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SEASONAL CHANGES IN FLORIDA TANGELOS

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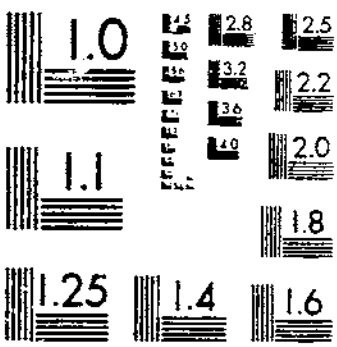

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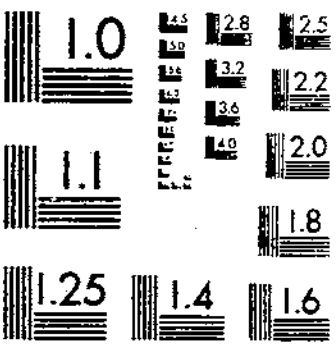

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Seasonal Changes in Florida Tangelos

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Seasonal Changes in Florida Tangelos

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Summary

Seasonal changes and yearly variations for the principal commercial varieties of tangelos (*Citrus reticulata* × *C. paradisi*) are presented. The varieties included are Orlando, Thornton, Minneola, and Seminole. Chemical constituents and physical characteristics were determined and the data correlated with palatability tests. These tests provided a basis for the establishment of standards of maturity at harvest for these varieties of tangelos. The test period was from October to February for the four crop years 1952–53 to 1955–56. The groves were chosen to represent typical plantings in Florida. The rootstocks included sour orange (*Citrus Aurantium*), Cleopatra tangerine (*C. reticulata*), rough lemon (*C. Limon*), sweet orange (*C. sinensis*), Rusk citrange (*Poncirus trifoliata* × *C. sinensis*), and sweet lemon (*C. Limon*).

The Orlando reached maturity first and Seminole last; Thornton and Minneola were intermediate. To insure good eating quality, a marketing standard was established having varying requirements through the season. A nomograph was devised for easy calculation of minimum market acceptability. This standard provides for a sliding scale of acceptability based on seasonal changes in solids and acids and in the solids-to-acid ratio. Early season fruit must have a minimum of 9 percent total solids and a minimum ratio of solids to acid of 10 to 1. As the season progresses the minimum total solids requirement decreases and the minimum total solids to total acid ratio increases. The quality and quantity of fruit reaching the consumer can easily be controlled by adjustment of this standard.

The weight of total soluble solids increased and the weight of total acid decreased during the marketing season. These factors, together with the resulting solids-to-acid ratio, were closely associated with the palatability ratings.

Ascorbic acid (vitamin C) concentration showed no marked tendency to fluctuate during the season. Active acidity gradually decreased as the tangelos ripened.

[1] Acknowledgment is made to Mr. J. B. Prevatt, Chairman of the Tangelo Maturity Committee, and to committee members R. H. Prine, William Franklin Ward, and Leo H. Wilson for their helpful suggestions and approval of the tangelo maturity "code," and to the following growers and shippers for generously providing fruit for the investigation: Charles E. Bradshaw, H. A. Bradwell, G. R. Brooks, W. C. Daniels, S. Carey Colley, the late H. J. Edsall, Colin English, E. Allen Haley, Jr., T. S. Jefferies, J. A. Kauffman, Don Kemp, Lake Region Packing Association, J. W. Moore, A. E. Pickard, W. R. Pollard, C. W. Rex, F. E. Roberts, T. Ralph Robinson, R. S. Salter, Byrum Shockley, Jason Smith, C. C. Thullberry, E. G. Todd, G. F. Ward, and C. W. Worn. Staff members who assisted in conducting the investigations were: Helen L. Dudak, Bucton S. Floyd, Ernest E. Forrest, Jr., William H. Henry, Earl F. Nelson, G. Lee Roberts, Emily A. Ross, M. J. Soule, Jr., and T. A. Wheaton.

Both the volume of juice and weight of the fruit increased during maturation and tended to level off or decrease slightly after prime eating quality was reached.

Degreening was associated with maturation and took place rapidly during the October to February period.

By the time the fruit reached the minimum standard of consumer acceptability the color of the flesh was yellow-orange to orange for Orlando, Minneola, and Seminole tangelos, and tannish yellow for Thornton. Flesh texture of all varieties was good at this time.

Variation associated with rootstock was not as pronounced as that associated with variety. For Orlando tangelos, total solids, total acid, and palatability ratings were higher in fruit from trees on Cleopatra rootstock than in fruit from trees on some of the others, such as rough lemon.

Yearly variations in fruit characteristics were associated with rainfall. Fruits produced during a relatively wet season were heavy and had a high volume of juice; the juice had low total solids and total acid. During a relatively dry season the fruits were relatively light and had a low volume of juice. However, the total solids, total acid, and solids-to-acid ratio were high.

The Orlando, Minneola, and Seminole tangelos resemble the tangerine parent in many respects, such as total solids content, ascorbic acid concentration, active acidity, and rind color. The Thornton tangelo resembles the grapefruit parent in total solids content, ascorbic acid concentration, and color of the rind.

Introduction

Tangelos (*Citrus reticulata* × *C. paradisi*) are grown in Florida and marketed as specialty fruits. They are important items in the gift box trade which comprises about three million pieces, but in recent years commercial marketing of tangelos on the carlot basis has become even more important. Within 29 years, 1928 to 1957, nearly 400,000 tangelo trees, enough for planting over 5,000 acres, were reported to the Florida State Plant Board inspector as having been moved from Florida nurseries to Florida destinations (*14*).[2] During the 1957–58 season, about 250,000 packed 4/5-bushel boxes of tangelos were certified by the Florida Inspection Service (*6*).

Tangelos comprise a group of citrus fruits which are hybrids of the tangerine, or mandarin orange (*Citrus reticulata*), with either the grapefruit, or pummelo (*C. paradisi* and *C. grandis*) (*21*). The tangelos used in this investigation, however, were crosses of *Citrus reticulata* × *C. paradisi*. The name tangelo is a combination of the first syllable of tangerine and the last three letters of pummelo. The first crosses giving rise to this group of fruits were made by Swingle at Eustis, Fla., in 1897. Other crosses were made by Webber in 1898. Another series of crosses by Swingle, Robinson, and Savage (*17*) cover a period from 1908 to 1912. This plant breeding work was done principally at Eustis and Glen St. Mary, Fla., by scientists of the U.S. Department of Agriculture.

In this investigation the fruit development and compositional changes of the principal varieties of tangelos were studied during marketing seasons 1952–53 to 1955–56. From the results, it has been possible to establish minimum maturity standards by correlating physical measurements and chemical constituents with palatability ratings of the fruit. Practical standards were set up on a sliding scale. For example, early in the season a minimum of 9 percent total solids and a minimum solids-to-acid ratio of 10 to 1 is required, while for late season fruit the requirements

[2] Italic figures in parentheses refer to items in Literature Cited, page 25.

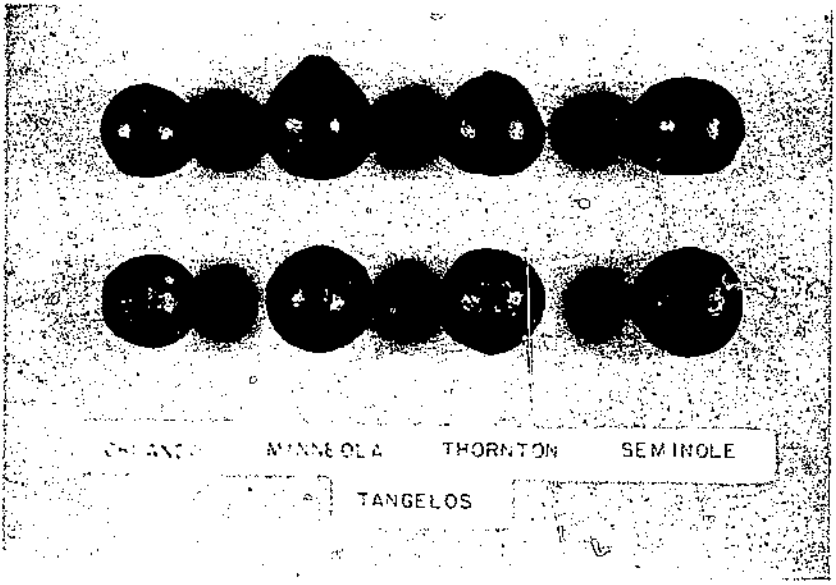

PLATE 1.—Typical fruits of the Orlando, Minneola, Thornton, and Seminole tangelos.

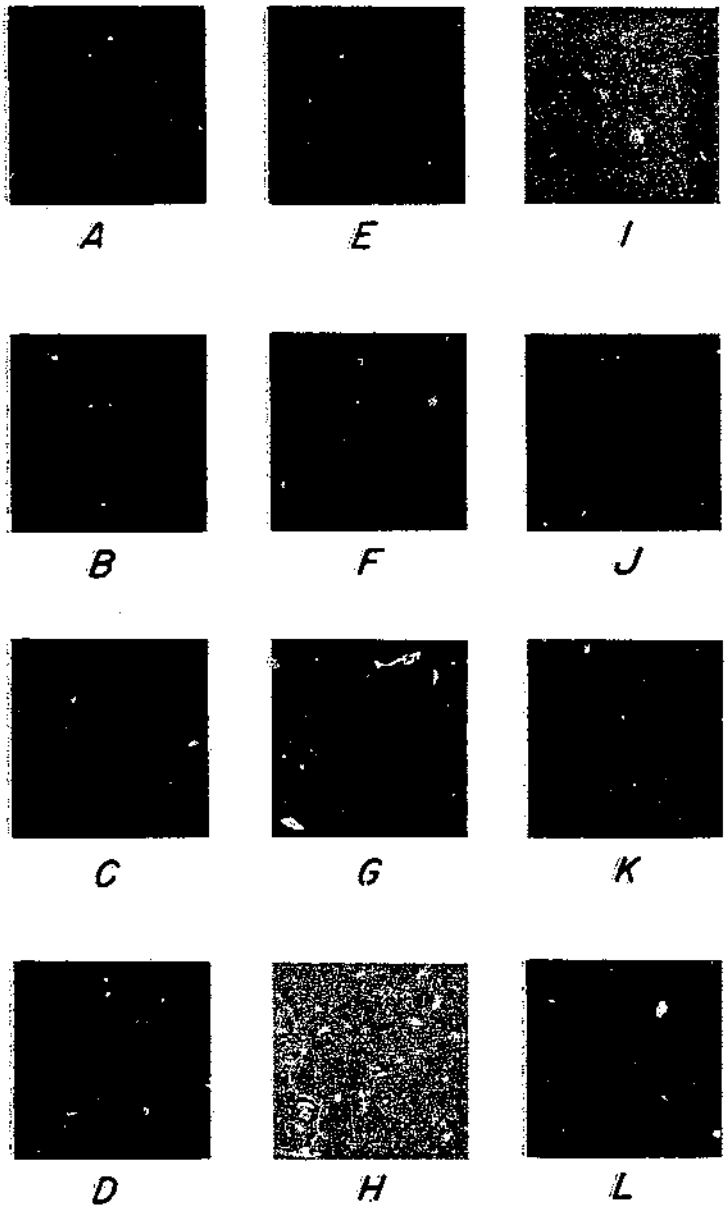

PLATE II. United States Department of Agriculture standards for determining the color of Tangelo rind.

are a minimum of 8 percent total solids and a minimum solids-to-acid ratio of 10.50 to 1.

This study is a part of a broad program of research aimed at improving market efficiency, and expanding markets for farm products.

Description of Orlando, Thornton, Minneola, and Seminole Tangelos and Their Rootstocks

Tangelo varieties vary widely in tree and fruit characteristics. The trees are vigorous, usually attaining standard orange tree size. However, it is mainly the fruit characteristics that interest the grower, shipper, and consumer. The different kinds of tangelo fruits vary considerably in size, shape, color of rind and flesh, flavor, and date of maturation. Webber (*21*) points out that in general, tangelo trees produce fruits about the size of the common sweet orange. The fruits exhibit a tendency to be slightly drawn out at the stem end or necked. Tangelo fruits are usually highly colored—the Orlando, Minneola, and Seminole, bright orange; Thornton, bright yellow. They are aromatic, richly flavored, sprightly acid, only slightly bitter, and very juicy. The rind is usually smooth or slightly bumpy, thin, comparatively loose and easily removable like that of the tangerine.

The Orlando tangelo (formerly known as "Lake") is the result of the cross, Bowen grapefruit × Dancy tangerine, with the latter as the pollen parent (*17*, *18*, *21*). Orlando is one of the earliest maturing tangelos and harvesting usually begins in early November. However, prime eating quality is not reached until January. The fruit is attractive, highly colored, deep orange to almost tangerine red, and has a thin rind, which is slightly pebbly but not rough. They are about the size of tangerines, the average diameter being from 2 5/16 to 3 7/16 inches. The fruit is slightly flat and contains 10 to 12 seeds (plate I).

The Thornton tangelo is believed to be a result of crosses between tangerine and grapefruit (*16*, *17*). It dates back to crosses made by Swingle and Webber in 1897–98 at Eustis, Fla. Swingle, Robinson, and Savage state that "the original records of the group of hybrids giving rise to the Thornton tangelo were lost, so that the pollen parent is not definitely known. As many of the sister hybrids show unmistakable tangerine characteristics, however, it is safe to say that this fruit is a tangelo with grapefruit the known seed parent" (*17*).

The fruit attain prime eating quality in January and February, although harvesting begins in December. The Thornton is unusual in appearance in that the rind is soft and thick, somewhat wrinkled and pebbly, and the color of the rind and flesh is yellow orange. The fruits range in size from about 2 7/16 to 3 3/16 inches and are flattened at the blossom end and slightly tapered at the stem end. Seeds range in number from 10 to 25 per fruit (plate I).

The Minneola tangelo is the result of a cross in which the Bowen grapefruit was pollinated with pollen from the Dancy tangerine (*17*, *21*). The fruit reaches prime eating quality in January and February, although harvesting begins in December. The Minneola is probably the most attractive of the tangelos, and when fully ripe the color of the rind is deep reddish orange. The fruits are medium large in size and range from 2 5/16 to 3 5/16 inches in diameter or larger. They are somewhat flattened at the blossom end, and the stem end of the fruit is slightly raised but does not form a distinct nipple. The fruit contains 7 to 12 small seeds closely grouped at the center (plate I).

The Seminole tangelo, like the Orlando and Minneola, is a result of crosses between Bowen grape-

fruit with pollen from the Dancy tangerine (*17*, *21*). The fruit reaches prime eating quality in February or March, although harvesting begins in January. This is one of the most attractive of the tangelo fruits, and in general appearance it is more like a highly colored orange. Fruit size averages from about 2⅝ to 3⅜ inches in diameter. The rind is thin, smooth, and glossy with a tendency to crease. Seeds are numerous, 20 or more, short, plump, and closely grouped at the center (plate I). The flavor of the juice is tart and sprightly which accounts for the late marketability.

Tangelos have been grown chiefly on sour orange (*Citrus Aurantium*) rootstock. However, because of the susceptibility of sour orange to the virus disease tristeza, this rootstock is losing favor. In recent years there has been fairly large-scale planting of tangelos on rootstocks of Cleopatra tangerine (*C. reticulata*, referred to hereafter as Cleopatra), rough lemon (*C. Limon*), and sweet orange (*C. sinensis*). Rusk Citrange (*Poncirus trifoliata* × *Citrus sinensis*, referred to hereafter as Rusk) rootstock is also used in a limited way in Florida.

During the 5 months, October through February, marked physical and chemical changes occur in the fruit. Tangelos, like oranges and grapefruit, do not improve in palatability after harvest. Since they contain practically no starch, they do not undergo marked changes in composition after being picked from the tree, as do apples, pears, mangos, and bananas. The degree of maturity of tangelos at the time of harvest is the most important factor determining their eating quality. They owe their sweetness to natural sugars contained when they are picked and it can readily be understood that they should not be harvested until they are ripe. It is recognized that other factors, such as weather conditions, soils, fertilizers, cultivation, spraying, and dusting, may also affect eating quality. Some observations regarding the effect of rainfall were made in connection with this investigation.

Materials and Methods

Selection of Plots and Samples

The varieties studied were the commercially important ones—Orlando, Thornton, Minneola, and Seminole. The commercial groves used for fruit sampling were selected to represent average tangelo plantings in Florida. They were located in the central and ridge districts on sandy soils relatively low in organic matter, and in the west coast Bradenton-Terra Ceia districts, where the soils have a relatively higher organic matter content. In each of these districts the tangelos in the plots were on the following rootstocks. Six different groves of Orlando tangelos were on rough lemon, 10 on sour orange, 4 on Cleopatra, 3 on Rusk, and 1 on sweet lemon. Three different groves of Thornton tangelos were on rough lemon, and three on Cleopatra. Two different groves of Minneola tangelos were on rough lemon, three on sour orange, two on Cleopatra, and one on sweet orange. Three different Seminole tangelo groves were on sour orange and one on Cleopatra.

The sample groves ranged in age from 5 to approximately 25 years. Most of them were mature but none were considered old for citrus trees. All the groves were in good condition and had received normal culture, fertilizer, and spray treatments. The trees showed no evidence of deficiency disorders. The location of the plots, variety, kinds of rootstock, age of the trees, and the seasons of investigations are given in table 1.

The tests were started the first week in October and continued until January or February, at which time

TABLE 1.—*Description and location of study plots in Florida commercial plantings of tangelos, and dates of study of each plot*

Variety, kind of rootstock, and plot number	Age of trees in years [1]	Location	District	Season or seasons of study
Orlando:				
Rough lemon:				
1	9	Apopka	Central	1952–53 to 1955–56.
2	9	Groveland	do	1953–54 to 1955–56.
3	5	Avon Park	Ridge	Do.
4	8	do	do	Do.
5	13	do	do	Do.
6	17	do	do	Do.
Sour orange:				
7	6	Tavares	Central	1952–53 to 1955–56.
8	9	Apopka	do	Do.
9	6	Terra Ceia	West coast	Do.
10	7	do	do	Do.
11	9	Bradenton	do	Do.
12	13	Avon Park	Ridge	1953–54 to 1955–56.
13	15	Okahumpka	Central	Do.
14	7	Mount Homer	do	1952–53.
15	9	Groveland	do	Do.
16	17	Bradenton	West coast	Do.
Cleopatra:				
17	14	Altamonte Springs	Central	1952–53 to 1955–56.
18	5	Avon Park	Ridge	1953–54 to 1955–56.
19	8	do	do	Do.
20	18	Okahumpka	Central	Do.
Rusk:				
21	8	Tavares	do	1952–53 to 1955–56.
22	10	do	do	Do.
23	17	Bradenton	West coast	Do.
Sweet lemon:				
24	5	Avon Park	Ridge	1953–54 to 1955–56.
Thornton:				
Rough lemon:				
25	12	Mount Homer	Central	1952–53 to 1955–56.
26	21	do	do	Do.
27	[2] 25	Clermont	do	1953–54 to 1955–56.
Cleopatra:				
28	9	Forest City	do	1952–53 to 1955–56.
29	17	Tavares	do	Do.
30	11	Grand Island	do	1953–54 and 1955–56.
Minneola:				
Rough lemon:				
31	8	Tavares	do	1952–53 to 1955–56.
32	9	Groveland	do	Do.
Sour orange:				
33	6	Terra Ceia	West coast	Do.
34	10	Bradenton	do	Do.
35	12	do	do	1953–54.
Cleopatra:				
36	14	Altamonte Springs	Central	1952–53 to 1955–56.
37	7	Sorrento	do	1953–54 to 1955–56.
Sweet orange:				
38	7	Bradenton	West coast	1953–54 and 1955–56.
Seminole:				
Sour orange:				
39	10	do	do	1952–53 to 1955–56.
40	7	Terra Ceia	do	1953–54 to 1955–56.
41	8	Tavares	Central	1952–53.
Cleopatra:				
42	11	Grand Island	do	1953–54 and 1955–56.

