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JB 988 (1949) USDA TECHNICAL BULLETINS UPDATA
SEASONAL CHANGES IN FLORIDA TANGERINES
HARDING P. E. SUNDAY M. B. 1 OF 1

START



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A



**UNITED STATES
DEPARTMENT OF AGRICULTURE
WASHINGTON, D. C.**

Seasonal Changes in Florida Tangerines¹

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¹ Submitted for publication February 8, 1949.

² Acknowledgment is due the following growers and producers for their generous cooperation in providing fruit used in the investigation: Aleoma Packing Co., Inc., Brooksville Citrus Association, Walter S. Buckingham, W. G. Charles, Chase Investment Co., Cocoa-Merritt Island Citrus Association, V. V. Coogler, J. T. Daniel, Deerfield Groves Co., H. O. Estes, the late B. F. Floyd, J. R. Gray, F. H. Guess, Mayo Hill, Holly Hill Cooperative Citrus Association, Indian River Products Co., Inc., the late A. J. Kennedy, Mrs. Thelma Cornell Kirtley, F. E. Lykes, J. P. Lyons, Herbert Mussey, R. E. McCleery, A. B. Michael, Fred O. Moore, Mountain Lake Corp., J. D. Nagel, Jr., the late J. J. Parrish, Sr., Pasco Packing Association, W. C. Pederson, Mrs. A. T. Rhee, T. L. Sladen, Tom B. Swann, The Nevins Fruit Co., and A. R. Updike. Acknowledgment is also due the late D. F. Fisher and J. R. Winston, who were in general charge of the work, and other present and former staff members of the Division of Fruit and Vegetable Crops and Diseases as follows for their assistance in conducting the investigation: Doris P. David, Virginia Faust, Marion Floyd, G. A. Meckstroth, G. Lee Roberts, and Frances B. Whitley; and E. A. Siegler, formerly pathologist, of this Division, for his suggestions on and criticisms of this manuscript. The assistance of other staff members of the United States Department of Agriculture who regularly participated as taste judges is also acknowledged.

QUALITY IN TANGERINES

The physical and chemical changes that occur in Daney tangerines (*Citrus reticulata*) during their ripening period were studied to obtain data that could serve as a basis for a practical evaluation standard for quality in fruit. The work was carried out in a manner similar to that reported for oranges (8)³ and grapefruit (5), for which it was shown that palatability ratings were definitely associated with the chemical composition of the fruit. A practical method was devised for identifying* fruit that would meet consumer approval by means of chemical analysis of a representative sample. This can be done by reference to a chart, or nomograph (see fig. 5), which shows definite limits, or boundary lines, for total solids and total acid contents and their relation to each other. As shown in the nomograph, any lot of fruit with less than 9 percent of total solids or more than 1.4 percent of total acid would not meet consumer approval and therefore should not be sent to market.

The work was carried on for four harvest seasons, or crop years (1943-47), in order to give reasonable assurance that the results would be of value under various seasonal conditions. Because considerable variation in weather conditions, particularly rainfall, occurred during this period, the results should be applicable to somewhat extreme or unusual conditions as well as to usual ones.

The Daney tangerine is the most important commercial variety of the mandarin type of orange (*Citrus reticulata*) in Florida, but it is of minor economic importance in other States. In Florida the acreage in tangerines reached an all-time high of over 25 thousand acres in 1937-38, but subsequently the acreage slightly decreased. On the other hand, production generally increased and about 4 million boxes or more were produced annually after 1942. From 1942 to 1947 the annual value of tangerines to Florida ranged from about 6½ to about 12 million dollars.⁴

Marked physical and chemical changes occur in the fruit from November to March, when tangerines are usually harvested. In general, the appearance and certain other physical qualities of the fruit are indicative of its eating quality. But aside from the fact that individual judgment on appearance is frequently whimsical, there are many exceptions to the general rule. In many instances unattractive fruit, as judged by present standards, actually rates higher in palatability than fruit more attractive in appearance. In these investigations emphasis was placed on palatability because, regardless of the merits of all other qualities that make for consumer appeal, the consumer's reaction to the taste of the fruit is ultimately the supreme test. This is true for fruit that is to be canned or processed as well as for that which goes to the fresh-fruit market.

The stage of maturity, or degree of ripeness the fruit has reached, when harvested is directly related to its palatability and is the most important factor that influences the eating quality. Other factors, such as weather conditions, including rainfall and sunshine, soils,

³ Italic numbers in parentheses refer to Literature Cited, p. 32.

⁴ U. S. Bureau of Agricultural Economics. Citrus Fruits: Production, Farm Disposition, Value, and Utilization of Sales. 25 pp. 1947. [Processed.] (See pp. 13 and 22.)

fertilizers, cultivation, pruning, spraying, and dusting, may likewise affect eating quality, but it has not been feasible to determine in what way or to what extent.

Results obtained when total acid (as citric), ascorbic acid (vitamin C), and total solids (principally sugars) were calculated on the basis of total amount per fruit not only show the actual physiological trends at various stages of ripening but also have great commercial value to canneries and concentrate industries that naturally desire to process the fruit at the stage of greatest volume of juice and greatest food value. Total acid decreased gradually from October to April. Tangerines on rough lemon contained less than those on Cleopatra tangerine (called "Cleopatra" herein in accordance with current usage) and sour orange rootstocks. The total ascorbic acid per fruit increased rapidly during October and November, remained rather constant during December and January, and decreased rapidly during February and March. The tangerines on Cleopatra and sour orange contained a greater total content of this vitamin than did those on rough lemon rootstock. The actual amounts of total solids increased regularly from October through January and then decreased during February and March.

Rootstocks affected the total solids per fruit; those on Cleopatra and sour orange contained greater amounts than those on rough lemon rootstock. The information on the actual amounts of total acid, ascorbic acid, and total solids per fruit shows when tangerine juice with the highest food value could be processed. The periods of maximum total solids and of ascorbic acid do not exactly coincide, but fairly high levels of both prevailed during late January and early February. After this time there was a diminution in both.

RELATION OF MATURITY AND RIPENESS

The meanings of the terms "mature" and "ripe" have been discussed in previous bulletins (5, 8). For all practical purposes tangerine fruits are mature when they have attained their greatest weight. At this stage they are ripe. For convenience, ripeness and maturity are used synonymously in this bulletin; similarly, the various stages in development are designated as "immature (not ripe)," "mature (ripe)," and "postmature (overripe)." That stage of ripeness when the fruit reaches perfection in taste is designated as "prime." Although in a large group of tasters some variation in scoring may be expected, analysis of the results of the taste tests shows that fruit which had attained its maximum weight and volume of juice and a medium-high content of total solids and at the same time had a relatively low total acid content was rated the most palatable.

MATERIAL AND METHODS

SELECTION OF PLOTS AND SAMPLES

The groves used for fruit sampling were selected to represent the average commercial tangerine plantings in Florida (see table 6). They were located in the ridge and central districts on soils relatively low in organic matter and in the east-coast and Dade City-Brooksville

districts on soils relatively high in organic matter. In each of these districts the tangerines in the plots were on both rough lemon and sour orange rootstocks. In 17 different groves they were on rough lemon, in 13 on sour orange, and in 2 on Cleopatra tangerines (called "Cleopatra" herein as explained on p. 3). The last-named rootstock is not used extensively, but it is gaining in favor.

All the groves were in good condition and had received normal cultural, fertilizer, and spray treatments. The trees showed no evidence of deficiency disorders. They were mostly mature (ranging in age from 6 to more than 52 years) and had a history of average crop production.

The tests on the fruit were started early in October and continued until April except in 1946, when they were discontinued after January because of the drying out of the fruit, and in 1947, when they were discontinued after February because of a freeze.

In picking fruit for sampling, care was taken to select only fruit from the regular bloom; otherwise, the tangerines for all tests were selected at random at 2- to 4-week intervals from plots consisting of 10 to 15 trees. Each sample consisted of 100 or more fruits. The fruit samples were taken to the laboratory at Orlando, Fla., immediately after they were picked, placed in storage at 36° F., and tested as promptly thereafter as feasible.

METHODS OF EVALUATING PALATABILITY

The eating quality of the fruit was given special attention. Taste appeal is determined by the texture of the flesh, juiciness, contents of total solids and total acid, and the ratio of total solids to total acid (solids-acid ratio).

The panel of taste testers consisted of about 40 individuals, mostly staff members of the Bureau of Plant Industry, Soils, and Agricultural Engineering or of the Bureau of Entomology and Plant Quarantine, stationed at Orlando, Fla. These taste judges appraised and scored each lot of fruit, and their numerical ratings were averaged. Scoring of all samples of tangerines was done according to the arbitrary standard scale shown on page 5.

The taste judges were a cosmopolitan group. All were adults, ranging in age from 19 to 70 years, and averaging 38. For its possible bearing on taste preferences, information was obtained from each judge as to his birthplace and his State of longest residence. The judges were born in 28 different States and in Canada, but only 1 in Florida. Most of the judges had resided longest in States other than the one where they were born; only about 25 percent of them had resided longest in Florida.

At the beginning of each season the arbitrary standard scale for evaluating internal quality was discussed with the staff members who were to participate as taste judges, to make sure that each one was informed as to its use. In particular, it was stressed that the numerical value 70 would be the minimum standard of acceptability, that any tangerines rated less than 70 would be considered unpalatable, and that desirable internal quality should be given values of 70 to 100.

SCORE CARD FOR TESTING TASTE OR FLAVOR OF TANGERINE¹

Arbitrary standard	Taste or flavor of fruit	Numerical rating range corresponding to description	Individual numerical rating
Very acid.....	Very acid, raw, immature flavor.....	20-30	
Acid.....	Acid with absence of raw, immature flavor.....	40-55	
Part.....	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 score card 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.

In each individual test 50 to 100 tangerines were used. The fruits were cut transversely, and from each half was cut a wedge-shaped piece for testing.

The reliability of the results obtained by the panel of judges was established by collateral studies in which a series of taste ratings were made on replicate samples of the same fruit. The judges repeated their ratings closely, and their average scores seldom varied more than one point. Statistical studies were then made to ascertain the variation among individual tasters. Differences were found, but they were not large enough to be of a practical importance.

The reliability of the method employed by the taster panel obviously requires careful consideration in evaluating the results. It is believed that the method used in this investigation permits a fair approximation of the average consumer reaction. This was found to be true in the earlier studies made on oranges (8) and grapefruit (5), wherein there was shown to be a statistically significant relation between panel evaluation and chemical tests similar to those made in the present study.

CHEMICAL ANALYSES

Lots of about 25 fruits from the samples rated for palatability were used for chemical analysis. These fruits were analyzed individually or as composited juice samples. The analyses of the fruits (1943-46) brought out the variation among fruits and showed the percentages in each sample which passed existing legal requirements for total solids and solids-acid ratio.

The juice was extracted from the tangerines by a pressure extractor and then strained through cheesecloth to remove the seeds and pulp.

The analyses included determinations of ascorbic acid (vitamin C) content, active acidity (pH), total ash, total solids (principally sugars), and total acid (as citric). The data are based on the analyses of about 4,200 individual fruits and on more than 400 composited juice samples on which duplicate determinations were made for the various chemical constituents.

Official methods were followed in determining the chemical constituents (1, 2). The average pH was determined by averaging the hydrogen-ion concentrations and converting the average to pH. (See figs. 3 and 13 and tables 7 to 38, Appendix.)

METHODS OF EVALUATING PHYSICAL CHARACTERS

Despite a natural tendency to place considerable reliance on physical characteristics as a criterion of taste qualities as well as of appearance and general marketability, these factors are not always correlated with taste. Nevertheless, considerable attention was given to measuring the physical characteristics each time the fruit was rated for palatability. The measurements of these characteristics were averaged to determine as closely as possible how the appearance and physical qualities are correlated with the results of the chemical analyses and palatability tests.

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

Color of Rind.—The color of the rind of each individual fruit was determined by matching it with the colors A to L of plate 1. 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. (See figs. 4 and 6 and tables 7 to 38, Appendix.)

