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Distribution of Three Citrus Viruses in Brazil Relative to the Main Propagative Material Sources

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ABOUT 300,000 hectares are devoted to citrus culture in Brazil with the estimated production in 1966 of over 50 million boxes (90 pounds). Approximately 10 per cent of the crop is exported as fresh fruit or concentrated juice.

The citrus virus diseases found in the Brazilian groves in the order of their economic importance are tristeza, exocortis, psorosis, and xyloporosis (1, 3, 4). Only the tristeza virus is insect transmitted in Brazil; the other three viruses are usually transmitted only by budding. Only the latter diseases will be discussed because tristeza became endemic in Brazil in the forties, and its spread has no relation to the distribution of propagating material.

The investigation here reported deals with the virus situation in groves planted before the distribution of nucellar clones was started in 1955 (2).

Citrus trees were distributed to growers from four main centers: 1) Deodoro Federal Horticultural Station, near Rio de Janeiro (1); 2) Escola Superior de Agricultura, Piracicaba, São Paulo (2); 3) Estação Experimental de Limeira, São Paulo (3); and 4) Estação Experimental de Taquari, Rio Grande do Sul (4).

The Actual Situation

Examination of citrus groves all over Brazil showed the point of origin and the virus infection status of the 16 main varieties to be as follows.

PERA ORANGE [*Citrus sinensis* (L.) OSB.].—This is the most important variety; it constitutes 45 per cent of the citrus trees in the country and produces 55 per cent of the exported fruit. Most of the Pera orange material was distributed by center 1 and carries xyloporosis (always), psorosis (frequently), and exocortis virus (sometimes). Many groves received propagating material from centers 2 and 3 in the State of São Paulo. These are free from xyloporosis, but some clones are psorosis and exocortis carriers. A few clones carry only psorosis, others only exocortis, and others none of the three viruses. Trees from the fourth center are free from xyloporosis and exocortis but carry psorosis virus. A few clones from this latter center are free from the three viruses.

BAIANINHA ORANGE (*C. sinensis*).—This is the second most important variety. It appeared as a bud mutation from the Washington navel and was selected and propagated in center 2. All the trees from that source are free from xyloporosis but always carry psorosis and exocortis viruses.

HAMLIN ORANGE (*C. sinensis*).—This variety was first introduced at Pitangueiras, São Paulo. Budsticks from one selected tree were propagated by center 3. All the trees from that source are free from xyloporosis and psorosis viruses but all carry exocortis virus.

NATAL ORANGE (*C. sinensis*).—The Natal (Christmas) orange closely resembles the Valencia orange and was introduced several times into the States of São Paulo, Rio de Janeiro, and Bahia. The propagative material was later distributed from centers 1, 2, and 3. Apparently, all the trees from those origins carry a weak strain of psorosis, but are free of xyloporosis and exocortis.

VALENCIA ORANGE (*C. sinensis*).—This is the Valencia late orange grown in the United States; it was introduced from there and is propagated and distributed by center 3. All trees of that origin carry psorosis virus, and in some groves the trees are also infected with exocortis virus.

PIRALIMA ORANGE (*C. sinensis*).—This is a mutant from the Lima (sugar) orange that was selected and propagated at center 2. The Piralima has no export value, but is well-liked on the local market. The mother tree is free from exocortis, psorosis, and xyloporosis, but exocortis and psorosis viruses are present in a small percentage of the commercial Piralima trees, possibly because of some top working.

BARAO ORANGE (*C. sinensis*).—The Barão orange was introduced in the State of São Paulo by a private grower and propagated by center 3. Xyloporosis disease was first described in Brazil on trees of this variety. It always carries this virus, but it is free from psorosis and exocortis.

SELETA ORANGE (*C. sinensis*).—This variety was introduced in the State of Bahia and later propagated in center 1. It exists in a number of selections; some are virus free, like the Seleta do Rio, others, such as Seleta do Itaboray, are infected with all three viruses. The Seleta orange is cultivated mainly in the coastal area of the State of Rio de Janeiro.

BAHIA ORANGE (*C. sinensis*).—This variety, also called Baiana is the mother of the Washington navel orange. It originated by bud mutation in a Seleta orange tree at Salvador, State of Bahia. Psorosis is present in 100 per cent of the trees propagated from the Salvador source. It was distributed by all four centers and many of its clones, probably produced from seed, are free from the three viruses.

MARSH SEEDLESS GRAPEFRUIT (*C. paradisi* MACF.).—Marsh seedless was introduced from Florida by center 3 and all trees are infected with psorosis and exocortis viruses. Some trees also carry xyloporosis virus.

CRAVO TANGERINE (*C. reticulata* BLANCO).—This local variety has been propagated many times by seed and consequently, is usually free from the three viruses. Occasionally, trees are found infected with exocortis virus.

MEXERICA MANDARIN (*C. reticulata*).—This is a locally developed selection of common mandarin distributed by the four centers. Almost 50 per cent of the trees from center 1 are xyloporosis-infected. Propagations from the other centers are generally free from the three viruses, but in the area of Sorocaba, São Paulo, many trees show blind pocket symptoms.

PONKAN TANGERINE (*C. reticulata*).—This variety was introduced from Japan in 1930 by a private grower and propagated by him. Some trees from that source are exocortis-infected.

GALEGO LIME [*C. aurantifolia*, (CHRISTM.) SWING.].—This local selection of the Mexican lime group is frequently propagated by seed in the

four centers. Consequently, most groves are free from the three viruses. However, at one plantation the trees are infected with exocortis and psorosis viruses. Because of its intolerance to the tristeza virus this variety is being abandoned in new plantings.

TAHITI LIME (*C. latifolia* TANAKA).—This variety, introduced from Florida by center 1, was also distributed by center 3. Exocortis is present in 100 per cent of the trees distributed from these two centers. A recent introduction from Peru made by center 1 is free of the three viruses and is being actively propagated by center 3.

EUREKA OR SICILIANO LEMON [*C. limon* (L.) BURM. F.].—There are two introductions of this lemon by center 3: Eureka, from California, and Siciliano, from Sicily. The Eureka lemon always carries exocortis virus, but the Siciliano is free of the three viruses.

Conclusions

The distribution of psorosis, exocortis, and xyloporosis in old clones of 16 common citrus varieties in Brazil is largely related to the four propagating centers located in the States of Rio de Janeiro, São Paulo, and Rio Grande do Sul. The influence of private nurseries on the propagation of these viruses is very small.

Because tristeza disease is spread naturally by the efficient vector *Toxoptera citricida* Kirk., its distribution is not related to the propagating centers.

Now that the principal commercial citrus varieties have been cleansed of these viruses through the production of nucellar lines at the Limeira Citrus Experiment Station, the other centers should stop distributing non-tested lines.

Introduction of new varieties of interest to Brazilian citrus growers should be done by seed or under severe quarantine measures.

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