[1] As of 1953. [2] Approximate.

some of the fruit was showing signs of senescence as indicated by greasing, puffiness, separation of the flesh from the rind, drying out of segments, and dropping from the trees.

Samples consisting of at least 125 fruits were picked from each plot at intervals of about 4 weeks. Care was taken to pick fruits from only the regular bloom and the fruits were selected to be representative of various parts of the trees since some of the chemical constituents vary with location of the fruit on the tree (*11*, *15*). Immediately after being picked the samples were taken to the U.S. Department of Agriculture Horticultural Field Station at Orlando, Fla., and placed in storage at 32° F. They were tested as promptly thereafter as was feasible. The sampling continued through four marketing seasons 1952–53 to 1955–

56, a period within which considerable variation occurred in weather conditions and fruit quality.

Evaluating Palatability

As pointed out in a recent symposium (*1*) flavor is highly complex and usually involves more than the major flavor constituent. The complexity of flavor is shown by the fact that analysis of volatile odorous substances in the strawberry has led to the isolation of about 35 substances; however, it is still not possible to reconstitute a really fresh strawberry flavor. The characteristic aroma of citrus is ascribed to high-boiling, sparingly water-soluble oils. Unlike the plant lipids, which are esters of long-chain fatty acids, these oils are mainly mixtures of terpenes, such as *d*-limonene.

Special attention was given to the eating quality of the fruit, since the taste ratings were to be compared with certain chemical constituents. Taste appeal is determined by the texture of the flesh, juiciness, contents of total solids and total acid, the ratio of total solids to total acid, frequently referred to as the solids-to-acid ratio, and a host of trace components which go to make up "flavor."

In each taste test about 100 tangelos were used. The fruits were halved crosswise, and from each half two wedge-shaped pieces were cut for testing. Each judge was instructed to taste several pieces before rating the lot. Judges did not discuss their ratings with each other. Each judge individually appraised each lot of fruit and gave it a numerical rating, and the ratings of all judges were averaged. Tasters were not restricted to any numerical range in rating insipid or aged fruit. Scoring of all samples of tangelos was done according to the following scorecard.

SCORECARD FOR PALATABILITY RATING OF TANGELOS[1]

Arbitary standard	Taste or flavor of fruit	Numerical rating range corresponding to description	Individual numerical rating
Very acid	Very acid, raw, immature flavor	20–39	
Acid	Acid with absence of raw, immature flavor.	40–59	
Tart	Too tart for consumer approval	60–69	
Pleasantly tart	Minimum stage of acceptability for consumer.	70–79	
Pleasantly tart to sweet.	Pleasant blend of sugars and acid, with very good texture and flavor.	80–100	
Insipid (aged)	Very sweet, watery, lacking in flavor, low in acidity, aged.		

[1] This scorecard was used by the panel of taste testers. A rating of 70 was selected as the arbitrary standard below which the judges would consider the fruit not acceptable, or not meeting consumer approval.

Chemical Analyses

Juice of 25 fruits from the samples rated for palatability was composited for chemical analysis. The juice was extracted by a pressure extractor (*12*) and strained to remove seeds and pulp. Chemical analyses continued through the 4 seasons for 21 plots, through 3 seasons for 13 plots, through 2 seasons for 3 plots, and through 1 season for 5 plots.

The analyses included determina-

tions of total solids (principally sugars), total acid (as citric), ascorbic acid (vitamin C), and active acidity (pH). Standard methods were followed (*2, 4, 7*).

Evaluating Physical Characters

The appearance or "eye appeal" cannot be overlooked in general marketability, even though it may not always be correlated with taste. In this, as in other studies on citrus fruits (*8, 9, 10, 12*) considerable attention was given to the measuring of physical characteristics each time the fruit was rated for palatability. The measurements of these characteristics were averaged to determine the correlation between the appearance and physical qualities and the results of chemical analyses and palatability tests.

Certain characters, such as weight, volume of juice, and weight of juice are readily measured and averaged. Other characteristics, such as color and texture were determined as described herein.

Color of Rind.—The color of the rind was determined for each sample by matching the fruit with the colors A to L of plate II. The "average" color for each sample was ascertained by assigning a numerical value to each color, averaging these values, and then converting each numerical average to the nearest color designation.

Color of Flesh.—Color of the flesh of tangelos was determined by matching the halves of 25 transversely cut fruit with the color charts of the Maerz and Paul Dictionary of Color (*13*). Because the color graduations were many, these colors were grouped in five classes: PY, pale yellow; TY, tannish yellow; OY, orange yellow; YO, yellow orange; O, orange. Typical color for a sample lot was determined by the procedure given in the previous paragraph.

Condition of Flesh.—The texture of the flesh was determined for each sample after the fruits were halved transversely. Classification was based on the percentage of tangelos in each sample that were of coarse texture, good texture, and overmature. Fruit in which the vesicle cell walls were thick and conspicuous and the juice vesicles not distended with juice was designated as coarse; that fruit in which the vesicle cell walls were thin and inconspicuous and the juice vesicles fully expanded was designated as good-textured; and that fruit in which the flesh had separated from a part or most of the rind, or where there was a separation of the segments, or granulation or drying-out of the flesh, was designated as overmature.

Results

Values obtained for Orlando, Thornton, Minneola, and Seminole tangelos by averaging original data for the plots studied are presented in tables 2, 5 to 16 and in figures 1 to 3. Values representing the 4-year averages were arithmetic averages of the total plots for the four crop years and were weighted according to the number of plots observed per year. Data for individual plots are presented in appendix, table 18. Comparisons among certain varieties and rootstocks are also presented but data are somewhat limited.

Relationship of Physical and Chemical Factors to Palatability

Quality of citrus fruits affects prices, sales, and the consumer's decision to buy or not to buy a particular product. With this in mind, considerable study was given to the correlation of results of taste tests with chemical analyses and physical characteristics (tables 2, 5 to 16, figs. 1 to 3).

Palatability as measured by taste test panels generally increased rapidly as fruit matured, and was correlated with increases in total solids

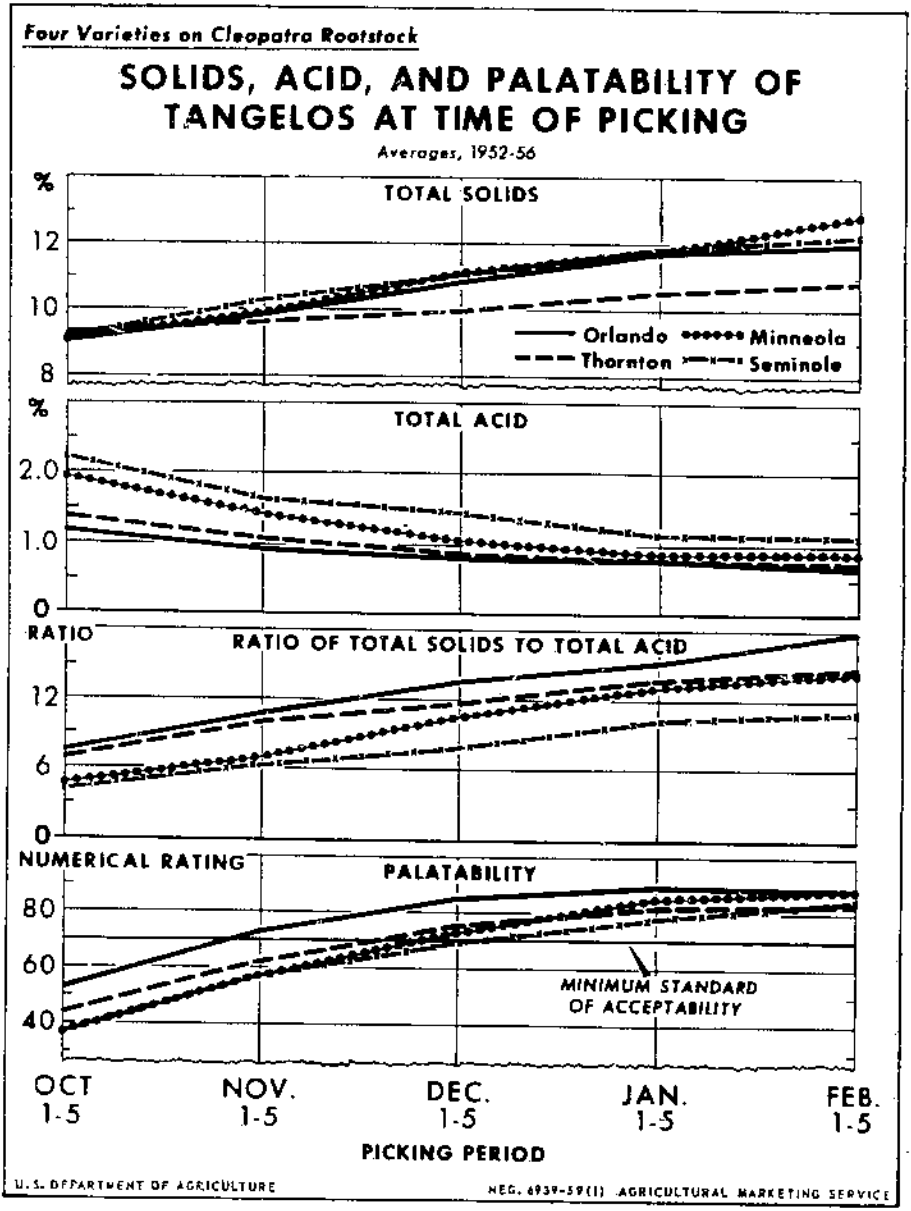

FIGURE 1.—Palatability (see scorecard p. 6), percentages of solids and acid by weight and solids-to-acid weight ratio of Orlando, Thornton, Minneola, and Seminole tangelos on Cleopatra rootstock at different picking periods. (Averages, 1952–56)

and total solids to total acid ratio (fig. 1), color of rind, weight of fruit, volume of juice (fig. 2), and pH values (fig.3). The Orlando reached maturity first and Seminole last; Thornton and Minneola were intermediate. At prime condition, the Orlando and Minneola tangelos rated higher in palatability than the Thorntons and Seminoles.

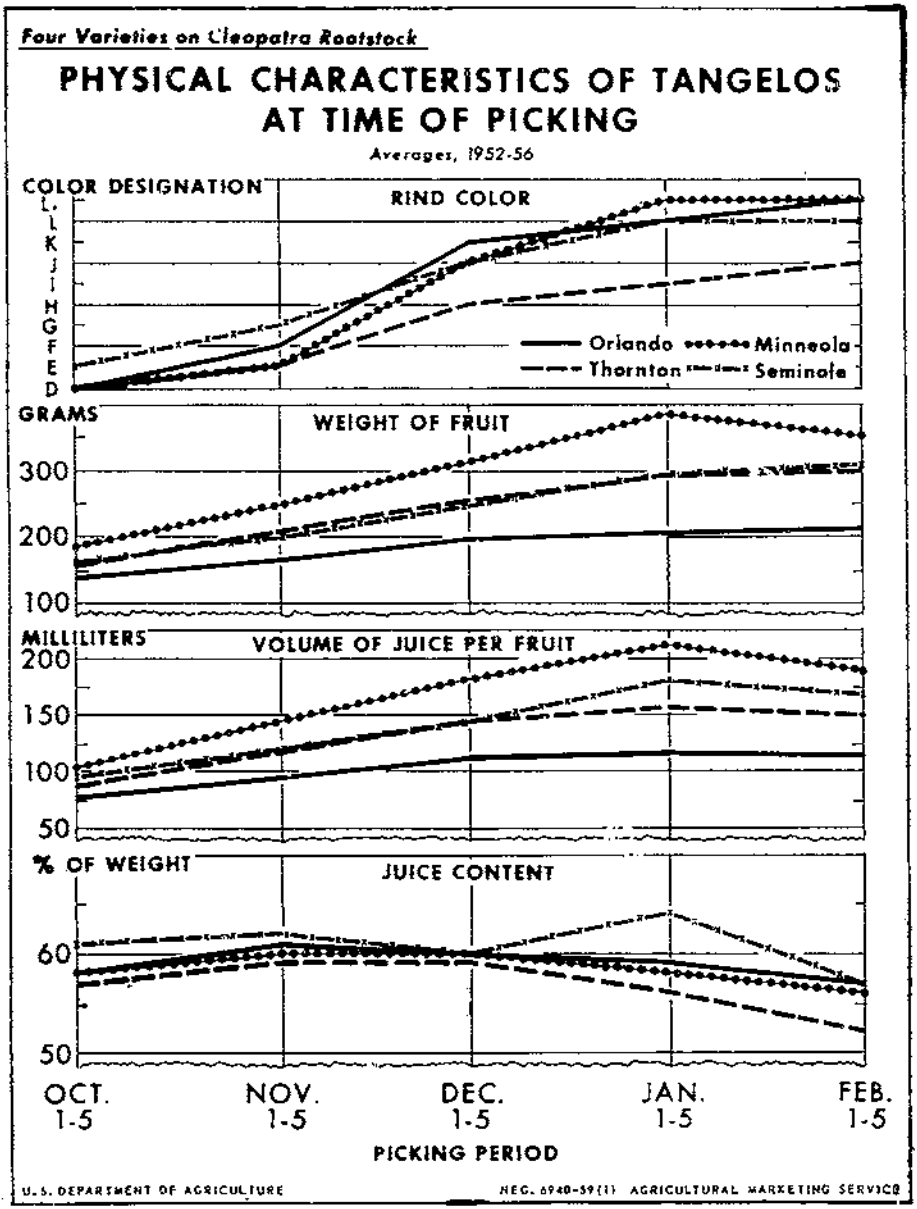

FIGURE 2.—Weight of juice as a percentage of weight of fruit, volume of juice per fruit, weight per fruit, and color of rind (as rated according to the standards shown in plate II) of Orlando, Thornton, Minneola, and Seminole tangelos on Cleopatra rootstock at different picking periods. (Averages, 1952–56)

Although it is recognized that many factors influence fruit quality and acceptability to the consumer, a reliable index of acceptability has been found in the relation of the total solids to the total acid (the total solids to the total acid ratio) of the juice.

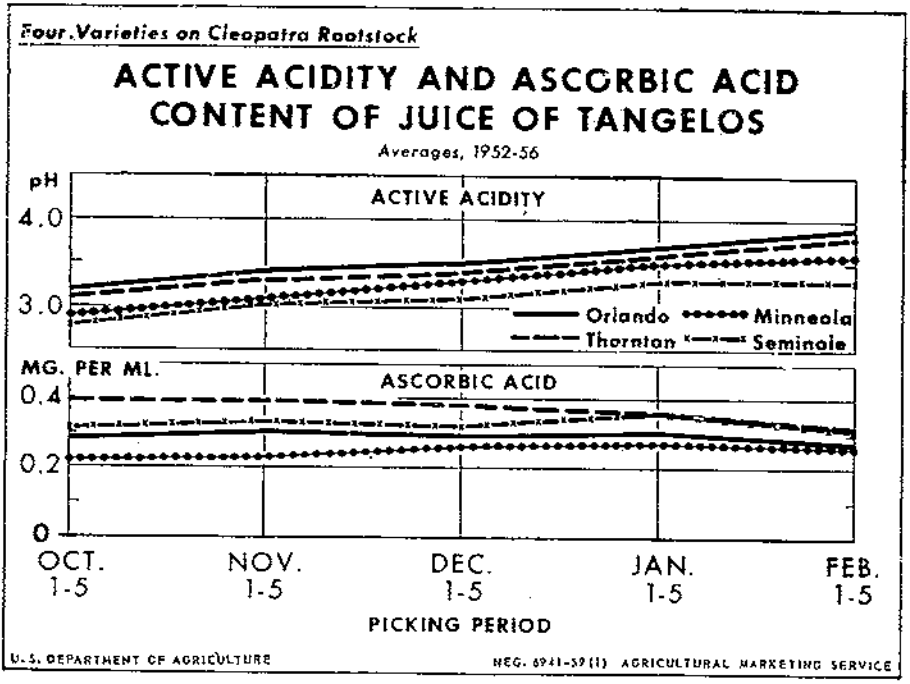

FIGURE 3.—Weight of ascorbic acid per milliliter and active acidity of juice of Orlando, Thornton, Minneola, and Seminole tangelos on Cleopatra rootstock at different picking periods. (Averages, 1952–56)

TABLE 2.—*Palatability ratings: Seasonal changes in tangelos, by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average palatability ratings of fruit harvested at indicated period [1]				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Orlando:					
Rough lemon	54	71	82	86	80
Sour orange	53	71	83	89	87
Cleopatra	53	73	85	89	88
Rusk	54	72	85	88	84
Thornton:					
Rough lemon	40	60	72	77	79
Cleopatra	44	62	75	82	83
Minneola:					
Rough lemon	40	61	77	85	86
Sour orange	44	65	80	87	89
Cleopatra	37	57	73	85	88
Sweet orange	45	66	82	87	92
Seminole:					
Sour orange	41	58	68	76	80
Cleopatra	37	57	69	78	84

[1] Average of ratings given by about 35 tasters using the scorecard shown on p. 6.

Nomographs similar to those previously made for Temple oranges (*10*), tangerines (*9*), and grapefruit (*8*), showing the relation of consumer approval to total solids and total acid were constructed for each variety of tangelo. These were obtained by connecting lines between values for total solids and total acid for each of the samples which rated 70 or more in the taste tests. From the nomographs thus drawn, base lines of minimum acceptability were established. The composite nomograph for Orlando, Thornton, Minneola, and Seminole tangelos is shown in figure 4. From this basic information, it was possible to set forth in tabular form the percent minimum total solids and the minimum total solids to total acid ratio for practical standards (appendix table 19).

These standards were enacted by the Legislature of the State of Florida in 1957 at the request of the citrus industry (*5*). Should the consumer demand sweeter fruit, the standards could be easily adjusted by an increase in ratio requirements, or an increase in minimum solids, or both. Conversely, in order to allow more tart fruit to be shipped, the ratio requirements could be decreased, the minimum solids requirement decreased, or both.