Color of Flesh.—Color of the flesh of tangerines was determined by matching the halves of transversely cut fruit with the color charts of Maerz and Paul (9). Because the color graduations were many, these colors were grouped in three classes: OY, orange yellow; YO, yellow orange; O, orange. The average flesh color for each sample was ascertained by assigning a numerical value to each color designation, averaging these values, and then converting each average to the nearest color designation. (See tables 7 to 38, Appendix.) Very ripe tangerines showed a pronounced tendency to dry out and lose color. In this case no color designation was given to the sample, and it was recorded as dry.

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 tangerines in each sample that were (1) ricey-textured, (2) coarse-textured, (3) good-textured, and (4) puffy. Fruit in which the flesh had a ricelike appearance and the juice vesicles contained very small quantities of juice was designated as ricey; that in which the vesicle cell walls were thick and conspicuous and the juice vesicles were not distended with juice as coarse; that in which the vesicle cell walls were thin and inconspicuous and the juice vesicles were fully expanded as good-textured; and that in which the flesh had separated from a part or most of the rind as puffy.

In examining for puffiness each fruit in the sample was observed, and the sample was designated (P) if most of the fruits showed puffiness. (See table 3 and tables 7 to 38, Appendix.) The average texture of the flesh for each sample was ascertained by assigning a numerical value to each texture designation, averaging these values, and then converting each average to the nearest texture designation. (See table 3 and tables 7 to 38, Appendix.)



A



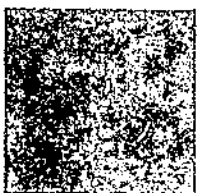
E



I



B



F



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C



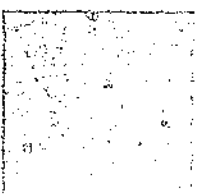
G



K



D



H



L

Standards for determining the color of tangerine rind.

RESULTS

The important objective of this study, as stated on page 2, was to show to what extent the eating quality of tangerines as determined by taste tests is correlated with the total solids and the total acid content of the fruit. The nomograph (see fig. 5) was plotted from data obtained from the palatability ratings and the chemical analyses of total solids and total acids.

EVALUATION OF PALATABILITY

The importance of the various physical characteristics such as weight, color, and volume of juice that affect the appearance and commercial grading of fruit should not be minimized, but inherently it is the composition of the fruit, and not its color or appearance, that determines whether it is ripe. A green-colored fruit may be fully ripe under certain conditions, whereas a yellow or an orange one may be immature under other conditions. Therefore, granting that eye appeal and an attractive appearance of the fruit may enhance its value, it is obvious that in the final analysis the taste, or palatability, of the fruit is the all-important factor from the standpoint of consumer acceptance and approval.

As evidenced by the numerical ratings on the score cards, the eating quality of tangerines increased very rapidly during October and November. Fruit generally reached the minimum standard for consumer acceptance about the middle of November, and the rating became progressively higher until January or February, when tangerines reached prime eating condition. Then there was a gradual decrease in palatability.

The passing score of 70 was given to fruit that a consumer would consider sufficiently acceptable in taste to warrant purchase. The differentiation between the terms "consumer acceptance" and "consumer appeal" should be reasonably clear, but it seems desirable to point out again that in these taste tests the judges used the rating 70 to indicate that the tested fruit gave them a feeling of satisfaction rather than the negative reaction and that it was considered acceptable. If the fruit was riper and really pleasing in flavor it was considered as having consumer appeal and therefore was rated higher than 70.

ANALYSES FOR TOTAL SOLIDS AND TOTAL ACID

The total solids (principally sugars) in the fruit generally increased during ripening. The rate of increase was rather uniform throughout the commercial shipping season, but there was a tendency for the total solids content to remain more or less constant in very ripe fruit picked late in the season (fig. 1). (See also tables 7 to 38, Appendix.)

The data were expressed as grams of total solids per tangerine. The tendency was for the total solids to increase from October to February, as the volume of juice increased during this period. In March and April, however, there was a diminution in amount of juice, as well as a leveling off in the total solids, and thus a gradual decrease in the grams of total solids per tangerine. The averages for four seasons, 1943-47, are shown in figure 2.

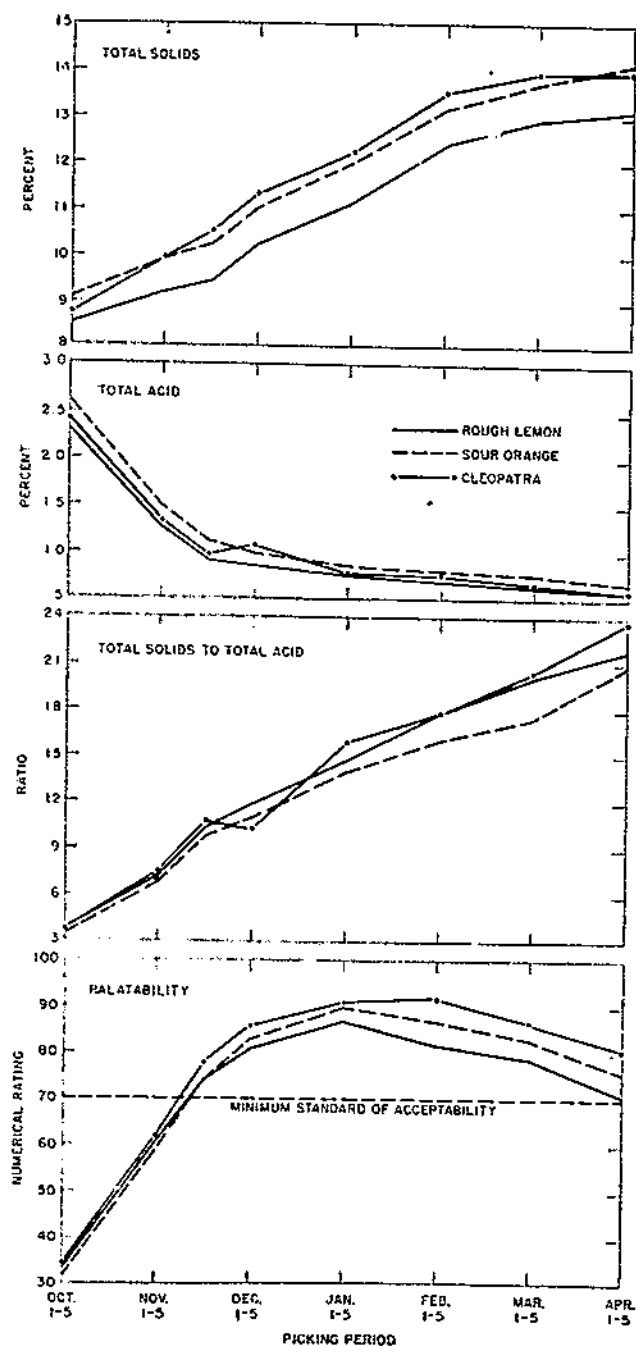


FIGURE 1.—Interrelation of palatability, total solids, total acid, and ratio of total solids to total acid of tangerines on rough lemon, sour orange, and Cleopatra rootstocks at different picking periods. (Averages, 1913-17.)

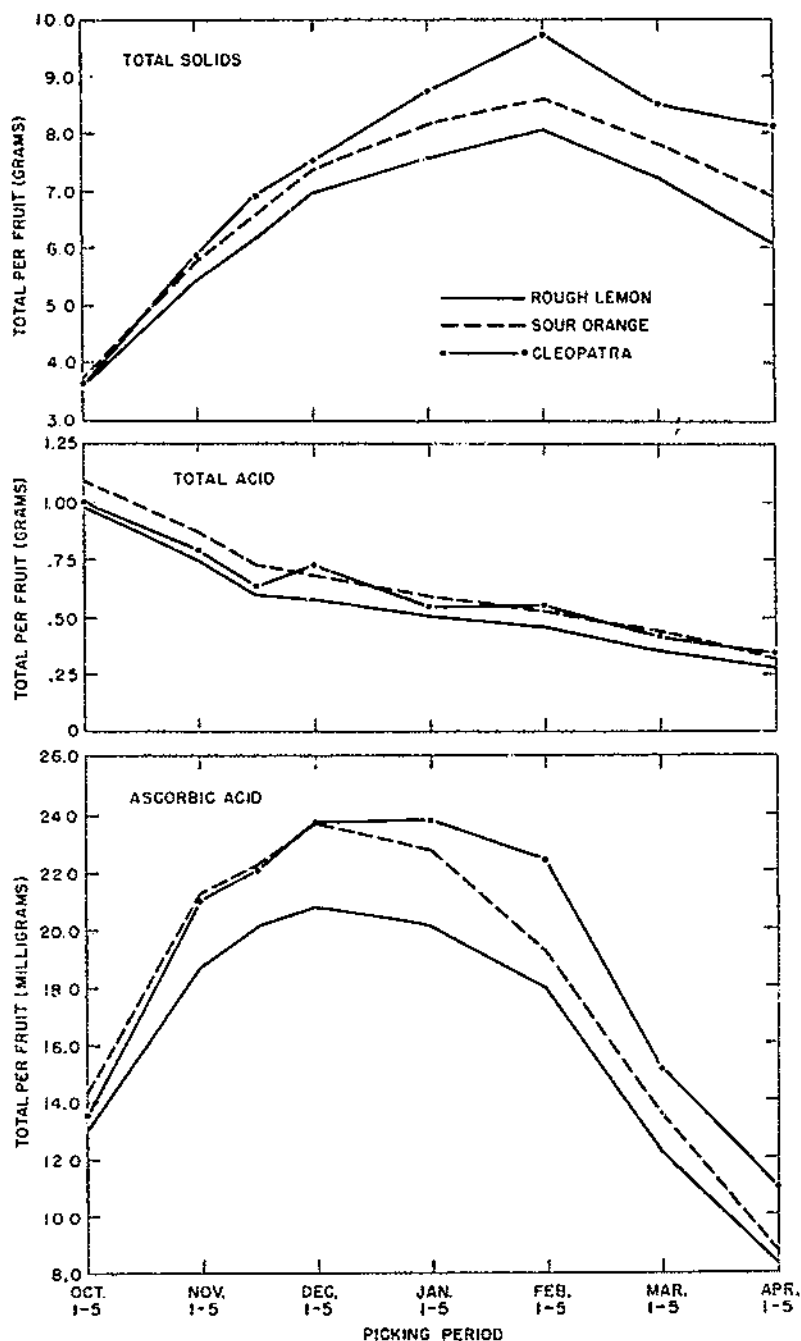


FIGURE 2.—Actual amounts of total solids, total acid, and ascorbic acid of tangerines on rough lemon, sour orange, and Cleopatra rootstocks at different picking periods. (Averages, 1943-47.)

The total acid (as citric) decreased with development and ripening. Total acid decreased more rapidly early in the season when the fruit was less mature than it did later. In very ripe fruit the change was very gradual. The data are shown graphically in figure 1. (See also tables 7 to 38, Appendix.) In general, these findings agree with the results obtained on oranges (8) and grapefruit (5).

When the data were expressed as grams of total acid per tangerine, there was a general tendency for the total acid to decrease regularly from October to April. The averages for four seasons, 1943-47, are presented in figure 2.

The solids-acid ratio increased progressively as the fruit matured, because of an increase in total solids and a decrease in total acid. Average ratios were computed for four seasons, 1943-47, and the results are shown graphically in figure 1.

ANALYSES FOR ASCORBIC ACID, ACTIVE ACIDITY, AND TOTAL ASH

ASCORBIC ACID

Because of the importance of the vitamin content of citrus fruits in determining their dietetic value, the data on the ascorbic acid (vitamin C) content of tangerines are of particular interest. The highest concentration of ascorbic acid in the juice was found during November, December, and January, the period when the fruit was developing and ripening. In very ripe tangerines there was a gradual diminution in milligrams of ascorbic acid per milliliter of juice (fig. 3). (See also tables 7 to 38, Appendix.)

