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Behavior of 77 Tristeza Tolerant Rootstocks with Old and Nucellar Clones of Barão Orange Scions

THE SPREAD of tristeza disease in the citrus plantings of Brazil created a demand for a rootstock tolerant to tristeza virus, yet vigorous in the nursery and in the field, fruitful, resistant to drought and to fungi, and inducing good fruit quality. Most of these requirements were found in the Rangpur lime or limão Cravo (*Citrus limonia* Osbeck) and so its use became general. In a few years, however, it was realized that Rangpur lime has no tolerance to two other viruses—those of exocortis and xyloporosis—which occur in many lines of the most important commercial varieties (4).

This paper reports the results of a search for outstanding rootstocks. It summarizes the differences in behavior of 77 rootstocks which are tolerant to tristeza virus when they were budded with a healthy nucellar line and a xyloporosis-virus-infected old line of a sweet orange [*C. sinensis* (L.) Osbeck] variety.

Materials and Methods

In the tristeza studies, cooperatively conducted by the Instituto Agronômico and the United States Department of Agriculture, nearly 400 citrus varieties were tested for their tolerance to tristeza virus as a rootstock for different scion varieties. A nucellar line and an old line of a sweet orange, locally named Barão, were two of the scions used. The young trees were infected with tristeza virus by aphid inoculation (1). Only the trees on 77 rootstocks of the 400 budded with Barão orange were tolerant to tristeza virus and survived (2, 3). Three trees of each scion-rootstock combination remaining alive were transplanted in 1950-

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51 to the field at the Limeira Experiment Station in two blocks: Block A—trees of the nucellar line and Block B—trees of the old line. The old-line Barão orange was carrying, in addition to tristeza virus, xyloporosis virus but not the viruses of psorosis or exocortis. The records of individual crops started in 1955. No irrigation was given to the trees.

Results

The yields of the ten most productive rootstocks with both nucellar- and old-line Barão orange tops from 1955 to 1962 are given in Table 1. Among the 77 rootstocks tested, Rangpur lime produced the heaviest crops when the scion was nucellar Barão orange but dropped to 37th place when the scion was old-line Barão. All trees with old-line tops developed xyloporosis symptoms on the Rangpur lime rootstock. Sunki mandarin (*C. sunki* Hort. ex Tanaka), which ranks second with nucellar tops, dropped to 35th place with the old-line scion. The trees with the old-line scion were apparently healthy, having no xyloporosis symptoms as long as 14 years after budding.

TABLE 1. YIELDS OF THE TEN MOST PRODUCTIVE ROOTSTOCKS WITH NUCELLAR AND OLD LINES OF BARÃO SWEET ORANGE TOPS FROM 1955 TO 1962. TOTAL NUMBER OF FRUIT PER TREE

Rank	Rootstock	Nucellar
1.	Rangpur lime (<i>Citrus limonia</i> Osbeck)	5.931
2.	Sunki mandarin (<i>C. sunki</i> Hort. ex Tanaka)	4.645
3.	Kinnow mandarin (<i>C. reticulata</i> Blanco)	4.069
4.	Morton citrange [<i>C. sinensis</i> (L.) Osbeck x <i>Poncirus trifoliata</i> (L.) Raf.]	3.497
5.	Hamlin orange (<i>C. sinensis</i>)	3.415
6.	Florida sweet seedling (<i>C. sinensis</i>)	3.284
7.	Citrumelo 4477 (<i>P. trifoliata</i> x <i>C. paradisi</i> Macf.)	3.270
8.	Parson Brown orange (<i>C. sinensis</i>)	3.125
9.	Cleopatra tangerine [<i>C. reshni</i> (Engl.) Hort. ex Tanaka]	3.118
10.	Seminole tangelo (<i>C. paradisi</i> Macf. x <i>C. reticulata</i>)	3.037

	Old line
1. Sampson tangelo	3.907
2. Sunshine tangelo	3.817
3. Orlando tangelo	3.632
4. Swatow tangerine (<i>C. tangerina</i> Hort. ex Tanaka)	3.624
5. Cleopatra tangerine	3.612
6. Dancy tangerine (<i>C. tangerina</i>)	3.551
7. Hamlin orange	3.521
8. Minneola tangelo	3.429
9. Oneco tangerine	3.295
10. Suen Kat mandarin	3.267

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The trees on Hamlin orange and Cleopatra tangerine [*C. reshni* (Engl.) Hort. ex Tanaka] rootstocks, which are tolerant of xyloporosis virus, yielded respectively 3,415 and 3,118 fruit per tree with nucellar Barão and 3,521 and 3,612 fruit per tree with old-line Barão. In this case there was apparently no difference in the productivity of the trees with old-line and nucellar-line tops.

The trees with nucellar-line tops were, as a rule, more vigorous than those with old-line tops. They were also more susceptible to drought than the old-line trees, probably because of their larger size.

As a whole the trees with nucellar tops in Block A produced a total of 156,154 fruit during the eight years of the test, in contrast to 142,486 fruit produced by the old-line trees in Block B.

Discussion and Conclusions

The data in this paper emphasize the recommendation presented by Moreira (4) and approved at the 4th Citrus Congress of the Mediterranean Area held in Israel in 1956, that "in order to obtain the real reactions of one variety on a specific root the rootstock tests should be established only with seedling plants, budded or grafted with scions from new nucellar clones." Rangpur lime was confirmed in its superiority as a rootstock under Brazilian conditions when budded with nucellar budwood. It was a failure when grafted with old-line scions infected with xyloporosis virus. Sunki, a mandarin similar to Cleopatra, was revealed to be a very good rootstock, inducing high yields in the trees when grafted with a nucellar scion.

It was shown also that the virus content in the scion variety plays a very important role in the behavior of many rootstocks.

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