Table 3 shows the relationship between total solids, total acid, solids-to-acid ratio, and palatability

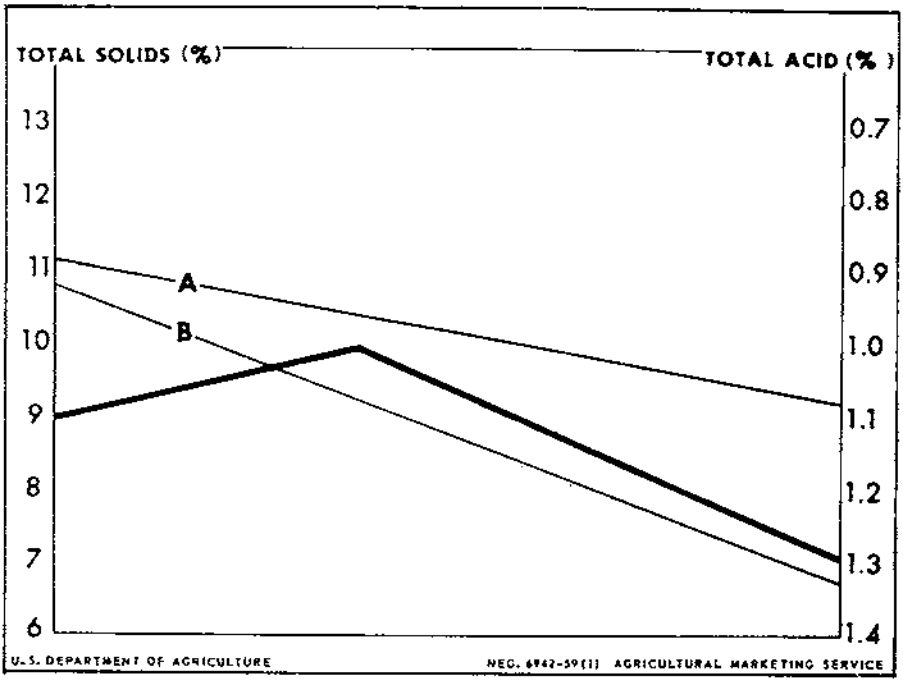

FIGURE 4.—Base line of a composite nomograph showing the relation of total solids and total acid in 398 samples of Orlando, Thornton, Minneola, and Seminole tangelos rated as meeting consumer approval according to taste tests. Using this information, 5 picking periods for acceptable fruit were established, August 1 through October 31, November 1 through November 15, November 16 through November 30, December 1 through January 31, and February 1 through July 31. See table 19, Appendix.

Line A, entirely above the base line, is representative of fruit meeting consumer approval. Line B, crossing the base line, is representative of fruit not meeting consumer approval.

TABLE 3.—*Composition of 398 samples of Orlando, Thornton, Minneola, and Seminole tangelos rated "acceptable" in taste tests by scoring 70 or above*

Total solids (percent)	Total acid (percent)	Solids to acid ratio	Palatability rating	Samples
7.90 to 7.98	0.41 to 0.55	14.36 to 19.32	70 to 79	3
8.03 to 8.97	0.42 to 0.81	10.89 to 21.07	71 to 84	27
9.17 to 9.98	0.41 to 1.09	8.66 to 23.49	70 to 87	80
10.00 to 10.98	0.43 to 1.23	8.38 to 25.05	70 to 90	148
11.00 to 11.99	0.38 to 1.42	7.80 to 29.29	71 to 93	100
12.00 to 12.88	0.60 to 1.31	9.21 to 20.95	75 to 94	31
13.21 to 13.88	0.81 to 1.04	12.70 to 16.43	84 to 93	9

of the 398 samples rated as acceptable and used in construction of the nomograph. From this it can be seen that over 60 percent of the fruit had total solids ranging from 10.00 to 11.99 percent, total acid from 0.38 to 1.42 percent, and ratios from 7.80 to 29.29. Over 80 percent of the samples had total solids between 9.17 and 11.99 percent with the same ranges as above for total acid and ratios.

Of a total of 585 samples tested, 187 samples failed to pass the test for consumer approval. The data for these samples are given in table 4. Low palatability ratings were usually associated with low total solids content, high total acid content, and, in some cases, lack of juiciness and coarse texture of the flesh.

Total Solids, Total Acid, and Solids-to-Acid Ratios

The balance between total solids, which are principally sugars in mature fruit, and total acid, is closely related to palatability. As with tangerines (*9*), the Orlando, Minneola, and Seminole tangelos increased in total solids rapidly and reached high levels of total solids. Thornton tangelos resembled grapefruit (*8*), in that they increased slowly in total solids content from an average of about 9 percent in October to about 10.5 percent in February (table 5, fig. 1). At the level of minimum acceptability the total solids were 9.8 percent for Orlando and Thornton tangelos, 11.0 percent for Minneolas, and 11.2 percent for Seminoles. Orlando, Thornton, and Minneola tangelos grown on Cleopatra rootstock were consistently higher in total solids than when grown on rough lemon rootstock.

Total acid decreased during the season, this decrease being fairly rapid up to maturity, and very slow thereafter (table 6, fig. 1).

TABLE 4.—*Composition of 187 samples of Orlando, Thornton, Minneola, and Seminole tangelos rated "unacceptable" in taste tests by scoring less than 70*

Total solids (percent)	Total acid (percent)	Solids to acid ratio	Palatability rating	Samples
7.40 to 7.98	0.65 to 1.54	5.14 to 11.65	34 to 67	8
8.09 to 8.97	0.41 to 2.38	3.63 to 20.58	27 to 68	64
9.03 to 9.98	0.81 to 2.41	3.82 to 12.25	27 to 69	88
10.02 to 10.87	0.95 to 2.23	4.78 to 10.55	32 to 67	22
11.12 to 11.27	1.11 to 1.56	7.16 to 10.15	66 to 69	4
12.20	1.15	10.61	68	1

TABLE 5.—*Total solids: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average total solids of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Orlando:					
Rough lemon	8.45	9.23	9.72	10.14	10.03
Sour orange	9.20	10.09	10.73	11.32	11.79
Cleopatra	9.00	9.81	10.80	11.70	12.00
Rusk	9.26	9.88	10.83	11.26	11.61
Thornton:					
Rough lemon	8.84	9.17	9.55	9.67	10.08
Cleopatra	9.30	9.59	9.98	10.50	10.81
Minneola:					
Rough lemon	9.08	9.51	10.32	10.99	11.33
Sour orange	9.26	9.69	10.71	11.12	11.99
Cleopatra	9.04	9.82	11.15	11.75	12.80
Sweet orange	9.24	9.91	11.09	11.49	12.57
Seminole:					
Sour orange	9.13	9.90	10.42	10.80	10.67
Cleopatra	9.09	10.27	11.06	11.76	12.27

There were consistent varietal differences in total acid content. At minimum acceptability, Orlando tangelos averaged 0.93, Thorntons 0.93, Minneolas 1.26, and Seminoles 1.38 percent acid, when all were grown on Cleopatra rootstock (fig. 1).

Orlando tangelos grown on Cleopatra, sour orange, and Rusk rootstock had a slightly higher total acid than those grown on rough lemon. The effect of rootstock on total acid was more variable for Minneola and Seminole tangelos (table 6).

TABLE 6.—*Total acid: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average total acid of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Orlando:					
Rough lemon	1.05	0.79	0.66	0.64	0.57
Sour orange	1.23	.91	.76	.74	.73
Cleopatra	1.19	.92	.80	.77	.68
Rusk	1.18	.84	.72	.71	.67
Thornton:					
Rough lemon	1.42	1.04	.81	.73	.70
Cleopatra	1.37	1.08	.86	.77	.74
Minneola:					
Rough lemon	1.85	1.21	.90	.85	.89
Sour orange	1.54	1.07	.82	.74	.69
Cleopatra	1.95	1.42	1.06	.90	.89
Sweet orange	1.77	1.13	.87	.73	.68
Seminole:					
Sour orange	1.89	1.44	1.22	1.01	.98
Cleopatra	2.23	1.66	1.43	1.15	1.12

The ratio of weight of total solids to weight of total acid gives an indication both of maturity and consumer acceptability, and is a part of the Florida laws. At minimum maturity, Orlando, Thornton, Minneola, and Seminole tangelos on Cleopatra rootstock had high solids-to-acid ratios, 10.20, 10.50, 9.90, and 8.10, respectively. The low ratio for Seminole was due primarily to the high acid content of this variety (table 7, fig. 1).

The kind of rootstock had little effect on the solids-to-acid ratio for Orlando, Thornton, or Seminole varieties. Minneola tangelos, in February, showed wider variation according to rootstock, with a low of 12.73 on rough lemon and a high of 18.49 on sweet orange (table 7).

Ascorbic Acid

The ascorbic acid content of the principal varieties of tangelos was about equal to that of the tangerine parent (*9*), and slightly lower than that normally found in the grapefruit parent (*8*). The concentration of ascorbic acid of the juice reaches a maximum in the early stages of development and remains fairly constant during the marketing season (table 8, fig. 3).

Of the different varieties on Cleopatra rootstock, Thornton tangelos had the highest average ascorbic acid concentration, and Minneola the lowest. Orlando and Seminole fruits were intermediate.

The ascorbic acid concentration varied less with rootstock than with variety, although Orlando tangelos on sour orange and Cleopatra rootstock averaged slightly higher in ascorbic acid than those on rough lemon or Rusk (table 8).

Active Acidity

In active acidity, the tangelos resemble the tangerine parent (*9*), rather than the grapefruit (*8*). In October, when all varieties of fruit are immature, the pH values ranged from as low as 2.8 in Seminoles to 3.2 in Orlandos. By February, the pH values had increased, ranging from 3.3 in Seminoles to 3.9 in Orlando tangelos. Thus the active acidity, a measure of hydrogen ion concentration, decreased (pH values increased) steadily during the de-

TABLE 7.—*Ratio of total solids to total acid: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average solids to acid ratio of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Orlando:					
Rough lemon	8.05	11.68	14.73	15.84	17.60
Sour orange	7.48	11.09	14.12	15.30	16.15
Cleopatra	7.56	10.66	13.50	15.19	17.65
Rusk	7.85	11.76	15.04	15.86	17.33
Thornton:					
Rough lemon	6.23	8.82	11.79	13.25	14.40
Cleopatra	6.79	8.88	11.60	13.64	14.61
Minneola:					
Rough lemon	4.91	7.86	11.47	12.93	12.73
Sour orange	6.01	9.06	13.06	15.03	17.38
Cleopatra	4.64	6.92	10.52	13.06	14.38
Sweet orange	5.22	8.77	12.75	15.74	18.49
Seminole:					
Sour orange	4.83	6.88	8.54	10.69	10.89
Cleopatra	4.08	6.19	7.73	10.23	10.96

TABLE 8.—*Ascorbic acid concentration: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Ascorbic acid milligrams (mg.) per milliliter of juice of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Mg.	*Mg.*	*Mg.*	*Mg.*	*Mg.*
Orlando:					
Rough lemon	0.28	0.29	0.28	0.26	0.24
Sour orange	.29	.31	.30	.29	.28
Cleopatra	.28	.30	.29	.30	.27
Rusk	.24	.26	.26	.24	.22
Thornton:					
Rough lemon	.36	.36	.35	.33	.32
Cleopatra	.39	.39	.38	.36	.32
Minneola:					
Rough lemon	.22	.22	.23	.23	.21
Sour orange	.19	.21	.21	.20	.18
Cleopatra	[illegible]	.23	.26	.27	.26
Sweet orange		.19	.20	.20	.17
Seminole:					
Sour orange	.26	.27	.27	.26	.22
Cleopatra	.31	.33	.32	.36	.31

velopment of the fruit (table 9, fig. 3). It should be borne in mind that since pH units are logarithmic values, a change of one pH unit represents a tenfold change.

Weight of Fruit and Juice per Fruit

The changes in weight of fruit closely paralleled the increase in volume of juice per fruit (fig. 2). The average weight of fruit increased until maturity was reached. Thornton, Minneola, and Seminole tangelos showed greater rates of increase than the Orlando. Rootstock had only a very slight effect on weight of fruit as may be observed in the case of Orlando and Seminole tangelos (table 10).

During early stages of development the volume of juice increased rapidly, reached a maximum when the fruit was in prime condition, and decreased slowly as the fruit remained on the tree. The volume of juice per fruit was associated with variety (table 11, fig. 2). Minneola tangelos were the largest in size and averaged about 200 milliliters of juice per fruit. Seminole and Thornton tangelos were intermediate as to size and volume of juice. Orlando tangelos were smaller and contained a lower amount of juice.

The percentage of fruit by weight that was juice and the milliliters of juice per 100 grams of fruit decreased very slightly throughout the season. Variety and rootstock had little influence on the amount of juice per fruit, and during the period of prime eating quality the juice averaged from about 58 to 61 percent of the fruit (tables 12, 13, fig. 2).

Rind Color

Rind color was determined by matching samples of 25 fruit against the color standards shown in plate II. In October the tangelos were deep yellow-green in color. As the fruit matured the green pigment faded rather rapidly. The rinds of Minneola, Orlando, and Seminole tangelos progressed through yellow to yellow-orange and finally became deep red-orange in color. Of these varieties, Minneola had the deepest color. Thorntons remained yellow to yellow-orange at maturity and

TABLE 9.—*Active acidity: Seasonal changes in tangelos by variety and by kind of rootstock, 1953–56*

Variety and kind of rootstock	Average active acidity of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	pH	*pH*	*pH*	*pH*	*pH*
Orlando:					
Rough lemon	3.4	3.5	3.6	3.8	4.0
Sour orange	3.2	3.3	3.5	3.7	3.8
Cleopatra	3.2	3.4	3.5	3.7	3.9
Rusk	3.3	3.5	3.6	3.7	3.9
Thornton:					
Rough lemon	3.1	3.3	3.4	3.6	3.7
Cleopatra	3.1	3.3	3.4	3.6	3.8
Minneola:					
Rough lemon	2.9	3.2	3.5	3.6	3.6
Sour orange	3.0	3.3	3.5	3.7	3.9
Cleopatra	2.9	3.1	3.3	3.5	3.6
Sweet orange	3.0	3.3	3.4	3.7	3.7
Seminole:					
Sour orange	2.9	3.1	3.2	3.4	3.5
Cleopatra	2.8	3.0	3.1	3.3	3.3

TABLE 10.—*Weight changes: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average weight of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Gm.	*Gm.*	*Gm.*	*Gm.*	*Gm.*
Orlando:					
Rough lemon	143	175	207	217	215
Sour orange	136	164	196	201	194
Cleopatra	137	164	196	206	210
Rusk	131	158	192	197	207
Thornton:					
Rough lemon	167	213	262	289	285
Cleopatra	156	206	255	291	298
Minneola:					
Rough lemon	200	259	313	373	344
Sour orange	211	266	327	354	343
Cleopatra	183	249	316	385	352
Sweet orange	198	243	303	349	327
Seminole:					
Sour orange	192	237	287	310	328
Cleopatra	163	199	249	294	307

TABLE 11.—*Volume of juice: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average volume of juice of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Ml.	*Ml.*	*Ml.*	*Ml.*	*Ml.*
Orlando:					
Rough lemon	83	104	122	124	114
Sour orange	78	97	116	116	107
Cleopatra	78	96	113	116	114
Rusk	74	94	112	114	114
Thornton:					
Rough lemon	92	120	143	151	140
Cleopatra	87	117	144	155	149
Minneola:					
Rough lemon	111	150	182	206	187
Sour orange	120	155	191	202	185
Cleopatra	104	144	182	213	189
Sweet orange	112	140	182	194	174
Seminole:					
Sour orange	110	141	169	179	177
Cleopatra	96	120	144	180	168

TABLE 12.—*Percentage of fruit that is juice: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average percent of juice of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*
Orlando:					
Rough lemon	59	61	61	59	55
Sour orange	59	61	61	60	58
Cleopatra	58	61	60	59	57
Rusk	58	61	61	60	57
Thornton:					
Rough lemon	57	58	56	54	51
Cleopatra	57	59	59	56	52
Minneola:					
Rough lemon	57	61	60	58	56
Sour orange	59	60	60	59	56
Cleopatra	58	60	60	58	56
Sweet orange	59	60	63	58	56
Seminole:					
Sour orange	59	62	61	60	56
Cleopatra	61	62	60	64	57

TABLE 13.—*Milliliters of juice per 100 grams of fruit: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Milliliters of juice per 100 grams of fruit harvested at indicated periods				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
	Ml.	*Ml.*	*Ml.*	*Ml.*	*Ml.*
Orlando:					
Rough lemon	57	59	59	57	53
Sour orange	57	59	59	58	56
Cleopatra	57	59	58	56	54
Rusk	56	59	58	58	55
Thornton:					
Rough lemon	55	57	55	52	50
Cleopatra	55	57	57	54	50
Minneola:					
Rough lemon	56	59	58	56	54
Sour orange	57	59	58	57	54
Cleopatra	56	58	58	55	54
Sweet orange	57	58	60	56	53
Seminole:					
Sour orange	57	60	59	58	55
Cleopatra	59	60	58	61	55

resembled the grapefruit parent rather than the tangerine (table 14, fig. 2).

Natural degreening, associated with maturation of the fruit, progressed very rapidly during the 3 months October through December. It has been found by Bain (*3*) that the period of maturation is distinguished by a change in rind color accompanied by decreased rates of morphological, anatomical, and

TABLE 14.—*Color of rind: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56* [1]

Variety and kind of rootstock	Average color of rind of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Orlando:					
Rough lemon	D	F	J	K	L
Sour orange	D	F	J	K	L
Cleopatra	D	F	K	L	L+
Rusk	D	F	J	K	L
Thornton:					
Rough lemon	D	E	F	H	J
Cleopatra	D	E	H	I	J
Minneola:					
Rough lemon	C	D	I	L	L+
Sour orange	C	E	J	L+	L+
Cleopatra	D	E	J	L+	L+
Sweet orange	D	E	J	L	L
Seminole:					
Sour orange	D	F	J	K	L
Cleopatra	E	G	J	L	L

[1] See plate II.

physiological changes. Rootstock had only a slight effect on rind color (table 14).

Color and Texture of Flesh

The changes in color and texture of the flesh are shown in tables 15 and 16.

The flesh of the Orlando and Minneola tangelos was yellow-orange in October, became orange by November and remained so during the November to February period. Seminole tangelos changed from orange-yellow to yellow-orange to orange at about minimum maturity. Thornton tangelos retained a tannish-yellow color throughout the harvesting season. The different rootstocks had no apparent effect on color or texture of the flesh.

In October the flesh texture of Orlando, Thornton, Minneola, and Seminole tangelos was classified as "coarse." As each variety reached the stage of consumer acceptability, the texture became "good."

Influence of Kind of Rootstock on Fruit Quality

Slight differences in total solids, total acid, ascorbic acid, and palatability were associated with kind of rootstock (tables 2, 5, 6, 8). There was very little difference in weight of fruit, rind color, active acidity, or color or condition of flesh attributable to kind of rootstock (tables 9, 10, 14, 15, 16).

The effect of rootstock on fruit characteristics of young Orlando variety trees is shown in data presented in table 17. These trees were 5 years of age and were grown under similar cultural conditions. Fruit from trees on Cleopatra rootstock had significantly higher total solids, total acid, and palatability ratings than fruit from trees on rough lemon or sweet lemon. The weight of the fruit and volume of juice were not influenced by kind of rootstock. These findings on young trees were in general agreement with the averages of all trees.

Yearly Variations in Chemical and Physical Factors

Yearly variations in chemical and physical factors are illustrated by a comparison of Orlando tangelos on rough lemon, sour orange, and Cleopatra rootstocks (figs. 5 to 7). In the four year period the greatest differences were noted between the 1953–54 and the 1955–56 crop years. During the 1953–54 season the weight of fruit, volume of juice, and pH values were high, and total solids (fig. 5), total acid (fig. 6), and ascorbic acid concentration were low. The low acid content resulted in a high solids-to-acid ratio early in the season and is reflected in consumer acceptance of early harvested fruit, according to palatability tests for that year (fig. 7). On the other hand, in crop year 1955–56, the weight of fruit and volume of juice were low, and total solids, total acid, and solids-to-acid ratio were high. Palatability, however, was not appreciably different from the 1952–53 and 1954–55 crop years. (Appendix table 18.)

