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Stem Pitting and Decline of Pera Sweet Orange in the State of São Paulo

THE PERA SWEET ORANGE [*Citrus sinensis* (L.) Osbeck] is one of the most important citrus varieties in Brazil and represents about 35 per cent of all citrus trees cultivated in the state of São Paulo (3). Because of its high fruit quality, this variety is preferred for both local and export markets as well as for processing.

In recent years, severe stem pitting has been observed in Pera orange trees along with stunting, production of small fruit of no commercial value, and marked zinc deficiency symptoms in young leaves (1, 2) (Fig. 1). These symptoms are found on one or two branches of affected trees and less frequently on the whole tree. In many cases, affected trees develop secondary branches that grow vigorously, growing over the top branches, which is generally related to the occurrence of severe stem pitting. These vigorous sprouts have apparently escaped initial infection with the severe tristeza stem pitting virus. In general, citrus growers from the state of São Paulo claim that trees in their Pera orange groves have either stopped growing or are growing at a slower rate than trees in similar groves of other varieties.

This paper reports the results of a survey carried out in 1960 and 1961 throughout the commercial citrus area of the state of São Paulo to evaluate the general situation of the Pera orange groves in relation to the stem pitting and decline problem.

Field Survey

Sixty-one Pera orange groves, chosen at random, in the four main citrus areas of the state were examined for stem pitting and decline: 33 in Limeira, 15 in Bebedouro, 10 in Araraquara, and 3 in Sorocaba. In

