It would seem fitting that recognition, though belated, should be given to the far seeing scientist who over twenty-five years ago visualized the conditions we are now facing and the chance to make a fresh start utilizing nucellar seedlings of our standard varieties threatened by the inroads of insidious virus diseases. It is well also to recognize that it is to Dr. Swingle that we owe the existence of the wonderful tangelos rapidly becoming market favorites.

ROBINSON, OSCEOLA, AND LEE — NEW EARLY-MATURING TANGERINE HYBRIDS

PHILIP C. REECE AND FRANK E. GARDNER

Crops Research Division

USDA *Agricultural Research Service*

Orlando

Natural hybridization, occasional mutation, and subsequent horticultural selection have produced most of the citrus varieties in existence today. Not until the pioneer systematic breeding experiments by W. T. Swingle and H. J. Webber of the U. S. Department of Agriculture was artificial hybridization of citrus recorded. The first cross-pollinations were made in Florida in 1893, and a great deal of citrus hybridization was continued until about 1914. During this period many hybrids of diverse parentage and characteristics were produced. The most important for fresh fruit were tangelos, which are hybrids between grapefruit and Dancy tangerine.

Systematic citrus breeding was not resumed by the Department of Agriculture until 1942, when 35 crosses were made on a large scale by John M. Bellows at the U. S. Horticultural Field Station at Orlando, Florida. Shortly afterward, Bellows left the Department of Agriculture, and the breeding work has been carried forward by other workers who have made scores of additional crosses. At present the progeny of these crosses are in various stages of development, and citrus breeding is being expanded by the U. S. Department of Agriculture in Florida, Texas, and California.

In resuming the citrus breeding work the Department felt that a real need existed for true, loose-skinned tangerine types currently being filled in Florida only by Dancy tangerine and in Texas and California chiefly by the Algerian tangerine (Clementine). The Clementine, although rather seedy and usually shy-bearing, is early-maturing and of high quality; for these reasons it was selected as one parent. Not until later, in attempting to distinguish hybrid from nucellar seedlings, did Furr and Reece (2) learn that, as a female parent, Clementine has another and very important characteristic, failure to produce nucellar seedlings. Many other parents were used, but are not listed here, for Clementine × Orlando tangelo proved to be a very fortunate cross that yielded an unusually high percentage of promising hybrids including the three described here. In a population of only 327 seedlings a wide range of forms occurred. Most of them are predominantly tangerine in type. A few somewhat resemble oranges; others are like tangelos. Most of them are early maturing, large and sweet and have a red peel color, but unfortunately they are rather seedy in mixed plantings. Prominent navels are characteristic of many of these F_1 hybrids.

Because Clementine has been a useful parent in citrus breeding, it may be desirable to include here something about its origin. In 1902 the chief of the botanical service in Algeria, L. Trabut, described a new tangerine variety called Clementine, reputed to be a natural hybrid between "Granito," a particular strain of sour orange, and tangerine (4). Whether the Clementine actually carries any sour orange inheritance remains an unanswered question. However, Clementine budwood was sent in 1909 to W. T. Swingle, who propagated the variety at Glen St. Mary, Florida. He used it as the pollen parent in a cross with a grapefruit to produce the Clement tangelo. There is no record that Swingle ever used it as a seed parent.

The Orlando tangelo, the pollen parent of the tangerine hybrids described here, is itself a hybrid of Bowen grapefruit by Dancy tangerine, made at Eustis, Florida, in 1911. In 1931 it was introduced with several sister hybrids by Swingle, Robinson, and Savage (3).

Robinson Tangerine Hybrid

The Robinson variety (Orlando No. 426-7-4) is the earliest of the new hybrids. It sometimes breaks color as early as September 15 and reaches prime eating condition in late October. The parent tree has the habit of regular bearing.

(Colorplate, Fig. 1)

Technical description: Fruit color Ridgway cadmium-orange to orange-chrome; surface smooth and glossy; shape oblate; size medium large, diameter 3 inches, height 2¼ to 2½ inches; apex broadly depressed, base evenly rounded or only slightly necked, calyx small and inconspicuous; stem slender; rind thin, 1/8 to 3/16 inches, leathery, tough and easily removed; axis large, hollow; segments 12 to 14; pulp dark orange, flavor rich and sweet; seeds 10 to 20; cotyledons Ridgway glass-green. Season October to December.

Trees thornless or nearly so; foliage dense, leaves broadly lanceolate, large, length 3½ to 4½ inches, width 1½ to 2½ inches, margin crenate, particularly the upper half of the leaf; apex tapering to a point or frequently rounded and notched at tip; petioles if present very slightly winged, length 3/8 to 1/2 inch. Branches nearly thornless, erect, spreading under weight of fruit.

Osceola Tangerine Hybrid

The Osceola (Orlando No. 426-12-3) is an exceptionally high-colored hybrid that usually produces heavy crops of attractive fruit somewhat lower in solids and higher in acids than the Robinson. The variety is at its best in November, and the flavor is generally acceptable.

(Colorplate, Fig. 2)

Technical description: Fruit color Ridgway cadmium-orange to almost coral-red; surface smooth and glossy; shape oblate; size medium, diameter 2¾ to 3 inches, height 2 to 2¼ inches; base mainly flattened, slightly corrugated, stem slender, calyx very small and inconspicuous; apex smoothly flattened or slightly depressed; rind thin, 1/8 inch, leathery, and rather easily removed but not loose and baggy, and of a character judged to carry well in shipment; axis hollow, large; segments 10 or 11; pulp dark orange, flavor rich and unusual; seeds many, 15 to 25; cotyledons very pale green, almost white. Season November.