Undoubtedly variations in yearly rainfall influenced these factors. The year 1953 was the second wettest since 1891 with a Statewide average of almost 15 inches above normal (*19*). The precipitation in 1955 totaled only a little over 42 inches and was about 80 percent of average expectancy (*20*). As previously pointed out, sunshine, soils, fertilizers, cultivation, spraying, and dusting may also have affected these factors.

TABLE 15.—*Color of flesh: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average color [1] of flesh of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Orlando:					
Rough lemon	YO	O	O	O	O
Sour orange	YO	O	O	O	O
Cleopatra	YO	O	O	O	O
Rusk	YO	O	O	O	O
Thornton:					
Rough lemon	TY	TY	TY	TY	TY
Cleopatra	PY	TY	TY	TY	TY
Minneola:					
Rough lemon	YO	O	O	O	O
Sour orange	YO	O	O	O	O
Cleopatra	YO	O	O	O	O
Sweet orange	YO	O	O	O	O
Seminole:					
Sour orange	OY	YO	O	O	O
Cleopatra	OY	YO	O	O	O

[1] YO, yellow orange; TY, tanish yellow; PY, pale yellow; OY, orange yellow; O, orange.

TABLE 16.—*Texture of flesh: Seasonal changes in tangelos by variety and by kind of rootstock, 1952–56*

Variety and kind of rootstock	Average condition of flesh of fruit harvested at indicated period				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Orlando:					
Rough lemon	Course	Good	Good	Good	Good.
Sour orange	do	do	do	do	Do.
Cleopatra	do	do	do	do	Do.
Rusk	do	do	do	do	Do.
Thornton:					
Rough lemon	do	Coarse	do	do	Do.
Cleopatra	do	do	do	do	Do.
Minneola:					
Rough lemon	do	do	do	do	Do.
Sour orange	do	do	do	do	Do.
Cleopatra	do	do	do	do	Do.
Sweet orange	do	do	do	do	Do.
Seminole:					
Sour orange	do	do	do	do	Do.
Cleopatra	do	do	do	do	Do.

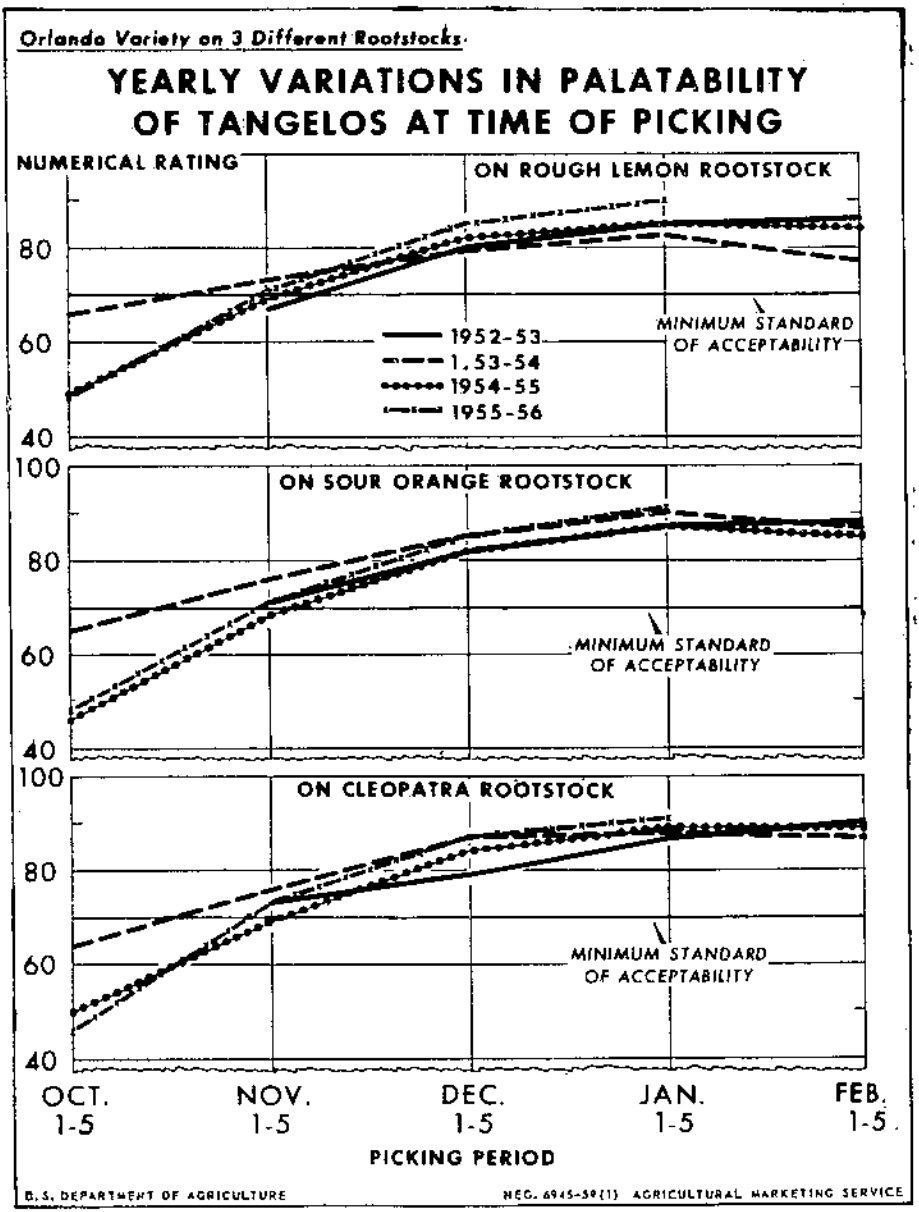

FIGURE 5.—Yearly variations in average weight of total solids of Orlando tangelos at different picking periods, 1952–53 to 1955–56: A, On rough lemon rootstock; B, on sour orange rootstock; C, on Cleopatra rootstock.

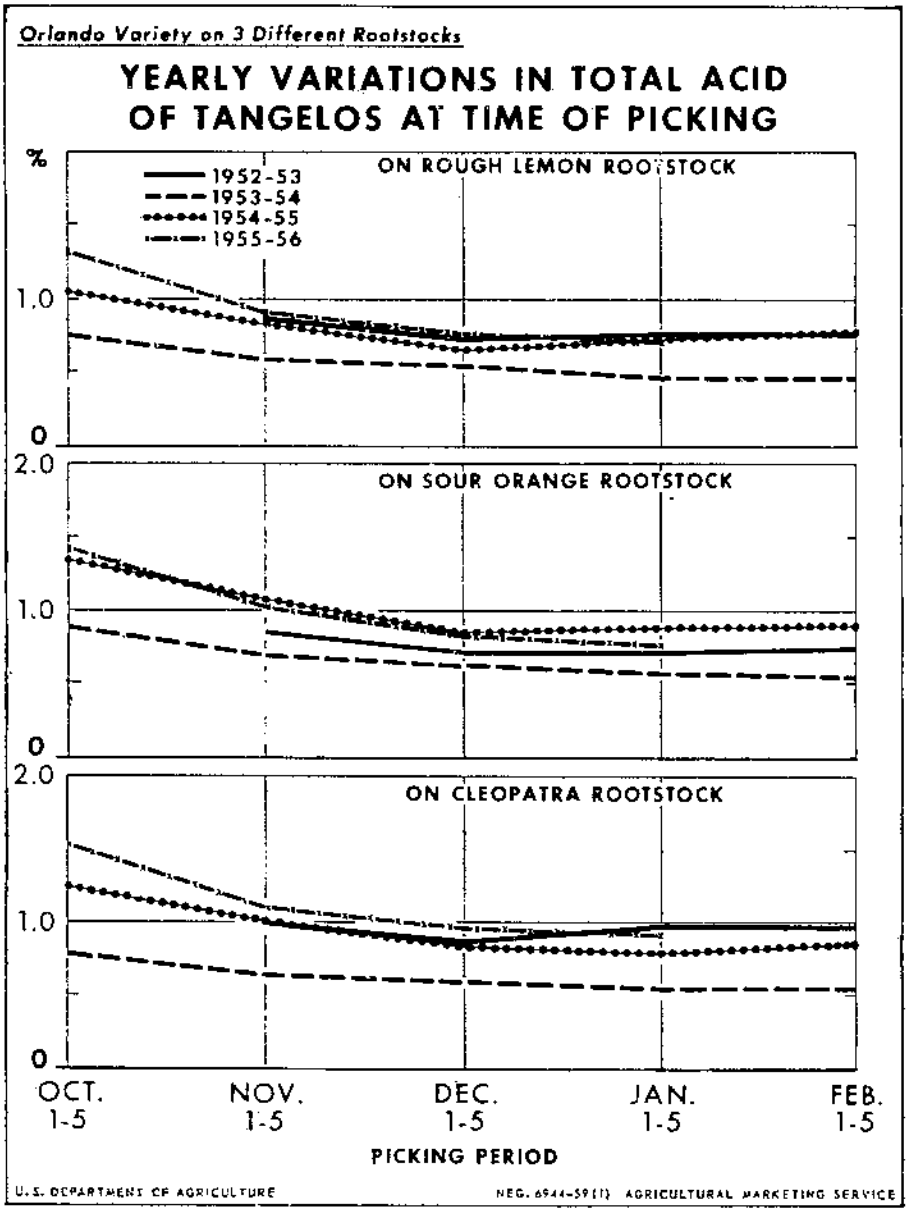

FIGURE 6.—Yearly variations in average weight of total acid of Orlando tangelos at different picking periods, 1952–53 to 1955–56: A, On rough lemon rootstock; B, on sour orange rootstock; C, on Cleopatra rootstock.

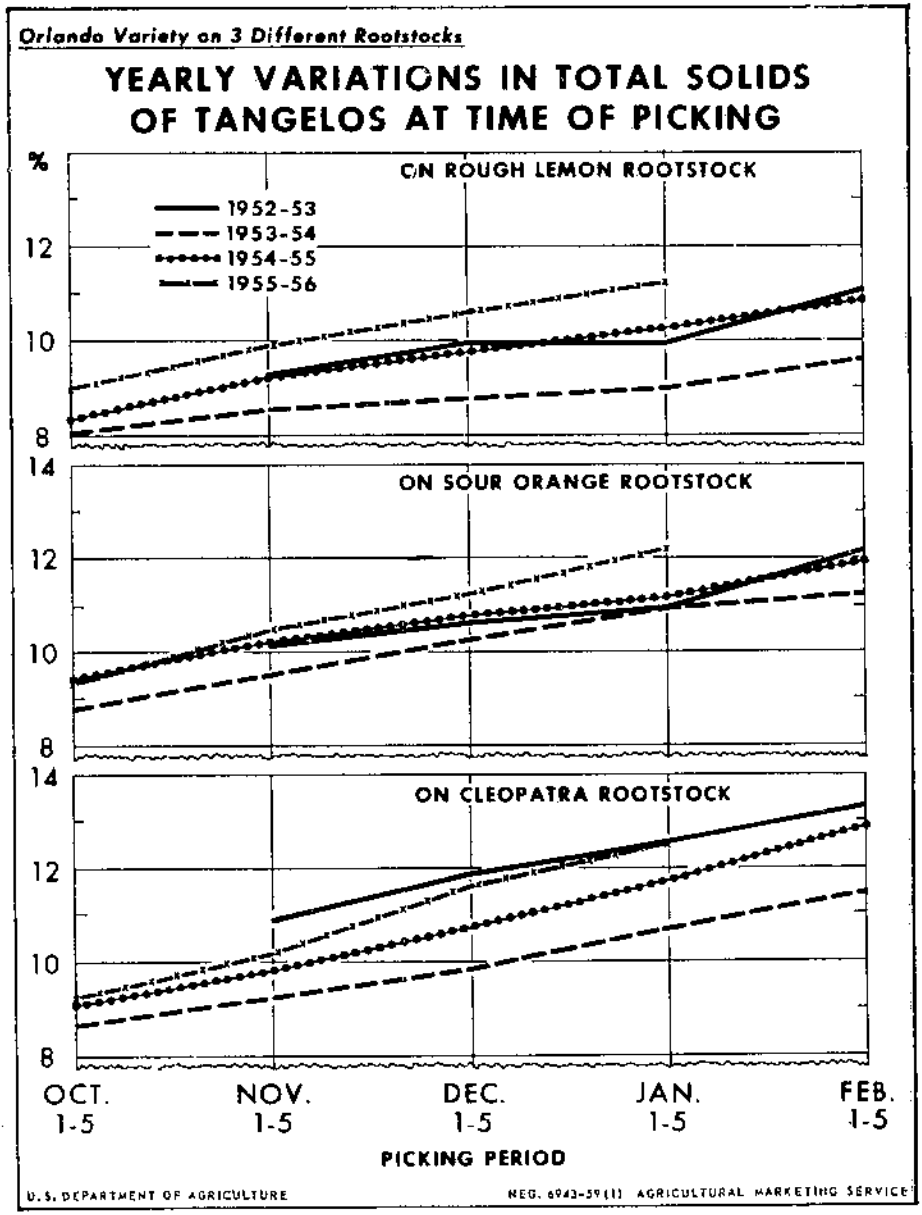

FIGURE 7.—Yearly variations in average palatability rating (see scorecard p. 6) of Orlando tangelos at different picking periods, 1952–53 to 1955–56: A, On rough lemon rootstock; B, on sour orange rootstock; C, on Cleopatra rootstock.

TABLE 17.—*Effect of rootstock on the characteristics of fruit from young Orlando tangelo trees at Avon Park, Fla., 1953–56*[1]

Kind of rootstock	Palatability rating[2]				Total solids				Total acid				Solids to acid ratio			
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5
					Pct.	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*	*Pct.*				
Rough lemon	55	71	83	85	8. 61	9. 16	9. 65	10. 01	1. 02	0. 80	0. 67	0. 63	8. 44	11. 45	14. 40	15. 89
Cleopatra	55	74	87	89	9. 02	9. 75	10. 61	11. 46	1. 20	. 88	. 77	. 70	7. 52	11. 08	13. 78	16. 37
Sweet lemon	54	70	83	83	8. 09	8. 85	9. 47	9. 80	1. 02	. 81	. 66	. 63	7. 93	10. 93	14. 35	15. 56

Kind of rootstock	Weight per fruit				Volume of juice per fruit				Ascorbic acid per milliliter			
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5
	Gm.	*Gm.*	*Gm.*	*Gm.*	*Ml.*	*Ml.*	*Ml.*	*Ml.*	*Mg.*	*Mg.*	*Mg.*	*Mg.*
Rough lemon	140	166	204	205	82	98	119	117	0. 28	0. 29	0. 28	0. 26
Cleopatra	141	167	203	209	80	99	117	120	. 27	. 29	. 28	. 29
Sweet lemon	150	172	206	220	87	102	119	123	. 26	. 28	. 28	. 25

[1] Trees were 5 years old in 1953.
[2] Average of ratings given by about 35 tasters using the scorecard shown on p. 6.

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Appendix

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*

Characteristic and season	Orlando, rough lemon rootstock, Plot 1, Apopka					Orlando, rough lemon rootstock, Plot 2, Groveland				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1] ... Gm.	144	172	206	209	199	146	175	205	222	204
Rind color: [2 3]										
1952–53		D	I	L	L+					
1953–54	D	G	K	L+	L	D	F	J	K	K
1954–55	D	F	L	K	L+	D	E	K	K	L
1955–56	D	F	J	K		D	E	J	J	
Flesh color: [4]										
1952–53		YO	O	O	O					
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O	O	YO	O	O	O	O
1955–56	OY	O	O	O		OY	YO	O	O	
Flesh condition: [2 5]										
1952–53		Good	Good	Good	Good					
1953–54	Coarse	Good	Good	Good	OV–M	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Good	Good	Good	OV–M	Coarse	Good	Good	Good	Good
1955–56	Coarse	Good	Good	Good		Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1] Ml.	58	61	59	56	55	59	60	59	57	55
Juice per fruit [1] Pct.	60	63	61	58	57	61	61	61	58	57
Palatability: [6]										
Arbitrary standard:										
1952–53		Tart	PTS	PTS	PTS					
1953–54	Tart	P tart	PTS	PTS	PTS	Tart	P tart	PTS	PTS	PTS
1954–55	Acid	P tart	PTS	PTS	PTS	Acid	Tart	PTS	PTS	PTS
1955–56	Acid	P tart	PTS	PTS		Acid	P tart	PTS	PTS	
Numerical rating:										
1952–53		67	86	85	86					
1953–54	64	73	83	84	82	66	73	82	83	86
1954–55	53	72	81	82	84	48	69	84	86	84
1955–56	48	71	86	85		50	71	81	88	
Ascorbic acid: [3 6]										
1952–53 Mg.		0.31	0.30	0.28	0.27					
1953–54 Mg.	0.26	.25	.24	.21	.21	0.30	0.30	0.30	0.25	0.26
1954–55 Mg.	.25	.27	.27	.24	.25	.33	.35	.35	.33	.37
1955–56 Mg.	.24	.23	.22	.20		.32	.31	.32	.31	
Active acidity: [3]										
1952–53 ...pH										
1953–54 ...pH	3.4	3.4	3.6	3.9	4.0	3.4	3.5	3.6	3.9	3.9
1954–55 ...pH	3.4	3.4	3.5	3.7	3.7	3.3	3.4	3.5	3.7	3.7
1955–56 ...pH	3.3	3.5	3.7	3.8		3.3	3.5	3.6	3.8	
Total solids: [3]										
1952–53 Pct.		9.30	9.92	9.91	11.04					
1953–54 Pct.	7.97	8.83	8.89	9.47	10.12	8.32	8.88	9.34	9.27	10.12
1954–55 Pct.	8.38	9.30	9.80	9.77	10.53	8.43	9.20	10.05	10.70	11.13
1955–56 Pct.	7.97	8.82	8.56	9.49		8.27	8.82	9.81	10.04	
Total acid: [3]										
1952–53 Pct.		.87	.73	.77	.77					
1953–54 Pct.	.84	.65	.59	.50	.52	.84	.65	.62	.50	.52
1954–55 Pct.	.96	.78	.72	.78	.76	1.21	.59	.76	.82	.80
1955–56 Pct.	1.17	.77	.60	.62		1.06	.81	.74	.65	
Solids-acid ratio:										
1952–53		10.69	13.59	12.87	14.34					
1953–54	9.49	13.58	15.07	18.94	19.46	9.90	13.66	15.06	18.54	19.46
1954–55	8.73	11.92	13.61	12.53	13.86	6.97	10.34	13.22	13.05	13.91
1955–56	6.81	11.45	14.27	15.31		7.80	10.89	13.26	16.37	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, rough lemon rootstock, Plot 3, Avon Park					Orlando, rough lemon rootstock, Plot 4, Avon Park				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1] Gm										
1952–53	140	166	204	205	[2] 224	143	170	211	228	[2] 237
Rind color: [3] [4]										
1952–53										
1953–54	D	F	H	I	J	D	F	G	H	J
1954–55	D	E	K	J		D	E	I		
1955–56	D	F	J	K		D	F	J	J	
Flesh color: [3] [4]										
1952–53										
1953–54	OY	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O		OY	O	O		
1955–56	YO	O	O	O		OY	O	O	O	
Flesh condition: [3] [4]										
1952–53										
1953–54	Coarse	Good	Good	Good	Good	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Good	Good	Good		Coarse	Good	Good		
1955–56	Coarse	Good	Good	Good		Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1] Ml	58	58	59	57	[2] 50	58	59	59	57	[2] 50
Juice per fruit [1] Pct	60	60	60	59	[2] 51	59	61	61	59	[2] 51
Palatability: [4]										
Arbitrary standard:										
1952–53										
1953–54	Tart	P tart	P tart	P tart	Insipid	Tart	P tart	P tart	PTS	Insipid
1954–55	Acid	Tart	PTS	PTS		Acid	Tart	P tart		
1955–56	Acid	P tart	PTS	PTS		Acid	P tart	PTS	PTS	
Numerical rating:										
1952–53										
1953–54	67	71	77	79	68	68	73	76	82	72
1954–55	50	69	84	85		51	67	78		
1955–56	48	72	87	92		52	71	87	92	
Ascorbic acid [3] [5]										
1952–53 Mg										
1953–54 Mg	0.24	0.24	0.23	0.10	0.18	0.32	0.32	0.20	0.25	0.22
1954–55 Mg	.27	.29	.27	.27		.29	.29	.28		
1955–56 Mg	.32	.35	.35	.32		.35	.36	.37	.34	
Active acidity: [4]										
1952–53 pH										
1953–54 pH	3.5	3.6	3.7	4.1	4.1	3.5	3.7	3.8	4.0	4.2
1954–55 pH	3.4	3.3	3.5	3.7		3.4	3.5	3.7		
1955–56 pH	3.2	3.3	3.5	3.6		3.2	3.4	3.6	3.7	
Total solids: [4]										
1952–53 Pct										
1953–54 Pct	7.57	7.90	8.00	7.92	8.27	8.12	8.17	8.86	8.67	8.85
1954–55 Pct	8.80	9.40	9.70	9.67		8.12	8.75	8.80		
1955–56 Pct	9.47	10.17	11.16	12.24		8.67	9.54	10.66	11.30	
Total acid: [4]										
1952–53 Pct										
1953–54 Pct	.65	.58	.50	.41	.41	.60	.53	.50	.42	.42
1954–55 Pct	1.01	.81	.65	.67		.99	.74	.58		
1955–56 Pct	1.40	1.05	.87	.81		1.27	.90	.72	.71	
Solids-acid ratio:										
1952–53										
1953–54	11.65	14.38	16.18	19.32	20.17	11.77	15.42	17.60	20.64	21.07
1954–55	8.71	11.60	14.92	14.73		8.20	11.82	15.17		
1955–56	6.76	9.69	12.83	15.11		6.83	10.60	14.81	16.04	