The seasonal changes in the ascorbic acid content of tangerines herein reported are in accord with the changes previously reported for Florida oranges (4, 7, 8) and grapefruit (4, 5, 6). In general, a gradual diminution in ascorbic acid was noted as the fruit ripened, and the ascorbic acid content was found not to be directly associated with juice quality.

When these data were expressed as total ascorbic acid per fruit, the tendency was for the ascorbic acid to increase sharply with ripening as the volume of juice increased (fig. 2). However, later in the season (February to April) as the fruit became overripe, there was a diminution of juice, as well as of concentration of ascorbic acid, and thus there was a sharp decrease in the total ascorbic acid per fruit.

ACTIVE ACIDITY

The pH value, the measure of the active acidity, of the juice gradually increased as the fruit ripened. The average pH of tangerine juice ranged from 2.78 to 2.85 in immature fruit and from 3.91 to 4.02 in overripe fruit. The pH was determined on the composited juice samples for four seasons, 1943-47. (See fig. 3 and tables 7 to 38, Appendix.) The variation in pH values within groves during the same year was not great.

TOTAL ASH

The percentage of ash in the juice of tangerines was determined during three seasons, 1944-47. (See fig. 3 and tables 7, 9 to 13, 16, 18, 21, 24, 25, 28 to 32, and 38, Appendix.) In general, the results

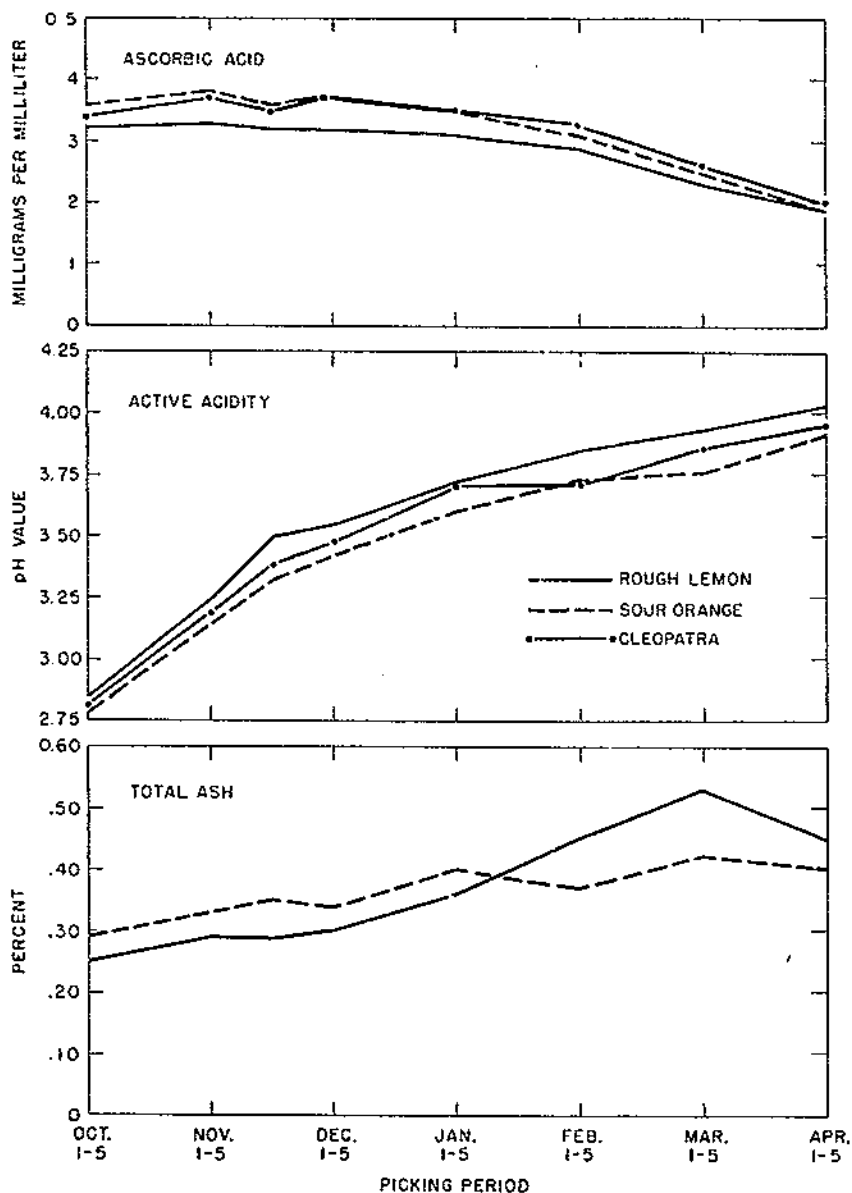


FIGURE 3.—Interrelation of total ash, active acidity, and ascorbic acid of tangerines on rough lemon, sour orange, and Cleopatra rootstocks at different picking periods. (Averages, 1943-47 except for total ash, which are for 1944-47.)

show that the percentage of ash in the juice of tangerines increased with ripening. The increase, however, was not great enough to have much practical significance.

JUICINESS AND OTHER PHYSICAL CHARACTERISTICS

JUICINESS

The importance of juiciness is obvious. As shown in figure 4, the volume of juice (based on samples of 25 fruits) increased rapidly during the early stages of maturity, remained relatively constant while the fruit was in prime eating condition, and decreased in very ripe fruit.

The percentage of the tangerine that was juice (fig. 4) and the milliliters of juice per 100 gm. of fruit also were ascertained. (See tables 7 to 38, Appendix.) The percentage increased slightly with advancing maturity until approximately the middle of November, when a gradual decrease began; this decrease might suggest the beginning of senescence even though the fruit showed no other evidence of overripeness. Actually there was some drying out and some lack of palatability. The tangerines on Cleopatra and sour orange rootstocks retained relatively more juice than did those on rough lemon.

WEIGHT

The average weight of tangerines increased rapidly as they ripened, remained rather constant while the fruit was in prime eating condition, and decreased rapidly in very ripe fruit. Drying out accounted for most of the loss in weight. (See fig. 4, table 1, and tables 7 to 38, Appendix.)

TABLE 1.—Seasonal changes in average weight of tangerines on rough lemon and sour orange rootstocks, 1943-47

Rootstock and crop year	Oct. 1-5	Nov. 1-5	Nov. 16	Dec. 1-5	Jan. 1-5	Feb. 1-5	Mar. 1-5	Apr. 1-5
Rough lemon rootstock:								
1943 41	68	90		115	130	130	124	117
1944 42	83	118	121	129	133	128	110	90
1945 43	80	108	119	133	135			
1946 44	73	91	110	125	121	132		
Sour orange rootstock:								
1943 41	69	97		116	132	133	130	121
1944 42	82	119	120	125	125	122	103	90
1945 43	85	109	119	135	143			
1946 44	67	88	104	119	116	127		

DIAMETER

The diameter of tangerines increased with maturity and ripening of the fruit. (See tables 7, 10, 13, 14, 18, 24, 25, and 28, Appendix.) The greatest increase in diameter preceded the attainment of prime eating condition. Later, from January to April, there was little change in size as determined by measurements of the diameter of the fruit (fig. 4).

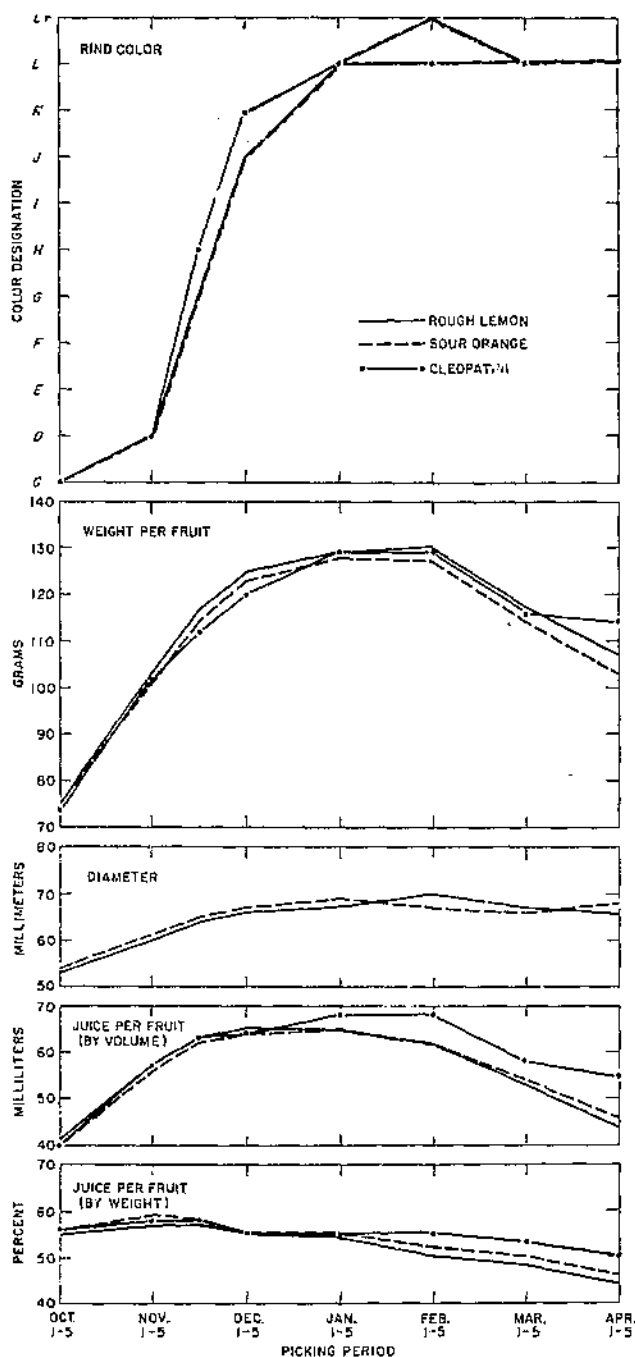


FIGURE 4. —Interrelation of percentage of fruit that was juice, milliliters of juice per fruit, diameter, weight, and color of rind of tangerines on rough lemon, sour orange, and Cleopatra rootstocks at different picking periods. (Averages, 1943-47 except for diameters, which are for 1943-46.)

COLOR OF RIND

The rind color of tangerines was determined by matching the fruit with the standards shown in plate 1. Each sample was fairly uniform in color. The results are presented graphically in figure 4. (See also tables 7 to 38, Appendix.) Degreening of the rind paralleled the ripening of the fruit. This process was brought about by natural conditions and was very rapid all through November and December. Practically all the fruit had degreened by January or February, and little change occurred in the bright-colored fruit during the remainder of the season.

THICKNESS OF RIND

Measurements were made to determine the thickness of the rind throughout the various stages of growth and ripening. (See table 2 and tables 7, 10, 13, 14, 18, 24, 25, and 28, Appendix.) The thickness of the rind of the ripe fruit averaged about 3 mm. regardless of the rootstock.

TABLE 2.—Seasonal changes in average thickness of rind of tangerines on rough lemon and sour orange rootstocks, 1943-46

Rootstock and crop year	Oct. 1-5	Nov. 1-5	Nov. 15	Dec. 1-5	Jan. 1-5	Feb. 1-5	Mar. 1-5	Apr. 1-5
Rough lemon rootstock:	Milli-meters	Milli-meters	Milli-meters	Milli-meters	Milli-meters	Milli-meters	Milli-meters	Milli-meters
1943-44.....	3	3	3	2	3	3	3	3
1944-45.....	3	3	3	2	3	3	3	3
1945-46.....	3	3	2	3	3	3	3	3
Sour orange rootstock:								
1943-44.....	3	3	3	2	3	3	3	3
1944-45.....	3	3	3	3	3	3	3	3
1945-46.....	3	3	2	3	3	3	3	3

COLOR OF FLESH

Miller, Winston, and Fisher (10) studied the seasonal changes in the total carotenoid pigments in the juice of Florida oranges of both the sweet and the mandarin type. They reported that seasonal changes in the color of mandarin oranges were for the most part similar to those in sweet oranges, but that the mandarin varieties were much higher in carotenoid pigments than other varieties. Smith, Caldwell, and Farrankop (12) studied the provitamin A content of Algerian and Dancy tangerines in Arizona. They found that less than 10 percent of the orange-yellow pigments was biologically active β -carotene.

