ABSTRACTS

Stem Pitting and Tristeza Strains in the Citrus Trees of São Paulo State, Brazil

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ABSTRACT. Tristeza stem pitting is present in most citrus trees in São Paulo State, Brazil. Symptoms vary from mild to severe in sweet orange, acid lime and grapefruit trees, but are rare in lemon, sour orange and mandarin trees.

Indexing using Mexican lime, sweet orange budded on sour orange and lemon seedlings indicated the presence of mild to very severe strains. Mild and severe strains were found within the same tree with one branch sometimes showing much more stem pitting than the others. Symptom expression of the same strain was affected by the degree of intolerance of the variety, by the rootstock and by the environment.

Pera sweet orange trees preimmunized with mild protective strains developed mild stem pitting (rate 1-2) and common Pera orange lines developed mild to severe stem pitting (rate 3-4 on a 0-4 scale). Pera sweet orange trees budded on eight different rootstocks showed variable amounts of pitting in the branches, according to the rootstock: Rangpur lime 2.70, Volkamer lemon 2.65, trifoliate orange 2.15, Carrizo citrange 2.10, rough lemon 2.00, Sunki mandarin 1.23, Cleopatra mandarin 0.98 and Caipira sweet orange 0.95. Curiously, the rootstocks inducing the smallest amounts of stem pitting (below 2.00) were those considered tolerant to blight or declinio in Brazil, suggesting a possible relationship between tristeza and blight.

Among tristeza strains, the one named CTV-SP was found to cause wood pitting in the rootstock portion of Satsuma mandarin trees budded on Morton citrange (severe) and on *Citrus taiwanica* (mild pitting) but not to affect trees on sour orange rootstock. Trees on Florida rough lemon in this experiment developed blight-like symptoms after a second fruit crop.

Cytological Determination of the Effect of Various Citrus Tristeza Virus Isolates on the Budunion of Sweet Orange on Sour Orange Rootstock

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ABSTRACT. Budunion samples of greenhouse grown sweet orange on sour orange plants infected with various mild and severe isolates of citrus tristeza virus were excised and cryosectioned. Sections were stained using thionin, a thiazine stain, prior to viewing under the light microscope. Previous studies have shown the usefulness of thionin in staining necrotic plant tissue. The intensity of stain in the phloem tissue in 8 to 10 sections per sample was rated on a 0 to 3 scale with 3 indicating intense heavy staining. Staining reactions were compared with the biological index rating for each virus isolate.

Cross Protection as a Procedure for Improving Pera Sweet Orange

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ABSTRACT. Pera sweet orange is the most important variety for the Brazilian citrus industry. In order to show the efficiency of cross protection for an improvement program of that variety, a sub-randomized trial was set up at the EMBRAPA/CNPMF, Cruz das Almas, in 1972. Four local selections, A, B, C and D nucellar lines obtained in 1961, were graft inoculated with: a) a mild strain (D6), b) a severe strain (B-10) and c) a mild + a challenge inoculation with a severe strain (B-10) grafted on Rangpur lime. Stem-pitting rate, tree vigor, fruit quality and yield data were evaluated from 1976 to 1981. There is clear evidence of the effect of a preimmunization against tristeza virus. On a stem-pitting scale of 0 to 4, the mild strain (D6) scored 1.84, the severe strain (B10) 3.18, the mild + severe strain (D6 + B10) 1.98 and the control (non-inoculated) 2.58. The nucellar lines C and D showed better resistance even when inoculated with a severe strain as compared with the other lines. No significant difference regarding tree vigor and fruit quality was found. The highest productivity, 24.5 t/ha, was obtained from the trees inoculated with a severe strain; whereas, the trees with a mild strain and with a mild + severe strain produced 22.0 t/ha. As we assumed from previous results, the nucellar line D gave the best yields and became the Pera orange variety to be recommended for the northeastern Brazilian citrus industry.

Exocortis Mild Strains to Control Tahiti Lime Tree Size

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ABSTRACT. Over one million trees of Tahiti lime infected with mild exocortis strains were planted in São Paulo State, Brazil over the last 5 yr. Growers search for small stunted trees that come into bearing early and produce fairly large out-of-season crops. Tahiti lime trees are intolerant to the exocortis viroid and trees show typical longitudinal bark cracks in the branches. Young branches break easily and the diseased clones are for this reason named "Quebra-galho" ("branch-break") Tahiti lime. Rangpur lime, used commonly as a rootstock, rarely develops exocortis symptoms, but trees are stunted and life span is reduced to 7 to 10 yr in commercial orchards. Interplanting healthy and exocortis-infected trees is frequent in many new plantations. No mechanical transmission of exocortis viroid was found under field conditions.

Selection of Tahiti lime started in 1961 when six clones were selected. All of them, except for one (IAC-5), were found to carry mild exocortis strains. Subsequent work has shown that Tahiti lime tissues do not allow multiplication of severe strains of the viroid and are severely affected by them. Indexing for exocortis in Tahiti lime trees with "Quebra-galho" (IAC-1, IAC-2 and IAC-6), using Etrog citron 60-13 as indicator, has shown the occurrence of a range of mild strains, which explains the variability of tree size and behaviour in the commercial orchards. Tree size reduction, ranged from 10 to 50% in experimental and commercial orchards. Fruit production was 30 to 40% higher in the first four crops of the exocortis-infected trees, with significantly higher production of out-of-season fruit.