[1] The mean of 50 determinations made in 2 seasons or of 75 determinations made in 3 seasons.
[2] The mean of 25 determinations
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, rough lemon rootstock, Plot 5, Avon Park					Orlando, rough lemon rootstock, Plot 6, Avon Park				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]—Gm.										
1952–53	142	177	207	221	[2] 229	144	183	212	228	[2] 238
Rind color: [3] [4]										
1953–54	D	G	J	J	K	D	G	J	J	K
1954–55	D	F	J	.....	.....	D	E	K	K	.....
1955–56	D	F	J	K	.....	D	E	J	J	.....
Flesh color: [3] [4]										
1952–53										
1953–54	OY	O	O	O	O	YO	O	O	O	O
1954–55	OY	O	O	.....	.....	OY	O	O	O	.....
1955–56	OY	O	O	O	.....	OY	O	O	O	.....
Flesh condition: [3] [4]										
1952–53										
1953–54	Coarse	Good	Good	Good	OV–M	Coarse	Good	Good	Good	Good
1954–55	Coarse	Coarse	Good	.....	.....	Coarse	Good	Good	Good	.....
1955–56	Coarse	Good	Good	Good	.....	Coarse	Coarse	Good	Good	.....
Juice per 100 gms. of fruit [4]—Ml.										
1952–53	55	58	58	57	[2] 51	56	60	59	59	[2] 54
Juice per fruit [4]—Pct.										
1952–53	57	60	60	59	[2] 53	58	61	61	61	[2] 56
Palatability: [4]										
Arbitrary standard:										
1952–53										
1953–54	Tart	P tart	P tart	PTS	Insipid	Tart	P tart	PTS	PTS	PTS
1954–55	Acid	Tart	P tart	.....	.....	Acid	P tart	PTS	PTS	.....
1955–56	Acid	P tart	PTS	PTS	.....	Acid	P tart	PTS	PTS	.....
Numerical rating:										
1952–53										
1953–54	64	72	75	84	73	66	75	80	87	83
1954–55	45	66	79	.....	.....	48	70	85	86	.....
1955–56	45	71	84	91	.....	47	70	88	90	.....
Ascorbic acid: [4] [5]										
1952–53—Mg.										
1953–54—Mg.	0.28	0.27	0.25	0.27	0.21	0.26	0.27	0.25	0.23	0.20
1954–55—Mg.	.25	.28	.28	.....	.....	.24	.29	.24	.24	.....
1955–56—Mg.	.29	.30	.33	.29	.....	.27	.28	.25	.23	.....
Active acidity: [3]										
1952–53—pH										
1953–54—pH	3.5	3.6	3.8	4.0	4.1	3.5	3.6	3.8	4.0	4.1
1954–55—pH	3.4	3.4	3.7	.....	.....	3.4	3.3	3.6	3.8	.....
1955–56—pH	3.2	3.3	3.5	3.7	.....	3.2	3.5	3.7	3.8	.....
Total solids [3]										
1952–53—Pct.										
1953–54—Pct.	7.87	8.07	8.34	8.97	9.37	8.27	9.47	9.30	9.62	10.84
1954–55—Pct.	8.15	9.05	9.40	.....	.....	8.20	9.85	10.70	10.72	.....
1955–56—Pct.	9.92	11.12	11.70	11.84	.....	9.67	10.82	11.61	11.89	.....
Total acid. [3]										
1952–53—Pct.										
1953–54—Pct.	.77	.59	.52	.47	.43	.81	.64	.56	.49	.53
1954–55—Pct.	1.10	.91	.63	.....	.....	1.09	.80	.63	.68	.....
1955–56—Pct.	1.56	1.05	.95	.85	.....	1.52	.93	.73	.67	.....
Solids-acid ratio:										
1952–53										
1953–54	10.22	13.68	16.04	19.00	21.79	10.21	14.80	16.61	19.63	20.45
1954–55	7.41	9.95	14.92	.....	.....	7.52	11.07	16.98	15.76	.....
1955–56	6.36	10.59	12.38	13.93	.....	6.36	11.63	15.90	17.75	.....

[1] The mean of 50 determinations made in 2 seasons or of 75 determinations made in 3 seasons.
[2] The mean of 25 determinations.
[3] See plate 11.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, sour orange rootstock, Plot 7, Tavares					Orlando, sour orange rootstock, Plot 8, Apopka				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1] ...Gm.	133	163	195	212	203	131	163	194	203	196
Rind color: [2] [3]										
1952–53	.....	E	I	K	.....	.....	F	J	L+	L+
1953–54	D	E	I	J	K	D	G	K	L+	L
1954–55	D	E	J	K	L	D	H	L	L	.....
1955–56	D	E	J	K	.....	D	F	J	K	.....
Flesh color: [2] [4]										
1952–53	.....	YO	O	O	.....	.....	YO	O	O	O
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O	O	YO	O	O	O	.....
1955–56	OY	O	O	O	.....	OY	O	O	O	.....
Flesh condition: [2] [4]										
1952–53	.....	Good	Good	Good	.....	.....	Good	Good	Good	Good
1953–54	Good	Good	Good	Good	OV–M	Course	Good	Good	Good	Good
1954–55	Course	Good	Good	Good	Good	Course	Good	Good	Good	.....
1955–56	Course	Course	Good	Good	.....	Course	Coarse	Good	Good	.....
Juice per 100 gms. of fruit [1] ...Ml.	56	60	58	57	55	59	60	59	58	57
Juice per fruit [1] ...Pct.	58	62	60	59	57	60	62	61	61	60
Palatability: [4]										
Arbitrary standard:										
1952–53	.....	Tart	PTS	PTS	.....	.....	P tart	PTS	PTS	PTS
1953–54	Acid	P tart	PTS	PTS	PTS	Tart	P tart	PTS	PTS	PTS
1954–55	Acid	Tart	PTS	PTS	PTS	Acid	P tart	PTS	PTS	.....
1955–56	Acid	Tart	PTS	PTS	.....	Acid	P tart	PTS	PTS	.....
Numerical rating:										
1952–53	.....	68	81	87	.....	.....	70	85	88	91
1953–54	58	72	82	87	85	67	77	87	92	91
1954–55	45	63	81	86	90	48	73	85	88	.....
1955–56	40	64	82	90	.....	48	72	83	91	.....
Ascorbic acid: [5] [6]										
1952–53 Mg	.....	0.34	0.35	0.34	.....	.....	0.34	0.34	0.34	0.31
1953–54 Mg	0.29	.29	.31	.26	.25	0.28	.29	.28	.26	.25
1954–55 Mg	.29	.30	.31	.31	.34	.29	.29	.30	.30	.....
1955–56 Mg	.31	.30	.31	.27	.....	.26	.26	.27	.25	.....
Active acidity: [4]										
1952–53...pH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1953–54...pH	3.3	3.3	3.5	3.8	3.9	3.3	3.3	3.5	3.7	3.9
1954–55...pH	3.1	3.1	3.3	3.5	3.5	3.2	3.2	3.3	3.5	.....
1955–56...pH	3.1	3.4	3.5	3.6	.....	3.1	3.3	3.5	3.6	.....
Total solids: [5]										
1952–53 Pct.	.....	9.60	10.12	10.21	.....	.....	10.77	11.27	12.04	13.35
1953–54 Pct.	8.17	8.54	9.50	9.92	10.73	8.87	9.67	10.75	11.27	11.57
1954–55 Pct.	10.87	10.75	10.85	11.38	12.13	9.47	10.40	11.40	11.98	.....
1955–56 Pct.	8.67	9.80	10.56	11.18	.....	8.67	9.75	10.56	11.54	.....
Total acid: [5]										
1952–53 Pct.	.....	.92	.70	.73	.....	.....	1.00	.87	.89	.94
1953–54 Pct.	1.04	.80	.71	.65	.63	.94	.75	.64	.58	.57
1954–55 Pct.	1.81	1.29	.98	1.00	.98	1.23	1.03	.87	.80	.....
1955–56 Pct.	1.46	1.08	.84	.75	.....	1.42	.89	.76	.72	.....
Solids-acid ratio:										
1952–53	.....	10.43	12.81	13.99	.....	.....	10.77	12.95	13.53	14.20
1953–54	7.86	11.05	13.38	15.26	17.03	9.44	12.89	17.06	19.43	20.30
1954–55	6.01	8.33	11.07	11.38	12.38	7.70	10.10	13.10	13.46	.....
1955–56	5.94	8.80	12.57	14.91	.....	6.11	10.96	13.89	16.03	.....

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, sour orange rootstock, Plot 9, Terra Ceia					Orlando, sour orange rootstock, Plot 10, Terra Ceia				
	Oct. 1–5	Nov. 1–7	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1] ... Gm	137	158	190	191	189	143	171	198	194	186
Rind color: [2 3]										
1952–53	.....	E	I	L	L	.....	F	I	L	L+
1953–54	D	G	J	K	K	D	G	J	J	K
1954–55	D	E	J	K	L	D	F	K	K	L
1955–56	D	F	J	K	.....	D	F	J	K	.....
Flesh color: [2 4]										
1952–53	.....	YO	O	O	O	.....	YO	O	O	O
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O	O	YO	O	O	O	O
1955–56	OY	O	O	O	.....	OY	O	O	O	.....
Flesh condition: [2 5]										
1952–53	.....	Good	Good	Good	Good	.....	Good	Good	Good	Good
1953–54	Coarse	Good	Good	Good	Good	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Coarse	Good	Good	Good	Coarse	Good	Good	Good	Good
1955–56	Coarse	Coarse	Good	Good	.....	Coarse	Coarse	Good	Good	.....
Juice per 100 gms. of fruit [1] Ml.	56	58	58	57	54	57	59	60	59	54
Juice per fruit [1] Pct.	58	60	60	59	56	59	61	62	61	56
Palatability: [4]										
Arbitrary standard:										
1952–53	.....	P tart	PTS	PTS	PTS	.....	P tart	PTS	PTS	PTS
1953–54	Tart	P tart	PTS	PTS	PTS	P tart	P tart	PTS	PTS	PTS
1954–55	Acid	Tart	P tart	PTS	P tart	Acid	P tart	PTS	PTS	PTS
1955–56	Acid	P tart	PTS	PTS	.....	Acid	P tart	PTS	PTS	.....
Numerical rating:										
1952–53	.....	71	83	85	85	.....	71	81	86	86
1953–54	67	78	87	90	86	71	78	87	88	83
1954–55	41	62	73	83	77	52	71	84	88	84
1955–56	50	71	86	93	.....	52	77	87	91	.....
Ascorbic acid: [5 6]										
1952–53 Mg	.....	0.29	0.29	0.27	0.23	.....	0.29	0.28	0.27	0.27
1953–54 Mg	0.30	.30	.29	.23	.21	0.25	.26	.24	.21	.20
1954–55 Mg	.20	.27	.26	.25	.23	.26	.28	.26	.25	.27
1955–56 Mg	.28	.30	.30	.31	.....	.28	.32	.28	.28	.....
Active acidity: [5]										
1952–53 pH	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1953–54 pH	3.4	3.4	3.7	3.8	4.0	3.6	3.7	4.0	4.1	4.3
1954–55 pH	3.2	3.3	3.4	3.6	3.6	3.3	3.3	3.5	3.6	3.6
1955–56 pH	3.2	3.3	3.4	3.5	.....	3.3	3.4	3.6	3.7	.....
Total solids: [5]										
1952–53 Pct	.....	10.27	10.62	10.85	11.42	.....	9.67	10.07	10.40	11.84
1953–54 Pct	8.92	9.50	10.23	10.72	10.68	8.92	9.80	10.27	10.77	11.13
1954–55 Pct	8.77	9.40	9.98	10.13	11.08	9.37	10.05	10.18	10.43	11.73
1955–56 Pct	9.27	10.05	10.96	11.93	.....	9.37	10.85	11.21	11.98	.....
Total acid: [5]										
1952–53 Pct	.....	.74	.64	.65	.66	.....	.70	.56	.59	.60
1953–54 Pct	.78	.67	.64	.59	.53	.68	.52	.45	.43	.38
1954–55 Pct	1.35	1.15	.91	.92	.91	1.00	.97	.72	.73	.77
1955–56 Pct	1.40	1.06	.80	.70	.....	1.22	.93	.70	.66	.....
Solids-acid ratio										
1952–53	.....	13.88	16.59	16.69	17.30	.....	13.81	17.98	17.63	19.73
1953–54	11.44	14.18	15.07	18.17	20.15	13.12	18.85	22.82	25.05	29.20
1954–55	6.50	8.17	10.97	11.01	12.18	9.37	10.36	14.14	14.29	15.23
1955–56	6.62	9.48	13.70	17.04	.....	7.68	11.67	16.01	18.15	.....

[1] The mean of 75 determinations made in 3 seasons or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, overmature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, sour orange rootstock, Plot 11, Bradenton					Orlando, sour orange rootstock, Plot 12, Avon Park				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]...Gm.	138	165	198	201	175	137	168	205	205	[2] 262
Rind color; [2] [3]										
1952–53		G	I	L	L+					
1953–54	D	G	J	J		D	G	J	K	L
1954–55	D	G	K	K	L	D	F	J		
1955–56	D	G	J	K		D	F	J	J	
Flesh color; [3] [4]										
1952–53		YO	O	O	O					
1953–54	YO	O	O	O		YO	O	O	O	O
1954–55	YO	O	O	O	O	YO	O	O		
1955–56	OY	O	O	O		OY	O	O	O	
Flesh condition: [3]										
1952–53		Good	Good	Good	Good					
1953–54	Coarse	Good	Good	Good		Coarse	Good	Good	Good	Good
1954–55	Coarse	Good	Good	Good	Good	Coarse	Good	Good		
1955–56	Coarse	Coarse	Good	Good		Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1]...Ml.	57	59	60	58	57	55	56	58	57	[2] 55
Juice per fruit [3] Pct.	59	61	62	60	59	57	59	60	60	[2] 57
Palatability: [4]										
Arbitrary standard;										
1952–53		P tart	PTS	PTS	PTS					
1953–54	Tart	P tart	PTS	PTS		Tart	P tart	PTS	PTS	PTS
1954–55	Acid	P tart	PTS	PTS	PTS	Acid	Tart	PTS		
1955–56	Acid	P tart	PTS	PTS		Acid	P tart	PTS	PTS	
Numerical rating:										
1952–53		71	81	88	88					
1953–54	67	77	85	92		65	75	80	93	88
1954–55	50	70	84	88	85	42	67	84		
1955–56	51	74	87	92		48	73	87	92	
Ascorbic acid: [3] [5]										
1952–53...Mg.		0.34	0.33	0.33	0.34					
1953–54...Mg.	0.29	.29	.27	.27		0.30	0.28	0.29	0.20	0.25
1954–55...Mg.	.29	.31	.32	.31	.30	.27	.31	.31		
1955–56...Mg.	.29	.31	.28	.31		.28	.32	.31	.34	
Active acidity: [3]										
1952–53...pH										
1953–54...pH	3.5	3.5	3.6	3.9		3.3	3.5	3.8	3.9	3.9
1954–55...pH	3.3	3.3	3.4	3.6	3.6	3.2	3.3	3.4		
1955–56...pH	3.3	3.5	3.6	3.6		3.6	3.3	3.5	3.5	
Total solids: [3]										
1952–53 Pct.		9.87	10.57	10.52	11.83					
1953–54 Pct.	8.92	9.70	10.60	11.17		8.87	9.40	9.93	11.37	11.43
1954–55 Pct.	8.97	10.50	10.85	10.83	11.93	8.87	9.63	10.96		
1955–56 Pct.	9.07	10.05	10.56	11.63		10.70	11.85	12.20	13.42	
Total acid: [5]										
1952–53 Pct.		.85	.71	.60	.62					
1953–54 Pct.	.85	.69	.65	.58		.90	.70	.61	.53	.53
1954–55 Pct.	1.18	.99	.78	.81	.82	1.41	1.05	.77		
1955–56 Pct.	1.13	.82	.67	.60		1.07	1.12	.88	.94	
Solids-acid ratio:										
1952–53		11.61	14.80	15.25	19.08					
1953–54	10.49	14.19	16.31	19.26		9.86	13.43	16.28	21.45	21.57
1954–55	7.60	10.61	13.01	13.37	14.55	6.29	9.17	14.23		
1955–56	8.03	12.26	15.76	17.62		6.41	10.58	13.86	14.28	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate 11.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, sour orange rootstock, Plot 13, Okahumpka					Orlando, sour orange rootstock, Plot 14, Mount Homer				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]...Gm.	131	161	193	212	222	.....	155	187	193	178
Rind color: [2 3]										
1952–53						.....	D	G	K	L
1953–54	D	F	J	K	L	.....	.....	.....	.....	.....
1954–55	D	E	K	K	L	.....	.....	.....	.....	.....
1955–56	D	F	J	J	.....	.....	.....	.....	.....	.....
Flesh color: [2 4]										
1952–53						.....	YO	O	O	O
1953–54	YO	O	O	O	O	.....	.....	.....	.....	.....
1954–55	YO	O	O	O	O	.....	.....	.....	.....	.....
1955–56	OY	YO	O	O	.....	.....	.....	.....	.....	.....
Flesh condition: [3]										
1952–53						.....	Good	Good	Good	Good
1953–54	Good	Good	Good	Good	Good	.....	.....	.....	.....	.....
1954–55	Coarse	Good	Good	Good	Good	.....	.....	.....	.....	.....
1955–56	Coarse	Good	Good	Good	.....	.....	.....	.....	.....	.....
Juice per 100 gms. of fruit [1] Ml.	59	60	59	57	57	.....	62	61	61	58
Juice per fruit [1] Pct.	61	62	61	60	60	.....	64	64	63	61
Palatability: [4]										
Arbitrary standard:										
1952–53						.....	P tart	PTS	PTS	PTS
1953–54	Tart	P tart	PTS	PTS	PTS	.....	.....	.....	.....	.....
1954–55	Acid	Tart	PTS	PTS	PTS	.....	.....	.....	.....	.....
1955–56	Acid	Tart	PTS	PTS	.....	.....	.....	.....	.....	.....
Numerical rating:										
1952–53						.....	70	81	88	90
1953–54	50	75	84	90	88	.....	.....	.....	.....	.....
1954–55	42	67	81	87	91	.....	.....	.....	.....	.....
1955–56	45	67	84	90	.....	.....	.....	.....	.....	.....
Ascorbic acid: [5 6]										
1952–53 Mg.						.....	0.32	0.33	0.31	0.29
1953–54 Mg.	0.34	0.33	0.34	0.35	0.34	.....	.....	.....	.....	.....
1954–55 Mg.	.33	.31	.33	.32	.31	.....	.....	.....	.....	.....
1955–56 Mg.	.33	.35	.38	.36	.....	.....	.....	.....	.....	.....
Active acidity: [5]										
1952–53 pH.						.....	.....	.....	.....	.....
1953–54 pH.	3.2	3.1	3.5	3.7	3.8	.....	.....	.....	.....	.....
1954–55 pH.	3.2	3.2	3.3	3.5	3.5	.....	.....	.....	.....	.....
1955–56 pH.	3.1	3.2	3.4	3.5	.....	.....	.....	.....	.....	.....
Total solids: [5]										
1952–53 Pct.						.....	10.47	10.67	11.11	11.79
1953–54 Pct.	8.87	9.57	10.60	11.52	12.00	.....	.....	.....	.....	.....
1954–55 Pct.	9.57	10.75	11.40	12.43	12.83	.....	.....	.....	.....	.....
1955–56 Pct.	9.92	11.25	12.46	13.59	.....	.....	.....	.....	.....	.....
Total acid: [5]										
1952–53 Pct.						.....	.93	.82	.77	.75
1953–54 Pct.	1.05	.78	.82	.70	.70	.....	.....	.....	.....	.....
1954–55 Pct.	1.50	1.11	.97	.98	1.00	.....	.....	.....	.....	.....
1955–56 Pct.	1.71	1.28	1.13	.96	.....	.....	.....	.....	.....	.....
Solids-acid ratio:										
1952–53						.....	11.26	13.01	14.43	15.72
1953–54	8.45	12.27	12.93	16.46	17.14	.....	.....	.....	.....	.....
1954–55	6.38	9.68	11.75	12.68	12.83	.....	.....	.....	.....	.....
1955–56	5.80	8.79	11.03	14.16	.....	.....	.....	.....	.....	.....