The flesh of immature, ricey fruit was usually orange yellow, that of coarse-textured fruit usually yellow orange, and that of good-textured fruit orange. Thus, the flesh was usually orange yellow or yellow orange in October and orange from about the middle of November until the end of the season. (See tables 7 to 38, Appendix.)

CONDITION OF FLESH

Immature tangerines picked in October and early November were usually ricey or coarse, whereas those picked after the middle of November had good texture. Puffiness was associated with ripe and overripe fruit and was more pronounced in some crop years than in others. Averages were computed for four seasons, 1943-47, and the results are presented in table 3. (See also tables 7 to 38, Appendix.)

TABLE 3.—Seasonal changes in average condition of the flesh of tangerines on rough lemon and sour orange rootstocks, 1943-47

Rootstock and crop year	Oct. 1-5	Nov. 1-5	Nov. 15	Dec. 1-5	Jan. 1-5 ¹	Feb. 1-5 ¹	Mar. 1-5 ¹	Apr. 1-5 ¹
Rough lemon rootstock:								
1943-44	Ricey	Coarse		Good	Good	Good	(P), good	(P), good.
1944-45	do	do	Good	do	do	(P), good	do	(P), dry.
1945-46	Coarse	do	do	do	(P), good			
1946-47	do	do	do	do	Good	(P), good		
Sour orange rootstock:								
1943-44	Ricey	do		do	do	Good	(P), good	(P), good.
1944-45	Coarse	Good	Good	do	do	(P), good	do	(P), dry.
1945-46	do	do	do	do	(P), good			
1946-47	do	Coarse	do	do	do	(P), good		

¹ (P), puffy fruit in which the flesh had separated from a part or most of the rind.

INTERRELATION OF TOTAL SOLIDS, TOTAL ACID, AND CONSUMER APPROVAL

The data from 275 tests were used in constructing a nomograph to show the minimum total solids and the maximum total-acid content of tangerines necessary to rate a score of 70 (fig. 5). In the samples that scored 70 or above according to taste the total solids ranged from 8.03 to 18.14 percent and the total acid from 0.38 to 1.67 percent. Actually, in most samples the range was somewhat smaller; the total solids varied from about 9 to 16 percent and the total acid from about 0.5 to 1.40 percent. In order to suggest a reliable standard for consumer acceptance, the nomograph was prepared so that the border-line cases (5 percent) were excluded. This was done by raising the base points slightly, the minimum content of total solids being set at 9 percent and the maximum of total acid at 1.40 percent. In order to be kept within the area of this nomograph, the tangerines that contained 9 percent total solids could not contain more than 1.01 percent total acid. On the other hand, fruit that contained 1.4 percent total acid could not contain less than 10.6 percent total solids. Under these conditions the solids-acid ratios would be 8.91 and 7.57, respectively.

The pattern formed by the nomograph strongly suggests a consumer demand for fruit that is more mature, hence sweeter, than that which would pass the present minimum Florida maturity requirements. The minimum requirements set up on the nomograph are higher than the present ones and would provide for the shipment of more mature and sweeter fruit. In Florida there is no fixed minimum for total solids content. The maturity law (3) merely stated that the total

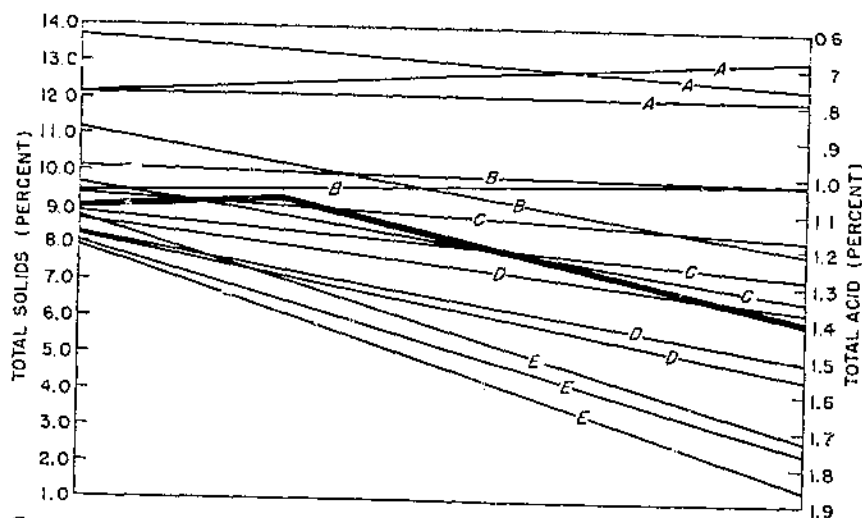


FIGURE 5.—Nomograph illustrating the relation of consumer approval or disapproval to total solids and total acid in representative samples of tangerines. The lines that are entirely above the heavy bar represent fruit that met consumer approval according to taste tests. Those that cross the heavy bar or are below it at all points represent fruit that did not meet consumer approval. A, Pleasantly tart to sweet fruit (scoring 80 to 100); B, pleasantly tart (scoring 70 to 79); C, tart (scoring 60 to 69); D, acid (scoring 40 to 59); E, very acid (scoring 20 to 39).

solids-acid ratio shall be 7.5 to 1 when the total solids content is below 10 percent; when the range of solids is 10.1 to 10.9 percent, the ratio is graduated, the minimum being 7 to 1.

The nomograph shows six samples that were rated 70 or above and nine that were rated below 70. Similar plotting of data for the many other samples considered in this bulletin would show that in practically all instances the rating indicated by the chart agrees with the rating given by the judges (p. 4). The chart can also be used to test the relation between the total solids and total acid contents and consumer approval of any particular sample of fruit in which a grower or shipper may be interested; that is, whether fruit of any given solids and acid contents could be expected to rate above or below 70.

EFFECT OF ROOTSTOCKS ON PALATABILITY

The effect of type of rootstock on palatability is very important. Although the solids-acid ratio generally increased as the fruit ripened, the detailed data show that the higher ratios were obtained with tangerines grown on Cleopatra and rough lemon rootstocks than with those grown on sour orange. The reason is the higher total acid of fruits on sour orange rootstocks. In taste ratings, however, the quality of tangerines grown on the different rootstocks was Cleopatra first, sour orange second, and rough lemon third, as indicated in table 4, which was prepared to show palatability ratings and chemical

composition of the fruit at critical dates during the ripening period. Detailed data on the relation of rootstock and quality are shown in figures 1 to 4 and 6 to 13. Thus, it is evident that a high ratio is not per se indicative of quality; fruit that is too low in total acid may taste insipid. A high sugar content with sufficient total acid to produce a balanced blending of flavors brings the fruit to its prime eating condition. The greatest amounts of sugars were found in fruits left on the tree until they had reached that stage of maturity commonly spoken of as ripe.

TABLE 4.—Seasonal effect of rootstock on internal quality of tangerines

(All figures are averages for 1943-47)

Rootstock	Palatability rating ¹			Volume of juice per fruit			Total solids			Total acid			Solids-acid ratio		
	Nov. 15	Jan. 1-5	Apr. 1-5	Nov. 15	Jan. 1-5	Apr. 1-5	Nov. 15	Jan. 1-5	Apr. 1-5	Nov. 15	Jan. 1-5	Apr. 1-5	Nov. 15	Jan. 1-5	Apr. 1-5
				<i>Ml.</i>	<i>Ml.</i>	<i>Ml.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>			
Rough lemon.....	74	87	71	63	85	44	9.45	11.14	13.11	0.91	0.75	0.60	10.38	14.85	21.85
Sour orange.....	74	90	78	62	85	46	10.26	12.02	14.23	1.13	.80	.68	9.08	13.08	20.79
Cleopatra.....	78	91	81	63	68	55	10.56	12.29	14.00	.98	.77	.59	10.78	15.06	23.73

¹ Palatability based on numerical ratings.

YEARLY VARIATIONS IN PHYSICAL CHARACTERS AND CHEMICAL CONSTITUENTS

There was considerable variation from year to year in the physical and chemical constituents of the fruit. Some of these results are briefly summarized in figures 6 to 13.

Degreening (fig. 6) was earlier and the fruit had a brighter colored rind during 1944-45 than during 1946-47.

During 1943-44 the volume of juice per fruit was relatively low in immature fruit and high in ripe fruit. The reverse was true during 1944-45, when the volume of juice was comparatively high in the immature fruit and decreased rapidly in the ripe (fig. 7).

Yearly variations affected the chemical composition and this, in turn, influenced fruit maturity and palatability (fig. 8). For example, the highest total solids (fig. 9) and total acid (fig. 10) occurred during 1943-44 and the lowest during 1945-46 and 1946-47. The solids-acid ratios (fig. 11) were thus found to be low during 1943-44, largely as a result of the high total acid, notwithstanding the unusually high content of total solids.

It will be noted in figure 12 that the juice contained the greatest concentration of ascorbic acid during 1943-44, which was the crop year of high total acid (fig. 10) and comparatively low pH (fig. 13).

Differences in fertilization and cultural practices could hardly account for the yearly variations found, since the individual grove management was about the same from year to year. During the four crop years covered by this investigation some unusual and extreme weather conditions prevailed; these may have accounted for at least some of the differences in the different harvest seasons.

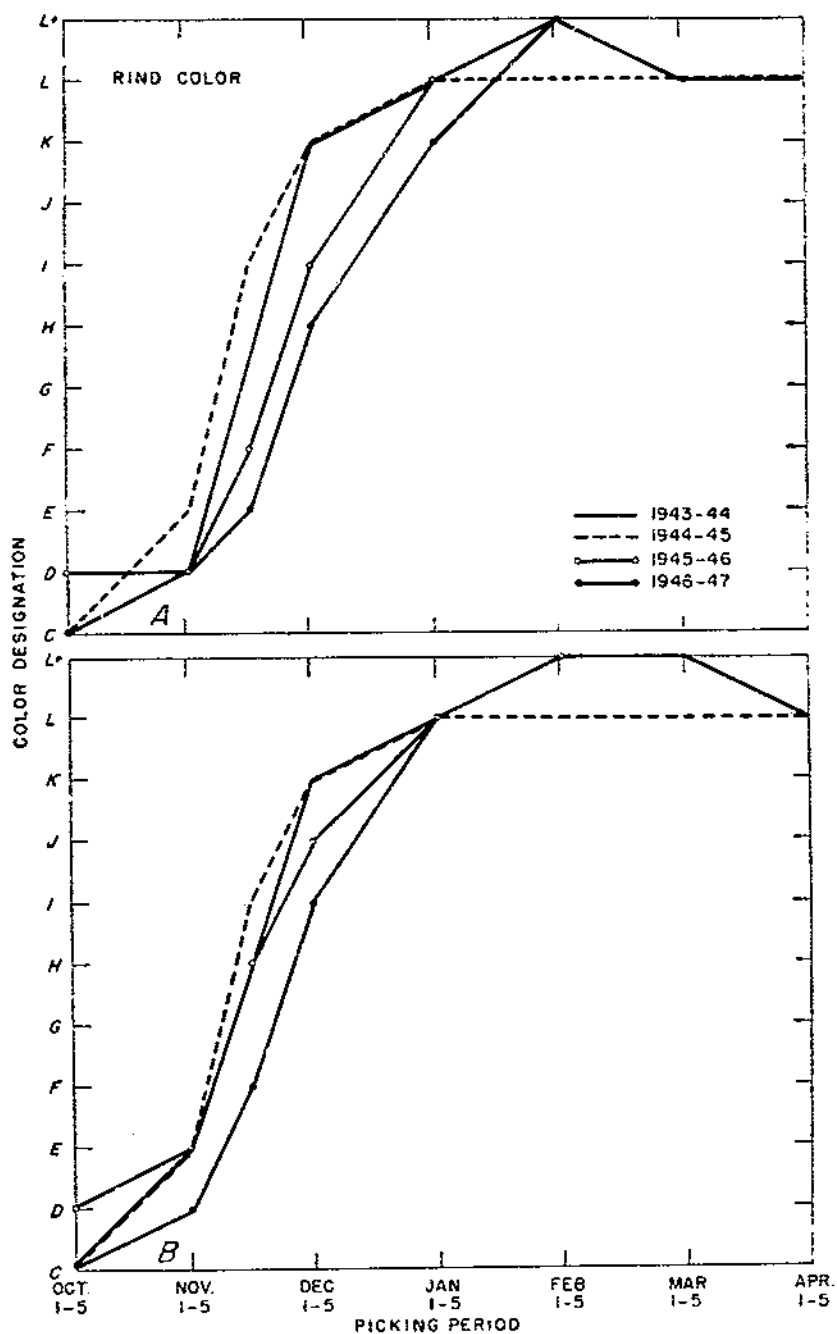


FIGURE 6.—Yearly variations in average color of the rind of tangerines at different picking periods, 1943-47: A, On rough lemon rootstock; B, on sour orange rootstock.