Trees nearly thornless; twigs more upright than Clementine; foliage dense; leaves lanceolate, length 2½ to 3 inches, width 1¼ to 1¾ inches, apex acute but often blunt-obtuse; margin almost entire—very slightly crenate; petiole ⅜ to ½ inch, wingless.

Lee Tangerine Hybrid

The fruit of Lee (Orlando No. 421-36-4) somewhat resembles an orange in size and shape or its pollen parent, the Orlando tangelo. Although fruit of this variety contains medium high solids and rather low acids, it develops good rind color by late October or early November. A high ratio of solids to acids produces a fruit that tastes very sweet. The fruit can be peeled easily and resembles a Temple orange in this characteristic.

(Colorplate, Fig. 3)

Technical description: Fruit color Ridgway orange-chrome to cadmium-orange; surface smooth and glossy; size medium, diameter 2¾ to 3¼ inches, height 2⅝ to 2⅞ inches; shape nearly round, basal area slightly raised and furrowed; calyx small; apex evenly rounded or slightly flattened with a stylar scar, diameter ⅛ to ¼ inch, slightly depressed; rind thin, ⅛ inch, leathery, and easily removed, axis large, hollow except for often a central placental axis free from segments; segments 9 or 10, usually 10; rag little, pulp orange, melting, tender; flavor rich and sweet; seeds 10 to 25 in mixed plantings; cotyledons Ridgway pale-veronese-green to glass-green. Season October to November.

Tree average for mandarin group, almost thornless; foliage dense; leaves lanceolate, length 3 to 3½ inches, width 1¼ to 1¾ inches, apex and base acute, margin very slightly crenate; petiole length ⅜ to ½ inch, wingless.

Discussion

Although these tangerine hybrids derive part of their inheritance from the Bowen grapefruit through the Orlando tangelo, they are predominantly tangerine in general characteristics. The Robinson and Osceola varieties closely resemble tangerines. However, the fruit of the Lee variety possesses some qualities that somewhat suggest a tangelo or even a round orange. These varieties are "specialty fruits" that all mature when most Dancy tangerines are still unable to meet the maturity standards. In "Seasonal Change in Florida Tangerines," Harding and Sunday (1) said that "Dancy

tangerines reached the minimum standards of consumer acceptance about the middle of November. Prime eating condition was reached in January and February." The Robinson, Osceola, and Lee tangerine hybrids will enable the grower to supply the public with mandarin fruits that are larger, sweeter, more high-colored than Dancy tangerines.

Although a few trees of each variety have been tested on several rootstocks, the information regarding their performance is exceedingly limited. Little is known regarding their cold tolerance or their disease and insect susceptibility. Because both parents, Clementine tangerine and Orlando tangelo, are unfruitful when self-pollinated, it would not be surprising to find that their progeny have the same characteristic. Therefore, a word of caution should be given against making extensive plantings of these varieties until additional information is available on their behavior in solid plantings and on their rootstock response. Preliminary tests indicate that Rough lemon rootstock results in a marked lowering of their fruit quality and should not be used. Present indications suggest that Osceolas on Cleopatra rootstock, at least on young trees, are shy bearing.

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THE USE OF TEDION AGAINST CITRUS RED MITE AND TEXAS CITRUS MITE

ROGER B. JOHNSON

Tedion[2] has been shown to be ineffective against the citrus rust mite, *Phyllocoptruta oleivora* (Ashm.) (1), but very effective against the citrus red mite (purple mite), *Panonychus citri* (McG.), under Florida conditions. King and Johnson (2) reported in 1957 that 0.75 pound of 25 percent Tedion per 100 gallons of spray consistently gave a longer period of control than any other acaricide tested. The effectiveness of Tedion against the Texas citrus mite, *Eutetranychus banksi* (McG.), however, has not been reported; nor has control of either citrus red mite or Texas citrus mite with different amounts of Tedion been discussed. The purpose of this paper is to present the findings of a three-year test with several dosages of Tedion against both citrus red mite and Texas citrus mite.

This experiment was conducted in a grove of Temple orange near Haines City, Florida. The experimental block was divided into plots of six trees randomized in four replicates and one or more rows of well-sprayed trees separated the experimental block from surrounding groves. Plots were kept small to insure ample opportunity for mites to migrate from plot to plot in order to test thoroughly the lasting properties of Tedion. Furthermore, each year Tedion was applied to the same plots to determine whether continued use of this acaricide would eventually result in reduced control.

Experimental acaricides were applied in combination with sulfur or zineb[3] for control of citrus rust mite, and in 1958 and the spring of 1959 with parathion[4] for control of scale insects. Experimental treatments were applied with a conventional hydraulic sprayer equipped with two double Boyce guns. All sprays, except when parathion was employed for scale control, were applied in brushing-type applications to outside foliage with no special effort made to secure complete coverage. This method, however, resulted in adequate coverage for mite control with little run-off. When parathion was used, a special effort was made to spray limbs and inside foliage. With the exception of the 1959 post-bloom spray, post-bloom and summer sprays were not experimental and were applied to all plots by the Haines City Citrus Growers Association.

Mite populations were estimated by counting the number of citrus red mites and eggs and the number of Texas citrus mites per

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[2] 25 or 50% 2,4,5,4'—tetrachlorodiphenylsulphone. Supplied by Niagara Chemical Division, Food Machinery and Chemical Corporation.

[3] 65% zinc ethylene-bis-dithiocarbamate.

[4] 25% O, O-diethyl O-p-nitrophenyl phosphorothioate.