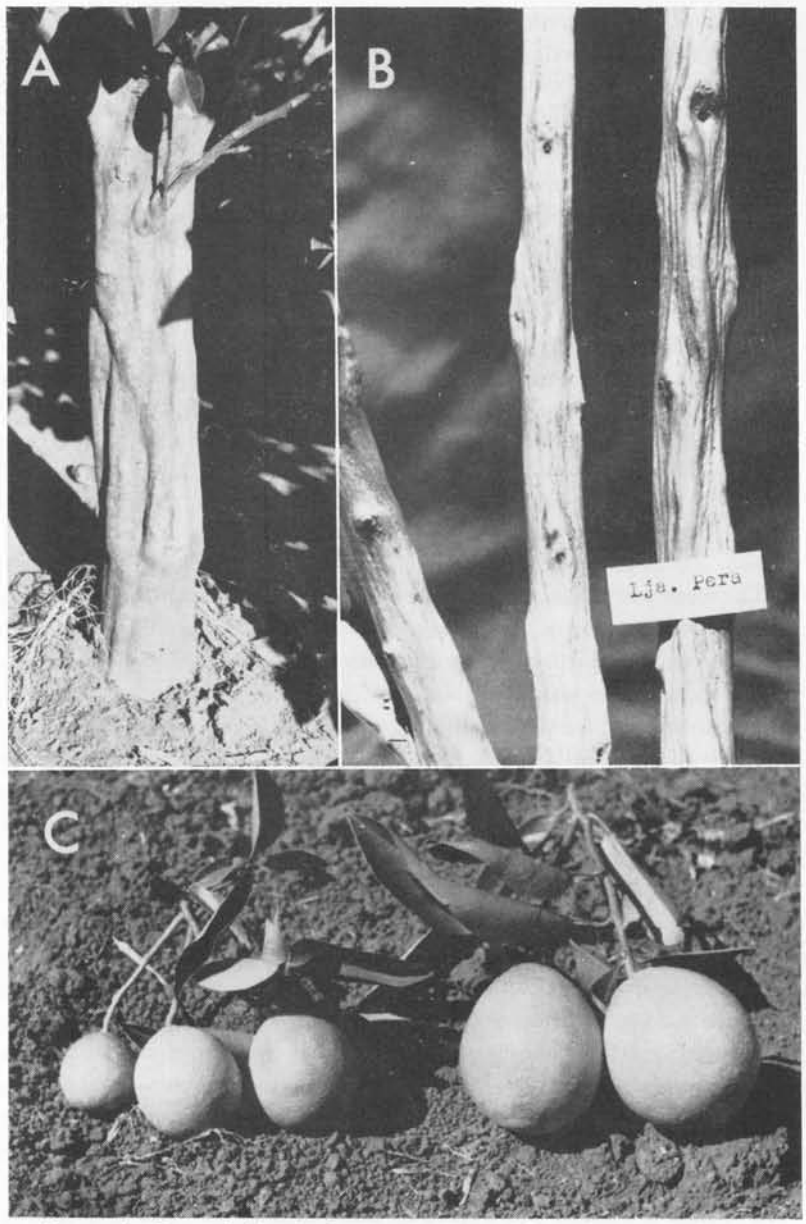

FIGURE 1. *Stem pitting in Pera orange caused by tristeza virus. A. Pitted trunk of a Pera orange tree on Rangpur lime rootstock. B. Stems of Pera orange. C. Normal and small fruit from an affected Pera orange tree.*

each grove, trees taken at random along two converging diagonals were selected and examined. The bark of 2 or 3 young branches of each tree was removed to the extent of 10-12 cm and a record was kept of the severity of stem pitting observed.

The groves surveyed in each area contained about 10 per cent of all Pera orange trees in that area. The total number of Pera orange trees in the state is approximately 7 million. The great majority of these trees are less than 15 years old.

The groves surveyed are of different ages and are budded on Rangpur lime (*C. limonia* Osbeck), Caipira sweet orange, and Cleopatra tangerine [*C. reshni* (Engl.) Hort. ex Tanaka] rootstocks. Groves of different selections of Pera orange were examined: Pera do Rio, Pera Coroa, Pera tardia, Pera Ipiguá, and Perão. Two of the 61 groves were from a nucellar line. In the old-line groves, attention was given to the occurrence of symptoms of other virus diseases, such as psorosis, exocortis, and xyloporosis.

Results and Conclusions

The stem pitting situation of the Pera orange groves in the four main citrus growing areas of the state of São Paulo was found to be as follows: Limeira, 19 groves with trees severely pitted, 11 mildly pitted, and 3 with no stem pitting; Bebedouro, 1 grove severely pitted, 7 mildly pitted, and 7 with no stem pitting; Araraquara, 2 groves severely pitted, 6 mildly pitted, and 2 with no stem pitting; and Sorocaba, 1 grove severely pitted, 1 mildly pitted, and 1 with trees showing no stem pitting. Of the 61 groves examined, 23 were found with severe pitting, 25 with mild pitting, and 13 with no stem pitting. The groves of Limeira, the largest and oldest citrus area, were found to be the most severely affected by stem pitting. There appeared to be a correlation between the severity of stem pitting and stunting of trees. Generally, young trees had more severe stem pitting than old trees, suggesting that buds infected with a severe strain of tristeza virus were being propagated. There was much variation among groves in the percentage of diseased trees they contained; in a few cases, all trees in the grove were severely affected; in others, a variable number of trees had stem pitting, ranging from mild to severe.

Some difference in the general condition of the groves of the various Pera orange selections was apparent. Mild and severe stem pitting was observed in trees of the various selections; Pera do Rio seemed to be most severely affected and Pera Ipiguá least severely affected.

No relation has been observed between the severity of stem pitting and the occurrence of other viruses in the same tree. Pera orange trees of some lines were found to be infected with viruses of psorosis and exocortis, but not with xyloporosis virus. No difference in degree of stem pitting was noticeable among trees on different rootstocks.

A number of trees more than 20 years old were also examined in the Limeira area. They were in poor growing condition with no vigorous new branches to be examined for stem pitting. However, gum impregnation in the wood cells was observed and attributed to tristeza virus.

Two declining Pera orange trees in the Bebedouro area exhibited inverted wood pitting (honeycombing) above the bud union. Young trees propagated with buds of these trees are growing normally.

Some trees of two nucellar Pera orange groves in the Bebedouro area had stem pitting but in general the trees showed good growth.

It seems obvious that the Pera orange groves in the state of São Paulo are affected by tristeza virus, which causes stem pitting and decline of the trees; and that this situation is more severe in the Limeira area than in the other citrus areas. It is possible that a severe strain of tristeza virus is being perpetuated in the Limeira area. This perpetuation could be avoided by careful selection of budwood sources and by indexing mother trees for severe strains of tristeza. Systematic control of the insect vector *Toxoptera citricidus* Kirk. seems to be unpracticable, but should be encouraged in nurseries.

Literature Cited

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