susceptibility to exocortis. The reaction of sweet lime to tristeza seedling yellows has not been previously reported.

The objective of the investigation herein reported is to compare the reaction of sweet lime, the main rootstock used for Shamouti sweet orange [*C. sinensis* (L.) Osbeck] in Israel (5) and in the Bella Vista citrus area of Argentina (2), to tristeza seedling yellows, exocortis, and xyloporosis.

Materials and Methods

Seedlings of sweet lime, six months old, under screenhouse conditions, were bud-inoculated with exocortis, xyloporosis, and mild and severe strains of tristeza viruses. Sour orange (*C. aurantium* L.) and Eureka lemon [*C. limon* (L.) Burm. f.] seedlings were included in the investigation, but were inoculated only with mild and severe strains of tristeza virus. The severe strain of tristeza virus was obtained from a Key lime tree (*C. aurantifolia* Swingle) showing stunting and massive stem pitting; this strain has been considered the most severe strain known in Brazil. The sources of exocortis and xyloporosis viruses are considered to be free of tristeza virus as far as lime tests have shown. Two months after inoculation, all seedlings were cut back to a single main stem averaging

20 cm and the branches from these stems were measured in centimeters. Seedlings with the severe strain were reinoculated eight months from the first inoculation.

Results

1. Tristeza: (a) Seedling yellows—the severe strain of tristeza virus reduced growth as can be seen in Table 1. However, seedling yellows symptoms as described by Fraser (3) did not develop as they did in sour orange and Eureka lemon seedlings. Just a few scattered pits were observed. The reinoculation did not produce any change nine months later. (b) Mild strain—the sweet lime, sour orange, and Eureka lemon seedlings looked just like the controls.

2. Exocortis: Sweet lime seedlings had shown, 16 months after inoculation, reduced growth and bark splitting similar to the symptoms described by Weathers and Calavan (11) and Olson (8); the splitting was not so conspicuous as that described by Moreira (7) for Rangpur lime (*C. limonia* Osbeck) and the yellow blotches were not present.

3. Xyloporosis: Sixteen months from inoculation the seedlings did not show any reduction in growth when compared with the control. Very few pits and pegs were found.

TABLE 1. AVERAGE STEM GROWTH IN CENTIMETERS OF SWEET LIME SEEDLINGS FOLLOWING INOCULATIONS WITH EXOCORTIS, XYLOPOROSIS, AND MILD AND SEVERE STRAINS OF TRISTEZA VIRUS[a]

Tristeza		Exocortis	Xyloporosis	Control	Date Measured
Mild	Severe				
30.0	28.6	22.5	30.5	30.6	Nov. 6-62
104.6	84.6	86.0	103.6	104.6	July 5-63
74.6	56.0	63.5	73.1	74.0	8 months growth

[a]First inoculations were made on February 27, 1962.

Discussion and Conclusion

The severe strain of tristeza virus that causes massive stem pitting on lime and seedling yellows on sour orange and Eureka lemon reduces growth and produces some pits in sweet lime seedlings but not seedling yellows symptoms, which indicates that sweet lime is more tolerant to tristeza virus than sour orange and Eureka lemon. Considering the susceptibility of sweet lime to exocortis, it is very possible that the loss of a thousand trees budded on sweet lime rootstock a few years ago in

São Paulo (4) was caused by the presence of a severe strain of tristeza virus plus exocortis virus, as it has been demonstrated by Salibe (10) that trees on Rangpur lime rootstock are more severely affected by exocortis virus when tristeza virus is present.

Sweet lime has not been considered a good indicator plant for xyloporosis (1, 8) and the seedlings will take more than three years to develop good symptoms such as pits, pegs, and phloem discoloration. As a rootstock for sweet orange carrying xyloporosis virus, the sweet lime has been reported to decline after ten years in Israel (5) and Argentina (2).

Where tristeza is widespread, sweet lime probably will do better as a rootstock for tops that are carriers of a mild strain of tristeza virus and that are free of exocortis and xyloporosis viruses.

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