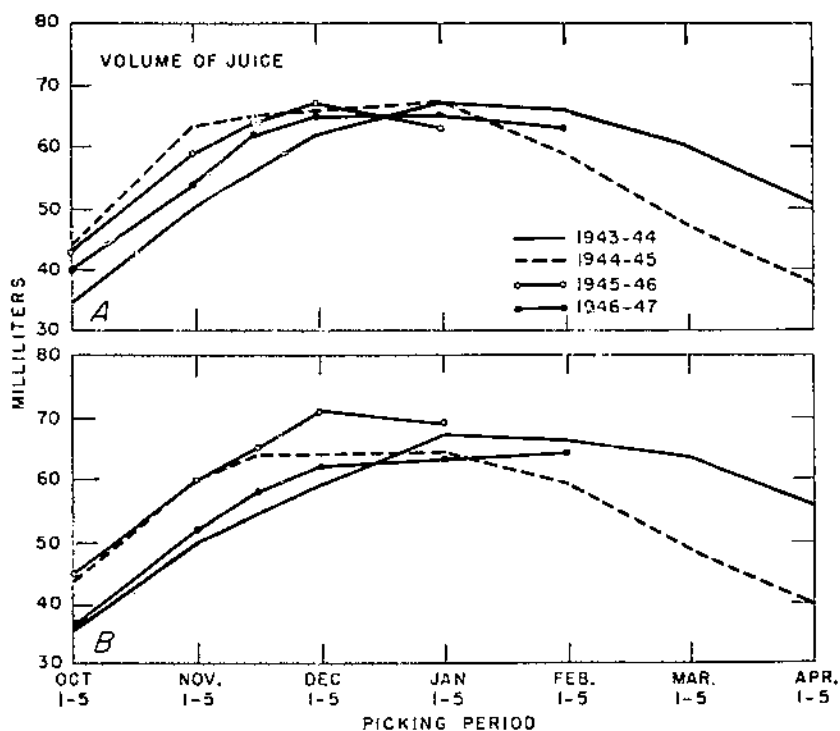


FIGURE 7.—Yearly variations in average volume of juice per fruit at different picking periods, 1943-47: A, On rough lemon rootstock; B, on sour orange rootstock.

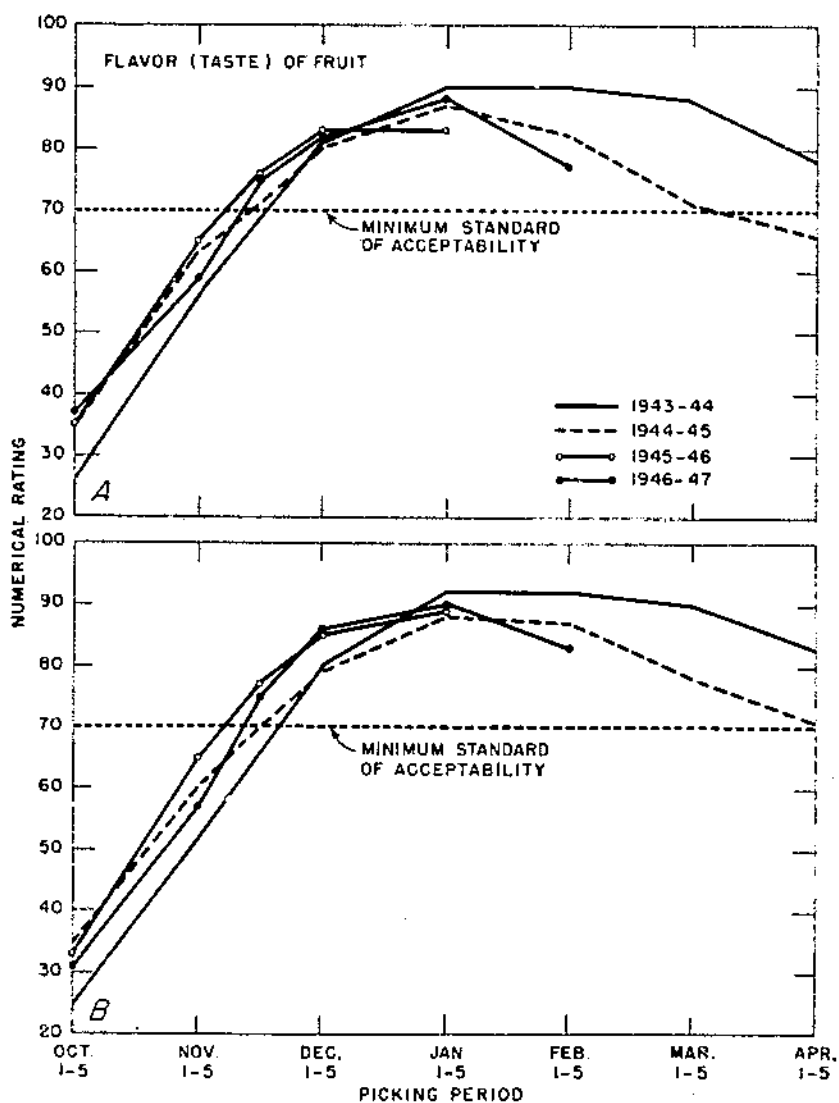


FIGURE 8.—Yearly variations in average palatability of tangerines at different picking periods, 1943-47: *A*, On rough lemon rootstock; *B*, on sour orange rootstock.

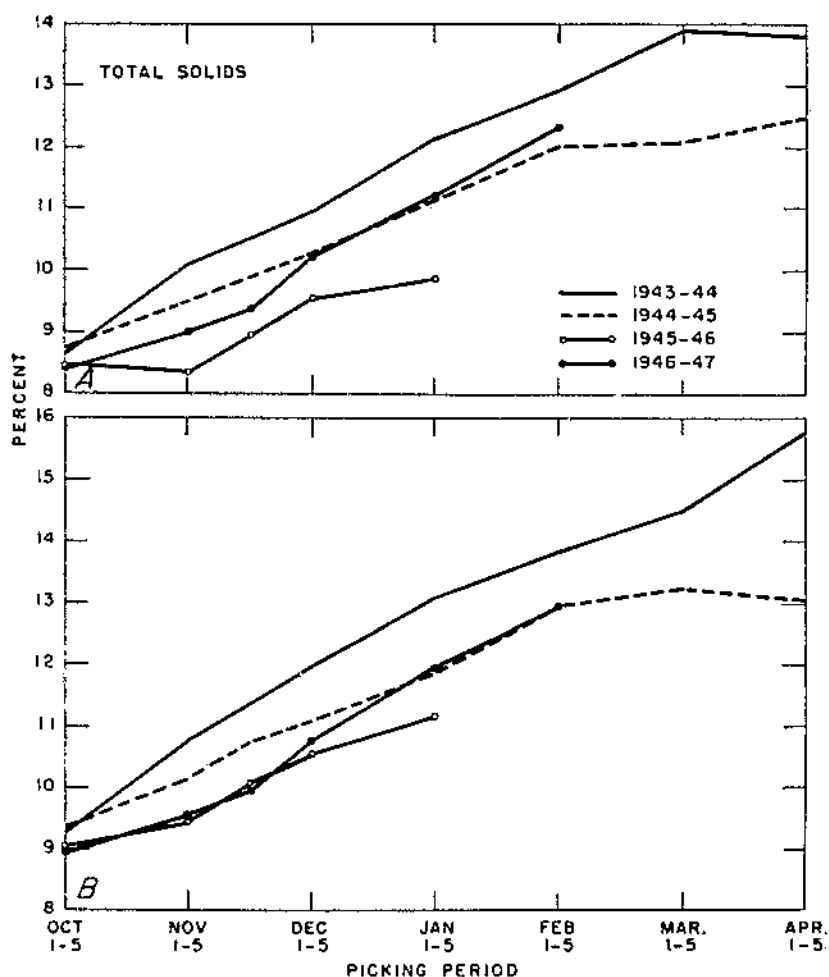


FIGURE 9.—Yearly variations in average total solids of tangerines at different picking periods, 1943-47: A, On rough lemon rootstock; B, on sour orange rootstock.

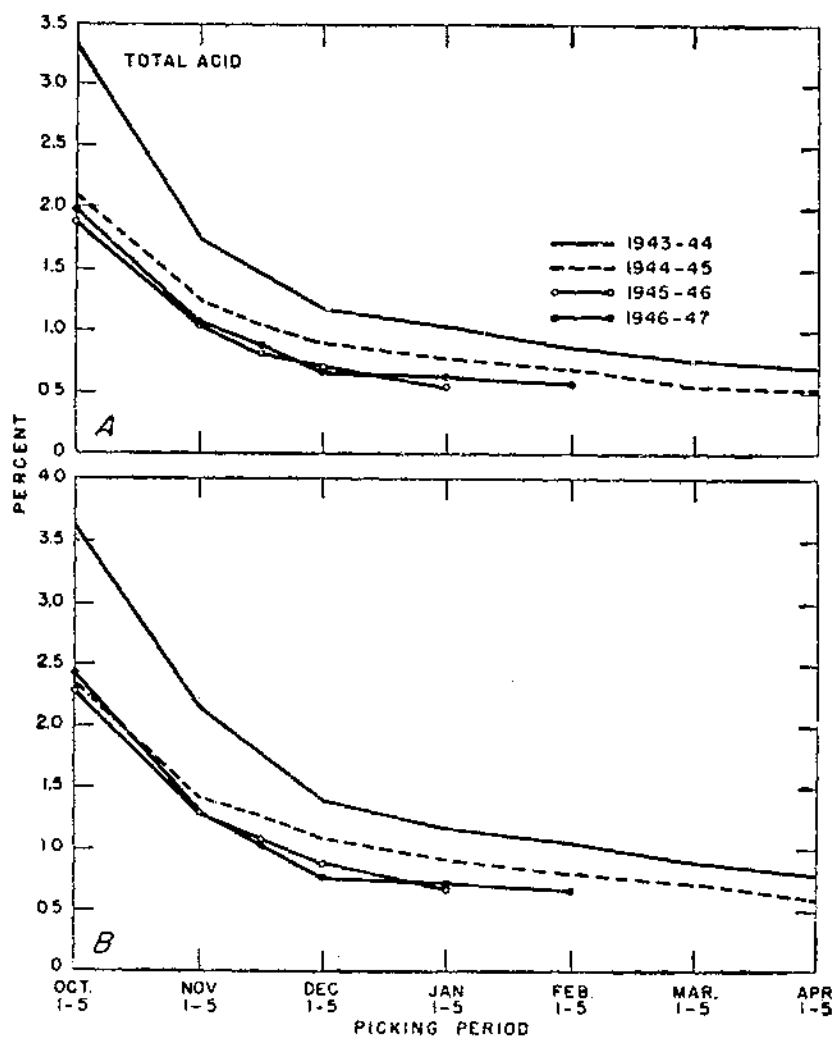


FIGURE 10.—Yearly variations in average total acid of tangerines at different picking periods, 1943-47: A, On rough lemon rootstock; B, on sour orange rootstock.