Factors Associated with Impietratura Favoring Excessive Fruit Drop of Navel Oranges

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During the summer months there are two distinct periods of fruit drop for navel orange: 1) summer drop occurring from mid-June to mid-July, and 2) summer-fall drop occurring from mid-August to late September.

The June drop, however, is severe in all the citrus orchards and is favored by the climatic conditions of Crete. On the other hand, the fall drop is negligible except when the trees are affected by impietratura. One of the characteristics of this disease is the large number of fruits that tend to fall off infected trees, especially in August. On closer examination, a large percentage of such fruits is found to have gum deposits particularly under the stem end of the fruits.

In a 30-yr-old orchard, 200 trees of the local sweet orange on sour orange rootstock were topworked in 1977 with two clones of Washington navel: Frost and New Hall. In this orchard two systems of irrigation, drip irrigation and sprinkler irrigation, were compared. Twenty trees of each clone were tagged for each system of irrigation. To determine the influence of impietratura on June drop and the summer-fall drop, fallen fruit were counted at 15-day intervals, Fallen fruit were segregated into 3 classes based on the diameter of the stylar end aperture as follows: small, less than 3 cm; medium, 3 to 6 cm; and large, greater than 6 cm.

Anatomical observations of fruit fallen during the first June period did not show impietratura symptoms. On the other hand, longitudinal sections of fruits fallen in late summer revealed albedo gumming, particularly at the stem end of the fruit. The fallen diseased fruit belonged to the first and second diameter classes. Under sprinkler irrigation, the largest fallen fruit belonged to the first and second size classes, but under drip irrigation, the largest fruit belonged to the second class.

Under drip irrigation, less than half of the tagged trees showed fruit drop and all fallen fruit showed symtoms of albedo gumming. Table 1 also shows that higher fruit drop occurred on trees irrigated with the sprinkler system than with the drip system.

TABLE 1
EFFECT OF IRRIGATION SYSTEM ON FRUIT DROP AND INTENSITY OF IMPIETRATURA SYMPTOMS ON TWO WASHINGTON NAVEL CULTIVARS

		Average of 3 yr (1984-1986)		
Irrigation system	Washington Navel clone	No. of trees with symptoms out of 20	No. of fallen fruits	Fruit with gum (%)
Sprinkler				
	Frost	18	402	28
	New Hall	10	150	23
Drip				
	Frost	9	61	100
	New Hall	5	24	100

New Results on the Transmissibility of Leprosis Symptoms by the mite *Brevipalpus phoenicis* in Citrus

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ABSTRACT. *Brevipalpus phoenicis* (Geijskes, 1939) from two different sources were used in transmission studies of leprosis. Young, potted Natal sweet orange were prepared leaving only five leaves on each one and the stem was bent over the laboratory table, allowing each leaf to be attached on the table, with the underside facing up. On the margin of each leaf, barriers were made using tanglefoot to prevent mites from leaving the leaf. Ten mite females contaminated by the leprosis agent were transferred to each leaf to feed there for a pre-established time. On the first plant, they were left for 2 days, on plant-2 for 4 days, on plant-3 for 8 days and on plant-4 for 16 days. Following each of these periods, contaminated mites were replaced by healthy ones for a 2-day period for possible contamination. After each period, the contaminated and non-contaminated mites were transferred to young Pera sweet orange seedlings. Results indicated that contaminated mites did not lose their ability to transmit leprosis when transferred from one healthy leaf to another, at least on the first 4 days of feeding. Also, it was found that to become a leprosis vector it is not necessary for the mite to feed on a conspicuous leprosis lesion but only to feed on areas where contaminated mites had fed previously. The more time a contaminated mite is left to feed on a leaf or as the time for lesion expression nears, there is an increase in the capacity of a new mite to become a vector.

An Emergency Citrus Budwood Registration Program for the São Paulo State, Brazil, in 1985-86

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ABSTRACT. The citrus budwood certification program was started for the State of São Paulo in 1960. In the following 20 yr this program did exceptionally well, thanks to the massive use of nucellar material. The yield average of the state went up from half a fruit box (1 box = 40.8 kg) to 2½ boxes per tree. Presently, it is very rare to find bud-transmitted viruses in the field other than tristeza which is always present.

At the end of 1984, the Citrus Budwood Registration Committee had to establish an emergency program to attend to the huge increase in demand of budwood necessary to prepare an estimated 30 million nursery plants for the 1985-86 period. This plan consisted of visually selecting, in private citrus groves, plots of Natal, Valencia and Hamlin sweet oranges that came from nucellar indexed clones registered in the budwood certification program. Plots of Pera sweet orange, "preimmunized", "bianchi" and "olimpia" were also selected in this way, in spite of not being registered. The criteria adopted for the selection were: choose trees at least 5 yr old of first, second and third propagation of the parent trees possessing outstanding vigor, health, yield and good fruit quality. Owners of the selected plots got a temporary permit to commercialize budwood. A total of 7,730 mother trees were selected from which 14,900,000 buds were obtained. The other 50% of the necessary budwood vas provided by existing parent trees. As a result of the emergency program, the demand of citrus budwood for the 1985-86 season was fulfilled and the nursery plants obtained were very satisfactory.