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Authors

Rossetti, Victoria
Fassa, Tauba G.
Nakadaira, J.

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VICTORIA ROSSETTI, TAUBA G. FASSA, and
J. T. NAKADAIRA

Reaction of Citrus Varieties to the Stem Pitting Virus of Pera Orange

IN RECENT YEARS, strong stem pitting symptoms have been observed in Pera orange [*Citrus sinensis* (L.) Osbeck] trees in orchards of São Paulo and other citrus-growing areas of Brazil. On previous occasions, young potted plants of Pera orange were inoculated with the stem pitting virus from Pera orange by means of the tropical citrus aphid [*Toxoptera citricidus* (Kirkaldy)]. Comparable control plants were infested with an equal number of non-viruliferous aphids. Two months later, the inoculated plants displayed pitting in the branches and stunting; growth was reduced to 55 per cent in seedlings and 20 per cent in young plants that had been grafted on sour orange (*C. aurantium* L.).

Because of the high degree of susceptibility of Pera orange, its distribution to the growers was discontinued by official departments of the state of São Paulo; other varieties, such as Natal orange, were propagated to replace it in the market. It seemed desirable, therefore, to carry out experiments in the greenhouse and in the field to determine the reactions to infection with the stem pitting virus, the growth, and the productivity of Pera and Natal orange trees when they were growing under identical conditions.

Experimental Transmission

Plants of 20 varieties of citrus were inoculated in the period between June and August, 1962, and kept in a greenhouse. Two groups of young potted plants of each variety were infested with the tropical citrus aphid: the control group was infested with approximately 150 non-viruliferous aphids and the inoculated group was infested with the same

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number of viruliferous aphids taken from Pera orange trees showing strong stem pitting. The infestation was repeated three times for periods of 48 hours each time.

STEM PITTING.—The first stem pitting symptoms were observed within 3-6 months after inoculation. The last reading was made 10-11 months after inoculation. Plants of 12 varieties developed stem pitting. West Indian lime [*C. aurantifolia* (Christm.) Swing.], Marsh Seedless grapefruit (*C. paradisi* Macf.), and Eureka lemon [*C. limon* (L.) Burm. f.] developed severe pitting; Pera orange, Caipera orange, and National rough lemon (*C. jambhiri* Lushington) had stem pitting almost as severe. The Hamlin, Natal, and Barão varieties of orange had symptoms of medium severity. The Coco, Lima, and Baianinha varieties of orange had mild symptoms. Some plants of Valencia orange were doubtful. No stem pitting was found on Troyer and Carrizo citrange [*C. sinensis* (L.) Osbeck x *Poncirus trifoliata* (L.) Raf.], trifoliolate orange (*P. trifoliata*), Florida rough lemon, Cleopatra tangerine [*C. reshni* (Engl.) Hort. ex Tanaka], sour orange, or Rangpur lime (*C. limonia* Osbeck). Three plants of West Indian lime and two of Eureka lemon died within a few months after inoculation.

STUNTING.—The plants of ten varieties affected by stem pitting showed variable degrees of stunting when compared with the control plants.

LENGTH OF INTERNODES.—The plants of nine varieties affected by stem pitting had shorter internodes than comparable control plants.

Field Observations

In 1963, 30 pairs of 8-year-old trees of the Pera and Natal varieties of orange, grafted on Rangpur lime rootstock, of a well-fertilized and properly treated orchard in Araras, were taken at random in order to compare these varieties with respect to the occurrence of stem pitting in the branches, height of tree, diameter of trunk, and productivity, including total number of fruit per tree, fruit size, and fruit weight. Paired trees were side-by-side, under identical conditions. The budwood source for these trees had been carefully selected to avoid severe stem pitting.

STEM PITTING.—Samples of five 50-cm-long branches were selected at random, peeled, and examined for pitting. Whereas most of the Pera orange trees had pitting in all the branches examined, most of the Natal branches had only mild pitting and not all branches were affected. Based

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on a total number of 150 branches examined for each variety, 32 per cent of the Natal branches had mild pitting and 68 per cent had no pitting at all. Of the Pera orange trees, 24 per cent had severe pitting, 31 per cent had pitting of medium severity, 39 per cent had mild pitting, and only 6 per cent had no pitting.

SIZE OF TREE.—The average height of 30 trees of each variety, measured from the bud union to the top, was 3.06 m for Natal and 2.82 m for Pera. The percentage mean difference was 7.8. The average diameter of the trunk, measured 15 cm above the bud union, was 13.5 cm for Natal and 13.7 cm for Pera; there was no significant difference in trunk diameters between the two varieties.

PRODUCTIVITY.—The Natal trees produced 24.3 per cent more fruit than the Pera trees, with an average of 1,219 and 923 fruit per tree, respectively. Little variation was found between sizes and weights of fruit of the two varieties.

CONCLUSION.—Similar data must be collected during several consecutive years in order to determine whether or not the productivity of the Natal variety is significantly better than that of the Pera variety. Nevertheless, the data so far available seem to show that, in spite of stem pitting symptoms being more frequent on Pera orange trees than on Natal orange trees, the Pera orange is not severely stunted in comparison with the Natal orange when properly treated and when budwood sources are carefully selected.