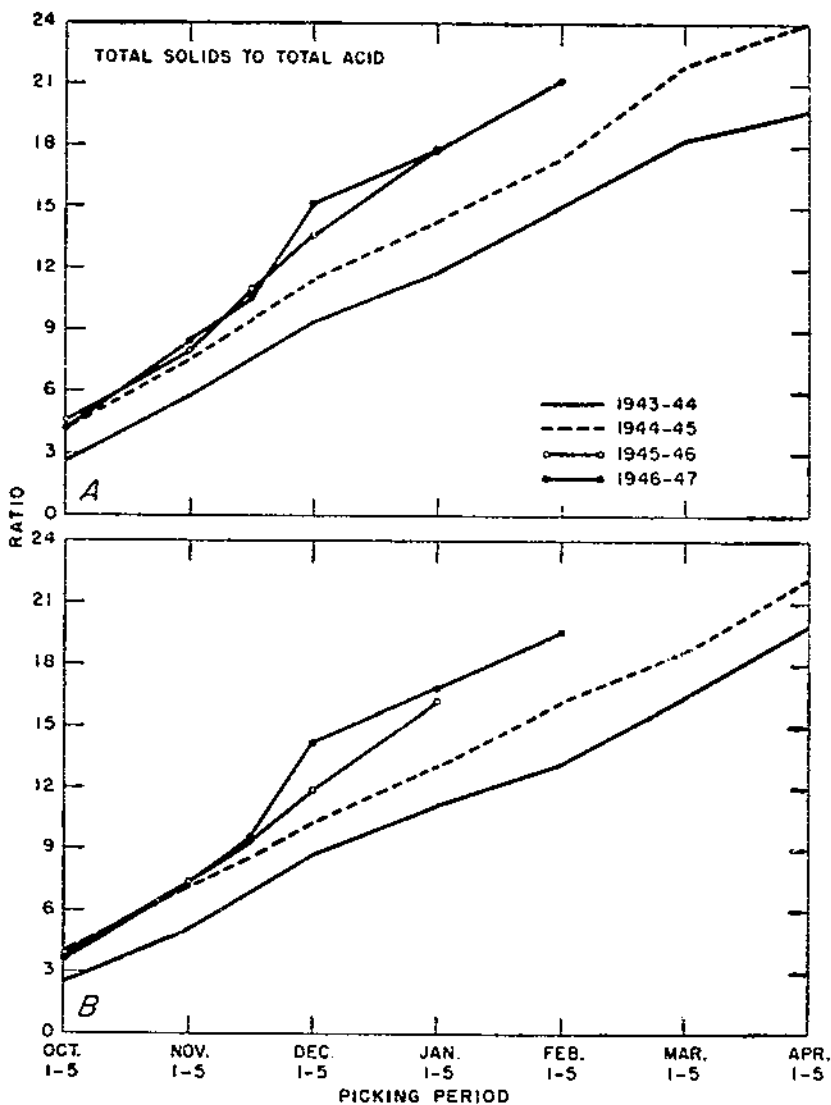


FIGURE 11.—Yearly variations in average ratios of total solids to total acid of tangerines at different picking periods, 1943-47: A, On rough lemon rootstock; B, on sour orange rootstock.

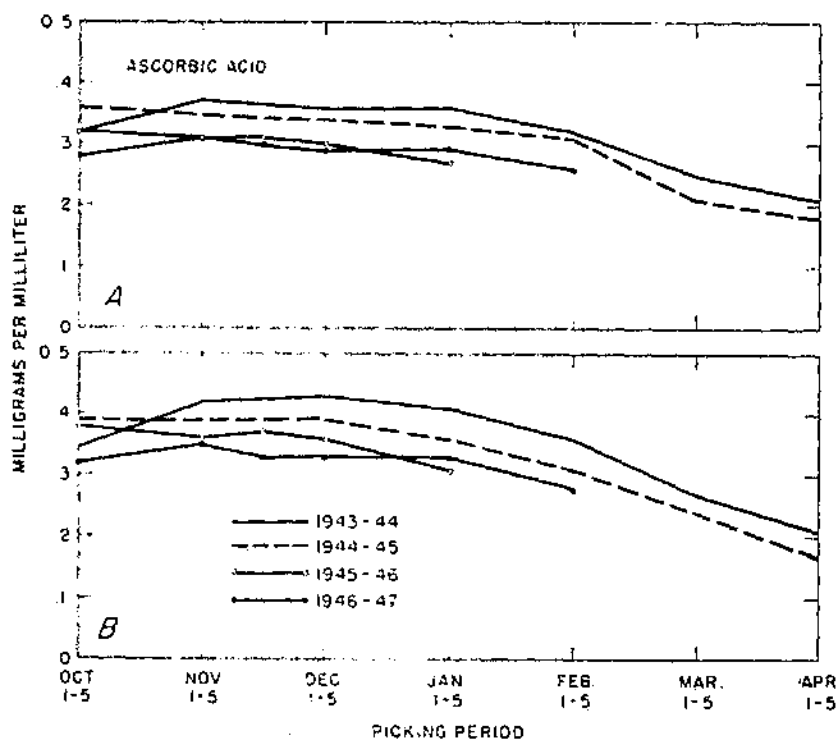


FIGURE 12.—Yearly variations in average ascorbic acid in tangerines at different picking periods, 1943-47: *A*, On rough lemon rootstock; *B*, on sour orange rootstock.

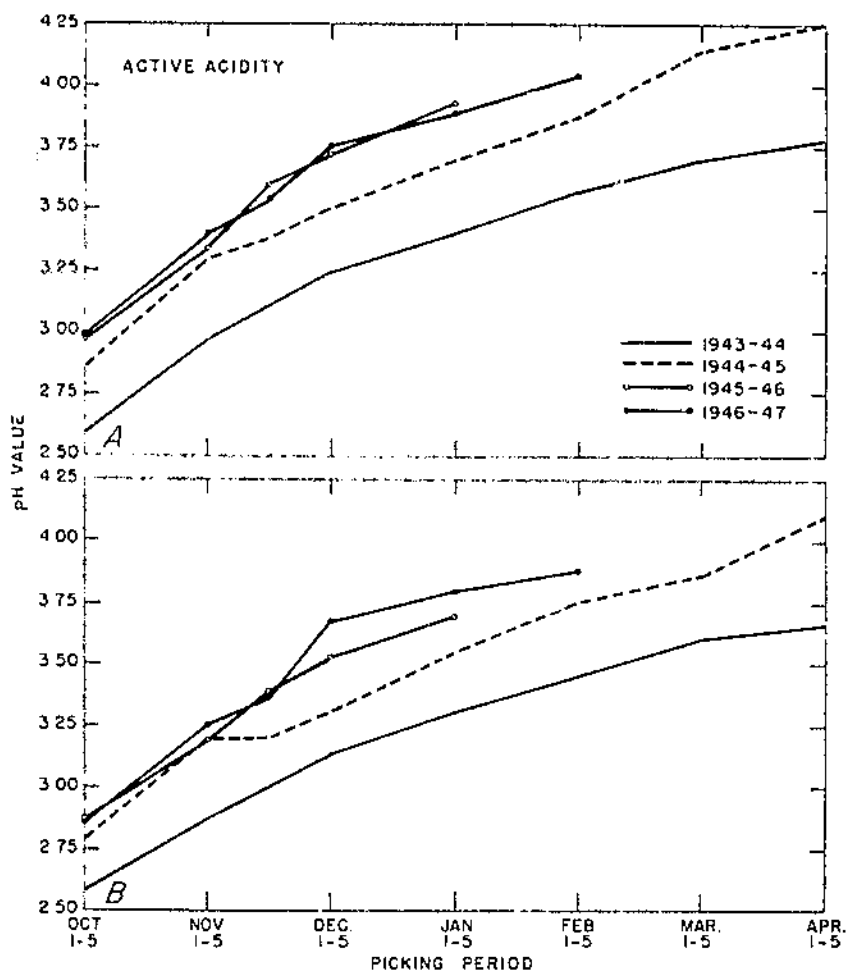


FIGURE 13.—Yearly variations in pH values of tangerines at different picking periods, 1943-47: A, On rough lemon rootstock; B, on sour orange rootstock.

LEGALLY MATURE FRUIT WITHOUT TASTE APPEAL

At the beginning of each shipping season there are complaints from buyers and consumers about sour, immature fruit. Since all fruit shipments must pass the legal requirements as to total solids and solids-acid ratio, it may be assumed that such complaints arise because these requirements are not an adequate criterion of satisfactory eating quality.

In the official analyses total solids and the solids-acid ratio are determined on a composited sample of mixed juice from fruit of good eating quality as well as possibly of some that might be considered inedible or unacceptable. The result is, therefore, an approximate average of the lot. The variation among individual fruits is not considered except as it may affect the average. The ultimate purchaser, however, generally eats the fruits one by one, and differences among them are noticeable, especially if sour, immature fruits are included. To show how such a mixed sample of 25 fruits varies, the tangerines from some of the key plots were analyzed individually for the various constituents. The results of these tests brought out the variability among fruits and showed also that if a composite sample is to represent a fair average of any given lot, it should consist of at least 25 fruits. (See tables 7, 10, 13, 14, 18, 24, 25, and 28, Appendix, which show percentages of tangerines that failed to pass existing legal requirements.)

In addition, a large number of tests were made on composited fruit samples according to the usual regulatory practice. Each of these samples included at least 25 fruits, and the chemical analyses were made in duplicate. (See tables 7 to 9, 11 and 12, 14 to 17, 19 to 27, and 29 to 38, Appendix, which show the samples of tangerines that passed legal requirements.) These are listed as "above," whereas those not meeting the requirements are listed as "below." A tabulation was made of the tangerines which passed legal requirements but which were rated as unacceptable according to taste. They were rated as acid (scoring 40 to 59) or tart (scoring 60 to 69). The findings showed that 41 samples passed legal requirements but failed to pass the taste ratings of pleasantly tart (70 or above), the minimum standard for acceptable fruit. Of these 41 samples, 17 fitted within the passing area of the nomograph (fig. 5), which indicates that the nomograph does not exclude all of the border-line fruit, especially when the taste rating is near 70.

COMPARISON OF PALATABILITY AND COMPOSITION OF PAIRED SAMPLES

When the results presented in tables 7 to 38, Appendix, are considered, a few tests constituting only a very small percentage of the total show apparent or real inconsistencies between the palatability ratings and the composition of the fruit. The results are evaluated herein by considering samples paired on the basis of their contents of total solids and total acid. From this reevaluation it is evident that maturity factors such as texture of flesh and date of picking influenced flavor ratings. For example, in comparisons A to E, table 5, the paired samples were identical, or nearly so, in both total solids and total acid; yet, in each of these pairs there was one sample that met the minimum

standard of consumer approval (70 or above) and one sample that did not. It is interesting that the samples that were rated below 70 were those from the earlier picking period. The texture of the flesh was coarse and the solids-acid ratios were usually slightly lower. Therefore it appears likely that coarse texture and possibly some undetermined flavor characteristic of immature fruit influenced the tasting panel.

Sinclair and Bartholomew (11) called attention to the fact that soluble constituents of the juice, other than sugars and acids, are important in taste sensations. They pointed out that about 15 percent of the soluble constituents of orange juice is something other than sugars and acids. This fraction consists of inorganic compounds, amino acids, ascorbic acid, and small amounts of pectins, essential oils, esters, and glucosides. Substances in this fraction are relatively unstable chemically, whereas the soluble sugars and acids of citrus juices are stable. The occurrence of off-flavors in either natural or processed orange juice is in no small measure due to oxidation and decomposition of substances in this relatively small fraction of the soluble solids.