[1] The mean of 25 determinations made in 1 season, of 50 determinations made in 2 seasons, or of 75 determinations made in 3 seasons.
[2] The mean of 25 determinations.
[3] See plate 11.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, sour orange rootstock, Plot 15, Groveland					Orlando, sour orange rootstock, Plot 10, Bradenton				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]—Gm		177	212	207	174		161	202	186	161
Rind color: [1 2]										
1952–53		F	I	L	L+		D	H	L	L
1953–54										
1954–55										
1955–56										
Flesh color: [1 2]										
1952–53		YO	O	O	O		YO	O	O	O
1953–54										
1954–55										
1955–56										
Flesh condition: [1]										
1952–53		Good	Good	Good	Good		Good	Good	Good	Good
1953–54										
1954–55										
1955–56										
Juice per 100 gms. of fruit [1] Ml		57	60	58	56		57	58	56	56
Juice per fruit [1] Pct		50	52	50	50		50	50	58	59
Palatability: [3]										
Arbitrary standard:										
1952–53		P tart	PTS	PTS	PTS		Tart	P tart	PTS	PTS
1953–54										
1954–55										
1955–56										
Numerical rating:										
1952–53		74	82	88	89		60	78	84	87
1953–54										
1954–55										
1955–56										
Ascorbic acid: [4 5]										
1952–53—Mg		0.36	0.38	0.36	0.36		0.27	0.28	0.26	0.25
1953–54—Mg										
1954–55—Mg										
1955–56—Mg										
Active acidity: [4]										
1952–53—pH										
1953–54—pH										
1954–55—pH										
1955–56—pH										
Total solids: [4]										
1952–53—Pct		10.87	11.17	12.06	13.30		9.92	10.62	10.50	11.53
1953–54—Pct										
1954–55—Pct										
1955–56—Pct										
Total acid: [4]										
1952–53—Pct		.90	.78	.84	.92		.81	.67	.71	.75
1953–54—Pct										
1954–55—Pct										
1955–56—Pct										
Solids-acid ratio:										
1952–53		11.74	14.32	14.36	14.46		12.25	15.85	14.70	15.37
1953–54										
1954–55										
1955–56										

[1] The mean of 25 determinations made in 1 season.
[2] See plate II.
[3] YO, yellow orange; O, orange; P, pleasantly; PTS, pleasantly tart to sweet.
[4] Mean of duplicate determinations.
[5] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, Cleopatra rootstock, Plot 17, Altamonte Springs					Orlando, Cleopatra rootstock, Plot 38, Avon Park				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]—Gm.	139	164	197	214	190	141	167	203	209	[2] 233
Rind color: [3]										
1952–53		F	J	L+	L+					
1953–54	D	G	K	L	L+	D	G	J	J	K
1954–55	D	G	L			D	E	K	K	
1955–56	D	F	K	L		D	F	K	K	
Flesh color: [3] [4]										
1952–53		YO	O	O	O					
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O			YO	O	O	O	
1955–56	OY	O	O	O		OY	O	O	O	
Flesh condition: [3] [4]										
1952–53		Good	Good	Good	Good					
1953–54	Coarse	Good	Good	Good	OV–M	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Good	Good			Coarse	Good	Good	Good	
1955–56	Coarse	Coarse	Good	Good		Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1]										
Ml.	57	60	58	56	55	56	59	57	57	[2] 56
Juice per fruit [1]										
Pct.	59	62	61	59	58	58	61	60	60	[2] 57
Palatability: [4]										
Arbitrary standard:										
1952–53		P tart	P tart	PTS	PTS					
1953–54	Tart	P tart	PTS	PTS	PTS	Tart	P tart	PTS	PTS	PTS
1954–55	Acid	P tart	PTS			Acid	Tart	PTS	PTS	
1955–56	Acid	P tart	PTS	PTS		Acid	P tart	PTS	PTS	
Numerical rating:										
1952–53		73	79	87	90					
1953–54	61	75	88	90	91	65	76	86	85	88
1954–55	52	72	83			52	68	86	89	
1955–56	40	72	84	88		47	77	89	93	
Ascorbic acid: [4] [5]										
1952–53—Mg.		0.30	0.31	0.31	0.31					
1953–54—Mg.	0.28	.29	.31	.29	.26	0.25	0.24	0.22	0.20	0.20
1954–55—Mg.	.27	.32	.29			.26	.28	.28	.31	
1955–56—Mg.	.27	.29	.29	.32		.31	.35	.35	.36	
Active acidity: [5]										
1952–53—pH										
1953–54—pH	3.3	3.5	3.6	3.6	3.9	3.4	3.7	3.8	3.9	4.0
1954–55—pH	3.2	3.3	3.4			3.1	3.3	3.4	3.6	
1955–56—pH	3.1	3.3	3.5	3.5		3.0	3.2	3.4	3.5	
Total solids: [5]										
1952–53—Pct.		10.87	11.87	12.51	13.32					
1953–54—Pct.	8.79	9.34	10.33	11.42	11.88	8.09	8.80	9.18	9.57	10.15
1954–55—Pct.	8.84	9.03	10.01			9.00	9.53	10.61	11.50	
1955–56—Pct.	8.70	9.32	10.80	11.93		9.87	10.92	12.05	13.32	
Total acid: [5]										
1952–53—Pct.		.99	.87	.98	.97					
1953–54—Pct.	.87	.76	.71	.65	.65	.80	.60	.50	.50	.49
1954–55—Pct.	1.15	1.01	.87			1.13	.90	.79	.73	
1955–56—Pct.	1.30	1.02	.92	.84		1.60	1.13	.95	.86	
Solids-acid ratio:										
1952–53		10.98	13.04	12.77	13.73					
1953–54	10.10	12.29	14.55	17.57	18.28	10.11	14.67	16.39	19.14	20.71
1954–55	7.69	9.53	12.54			7.64	10.59	13.43	15.75	
1955–56	6.69	9.14	11.74	14.20		6.17	9.66	12.68	15.49	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, overmature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, Cleopatra rootstock, Plot 19, Avon Park					Orlando, Cleopatra rootstock, Plot 20, Okahumpka				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1] . . Gm	137	161	192	203	[2] 210	131	159	191	199	220
Rind color: [3]										
1952–53	-	-	-	-	-	-	-	-	-	-
1953–54	D	G	J	K	L	D	F	J	K	L
1954–55	D	E	J	K	-	D	E	K	L	L+
1955–56	D	F	I	J	-	D	F	K	K	- - -
Flesh color: [4]										
1952–53	-	-	-	-	-	-	-	-	-	-
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O	-	OY	O	O	O	O
1955–56	OY	O	O	O	-	OY	YO	O	O	.....
Flesh condition: [4]										
1952–53	-	-	-	-	-	-	-	-	-	-
1953–54	Good	Good	Good	Good	GV–M	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Good	Good	Good		Coarse	Good	Good	Good	Good
1955–56	Coarse	Coarse	Good	Good		Coarse	Coarse	Good	Good	- - - -
Juice per 100 cms. of fruit [3] . . Ml	56	58	59	56	[2] 49	57	59	59	57	56
Juice per fruit [3] Pct.	58	60	59	58	[2] 54	58	61	61	60	58
Palatability: [4]										
Arbitrary standard:										
1952–53	-	-	-	-	-	-	-	-	-	-
1953–54	Tart	P tart	PTS	PTS	Insipid	Tart	P tart	PTS	PTS	PTS
1954–55	Acid	P tart	PTS	PTS	-	Acid	Tart	PTS	PTS	PTS
1955–56	Acid	P tart	PTS	PTS	-	Acid	P tart	PTS	PTS	- - - -
Numerical rating										
1952–53	-	-	-	-	-	-	-	-	-	-
1953–54	68	77	86	86	79	63	76	86	89	90
1954–55	50	70	83	89	-	45	66	82	89	89
1955–56	45	72	87	91	-	44	71	88	91	.....
Ascorbic acid: [3] [5]										
1952–53 . . Mg	-	-	-	-	-	-	-	-	-	-
1953–54 . . Mg	0.27	0.28	0.25	0.25	0.23	0.29	0.30	0.29	0.31	0.30
1954–55 . . Mg	.28	.29	.28	.30	- - -	.28	.31	.30	.32	.31
1955–56 . . Mg	.32	.32	.32	.31	- - -	.32	.33	.34	.35	.....
Active acidity: [3]										
1952–53 . . pH	-	-	-	-	-	-	-	-	-	-
1953–54 . . pH	3.8	4.0	4.1	4.1	4.2	3.4	3.6	3.7	3.8	3.9
1954–55 . . pH	3.2	3.3	3.4	3.6	- - -	3.1	3.2	3.3	3.5	3.6
1955–56 . . pH	3.0	3.3	3.5	3.6	- - -	3.0	3.3	3.4	3.4	.....
Total solids: [3]										
1952–53 . . Pct	-	-	-	-	-	-	-	-	-	-
1953–54 . . Pct	8.81	9.30	9.63	10.33	11.37	8.84	9.50	10.15	11.43	12.37
1954–55 . . Pct	9.05	9.90	10.31	11.52	- - -	9.40	10.12	11.07	12.12	12.88
1955–56 . . Pct	8.57	9.44	11.40	12.77	- - -	9.87	10.89	12.10	11.98	.....
Total acid: [3]										
1952–53 . . Pct	-	-	-	-	-	-	-	-	-	-
1953–54 . . Pct	.52	.47	.41	.43	.42	.96	.77	.72	.66	.67
1954–55 . . Pct	1.13	.92	.83	.76	- - -	1.37	1.18	.88	.89	.85
1955–56 . . Pct	1.40	1.09	.91	.92	- - -	1.74	1.18	1.04	1.04	.....
Solids-acid ratio:										
1952–53	-	-	-	-	-	-	-	-	-	-
1953–54	17.00	19.79	23.49	24.02	27.07	9.21	12.34	14.10	17.32	18.46
1954–55	8.01	10.76	12.42	15.16	- - -	6.89	8.58	12.58	13.62	15.15
1955–56	6.75	8.66	12.53	13.88	- - -	5.67	9.23	11.63	11.52	.....

[1] The mean of 50 determinations made in 2 seasons or of 75 determinations made in 3 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, Rusk rootstock, Plot 21, Tavares					Orlando, Rusk, rootstock, Plot 22, Tavares				
	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5
Weight per fruit [1] Gm.	135	160	200	210	217	135	162	197	207	[2] 232
Rind color: [3] [4]										
1952-53		E	H	K			E	H	K	
1953-54	D	F	J	K	K	D	F	K	L	L+
1954-55	D	F	J	K	L	D	F	J		
1955-56	D	E	K	K		D	F	J	K	
Flesh color: [3] [4]										
1952-53		YO	O	O			YO	O	O	
1953-54	YO	O	O	O	O	YO	O	O	O	O
1954-55	YO	O	O	O	O	YO	O	O		
1955-56	OY	O	O	O		OY	O	O	O	
Flesh condition: [3] [4]										
1952-53		Good	Good	Good			Good	Good	Good	
1953-54	Coarse	Good	Good	Good	Good	Coarse	Good	Good	Good	OV-M
1954-55	Coarse	Good	Good	Good	Good	Coarse	Good	Good		
1955-56	Coarse	Coarse	Good	Good		Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1] ML.	57	61	59	58	57	56	58	57	57	[2] 53
Juice per fruit [1] Pct.	59	62	61	61	59	58	60	60	59	[2] 55
Palatability: [4]										
Arbitrary standard:										
1952-53		Tart	P tart	PTS			P tart	PTS	PTS	
1953-54	Tart	P tart	PTS	PTS	PTS	Tart	P tart	PTS	PTS	PTS
1954-55	Acid	Tart	PTS	PTS	PTS	Acid	Tart	PTS		
1955-56	Acid	P tart	PTS	PTS		Acid	P tart	PTS	PTS	
Numerical rating:										
1952-53		68	79	80			72	81	86	
1953-54	62	76	86	88	87	66	77	87	92	86
1954-55	49	66	84	85	82	49	67	82		
1955-56	49	73	90	88		52	74	90	92	
Ascorbic acid: [5] [6]										
1952-53 Mg.		0.33	0.33	0.31			0.29	0.28	0.27	
1953-54 Mg.	0.26	.26	.26	.23	0.21	0.26	.26	.25	.23	0.21
1954-55 Mg.	.26	.28	.28	.27	.24	.24	.23	.23		
1955-56 Mg.	.26	.25	.27	.24		.26	.28	.28	.25	
Active acidity: [5]										
1952-53 pH.										
1953-54 pH.	3.4	3.6	3.7	3.9	4.0	3.5	3.7	3.8	4.0	4.0
1954-55 pH.	3.2	3.3	3.4	3.5	3.7	3.2	3.3	3.5		
1955-56 pH.	3.2	3.4	3.6	3.7		3.2	3.4	3.5	3.6	
Total solids: [5]										
1952-53 Pct.		9.37	10.15	10.43			10.07	11.15	11.23	
1953-54 Pct.	8.75	8.82	9.70	10.58	10.80	8.75	9.33	10.20	11.33	11.65
1954-55 Pct.	10.80	10.87	11.18	11.50	11.58	10.10	10.07	10.88		
1955-56 Pct.	8.67	9.74	10.80	11.78		9.27	9.94	11.40	11.98	
Total acid: [5]										
1952-53 Pct.		.85	.77	.72			.80	.63	.72	
1953-54 Pct.	.95	.70	.62	.58	.57	.86	.67	.61	.54	.57
1954-55 Pct.	1.37	1.07	.87	.83	.77	1.35	1.00	.82		
1955-56 Pct.	1.35	.92	.74	.77		1.21	.84	.76	.78	
Solids-acid ratio:										
1952-53		11.02	13.18	14.49			12.59	17.70	15.60	
1953-54	9.21	12.60	15.65	18.41	18.95	10.17	13.93	16.72	20.98	20.44
1954-55	7.88	10.16	12.85	13.86	15.04	7.48	10.07	13.27		
1955-56	6.42	10.59	14.59	15.30		7.66	11.83	15.00	15.76	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV-M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Orlando, Rusk rootstock, Plot 23, Bradenton					Orlando, sweet lemon rootstock, Plot 24, Avon Park				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]—Gm.	122	153	170	177	185	150	172	200	220	[2] 226
Rind color: [2 3]										
1952–53		E	H	L						
1953–54	D	G	J	J	K	D	G	J	J	J
1954–55	D	H	K	K	L	D	F	K	K	
1955–56	D	F	J	J		D	F	J	J	
Flesh color: [2 4]										
1952–53		YO	O	O						
1953–54	OY	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O	O	YO	O	O	O	
1955–56	OY	O	O	O		OY	O	O	O	
Flesh condition: [2 4]										
1952–53		Good	Good	Good						
1953–54	Coarse	Good	Good	Good	Good	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Good	Good	Good	Good	Coarse	Good	Good	Good	
1955–56	Coarse	Coarse	Good	Good		Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1]—Ml.	56	59	59	58	54	58	59	58	56	[2] 48
Juice per fruit [1]—Pct.	58	61	61	60	57	59	61	60	58	[2] 49
Palatability: [4]										
Arbitrary standard:										
1952–53		P tart	PTS	PTS						
1953–54	Part	P tart	PTS	PTS	PTS	Tart	P tart	P tart	Insipid	Insipid
1954–55	Acid	P tart	PTS	PTS	PTS	Acid	Tart	PTS	PTS	PTS
1955–56	Acid	P tart	PTS	PTS		Acid	P tart	PTS	PTS	
Numerical rating:										
1952–53		70	83	82						
1953–54	61	77	87	87	86	65	70	79	76	67
1954–55	54	70	82	80	80	49	68	83	83	
1955–56	46	77	80	91		49	71	87	89	
Ascorbic acid: [5 6]										
1952–53—Mg.		0.24	0.26	0.22						
1953–54—Mg.	0.22	.25	.24	.21	0.20	0.22	0.24	0.22	0.19	0.19
1954–55—Mg.	.21	.23	.23	.23	.22	.25	.28	.27	.26	
1955–56—Mg.	.23	.25	.25	.22		.31	.33	.34	.31	
Active acidity: [5]										
1952–53—pH										
1953–54—pH	3.6	3.7	3.7	3.9	4.0	3.7	3.8	3.9	4.1	4.2
1954–55—pH	3.2	3.4	3.4	3.6	3.6	3.3	3.4	3.6	3.7	
1955–56—pH	3.1	3.5	3.6	3.5		3.2	3.4	3.5	3.7	
Total solids: [5]										
1952–53—Pct.		10.07	10.90	10.83						
1953–54—Pct.	8.84	9.07	10.80	10.98	11.60	7.46	7.98	8.15	8.93	8.85
1954–55—Pct.	9.40	10.17	11.07	11.74	12.33	8.10	8.84	9.47	10.20	
1955–56—Pct.	8.72	10.09	11.45	11.35		8.77	9.74	10.80	11.18	
Total acid: [5]										
1952–53—Pct.		.82	.74	.76						
1953–54—Pct.	.84	.68	.61	.55	.50	.68	.55	.47	.42	.43
1954–55—Pct.	1.17	.89	.80	.82	.86	1.02	.87	.67	.70	
1955–56—Pct.	1.48	.79	.71	.70		1.35	1.00	.84	.77	
Solids-acid ratio:										
1952–53		12.28	14.73	14.25						
1953–54	10.52	14.66	17.70	19.96	20.88	10.88	14.51	17.34	19.12	20.58
1954–55	8.03	11.43	14.59	14.32	14.34	7.94	10.16	14.13	14.57	
1955–56	5.89	12.77	16.43	14.93		6.50	9.74	12.80	14.52	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Thornton, rough lemon rootstock, Plot 25, Mount Homer					Thornton, rough lemon rootstock, Plot 26, Mount Homer				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]...Gm.	168	220	261	287	278	166	208	256	286	285
Rind color: [2] [3]										
1952–53	----	D	F	I	I	----	D	F	I	I
1953–54	D	E	G	J	J	D	E	G	J	J
1954–55	D	E	F	H	J	D	E	F	H	K
1955–56	D	E	F	H	----	D	E	F	H	I
Flesh color: [3] [4]										
1952–53	----	PY	PY	TY	TY	----	PY	PY	TY	TY
1953–54	TY	TY	TY	TY	TY	TY	TY	TY	TY	TY
1954–55	TY	TY	TY	TY	TY	TY	TY	TY	TY	TY
1955–56	PY	TY	TY	TY	----	PY	TY	TY	TY	TY
Flesh condition: [3] [4]										
1952–53	----	Good	Good	Good	Good	----	Good	Good	Good	Good
1953–54	Coarse	Good	Good	Good	Dry	Coarse	Good	Good	Good	OV-M
1954–55	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	Good
1955–56	Coarse	Coarse	Good	Good	----	Coarse	Coarse	Good	Good	Good
Juice per 100 gms. of fruit [1]...Ml.	55	57	55	53	51	54	57	55	53	50
Juice per fruit [1]...Pct.	57	58	57	55	52	56	59	56	54	52
Palatability: [4]										
Arbitrary standard:										
1952–53	----	Tart	P tart	PTS	PTS	----	Tart	P tart	PTS	PTS
1953–54	Acid	Acid	P tart	P tart	P tart	Acid	Tart	P tart	PTS	P tart
1954–55	V acid	Acid	P tart	P tart	P tart	V acid	Acid	P tart	P tart	PTS
1955–56	V acid	Tart	P tart	P tart	----	V acid	Tart	P tart	P tart	PTS
Numerical rating:										
1952–53	----	63	70	81	84	----	64	72	81	84
1953–54	50	59	75	78	72	48	60	75	81	77
1954–55	37	59	74	78	79	39	59	73	76	84
1955–56	35	60	71	75	----	35	60	71	74	82
Ascorbic acid: [5] [6]										
1952–53...Mg.	----	0.38	0.38	0.36	0.36	----	0.39	0.38	0.36	0.35
1953–54...Mg.	0.37	.36	.36	.32	.30	0.37	.35	.33	.30	.27
1954–55...Mg.	.37	.38	.39	.36	.35	.35	.34	.34	.33	.37
1955–56...Mg.	.41	.39	.35	.36	----	.38	.38	.35	.32	.30
Active acidity: [3]										
1952–53...pH	----	----	----	----	----	----	----	----	----	----
1953–54...pH.	3.2	3.4	3.5	3.8	3.9	3.3	3.5	3.5	3.7	3.8
1954–55...pH.	3.0	3.2	3.3	3.5	3.6	3.1	3.3	3.4	3.6	3.6
1955–56...pH.	3.0	3.2	3.3	3.5	----	3.0	3.2	3.4	3.6	3.6
Total solids: [3]										
1952–53...Pct.	----	9.47	10.15	10.43	10.79	----	10.02	10.15	10.46	10.81
1953–54...Pct.	8.80	8.73	9.30	9.57	9.75	8.80	9.18	9.40	9.82	10.24
1954–55...Pct.	9.57	9.74	9.97	9.90	10.87	9.50	9.74	9.87	10.10	10.92
1955–56...Pct.	9.07	9.25	9.57	9.93	----	9.27	9.76	9.87	10.03	10.12
Total acid: [3]										
1952–53...Pct.	----	1.03	.82	.74	.71	----	.95	.79	.74	.69
1953–54...Pct.	1.19	.91	.73	.64	.56	1.13	.87	.69	.61	.57
1954–55...Pct.	1.47	1.14	.88	.74	.76	1.58	1.08	.89	.80	.70
1955–56...Pct.	1.67	1.18	.95	.84	----	1.50	1.17	.89	.82	.75
Solids-acid ratio:										
1952–53	----	9.19	12.38	14.09	15.20	----	10.55	12.85	14.14	15.71
1953–54	7.39	9.59	12.74	14.64	17.41	7.79	10.55	13.62	16.10	17.96
1954–55	6.51	8.54	11.33	13.38	13.84	6.01	9.02	11.09	12.63	13.82
1955–56	5.43	7.84	10.07	11.82	----	5.83	8.29	11.09	12.23	13.49

