Small Fruit and Stunting, Two New Disorders of Grapefruit Trees in the Delta del Paraná and San Pedro Areas of Argentina

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SAN PEDRO and Delta del Paraná are the southernmost of the citrus-growing regions in South America. Citrus trees thrive there, although there is some risk of cold weather. Because of its hardiness, trifoliate orange [*Poncirus trifoliata* (L.) Raf.] is the only rootstock used. Marsh seedless is the principal variety of grapefruit (*Citrus paradisi* Macf.) grown, and it is cultivated over an area of 400 hectares.

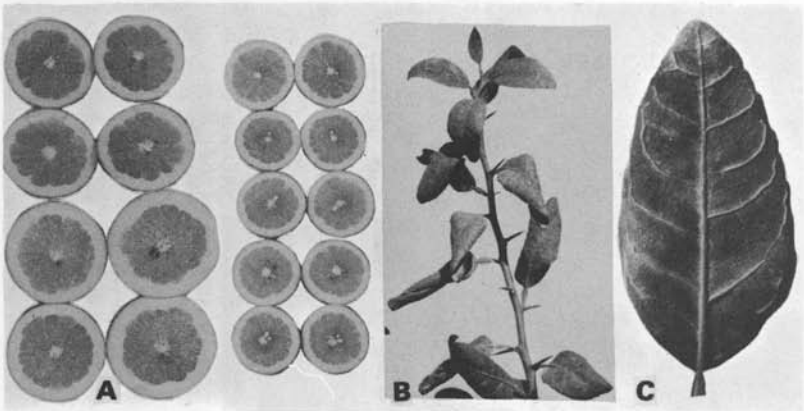

FIGURE 1. *Symptoms of small fruit disorder. A. Fruit from a healthy grapefruit tree and from a diseased tree. B. Twig of Mexican lime inoculated from a diseased grapefruit tree. C. Single leaf of Mexican lime inoculated from the same source.*

Psorosis and exocortis are the two most common virus diseases, but during the last few years two other abnormalities have appeared that make the plants worthless. One is the production of very small fruit by apparently healthy plants and the other is stunting accompanied by production of very small fruit.

SMALL FRUIT.—This disorder is similar to severe stem pitting caused by tristeza virus (Fig. 1). In one grove of 360 trees, 10 years old, there are only 3 trees with these characteristics; careful inspections during the last 3 years revealed that only these 3 trees continued to produce very small fruit, whereas the others produced fruit of normal size. This condition is not changed by fertilizers.

Strong strains of tristeza virus were not detected when buds from these trees were inoculated on Mexican lime [*C. aurantifolia* (Christm.) Swing.]. However, pronounced vein corking, similar to that mentioned by Tanaka *et al.* (1) for Hassaku dwarf virus, was obtained from one isolate.

STUNTING DISORDER.—The second disease is quite different from the

FIGURE 2. *Symptoms of grapefruit stunting disorder. Left: Trunk of a healthy tree, seven years old. Right: Trunks of three stunted trees of the same age.*

one described above. The plants remain small, have many very short branches especially at the top, and develop chlorotic leaves. Affected trees blossom more heavily and earlier than healthy ones and produce very small fruit. The small fruit are affected by the low winter temperatures which cause them to drop in the spring. The juice of such fruit tastes sour.

Most of the stunted trees exhibit bark scaling and sometimes, when the scaling reaches the wood, a large canker is produced (Fig. 2). This

scaling is quite different from the common type of psorosis that occurs in this area. Certain abnormalities are exhibited by the trifoliate rootstock also, such as irregularity in shape, flattened appearance, pitting, and profuse suckering.

In April, 1965, inoculations from stunted trees were made on seedlings of sweet orange [*C. sinensis* (L.) Osb.], sour orange (*C. aurantium* L.), lemon [*C. limon* (L.) Burm. f.], and Mexican lime. Only the common symptoms of tristeza were detected in the first year.

Three-year-old Marsh seedlings inoculated at the same time have shown dwarfing of the plants and production of small fruit, but no scaling on the trunk.

Discussion

Both diseases are apparently transmissible only with buds, since no new diseased plants have been seen on the groves in three years of careful observations.

The occurrence of small fruits on apparently healthy plants seems due to a strain of tristeza virus, although the possibility of a genetic cause is not discarded.

The stunting disorder seems the more complex of the two, and more than one virus may be involved in this disease. The affected trees are being indexed for psorosis, tristeza, exocortis, and xyloporosis.

Literature Cited

1. Tanaka, Shoichi; Kishi, Kunihei; and Yamada, Shunichi. 1965. Researches on the indicator plants of Satsuma dwarf and Hassaku dwarf viruses, p. 260-267. *In* W. C. Price [ed.], Proc. 3d Conf. Intern. Organization Citrus Virol. Univ. Florida Press, Gainesville.