In comparisons F, G, H, and I, the samples in each pair were identical, or nearly so, in total solids. They differed in total acid content and, consequently, in the solids-acid ratio. In these pairs of samples the taste judges showed a preference for the fruit with the lower total acid and higher solids-acid ratio; pair I, however, did not agree with pairs F, G, and H.

The pairs in comparisons J and K were nearly identical in total solids and in numerical palatability ratings, yet they differed in total acid, in solids-acid ratio, and in the arbitrary flavor rating. In each of these pairs one sample was rated pleasantly tart or pleasantly tart to sweet and the other insipid by the majority of taste judges. Insipid fruit had low total acid and high solids-acid ratios, but judging from the relatively high numerical ratings the quality of the fruit was good. In comparison K the pleasantly tart to sweet fruit rated 87, whereas the insipid fruit rated 84. The score 84 (insipid) appears high for fruit of such low total acid (0.48). Comparison J is an interesting example in which the pleasantly tart sample rated 76, whereas the insipid lot rated 77. In this comparison there was a one-point margin favoring the slightly postprime fruit picked January 1-5 over the slightly preprime fruit picked November 15.

TABLE 5.—Comparison of composition and palatability ratings between paired samples of tangerines grown in various parts of Florida

Comparison	Table No.	Location of grove	Rootstock	Picking period	Total solids	Total acid	Solids-acid ratio	Flesh condition ¹	Flavor ¹	
									Arbitrary standard	Numerical rating
A	7	Winter Haven	Rough lemon	Nov. 15, 1944	Percent 9.69	Percent 0.95	10.20	Good	P tart	71
	25	Dade City	Sour orange	Nov. 1-5, 1946	9.67	1.04	9.30	Coarse	Tart	62
B	33	Rockledge	Sour orange	Nov. 15, 1946	9.97	1.13	8.82	Good	P tart	72
	27	Sharpes	do	Nov. 1-5, 1944	9.92	1.17	8.48	Coarse	Tart	65
C	16	Dundee	Rough lemon	Nov. 15, 1946	10.00	1.21	8.26	Good	P tart	71
	9	do	do	Nov. 1-5, 1944	10.05	1.18	8.52	Coarse	Tart	63
D	12	Brooksville	Rough lemon	Dec. 1-5, 1943	10.89	1.15	9.47	Good	P tart	79
	38	Dade City	Cleopatra	Nov. 1-5, 1944	10.80	1.15	9.30	Coarse	Tart	67
E	15	Waverly	Rough lemon	Dec. 1-5, 1943	10.10	1.13	8.94	Good	P tart to S	83
	9	Dundee	do	Nov. 1-5, 1944	10.05	1.16	8.52	Coarse	Tart	63
F	22	Brooksville	Rough lemon	Dec. 1-5, 1945	10.12	.60	14.57	Good	P tart to S	80
	16	Dundee	do	Dec. 1-5, 1944	10.12	.92	11.00	do	P tart	76
G	11	Merritt Island	Rough lemon	Jan. 1-5, 1944	11.20	.76	14.74	Good	P tart to S	91
	30	Brooksville	Sour orange	Nov. 15, 1944	11.20	1.26	8.89	do	P tart	70
H	25	Dade City	Sour orange	Jan. 1-5, 1946	10.81	.68	15.90	(P), good	P tart to S	90
	27	Sharpes	do	Dec. 1-5, 1945	10.82	.87	12.44	Good	do	88
I	11	Merritt Island	Rough lemon	Dec. 1-5, 1943	10.10	.88	11.48	Good	P tart to S	83
	9	Dundee	do	Dec. 1-5, 1946	10.10	.63	16.03	do	do	82
J	17	Dade City	Rough lemon	Nov. 15, 1944	9.90	.81	12.22	Good	P tart	76
	18	Davenport	do	Jan. 1-5, 1946	9.96	.56	17.79	(P), good	Insipid	77
K	14	Dade City	Rough lemon	Jan. 1-5, 1946	9.88	.66	14.97	(P), good	P tart to S	87
	10	Windermere	do	Jan. 1-5, 1946	9.86	.48	20.54	do	Insipid	84

¹ (P), puffy; P tart, pleasantly tart; S, sweet.

INTERRELATION OF SOILS, ROOTSTOCK, AND QUALITY⁵

The representative commercial plantings selected for study (table 6) occurred on a variety of soil types described as follows:

Blanton Fine Sand.—Blanton fine sand is closely related to Lakeland fine sand, differing from it mainly in the subsoil, which is a slightly mottled pale-yellow to yellowish-gray fine sand underlain at 5 feet or lower by sandy clay beds. This soil is not as excessively drained as the Lakeland fine sand.

Blichton Fine Sand.—Blichton fine sand is related to Fellowship fine sandy loam. It is characterized by approximately 0 to 10 inches of light- to medium-gray fine sand, grading into 10 to 20 inches of light-gray fine sandy loam, which rests on mottled plastic clay similar to that found in the Fellowship series.

Bradenton Fine Sand.—The surface 4 inches is a medium-gray fine sand, which grades into about 8 to 10 inches of a light-gray to grayish-brown fine sand. This is underlain by about 12 to 24 inches of a gray sandy clay mottled with yellow and brown; this rests on a marl stratum.

Fellowship Fine Sandy Loam.—The surface 8 inches is a dark- to medium-gray fine sandy loam. This is underlain by about 8 inches of a light- or yellowish-gray fine sandy loam, which grades into a gray plastic clay mottled with red, yellow, and brown.

Gainesville Fine Sandy Loam.—Gainesville fine sandy loam is one of the best drained soils in the citrus belt. The surface 6 inches is a grayish-brown loamy fine sand underlain by a brown sandy loam to sandy clay.

TABLE 6.—Rootstocks on which Dancy tangerines were grown, age of trees, and soils and locations of experimental plots in Florida, 1943-47

Rootstock	Age of trees ¹	Location of grove	Soil	Season of investigation
Rough lemon	Years			
	21	Dade City.....	Kanapaha fine sand.....	1943-44, 1944-45.
	19	do.....	Gainesville fine sandy loam.....	1943-44, 1944-45.
	21	Brooksville.....	Kanapaha fine sand.....	1943-44, 1944-45, 1946-47.
	37	Windermere.....	Lakeland fine sand ²	1943-44, 1944-45, 1945-46.
	25	Winter Haven.....	Blanton fine sand.....	1943-44, 1944-45, 1945-46, 1946-47.
	14	Dundee.....	Lakeland sand ²	1943-44, 1944-45, 1945-46, 1946-47.
	24	Waverly.....	do.....	1943-44, 1944-45.
	21	Lake Wales.....	do.....	1943-44, 1944-45, 1945-46, 1946-47.
	About 25.....	Merritt Island.....	St. Lucie fine sand.....	1943-44, 1944-45, 1945-46.
	21	Dundee.....	Lakeland sand ²	1944-45, 1946-47.
	About 20.....	Dade City.....	Vauluse fine sand.....	1945-46, 1946-47.
	24	Davenport.....	Lakeland sand ²	1945-46.
	18	Brooksville.....	Blanton fine sand.....	1945-46.
	28	Vero Beach.....	Bradenton fine sand ³	1946-47.
	25	Brooksville.....	Fellowship fine sandy loam.....	1946-47.
	34	Lake Wales.....	Lakeland sand ²	1946-47.
	25	Alturas.....	do.....	1946-47.
	15	Dade City.....	Gainesville fine sandy loam.....	1943-44, 1944-45, 1945-46, 1946-47.
	21	Brooksville.....	Kanapaha fine sand.....	1943-44, 1944-45, 1946-47.
	10	Gotha.....	Orlando fine sand.....	1943-44, 1944-45, 1945-46, 1946-47.
Sour orange	About 20.....	Winter Haven.....	Lakeland sand ²	1943-44, 1944-45, 1945-46.
	About 20.....	Sharps.....	Portsmouth fine sand.....	1943-44, 1944-46, 1945-46, 1946-47.
	25	Merritt Island.....	St. Lucie fine sand.....	1943-44, 1944-45, 1945-46.
	16	do.....	Leon fine sand.....	1943-44, 1944-45, 1945-46, 1946-47.
	22	Spring Lake.....	Olthead loamy fine sand.....	1944-45.
	20	Dundee.....	Lakeland sand ²	1944-45, 1946-47.
	About 20.....	Brooksville.....	Kanapaha fine sand.....	1945-46.
	24	Vero Beach.....	Manatee fine sandy loam ²	1946-47.
	25	Brooksville.....	Blichton fine sand ²	1946-47.
	More than 52.	Rockledge.....	Lakeland fine sand ²	1946-47.
Cleopatra	17	Windermere.....	Blanton fine sand.....	1943-44, 1944-45, 1945-46, 1946-47.
	6	Dade City.....	Lakeland fine sand ²	1943-44, 1944-45, 1946-47.

¹ Age of trees at the time the experiment was started.

² Formerly called Norfolk.

³ Tentative name of soil mapped in Florida, but not yet correlated.

⁵ Information on soil types furnished by Dr. Matthew Drosdoff, soil technologist, Division of Fruit and Vegetable Crops and Diseases.

Gilead Loamy Fine Sand.—The surface 6 inches is a gray loamy fine sand, which is underlain by 8 to 12 inches of a yellow sandy clay mottled with red and gray in the lower part.

Kanapaha Fine Sand.—Kanapaha fine sand differs from Blanton fine sand in being less well drained, in having a darker colored surface soil, and in being underlain at 3 to 4 feet by a gray sandy clay mottled with brown.

Lakeland Fine Sand.—Lakeland fine sand is similar to Lakeland sand except that more than half of it consists of fine plus very fine sand; as a result this soil is usually considered a little more productive than the coarser textured Lakeland sand.

Lakeland Sand.—Lakeland sand and Lakeland fine sand are two of the most extensive soils planted to citrus in Florida. Lakeland sand is characterized by 4 to 6 inches of a gray sand underlain by yellow sand, which passes into sandy clay beds usually within 8 feet of the surface. The soil is exceptionally well drained and subject to excessive leaching because of its low content of clay and organic matter.

Leon Fine Sand.—Leon fine sand, a poorly drained soil, is characterized by the salt-and-pepper appearance of the surface fine sandy soil, which is about 3 to 4 inches deep. The next layer is a grayish-white fine sand, 12 to 24 inches thick, underlain by a dark-brown organic hardpan layer, which varies in degree of compactness. This layer grades into a brown and then a brownish-yellow loose, wet fine sand.

Manatee Fine Sandy Loam.—Under natural conditions Manatee fine sandy loam is very poorly drained. The surface 10 to 12 inches is a black loam underlain by 12 to 15 inches of a mottled gray, fine sandy clay, which rests on a hard marl. This soil was formerly included in the Parkwood series.

Orlando Fine Sand.—Orlando fine sand has a dark-gray surface soil 10 to 15 inches thick, grading into a gray fine sand, which generally grades into a light- to yellowish-gray fine sand.

Portsmouth Fine Sand.—Portsmouth fine sand is a very poorly drained soil under natural conditions, having about 8 inches of a gray and then a light-gray fine sand. The water table stands about 2 feet below the surface.

St. Lucie Fine Sand.—St. Lucie fine sand has a thin surface soil about 3 inches deep. This is made up of a light-gray fine sand underlain by 6 feet or more of white, loose, fine sand. This soil is one of the poorest soils planted to citrus.

Vauluse Fine Sand.—Vauluse fine sand is similar to Gilead loamy fine sand except that the surface horizons down to 15 inches are fine sand and the sandy clay subsoil is yellowish brown to brown or reddish brown, rather than yellow.

It is recognized that some soils are more suitable for citrus than others, but the great variation in soil types made it impractical to determine what direct influence soil type has on quality of tangerines. Quality, however, appears to be affected more by rootstock than by soil type, because regardless of the type of soil the quality of the fruit was better when the rootstock was sour orange than when it was rough lemon. Rough lemon, a very thrifty grower with an extensive root system, is used most frequently in rather sandy soils in which the organic matter is low and the topography rolling. Sour orange rootstock is used mostly on soils of slightly heavier texture and containing somewhat more organic matter. Cleopatra rootstock has not been used extensively; therefore, it is difficult to say to which soils it is best adapted. In the present investigation, Cleopatra rootstock appeared to be well adapted to the light and medium soils. There are, of course, exceptions where groves seem to thrive and produce satisfactory crops of high-quality fruit under good care and management even when the rootstocks are not the ones usually planted on the particular soil.