[1] The mean of 75 determinations made in 3 seasons or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] P, pleasantly; PTS, pleasantly tart to sweet; OV-M, over mature; PY, pale yellow; TY tannish yellow; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Thornton, rough lemon rootstock, Plot 27, Clermont					Thornton, Cleopatra rootstock, Plot 28, Forest City				
	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5
Weight per fruit [1]...Gm.	168	210	272	295	291	159	213	256	287	288
Rind color: [2] [3]										
1952–53							D	G	I	J
1953–54	D	E	G	G	J	D	E	G	H	J
1954–55	D	E	F	H	J	D	E	G	I	
1955–56	D	E	F	H	H	D	E	G	H	
Flesh color: [2] [4]										
1952–53							PY	PY	TY	TY
1953–54	TY	TY	TY	TY	TY	TY	TY	TY	TY	TY
1954–55	TY	TY	TY	TY	TY	PY	TY	TY	TY	
1955–56	PY	TY	TY	TY	TY	PY	TY	TY	TY	
Flesh condition: [3]										
1952–53							Good	Good	Good	Good
1953–54	Coarse	Coarse	Good	Good	Dry	Coarse	Good	Good	Good	Good
1954–55	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	
1955–56	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit: [1] Ml.	56	56	54	51	48	56	57	57	54	53
Juice for fruit: [1] Pct.	58	58	56	53	49	58	59	59	56	54
Palatability: [4]										
Arbitrary standard:										
1952–53							Tart	P tart	PTS	PTS
1953–54	Acid	Acid	P tart	P tart	Insipid	Acid	Tart	P tart	PTS	P tart
1954–55	V acid	Acid	P tart	P tart	P tart	V acid	Tart	P tart	P tart	
1955–56	V acid	Tart	P tart	P tart	PTS	V acid	Tart	P tart	PTS	
Numerical rating:										
1952–53							64	71	82	84
1953–54	48	56	74	74	71	50	61	74	82	78
1954–55	33	50	71	75	79	37	60	72	78	
1955–56	34	60	71	74	80	34	60	72	82	
Ascorbic acid: [4] [6]										
1952–53...Mg.							0.44	0.42	0.41	0.39
1953–54...Mg.	0.30	0.30	0.31	0.24	0.22	0.37	.38	.36	.32	.31
1954–55...Mg.	.36	.38	.38	.34	.35	.39	.40	.41	.39	
1955–56 Mg.	.34	.34	.31	.31	.28	.44	.41	.37	.38	
Active acidity: [5]										
1952–53...pH.										
1953–54...pH.	3.3	3.4	3.6	3.7	3.9	3.2	3.4	3.5	3.7	4.0
1954–55...pH.	3.1	3.2	3.3	3.5	3.5	3.0	3.2	3.4	3.5	
1955–56...pH.	3.0	3.2	3.4	3.6	3.6	3.0	3.1	3.3	3.6	
Total solids: [5]										
1952–53...Pct.							10.02	10.12	10.90	11.49
1953–54 Pct.	7.80	7.98	8.70	8.37	8.89	8.80	8.78	9.40	9.98	10.75
1954–55 Pct.	8.87	8.84	9.17	9.27	9.57	9.57	9.68	9.83	10.02	
1955–56 Pct.	7.92	8.20	8.95	8.68	8.87	9.27	9.30	9.90	10.53	
Total acid: [5]										
1952–53 Pct.							1.08	.88	.88	.84
1953–54...Pct.	1.08	.86	.62	.58	.57	1.17	.90	.76	.65	.59
1954–55...Pct.	1.54	1.10	.88	.81	.80	1.49	1.10	.89	.86	
1955–56...Pct.	1.54	1.12	.79	.66	.73	1.57	1.30	.88	.79	
Solids-acid ratio:										
1952–53							9.28	11.50	12.39	13.68
1953–54	7.22	9.28	14.03	14.43	15.44	7.52	9.76	12.37	15.35	18.22
1954–55	5.76	8.04	10.42	11.44	11.96	6.42	8.80	11.04	11.65	
1955–56	5.14	7.32	11.33	13.15	12.15	5.90	7.15	11.25	13.33	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] P, pleasantly; PTS, pleasantly tart to sweet; PY, pale yellow; TY, tannish yellow; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Thornton, Cleopatra rootstock, Plot 29, Tavares					Thornton, Cleopatra rootstock, Plot 30, Grand Island				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]...Gm.	134	199	251	284	288	155	204	262	311	[2] 346
Rind color: [3]										
1952–53		D	G	I						
1953–54	D	E	H	H	J	D	E	H	I	J
1954–55	D	E	H	H	K					
1955–56	D	E	G	H	H	D	E	G	H	
Flesh color: [3]										
1952–53		PY	PY	TY						
1953–54	PY	TY	TY	TY	TY	TY	TY	TY	TY	TY
1954–55	PY	TY	TY	TY	TY					
1955–56	PY	TY	TY	TY	TY	PY	TY	TY	TY	
Flesh condition: [4]										
1952–53		Good	Good	Good						
1953–54	Coarse	Good	Good	Good	OV–M	Coarse	Good	Good	Good	Good
1954–55	Coarse	Coarse	Good	Good	Good					
1955–56	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit [1] Ml.	54	56	56	53	48	57	58	59	53	[2] 50
Juice per fruit [1] Pct.	55	58	58	55	50	59	60	60	55	[2] 52
Palatability: [5]										
Arbitrary standard:										
1952–53		Tart	P tart	PTS						
1953–54	Acid	Tart	P tart	PTS	PTS	Acid	Tart	P tart	PTS	PTS
1954–55	V acid	Tart	P tart	PTS	PTS					
1955–56	Acid	Tart	P tart	PTS	PTS	Acid	Tart	PTS	PTS	
Numerical rating:										
1952–53		62	71	82						
1953–54	51	64	78	84	85	56	66	76	85	87
1954–55	37	60	73	80	83					
1955–56	40	60	78	81	83	44	64	80	81	
Ascorbic acid: [6]										
1952–53...Mg.		0.36	0.37	0.35						
1953–54...Mg.	0.38	.37	.37	.31	0.29	0.40	0.40	0.42	0.38	0.36
1954–55...Mg.	.37	.38	.38	.35	.31					
1955–56...Mg.	.37	.37	.33	.30	.26	.40	.38	.37	.35	
Active acidity: [7]										
1952–53...pH.										
1953–54...pH.	3.2	3.4	3.5	3.7	4.0	3.0	3.3	3.4	3.6	3.9
1954–55...pH.	3.0	3.1	3.1	3.4	3.5					
1955–56...pH.	3.0	3.3	3.4	3.6	3.6	3.0	3.5	3.4	3.6	
Total solids: [4]										
1952–53...Pct.		9.87	10.17	10.72						
1953–54...Pct.	8.80	9.43	9.80	9.98	10.40	8.93	9.40	10.00	10.73	10.66
1954–55...Pct.	10.05	9.98	10.08	10.87	10.02					
1955–56...Pct.	9.47	9.87	10.00	10.78	10.67	9.47	9.57	9.90	10.48	
Total acid: [4]										
1952–53...Pct.		1.15	.94	.79						
1953–54...Pct.	1.11	.91	.73	.62	.59	1.20	1.00	.85	.69	.72
1954–55...Pct.	1.17	1.21	.95	.91	.85					
1955–56...Pct.	1.73	1.11	.87	.83	.84	1.52	1.03	.82	.66	
Solids-acid ratio:										
1952–53		8.58	10.82	13.57						
1953–54	7.93	10.36	13.42	16.10	17.63	7.44	9.40	11.76	15.55	14.72
1954–55	8.59	8.05	11.24	11.95	12.85					
1955–56	5.47	8.89	11.49	12.99	12.70	6.23	9.29	12.07	15.88	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature; PY, pale yellow; TY, tannish yellow; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Minneola, rough lemon rootstock, Plot 31, Tavares					Minneola, rough lemon rootstock, Plot 32, Groveland				
	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5
Weight per fruit [1]...Gm.	103	256	319	368	[2] 380	207	253	308	376	326
Rind color: [3] [4]										
1952–53		D	H	L			D	G	L	L+
1953–54	C	D	I	L+		C	D	I	L+	
1954–55	C	D	K	L	L+	C	D	K	L	L+
1955–56	D	E	H			D	E	H	L	
Flesh color: [3] [4]										
1952–53		YO	O	O			YO	O	O	O
1953–54	YO	O	O	O		YO	O	O	O	
1954–55	YO	O	O	O	O	YO	O	O	O	O
1955–56	OY	O	O			OY	O	O	O	
Flesh condition: [3]										
1952–53		Good	Good	Good			Good	Good	Good	Good
1953–54	Coarse	Good	Good	Good		Coarse	Good	Good	Good	
1954–55	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	Good
1955–56	Coarse	Coarse	Good			Coarse	Coarse	Good	Good	
Juice per 100 gms. of fruit: [1] All	55	58	58	59	[2] 52	56	59	59	55	56
Juice per fruit: [1] Pct.	57	60	60	58	[2] 54	58	61	61	57	58
Palatability: [4]										
Arbitrary standard:										
1952–1953		Tart	P tart	PTS			Tart	P tart	PTS	PTS
1953–54	Acid	P tart	PTS	PTS		Acid	Tart	P tart	PTS	
1954–55	V acid	Acid	P tart	PTS	PTS	V acid	Tart	P tart	PTS	PTS
1955–56	V acid	Acid	PTS			V acid	Acid	PTS	PTS	
Numerical rating:										
1952–53		62	72	84			62	73	83	86
1953–54	51	70	81	87		49	66	79	89	
1954–55	32	55	73	84	85	36	61	75	85	88
1955–56	34	59	81			38	56	82	85	
Ascorbic acid: [5] [6]										
1952–53...Mg.		0.23	0.24	0.24			0.22	0.23	0.22	0.20
1953–54...Mg.	0.22	.21	.22	.22		0.25	.24	.25	.27	
1954–55...Mg.	.21	.18	.25	.20	.18	.21	.22	.24	.23	.24
1955–56...Mg.	.19	.19	.18			.23	.24	.24	.25	
Active acidity: [5]										
1952–53...pH										
1953–54...pH	2.9	3.3	3.5	3.8		2.9	3.2	3.4	3.6	
1954–55...pH	2.9	3.0	3.4	3.5	3.6	2.9	3.1	3.5	3.5	3.6
1955–56...pH	2.9	3.3	3.5			2.9	3.1	3.4	3.5	
Total solids: [5]										
1952–53...Pct.		10.05	10.70	11.04			9.70	10.65	11.19	11.50
1953–54...Pct.	8.87	9.50	10.00	10.26		8.87	9.50	10.10	11.01	
1954–55...Pct.	10.07	9.98	11.23	11.37	11.45	8.75	9.23	9.93	10.73	11.05
1955–56...Pct.	8.07	9.12	10.00			8.07	8.97	9.95	10.76	
Total acid: [5]										
1952–53...Pct.		1.28	.91	.89			1.14	.97	.91	.88
1953–54...Pct.	1.52	.93	.77	.70		1.46	1.17	.88	.73	
1954–55...Pct.	2.23	1.51	1.06	1.01	.95	1.90	1.24	.86	.89	.84
1955–56...Pct.	1.97	1.12	.84			2.00	1.30	.90	.82	
Solids-acid ratio:										
1952–53		7.85	11.70	13.08			8.51	10.98	12.30	13.07
1953–54	5.84	10.22	12.99	14.66		6.08	8.12	11.48	15.08	
1954–55	4.78	6.61	10.59	11.26	12.05	4.61	7.44	11.55	12.06	13.15
1955–56	4.40	8.14	11.90			4.34	6.90	11.06	13.12	

