An Unreported Symptom of Tristeza

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IN 1965, the authors noted lesions on Mexican lime [*Citrus aurantifolia* (Christm.) Swing.] and Tahiti lime (*C. aurantifolia* hyb.) trees in the citrus area of Rio de Janeiro. These lesions or bark splits were attributed to exocortis virus because of their similarity to those described for exocortis-infected plants of other varieties, i.e., elliptical splits sometimes reaching 5 cm in length and occurring most frequently in the softest parts of the plant (4).

The relation of the lesions to exocortis infection was questioned when identical symptoms were observed in 5-cm high seedlings in a seedbed. The seedlings were not inoculated in any way.

Inspection of numerous nurseries where plants of these varieties were grown revealed that almost all plants showed splits in the bark and severe reduction in growth. The same condition was observed in young seedlings and on small plants still in the seedbed.

The possibility of the splits being caused by injuries or by insect toxins was considered, and a search was made for insects such as *Platytylus bicolor* (Le Pelletier and Serville), previously identified as the cause of false exanthema lesions (3). However, no injuries or insects could be implicated in this disorder. The fact that the lesions appeared only on these two varieties of citrus seemed evidence against the insect or injury hypothesis.

Methods

To investigate the infectious nature of the disorder, seedlings germinated in the screenhouse were inoculated with leaf pieces or buds from non-grafted plants with bark splits. The inoculated plants and the uninoculated controls were maintained in the screenhouse and dusted regularly to control insects.

Transmission tests with the aphid *Toxoptera citricida* Kirk. were also conducted. Aphids collected in the field were caged on seedling sour orange (*C. aurantium* L.) plants for 4 days. Afterwards, they were transferred to Mexican lime plants budded on Rangpur lime [*C. aurantifolia* (Christm.) Swing. hyb.] rootstock showing many bark splits (Fig. 1). These plants were obtained from commercial nurseries. The aphids were fed on the affected Mexican lime plants for 24 hours and were then

transferred to potted Mexican lime seedlings in the screenhouse. Twenty plants were insect inoculated, and 20 uninoculated plants served as controls. The latter were caged to prevent feeding by insects. After 8 hours of feeding, the index plants were dusted with Vamidothion to kill the aphids.

Results

In 7 of the 8 plants inoculated by buds or leaf pieces, splitting appeared in the bark after 45 to 65 days (Fig. 2). No symptoms similar to those described appeared on the uninoculated control plants in a period of 8 months. The inoculated Mexican lime plants also showed typical symptoms of tristeza—small, chlorotic, and slightly cupped leaves, which became mottled and showed vein clearing as they became older.

Sixteen of the 20 Mexican lime plants inoculated with aphids showed bark splitting after 55 days, and 17 plants showed leaf symptoms of tristeza in the same period. All the plants that developed bark splitting also showed leaf symptoms of tristeza.

Discussion and Conclusions

At least two possible causes of bark splitting must be considered, exocortis and tristeza. Since this symptom (6) has been attributed to exocortis previously, that aspect is discussed first.

FIGURE 1. *Bark splitting on twigs of Mexican lime budded on Rangpur lime.*

EXOCORTIS.—The high incidence of bark splitting observed in ungrafted seedlings suggests that exocortis is not the cause of this disorder because only a low rate of transmission through the seed has been reported (4).

TRISTEZA.—Evidence that supports a causal relationship between bark splitting and tristeza virus may be enumerated as follows: (a) The high incidence of bark splitting in uninoculated seedlings in the field where they are exposed to aphids; (b) the high incidence of bark splitting in plants budded with nucellar lines or seedling lines; (c) the absence of insects that could cause such symptoms directly by toxins or injuries; (d) the transmission of the causal agent by grafting and by aphids; and (e) the occurrence of tristeza symptoms in leaves of plants inoculated from trees with bark splitting.

However, in none of the previous descriptions of tristeza symptoms was bark splitting mentioned. We conclude from this evidence that bark splitting in Mexican and Tahiti limes is not caused by exocortis virus. It is associated with tristeza virus and is transmitted by the *T. citricida*

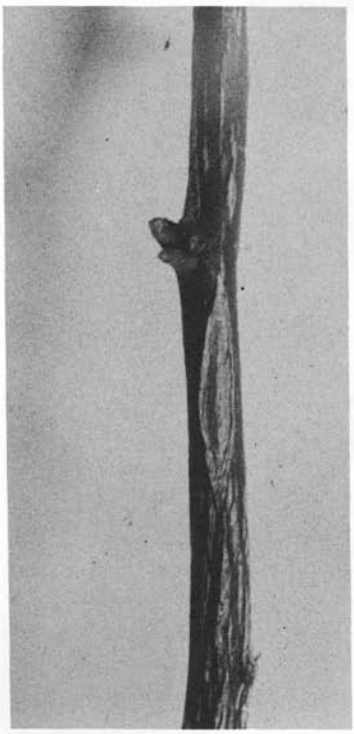

FIGURE 2. *Mexican lime seedling with bark splitting caused by tristeza virus.*

aphid. The fact that bark splitting has never been reported as a tristeza symptom suggests that it constitutes a new symptom of tristeza disease in limes.

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