Studies on Finger Mark Disorder of Citrus in Italy

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A BRANCH ABNORMALITY of Baianinha, Pera, and Hamlin sweet orange [*Citrus sinensis* (L.) Osb.] trees and Mexerica mandarin (*C. reticulata* Blanco) trees in Brazil was described by Rossetti and Salibe (2) as "finger marks." They considered it a form of psorosis. Finger marks were observed by Bové and Vogel (1) on grapefruit (*C. paradisi* Macf.), mandarin, and Valencia orange trees in Peru and by Rossetti *et al.* (3) in Argentina.

In Italy, this symptom has been observed since 1964 on 28-year-old trees of mascolino pregiato lemon (Fig. 1), a local clone of the feminello variety grown on sour orange (*C. aurantium* L.) rootstock at Siracusa (Sicily). Later, the symptom was observed on a 35-year-old lemon tree on Procida Island, on two 25- to 30-year-old bergamot (*C. bergamia* Risso) trees at Reggio Calabria, and on a 15-year-old Avana mandarin (*C. reticulata* Blanco) tree in the Sorrento area. The last also showed

FIGURE 1. *Finger mark symptoms on a branch of a mascolino pregiato lemon tree, with bark not removed.*

clear symptoms of concave-gum psorosis. All citrus trees were grown on sour orange rootstocks. Finger marks were recently observed on trees in several orchards in Sicily and in other countries.

The extent to which finger marks appear on any one tree varies from a short portion of one branch to a longer part of one or more branches.

Materials and Methods

Macroscopic observations were made on mascolino pregiato lemon trees, and transverse sections of affected branches were examined. To ascertain the possible virus nature of the abnormality, attempts were made to transmit it to sweet orange, sour orange, and lemon seedlings with buds and bark patches from affected branches.

Results

Examination of affected branches showed that 20 per cent of the trees in the Siracusa orchard were affected; symptoms ranged from mild to severe, but only a few trees exhibited mild symptoms. The malformation was exhibited principally by the main branches, but appeared occasionally on twigs 3 to 4 cm in diameter. Fruits were normal. The bark of affected branches showed no alteration in thickness from that of normal branches. However, the direction of the phloem tissues was affected, and likewise direction of the xylem tissues, as may be seen when the bark is removed. In the unaffected portions of the branch, xylem vessels and phloem sieve tubes parallel the axis of the branch. In the finger mark (depressed) areas, the direction of the xylem and phloem is contorted, or whorled and may even run at right angles to the branch axis (Fig. 2).

Transverse sections of affected branches show that cambial activity is abnormally great on the lower side of the branch; consequently, the xylem rings are decidedly eccentric. This form of eccentricity is not uncommon in citrus, and it is particularly evident in lemon trees (4).

Attempts to transmit a causal agent from lemon- and bergamot-affected trees to sweet orange, sour orange, and lemon seedlings by budding or by bark patches were negative after 2 years and after 6 months, respectively. Nor have psorosis indicator plants (sweet orange, sour orange, and lemon seedlings) inoculated from affected trees shown leaf symptoms in the same period. However, inoculations from the Sorrento mandarin tree, having both finger marks and concave-gum symptoms, to sweet orange and mandarin seedlings caused typical flecking and oak-leaf patterns of psorosis on the indicator plants 3 months later. The mandarin seedlings also showed leaf symptoms of crinkly-leaf virus.

Conclusions

To date, studies on the finger mark disorder do not allow its etiology to be defined exactly. Possibly, this is a physiologic disorder and not transmissible.

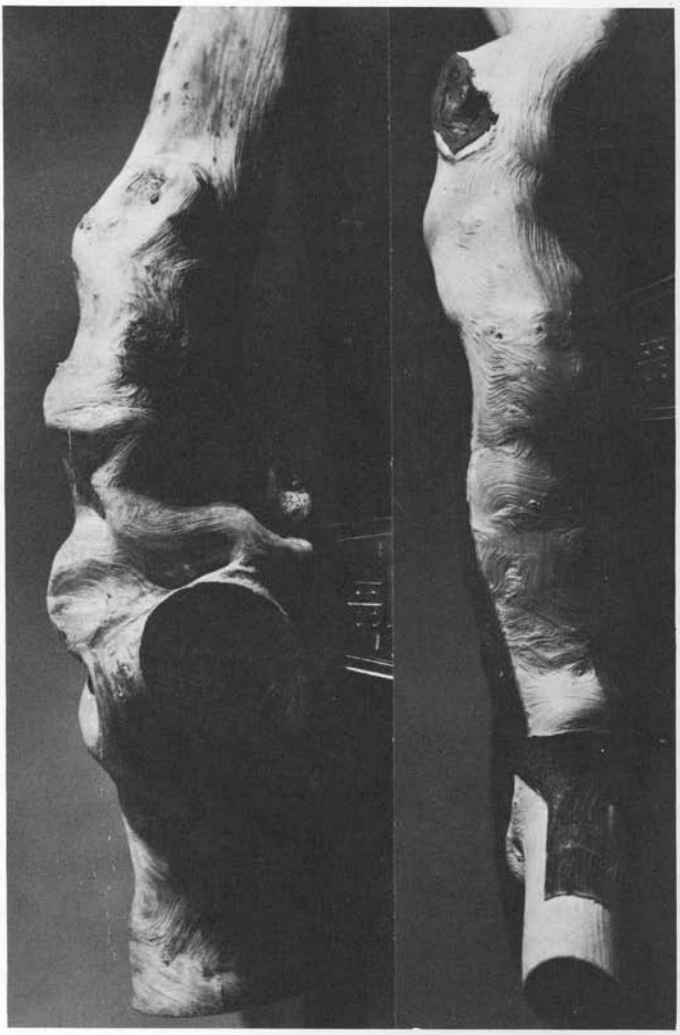

FIGURE 2. *Branches of a mascolino pregiato lemon tree, with bark removed, showing contorted xylem fibers at the location of finger marks.*

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