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate 11.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Minneola, sour orange rootstock, Plot 33, Terra Ceia					Minneola, sour orange rootstock, Plot 34, Bradenton				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit[1]: Gm.	213	275	323	360	350	200	252	330	342	333
Rind color:[2 3]										
1952–53		E	J	L+	L+		E	I	L+	L+
1953–54	D	F	K	L+	L+	C	E	J	L+	L+
1954–55	C	D	H	J	L+	C	E	K	L+	L+
1955–56	D	E	H	L	L	D	E	H	K	L
Flesh color:[3 4]										
1952–53		YO	O	O	O		YO	O	O	O
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	YO	O	O	O	O	YO	O	O	O	O
1955–56	OY	O	O	O	O	OY	O	O	O	O
Flesh condition:[3 4]										
1952–53		Good	Good	Good	Good		Good	Good	Good	Good
1953–54	Coarse	Good	Good	Good	OV-M	Coarse	Good	Good	Good	Good
1954–55	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	Good
1955–56	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	Good
Juice per 100 gms. of fruit: Ml.	57	58	59	56	54	56	59	58	58	54
Juice per fruit: Pct.	59	59	61	58	56	58	61	60	60	56
Palatability:[4]										
Arbitrary standard:										
1952–53		Tart	P tart	PTS	PTS		Tart	P tart	PTS	PTS
1953–54	Acid	P tart	PTS	PTS	PTS	Acid	P tart	PTS	PTS	PTS
1954–55	V acid	Tart	P tart	PTS	PTS	V acid	Tart	P tart	PTS	PTS
1955–56	V acid	Tart	PTS	PTS	PTS	V acid	Tart	PTS	PTS	PTS
Numerical rating:										
1952–53		65	78	85	89		62	74	85	86
1953–54	57	72	86	89	92	55	70	86	92	94
1954–55	34	60	73	84	88	36	60	77	89	91
1955–56	33	60	83	86	85	36	62	85	85	85
Ascorbic acid:[4 5]										
1952–53 Mg.		0.26	0.26	0.24	0.22		0.21	0.21	0.21	0.18
1953–54 Mg.	0.20	.23	.23	.21	.20	0.20	.20	.20	.21	.18
1954–55 Mg.	.23	.22	.23	.20	.20	.20	.21	.24	.23	.23
1955–56 Mg.	.21	.19	.20	.18	.19	.17	.18	.17	.18	.15
Active acidity:[3]										
1952–53 pH										
1953–54 pH	3.1	3.4	3.6	3.7	4.2	3.1	3.5	3.6	3.7	4.2
1954–55 pH	3.0	3.0	3.5	3.7	3.7	3.0	3.1	3.5	3.6	3.6
1955–56 pH	2.9	3.2	3.4	3.7	3.7	3.0	3.3	3.5	3.0	3.8
Total solids:[3]										
1952–53 Pct.		9.85	10.70	11.33	11.85		9.50	10.65	11.17	11.68
1953–54 Pct.	8.97	9.87	10.75	10.42	11.45	9.47	9.97	10.90	11.68	12.65
1954–55 Pct.	9.27	9.33	10.03	10.74	11.50	9.46	9.98	11.37	11.87	13.31
1955–56 Pct.	9.27	9.67	10.83	11.36	12.72	9.12	9.10	10.77	10.81	11.24
Total acid:[3]										
1952–53 Pct.		1.03	.81	.73	.65		1.06	.94	.82	.79
1953–54 Pct.	1.14	.82	.68	.64	.54	1.21	.79	.73	.69	.62
1954–55 Pct.	1.82	1.43	.92	.78	.77	1.68	1.24	.86	.80	.81
1955–56 Pct.	2.09	1.36	.94	.75	.77	1.70	1.02	.80	.75	.65
Solids-acid ratio:										
1952–53		9.50	13.21	15.52	18.23		8.96	11.33	13.62	14.78
1953–54	7.87	12.04	15.81	16.28	21.20	7.83	12.62	15.01	17.22	20.40
1954–55	5.09	6.52	10.90	13.77	14.94	5.63	8.05	13.22	14.84	16.43
1955–56	4.44	7.11	11.52	15.15	16.52	5.36	9.41	13.46	14.41	17.29

[1] The mean of 75 determinations made in 3 seasons or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV-M, over mature; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Minneola, sour orange rootstock, Plot 35, Bradenton					Minneola, Cleopatra rootstock, Plot 30, Altamonte Springs				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1 2] Gm	238	287	335	314	358	181	251	312	384	390
Rind color: [2 3]										
1952–53							D	J	L+	L+
1953–54	C	E	J	+	L+	D	D	J	L+	L+
1954–55						C	E	K	L+	
1955–56						D	E	J	L	L+
Flesh color: [2 4]										
1952–53							YO	O	O	O
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55						YO	O	O	O	
1955–56						OY	O	O	O	O
Flesh condition: [2 4]										
1952–53							Good	Good	Good	Good
1953–54	Coarse	Good	Good	Good	Good	Coarse	Good	Good	Good	OV–M
1954–55						Coarse	Good	Good	Good	
1955–56						Coarse	Coarse	Good	Good	Good
Juice per 100 gms. of fruit [1 2] Ml	50	61	59	59	54	56	58	57	56	52
Juice per fruit [1 2] Pct	61	63	61	61	56	58	60	59	58	55
Palatability: [4]										
Arbitrary standard:										
1952–53							Tart	Tart	PTS	PTS
1953–54	Acid	P tart	PTS	PTS	PTS	Acid	Tart	P tart	PTS	PTS
1954–55						V acid	Acid	P tart	PTS	
1955–56						V acid	Acid	P tart	PTS	PTS
Numerical rating:										
1952–53							60	68	81	84
1953–54	56	70	82	88	91	52	63	79	89	91
1954–55						33	58	73	85	
1955–56						30	50	72	82	86
Ascorbic acid: [3 4]										
1952–53 Mg.							0.24	0.27	0.26	0.30
1953–54 Mg.	0.15	0.15	0.16	0.14	0.11	0.24	.24	.26	.31	.25
1954–55 Mg.						.22	.25	.28	.26	
1955–56 Mg.						.21	.22	.24	.28	.26
Active acidity: [5]										
1952–53 pH										
1953–54 pH	3.1	3.4	3.5	3.7	3.8	2.9	3.2	3.4	3.6	3.8
1954–55 pH						2.9	3.1	3.4	3.5	
1955–56 pH						2.8	3.0	3.2	3.5	3.5
Total solids: [3]										
1952–53 Pct.							10.77	12.20	12.57	13.88
1953–54 Pct.	9.27	9.47	10.31	10.53	11.47	9.12	9.82	10.92	11.67	12.67
1954–55 Pct.						9.31	9.98	11.37	11.81	
1955–56 Pct.						9.03	9.34	10.72	11.09	11.99
Total acid: [3]										
1952–53 Pct.							1.38	1.15	1.08	1.04
1953–54 Pct.	1.12	.89	.71	.68	.63	1.41	1.16	.87	.74	.70
1954–55 Pct.						1.79	1.33	.97	.93	
1955–56 Pct.						2.27	1.63	1.23	.84	.92
Solids-acid ratio:										
1952–53							7.80	10.61	11.64	13.35
1953–54	8.28	10.64	14.52	15.49	18.21	6.47	8.47	12.55	15.77	18.10
1954–55						5.20	7.50	11.72	12.70	
1955–56						3.98	5.73	8.72	10.20	13.03

[1] The mean of 75 determinations made in 3 seasons or of 100 determinations made in 4 seasons.
[2] The mean of 25 determinations
[3] See plate 11.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Minneola, Cleopatra rootstock, Plot 27, Sorrento					Minneola, sweet orange rootstock, Plot 38, Bradenton				
	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5
Weight per fruit [1] ..Gm.	182	246	321	357	364	198	243	303	340	327
Rind color: [2 3]										
1952–53										
1953–54	D	D	J	L+	L+	D	D	J	L	L+
1954–55	C	E	K	L+	L+					
1955–56	D	D	H	L	L	D	E	I	K	K
Flesh color: [3 4]										
1952–53										
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	OY	O	O	O	O					
1955–56	OY	O	O	O	O	OY	O	O	O	O
Flesh condition: [3 4]										
1952–53										
1953–54	Coarse	Good	Good	Good	OV–M	Coarse	Good	Good	Good	OV–M
1954–55	Coarse	Coarse	Good	Good	Good					
1955–56	Coarse	Coarse	Good	Good	Good	Coarse	Coarse	Good	Good	Good
Juice per 100 gms. of fruit [1] ..Ml.	57	58	58	55	55	57	58	60	56	53
Juice per fruit [1] ..Pct.	59	60	61	58	58	59	60	63	58	56
Palatability: [4]										
Arbitrary standard:										
1952–53										
1953–54	Acid	Tart	P tart	PTS	PTS	Tart	P tart	PTS	PTS	PTS
1954–55	V acid	Acid	Tart	PTS	PTS					
1955–56	V acid	Acid	P tart	PTS	PTS	V acid	Acid	PTS	PTS	PTS
Numerical rating:										
1952–53										
1953–54	51	84	77	90	91	60	72	84	89	93
1954–55	27	50	69	82	88					
1955–56	27	53	74	85	90	30	59	80	84	90
Ascorbic acid: [3 4]										
1952–53 Mg.										
1953–54 Mg.	0.23	0.24	0.25	0.20	0.20	0.15	0.16	0.17	0.17	0.13
1954–55 Mg.	.21	.23	.28	.26	.29					
1955–56 Mg.	.20	.20	.21	.20	.23	.21	.21	.23	.22	.21
Active acidity: [5]										
1952–53 pH										
1953–54 pH	2.9	3.2	3.4	3.5	3.7	3.1	3.4	3.5	3.7	3.8
1954–55 pH	2.9	2.9	3.3	3.4	3.4					
1955–56 pH	2.8	3.0	3.2	3.5	3.6	2.8	3.1	3.3	3.6	3.6
Total solids: [5]										
1952–53 Pct.										
1953–54 Pct.	8.84	9.57	10.88	11.47	12.57	9.34	9.92	10.93	10.93	12.57
1954–55 Pct.	9.31	9.93	11.27	12.09	13.21					
1955–56 Pct.	8.93	9.31	10.72	11.54	12.49	9.13	9.89	11.25	12.04	12.56
Total acid: [5]										
1952–53 Pct.										
1953–54 Pct.	1.50	1.10	.94	.81	.84	1.14	.92	.76	.63	.60
1954–55 Pct.	2.36	1.73	1.11	1.08	1.04					
1955–56 Pct.	2.38	1.52	1.14	.84	.82	2.39	1.34	.98	.83	.76
Solids-acid ratio:										
1952–53										
1953–54	5.89	8.04	11.57	14.16	14.96	8.19	10.78	14.38	17.35	20.95
1954–55	3.94	5.74	10.15	11.19	12.70					
1955–56	3.63	6.14	9.40	13.74	15.23	3.82	7.38	11.48	14.51	16.53

[1] The mean of 50 determinations made in 2 seasons or of 75 determinations made in 3 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature, V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1955–56*—Continued

Characteristic and season	Seminole, sour orange rootstock, Plot 39, Bradenton					Seminole, sour orange rootstock, Plot 40, Terra Ceia				
	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5	Oct. 1–5	Nov. 1–5	Dec. 1–5	Jan. 1–5	Feb. 1–5
Weight per fruit [1]—Gm	166	224	274	290	330	217	250	307	326	319
Rind color: [2 3]										
1952–53	-	E	H	K	L	-	-	-	-	-
1953–54	E	G	J	K	K	E	G	J	K	K
1954–55	D	E	J	J	L	D	E	I	I	K
1955–56	D	F	H	J	-	D	F	I	J	-
Flesh color: [2 4]										
1952–53	-	YO	O	O	O	-	-	-	-	-
1953–54	YO	O	O	O	O	YO	O	O	O	O
1954–55	OY	O	O	O	O	YO	O	O	O	O
1955–56	OY	YO	O	O	-	OY	O	O	O	-
Flesh condition: [2 4]										
1952–53	-	Good	Good	Good	Good	-	-	-	-	-
1953–54	Course	Course	Course	Good	Good	Course	Good	Good	Good	OV–M
1954–55	Course	Course	Good	Good	Good	Course	Course	Good	Good	Good
1955–56	Course	Course	Good	Good	-	Course	Course	Good	Good	-
Juice per 100 gms. of fruit [1] Ml	50	60	59	59	55	57	59	59	56	53
Juice per fruit [1] Pct	58	62	61	61	57	59	60	61	58	54
Palatability: [4]										
Arbitrary standard:										
1952–53	-	Acid	Tart	P tart	P tart	-	-	-	-	-
1953–54	Acid	Tart	P tart	P tart	PTS	Acid	P tart	P tart	PTS	PTS
1954–55	V acid	Acid	Tart	P tart	PTS	V acid	Acid	Tart	PTS	PTS
1955–56	V acid	Acid	P tart	P tart	-	V acid	Tart	P tart	P tart	-
Numerical rating:										
1952–53	-	57	63	76	79	-	-	-	-	-
1953–54	55	64	72	76	84	56	71	74	81	83
1954–55	30	47	66	74	81	38	53	67	80	82
1955–56	32	57	72	77	-	32	60	74	77	-
Ascorbic acid: [5 6]										
1952–53 Mg	-	0.26	0.30	0.26	0.22	-	-	-	-	-
1953–54 Mg	0.24	.27	.26	.28	.22	0.25	0.26	0.22	0.23	0.16
1954–55 Mg	.28	.20	.28	.28	.28	.20	.26	.24	.24	.22
1955–56 Mg	.30	.31	.20	.26	-	.24	.22	.24	.23	-
Active acidity: [5]										
1952–53 pH	-	-	-	-	-	-	-	-	-	-
1953–54 pH	2.0	3.2	3.2	3.4	3.5	3.1	3.4	3.6	3.7	3.9
1954–55 pH	2.8	2.9	3.1	3.1	3.2	2.9	3.0	3.3	3.4	3.5
1955–56 pH	2.8	2.9	3.0	3.3	-	2.9	3.1	3.2	3.5	-
Total solids: [5]										
1952–53 Pct	-	9.73	10.20	10.83	10.80	-	-	-	-	-
1953–54 Pct	8.94	10.09	10.28	10.23	10.82	8.84	9.64	9.67	9.82	10.09
1954–55 Pct	9.53	10.33	11.17	11.92	12.07	8.93	9.93	10.17	10.60	10.17
1955–56 Pct	9.83	10.74	11.26	11.05	-	8.63	9.29	10.70	11.45	-
Total acid: [5]										
1952–53 Pct	-	1.48	1.21	1.05	1.03	-	-	-	-	-
1953–54 Pct	1.59	1.33	1.17	.97	.88	1.10	.92	.73	.61	.56
1954–55 Pct	2.41	1.91	1.56	1.42	1.31	1.86	1.50	1.16	1.00	.89
1955–56 Pct	2.38	1.53	1.40	1.10	-	1.97	1.20	1.07	.82	-
Solids-acid ratio:										
1952–53	-	6.57	8.43	10.31	10.49	-	-	-	-	-
1953–54	5.62	7.59	8.79	10.55	12.30	8.04	10.48	13.25	16.10	18.02
1954–55	4.00	5.41	7.18	8.30	9.21	4.80	6.62	8.77	10.60	11.43
1955–56	4.13	7.02	8.04	11.05	-	4.38	7.20	10.00	13.90	-

[1] The mean of 50 determinations made in 2 seasons, of 75 determinations made in 3 seasons, or of 100 determinations made in 4 seasons.

[2] The mean of 25 determinations.

[3] See plate II.

[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly; PTS, pleasantly tart to sweet; OV–M, over mature; V, very.

[5] Mean of duplicate determinations.

[6] Mg./ml.

TABLE 18.—*Seasonal changes in physical characteristics and chemical constituents of Florida tangelos, by variety and kind of rootstock, and location of test, picking dates 1952–53 to 1956–66*—Continued

Characteristic and season	Seminole, sour orange rootstock, Plot 41, Tavares					Seminole, Cleopatra rootstock, Plot 42, Grand Island				
	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5	Oct. 1-5	Nov. 1-5	Dec. 1-5	Jan. 1-5	Feb. 1-5
Weight per fruit [1] Gm										
1952-53		248	277	300	340	163	190	240	284	307
Rind color: [2 3]										
1952-53		F	I	K	K					
1953-54						E	G	J	L	L
1954-55										
1955-56						D	F	I	K	K
Flesh color: [2 4]										
1952-53		YO	O	O	O					
1953-54						YO	O	O	O	O
1954-55										
1955-56						OY	YO	O	O	O
Flesh condition [2]										
1952-53		Good	Good	Good	Good					
1953-54						Course	Good	Good	Good	Good
1954-55										
1955-56						Course	Course	Good	Good	Good
Juice per 100 gms. of fruit: [5]										
Ml		62	60	59	56	59	60	58	61	55
Juice per fruit [5] Pct		65	62	61	58	61	62	60	61	57
Palatability: [6]										
Arbitrary standard.										
1952-53		Acid	Acid	P tart	P tart					
1953-54						Acid	Tart	Tart	PTS	PTS
1954-55										
1955-56						V acid	Acid	P tart	P tart	PTS
Numerical rating										
1952-53		58	58	70	73					
1953-54						43	60	66	80	86
1954-55										
1955-56						30	54	72	75	82
Ascorbic acid [5 6]										
1952-53 Mg		0.29	0.29	0.26	0.23					
1953-54 Mg						0.32	0.34	0.33	0.30	0.32
1954-55 Mg										
1955-56 Mg						.30	.32	.31	.32	.29
Active acidity: [5]										
1952-53 pH										
1953-54 pH						2.8	3.0	3.1	3.3	3.3
1954-55 pH										
1955-56 pH						2.8	3.0	3.1	3.2	3.2
Total solids: [5]										
1952-53 Pct		9.47	9.95	10.17	10.05					
1953-54 Pct						8.84	10.21	11.12	11.47	12.37
1954-55 Pct										
1955-56 Pct						9.33	10.20	11.00	12.05	12.17
Total acid: [5]										
1952-53 Pct		1.57	1.46	1.18	1.20					
1953-54 Pct						2.04	1.77	1.44	1.10	1.06
1954-55 Pct										
1955-56 Pct						2.41	1.55	1.41	1.20	1.17
Solids-acid ratio:										
1952-53		6.03	6.82	8.87	8.38					
1953-54						4.33	5.70	7.72	10.43	11.67
1954-55										
1955-56						3.87	6.64	7.80	10.04	10.40

[1] The mean of 25 determinations made in 1 season or of 50 determinations made in 2 seasons.
[2] The mean of 25 determinations.
[3] See plate II.
[4] YO, yellow orange; O, orange; OY, orange yellow; P, pleasantly, PTS, pleasantly tart to sweet; V, very.
[5] Mean of duplicate determinations.
[6] Mg./ml.

TABLE 19.—*Standards for the determination of maturity of tangelos for fresh shipment (5)* [1]

Effective date	Minimum total soluble solids, percent	Solids to acid minimum ratio
Nov. 16–Nov. 30	8.00 to 8.09	10.50 to 1.
	8.10 to 8.19	10.45 to 1.
	8.20 to 8.29	10.40 to 1.
	8.30 to 8.39	10.35 to 1.
	8.40 to 8.49	10.30 to 1.
Nov. 1–Nov. 15	8.50 to 8.59	10.25 to 1.
	8.60 to 8.69	10.20 to 1.
	8.70 to 8.79	10.15 to 1.
	8.80 to 8.89	10.10 to 1.
	8.90 to 8.99	10.05 to 1.
Aug. 1–Oct. 31	9.00 to 9.09	10.00 to 1.
	9.10 to 9.19	9.95 to 1.
	9.20 to 9.29	9.90 to 1.
	9.30 to 9.39	9.85 to 1.
	9.40 to 9.49	9.80 to 1.
	9.50 to 9.59	9.75 to 1.
	9.60 to 9.69	9.70 to 1.
	9.70 to 9.79	9.65 to 1.
	9.80 to 9.89	9.60 to 1.
	9.90 to 9.99	9.55 to 1.
	10.00 to 10.09	9.50 to 1.
	10.10 to 10.19	9.45 to 1.
	10.20 to 10.29	9.40 to 1.
	10.30 to 10.39	9.35 to 1.
	10.40 to 10.49	9.30 to 1.
	10.50 to 10.59	9.25 to 1.
	10.60 to 10.69	9.20 to 1.
	10.70 to 10.79	9.15 to 1.
	10.80 to 10.89	9.10 to 1.
	10.90 to 10.99	9.05 to 1.
	11.00 to 11.09	9.00 to 1.
	11.10 to 11.19	8.95 to 1.
	11.20 to 11.29	8.90 to 1.
	11.30 to 11.39	8.85 to 1.
	11.40 to 11.49	8.80 to 1.
	11.50 to 11.59	8.75 to 1.
	11.60 to 11.69	8.70 to 1.
	11.70 to 11.79	8.65 to 1.
	11.80 to 11.89	8.60 to 1.
	11.90 and above	8.55 to 1.
Dec. 1–Jan. 31	No minimum	8.55 to 1.
Feb. 1–July 31	No minimum	8.00 to 1.

[1] A flat 8 to 1 ratio for tangelos harvested for canning Dec. 1 through July 31 is required; no minimum is stated for solids. Before Dec. 1 of each year all tangelos for canning must meet fresh fruit requirements.

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END