Behavior of Seedling Lines of Citrus Naturally Infected with Tristeza Virus

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This paper reports results of an examination carried out in three citrus variety collections at Limeira Experimental Station, Limeira, to determine the incidence of tristeza stem pitting.

Varieties were evaluated in relation to their response to tristeza virus since many are potential rootstock or scion material (1). Trees were infected naturally with tristeza in the field, where Toxoptera citricidus Kirk. was abundant.

Stem pitting in an older variety planting at Limeira was reported by Salibe (4). Varieties in our study are different from those studied by Salibe.

MATERIALS, METHODS, AND RESULTS

All trees were propagated from seedlings, and budded on Rangpur lime. The collections examined are six, eight, and 15 years old.

Three trees of each variety were examined by removing the bark from three branches, about 18 months old, on each tree. The peeled branches were rated as not pitted, slightly pitted, moderately pitted, strongly pitted, or very strongly pitted (fig. 1). The average determined the final classification of each variety.

NOT PITTED

Sweet Oranges

Baiana Retiro
Biondo
Bizri
Boa Vista
Caipira
Campista
Corsa Comune
Do Céu
Doppio Sanguigno Acireale
Feijão Crú
Grosse Sanguigno
Imperial
Itaboraí

Fig. 1. Left to right: Effect of tristeza on branches of sweet orange varieties Valencia Colorida (not pitted); Moro (slightly pitted); Seleta Branca (moderately pitted); Ovale Sanguigna (strongly pitted); and Sanguinello de Acireale (very strongly pitted).
João Nunes
José Paulino
Kinartí
Lanceta
Lara Campos
Limonada
Lisa Paulista
Mangaratiba
Magnum Bonum
Maracâna
Mímo do Céu
Non Pareil
Paulista
Parnazade Franca
Pingo de Ouro
Santa Lucia
São José
Sanguinea Piracicaba
Sanguinello Commune
Setubal
Serrana
Serra D'Agua
Tarocco Acireale
Valencia Olinda
Valencia Palida
Valencia Colorida
Vaccaro
Vermelha
Zancheta

Tangerines
Avana
Batangas
Big of Sicily
Cape Naartje
Dancy
Emperor
Giant of Sicily
Israel
Improved
Jaragua do Sul
Kara
Kaula
Large Local
Loose Jacket
Mel
Osceola
Rio
Romana
Santa Cruz

Scarlet
Siracusa
Tardivo de Ciaculli
Thomas
Weshart

Lemons
Armstrong
Deodoro
Estes
Flat Branch
Feminello Santa Thereza
Feminello Siracusa
Gênova
Inerme
Indianino
Limone Sanguigno
Lisboa
Méssina
Meyer
Milan
Monachello
Nostralle
Peretto
Rough lemon
Sicilia
Vicoso

Sour Oranges
Amaro Caldo Polposo
Bigarade
Corrugada
Iwaikan
Sicilia
Off Type
Willow Branch

Limes
Americana
Da Persia
De Umbigo
Teheran

Shaddocks
Ácida
Doce
Indochina
Siameza
Sunshine

Citrons
Cedrat Robbs el Arsa
Tristeza and Related Diseases

Tangelos
   São Jacinto
   Seminole

Tangors
   India
   Moreira
   Ouro
   Tangerona

Ranpur Limes
   Borneo
   Cravo Limeira
   India
   Kusaie
   Otaheite
   Philippine Red lime
   Rose lime
   Red Ling Mung
   Santa Barbara Red
   Taquaritinga

Miscellaneous
   Baia × Mexirica
   Calamondin
   Citremon
   Citrumelo 4475
   Citrus bergamia
   C. depressa
   C. karna
   C. keraji
   C. kokhai
   C. kimikawa
   C. pectinifera
   C. volkameriana
   C. yatsushiho
   Severinia buxifolia
   Szibat × Tizon

Slightly Pitted

Sweet Oranges
   Abacaxi
   Acoriana
   Baia Rosada
   Baiana Valente
   Baia Monte Parnazo
   Baia Tomazelli
   Branca
   Champagne
   Cléopatra

Corôa
Corôa de Rei
Coronel
Cipó
Itacurucá
Macaé
Malta Blood
Melrose
Monjolo
Moro
Parnazo de Goiaz
Pera sem sementes
Portuguaise
Rosa
Rubi Blood
Sanguinello Allungato
Sanguinello Marrocos
Sanguinello Moscato
Sanguinello Polidori
Sanguinea Venturi
Tomango
Washington Florida

Limes
   Francana
   Sharbutty
   Tahiti B. Horizonte

Shaddocks
   Periforme
   Yau Tau
   Zamboa

Citrons
   Cedrat de Corse
   Diamante
   Rosada

Tangelos
   Minneola

Tangors
   Sabara
   Temple
   Umatilla

Miscellaneous
   C. funadoko
   Laranja × Pomelo
   Periforme (lemon?)
   Sangue de Boi (tangor?)
   Sunwuinkon
MODERATELY PITTED

Sweet Oranges
- Baia Tremembé
- Cacau
- Campista
- Côco
- Demi Sanguigna
- Moro Palazelli
- Ovale de Siracusa
- Seleta Branca

Limes
- Galego Taquari

Shaddocks
- Singapura

Grapefruit
- Pernambuco

Miscellaneous
- Camargo (lemon?)
- *Citrus yukitsu*
- *C. volkameriana* de Catania
- Mexerica do Pará
- Mexerica Paraguai (tangor?)
- Rio Claro (lemon?)

STRONGLY PITTED

Sweet Oranges
- Alexandre Pereira
- Baia Gigante
- Corsa Tardia
- Ovale Sanguigna
- Pera Caire
- Pera de Abril

Limes
- Cristal

Grapefruit
- Leonardy

Tangors
- Maracujá
- Reticulata
- São Pedro

Shaddocks
- Kao Panne

Citrange
- Uvalde

Miscellaneous
- Acido (lemon?)
- *Citrus pseudoparadisi*
- Ingles (lemon?)
- Ponderosa
- São Matheus (lemon?)

VERY STRONGLY PITTED

Sweet Oranges
- Misteriosa de Aquidauana
- Ovale San Lio
- Pera de Umbigo
- Pera Mel
- Pera Coroada
- Sanguinello de Acireale

Grapefruit
- Duncan
- Foster
- Hart's
- Imperial
- Marsh seedless
- Red Blush
- Royal
- Retiro
- Triumph
- Thompson Pink

Limes
- Biksi
- Mexican lime
- Thornless sweet lime

Shaddock
- Chinesa

Citrange
- Rusk

Miscellaneous
- *Citrus macrophylla*
- *C. excelsa*
- *C. webberi*
- Citrumello I-84/67
- Meiwa kumquat
- Nippon kumquat
DISCUSSION AND CONCLUSIONS

Most orange, tangerine, and lemon varieties showed good tolerance to tristeza. Many of these have some potential commercial interest. Those varieties showing poor tolerance to the tristeza virus were Pera orange, grapefruit, and lime groups (4).

Among the grapefruit types only one, Pernambuco, was classified as moderately pitted. Pernambuco has fruits resembling those of an orange hybrid, but tastes like grapefruit. Fruits are very acid and have an average of 20 seeds per fruit. Variation in severity of stem pitting was found among trees of the same variety of grapefruit (2). One tree each of McCarthy, Leonardy, and Red Blush grapefruits was moderately pitted but most were very strongly pitted. Cedrat Robbs el Arsa citron was evaluated as not pitted, and trees were developing and producing well. These data suggest a need for preimmunization with mild strains if commercial orchards of susceptible varieties are to be grown (3).

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