SUMMARY

The results presented herein are based on the periodic analysis of about 4,200 fruits and more than 400 composite samples of at least 25 fruits each for four harvest seasons, or crop years (1943-47).

The tangerines were of the Daney variety on 3 different rootstocks: Rough lemon, sour orange, and Cleopatra tangerine. Most of the fruits came from tangerine trees on rough lemon and sour orange rootstocks.

The eating quality of tangerines increased very rapidly during October and November and reached the minimum standard of consumer acceptance about the middle of November. Prime eating condition was reached in January and February. After this time, palatability decreased. Fruit that met the minimum standard of consumer acceptance contained at least 9 percent total solids and not more than 1.01 percent total acid. When tangerines contain 10.60 percent total solids they should not have a maximum total acid of more than 1.40 percent. Under these conditions the solids-acid ratios would be 8.91 and 7.57, respectively. These requirements are higher than those of the present Florida laws.

The total solids gradually increased as the fruit ripened. The rate of increase was rather uniform throughout the commercial shipping season, but the total solids had a tendency to remain more or less constant in very ripe fruit late in the season. In contrast, downward trend in total acid characterized tangerines as they ripened. As a result the solids-acid ratios usually increased as the fruit ripened.

There was a gradual lowering of the concentration of ascorbic acid in the fruit as it developed and ripened. The pH value of the juice gradually increased and total ash, composed largely of mineral salts, slightly increased as the fruit ripened.

The volume of juice per fruit increased rapidly during the early stages of maturity, remained rather constant while the fruit was in prime eating condition, and then gradually decreased in ripe fruit.

The average weight per fruit increased rapidly with maturity, remained rather constant during prime eating condition, and then decreased rather fast in very ripe fruit. Drying out was the principal factor which accounted for loss in weight in overripe fruit.

Degreening of the rind was associated with ripening of the fruit, and the process of degreening was very rapid during November and December. Practically all the fruit had degreened by January or February, and little change occurred in the bright color of the tangerine rind throughout the remainder of the season.

The thickness of the rind averaged 2 mm. during the early stages of maturity and 3 mm. in ripe or overripe fruit.

The color of the flesh of tangerines was associated with its texture. Usually immature, ricey fruit was orange yellow; coarse-textured fruit, yellow orange; and good-textured fruit, orange. Thus, the flesh was usually orange yellow or yellow orange in October and orange from about the middle of November until the end of the harvest season. Very ripe tangerines showed a marked tendency to dry out and lose color.

Kind of rootstock had relatively little effect on the physical qualities of tangerines except juiciness. It had some effect on ascorbic acid content, but it principally affected total solids and total acid, which largely determine eating quality. According to taste tests, tangerines on Cleopatra rootstock rated first, those on sour orange second, and those on rough lemon third.

LITERATURE CITED

- (1) ASSOCIATION OF OFFICIAL AGRICULTURAL CHEMISTS.
1945. OFFICIAL AND TENTATIVE METHODS OF ANALYSIS . . . Ed. 6,
932 pp., illus. Menasha, Wis.
- (2) BESSEY, O. A., and KING, C. G.
1933. THE DISTRIBUTION OF VITAMIN C IN PLANT AND ANIMAL TISSUES.
AND ITS DETERMINATION. *Jour. Biol. Chem.* 103: 687-698.
- (3) FLORIDA CITRUS COMMISSION.
1941. STATE OF FLORIDA CITRUS FRUIT LAWS: CITRUS INSPECTION BUREAU,
174 pp. Winter Haven, Fla.
- (4) FRENCH, R. B., and ABBOTT, O. D.
1940. INVESTIGATION OF THE VITAMIN C CONTENT OF FLORIDA FRUITS
AND VEGETABLES. I. EFFECTS OF MATURATION AND OF COLD
STORAGE ON THE VITAMIN C POTENCY OF ORANGES AND GRAPE-
FRUIT. *Jour. Nutr.* 19: 223-232, illus.
- (5) HARDING, P. L., and FISHER, D. F.
1945. SEASONAL CHANGES IN FLORIDA GRAPEFRUIT. U. S. Dept. Agr.
Tech. Bul. 886, 100 pp., illus.
- (6) ——— and THOMAS, E. E.
1942. RELATION OF ASCORBIC ACID CONCENTRATION IN JUICE OF FLORIDA
GRAPEFRUIT TO VARIETY, ROOTSTOCK, AND POSITION OF FRUIT ON
THE TREE. *Jour. Agr. Res.* 64: 57-61.
- (7) ——— and WINSTON, J. R.
1939. THE ASCORBIC ACID (VITAMIN C) CONTENT OF JUICE OF THE PRIN-
CIPAL VARIETIES OF FLORIDA ORANGES. *Fla. State Hort. Soc.*
Proc. 52: 90-95, illus.
- (8) ——— WINSTON, J. R., and FISHER, D. F.
1940. SEASONAL CHANGES IN FLORIDA ORANGES. U. S. Dept. Agr. Tech.
Bul. 753, 89 pp., illus.
- (9) MAERZ, A., and PAUL, M. R.
1930. A DICTIONARY OF COLOR. 207 pp., 56 col. pls. New York and
London.
- (10) MILLER, E. V., WINSTON, J. R., and FISHER, D. F.
1941. A PHYSIOLOGICAL STUDY OF CAROTENOID PIGMENTS AND OTHER
CONSTITUENTS IN THE JUICE OF FLORIDA ORANGES. U. S. Dept.
Agr. Tech. Bul. 780, [32] pp., illus.
- (11) SINCLAIR, W. B., and BARTHOLOMEW, E. T.
1947. COMPOSITIONAL FACTORS AFFECTING THE EDIBLE QUALITY OF
ORANGES. *Amer. Soc. Hort. Sci. Proc.* 50: 177-186, illus.
- (12) SMITH, M. C., CALDWELL, E., and FARRANKOP, H.
1945. TANGERINES[,] THEIR PRO-VITAMIN A VALUE. *Ariz. Agr. Expt.*
Sta. Mimeographed Rpt. 70, [5] pp. [Processed.]

APPENDIX

TABLE 7.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Winter Haven, Fla., 1943-47

Picking period	Weight per fruit ¹	Rind color ²			Flesh color ²			Flesh condition ²				Diameter of fruit ²			Rind thickness ²			Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴												
		1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45			1945-46	1943-44	1944-45	1945-46	1946-47	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	77	B	C	D	C	O	O	O	O	Riccy	Coarse	Coarse	Coarse	Mm.	Mm.	Mm.	Mm.	Mm.	Ml.	Pd.	V acid	27	V acid	39	V acid	35	Acid	46				
Nov. 1-5	104	D	D	D	C	O	O	O	O	Coarse	Good	Good	Good	56	65	64	2	2	2	54	61	Acid	57	Tart	67	Tart	67	62				
Nov. 15	125	D	D	D	C	O	O	O	O	do	do	do	do	67	68	68	3	2	3	54	56	P tart	81	P tart	71	P tart	77	77				
Dec. 1-5	123	J	J	I	H	O	O	O	O	Good	do	do	do	62	69	72	2	2	3	50	54	P tart to S.	81	P tart to S.	80	P tart to S.	82	82				
Jan. 1-5	125	L	L	K	L	O	O	O	O	do	do	(P), good	do	66	68	73	3	3	3	49	55	do	89	do	85	Inspid	87	Inspid	84			
Feb. 1-5	125	L+	L	L	L	O	O	O	O	(P), good	(P), good	(P), dry	do	69	72	73	3	3	3	42	40	do	86	do	88	do	do	66				
Mar. 1-5	110	---	---	---	---	O	O	O	O	do	do	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				
Apr. 1-5	94	---	---	---	---	---	---	---	---	(P), dry	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---				

Picking period	Total ash ¹		Ascorbic acid per milliliter ¹				Active acidity ¹				Total solids				Total acid				Solids-acid ratio				Fruit below solids-acid ratio			Samples below or above solids-acid ratio (1946-47)	
	1944-45	1945-46	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46		
Oct. 1-5	Pct.	Pct.	Mg.	Mg.	Mg.	Mg.	pH	pH	pH	pH	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.		
Nov. 1-5	0.26	0.26	0.28	0.36	0.30	0.27	2.58	2.06	3.08	3.21	9.00	0.12	8.41	8.30	3.18	1.70	1.58	1.51	2.83	5.18	5.32	5.50	100	92	100	Below.	
Nov. 15	.32	.34	.34	.33	.30	.26	3.02	3.34	3.44	3.66	10.85	0.36	8.69	8.85	1.07	1.17	1.02	.98	6.50	8.00	8.52	9.00	80	28	20	Above.	
Dec. 1-5	.28	---	---	.31	.29	.25	---	3.52	3.68	3.85	---	0.69	8.40	9.47	---	---	.95	.79	---	10.20	11.14	12.97	---	---	---	Do.	
Jan. 1-5	.35	.32	.32	.31	.30	.24	3.23	3.60	3.72	4.06	11.06	10.23	9.53	10.26	1.12	.84	.72	.60	0.88	12.18	13.24	17.10	4	0	0	Do.	
Feb. 1-5	.30	.47	.34	.30	.28	.24	3.48	3.70	3.85	4.13	12.77	11.35	10.42	11.07	.91	.83	.65	.68	14.03	13.67	16.03	19.09	0	0	0	Do.	
Mar. 1-5	.45	---	.30	.21	---	.19	3.72	3.93	---	4.54	12.94	12.14	---	11.45	.75	.60	---	.37	17.25	18.39	---	30.95	0	0	0	Do.	
Apr. 1-5	.39	---	---	.10	---	---	---	4.28	---	---	---	12.80	---	---	---	.64	---	---	---	20.00	---	---	---	0	---	---	---
												8.92	---	---	---	.48	---	---	---	18.58	---	---	---	0	---	---	---

¹ Each figure represents a mean of 100 determinations for 4 seasons.

² Each figure or description represents a mean of 25 determinations for 1 season.

³ See U. S. Department of Agriculture color chart (pl. 1).

⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.

⁵ Each figure represents a mean of duplicate determinations on composited sample.

TABLE 8.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Lake Wales, Fla., 1948-47

Picking period	Weight per fruit ¹	Rind color ²				Flesh color ³				Flesh condition ⁴				Juice per 100 gm. of fruit ⁵	Juice per fruit ⁶	Flavor ⁷							
																1943-44		1944-45		1945-46		1946-47	
		1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47			Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5.....	Gm. 73	C	C	C	C	OY	YO	YO	YO	Riccy...	Riccy...	Coarse...	Riccy...	Ml. 53	Pct. 55	V acid	25	V acid	20	V acid	34	V acid	38
Nov. 1-5.....	103	E	E	D	D	O	O	YO	YO	Coarse...	Coarse...	do	Good	55	57	Acid...	48	Acid...	57	Tart	66	Tart	63
Nov. 15.....	115	I	I	E	E	O	O	O	O	do	Good	do	do	53	55	P tart	71	P tart	71	P tart	75	P tart	76
Dec. 1-5.....	120	K	L	K	I	O	O	O	O	Good	do	Good	do	52	53	P tart	77	do	77	P tart to S.	84	to S.	85
Jan. 1-5.....	127	L	K	L+	K	O	O	O	O	do	do	(P), dry	do	55	54	P tart to S.	87	P tart to S.	90	do	82	do	91
Feb. 1-5.....	136	L+	K	.....	L+	O	O	.....	O	do	(P), good	.....	(P), good	52	54	do	91	do	92	.....	Insipid	83	

Picking period	Ascorbic acid per milliliter ¹				Active acidity ²				Total solids ³				Total acid ⁴				Solids-acid ratio				Samples below or above solids-acid ratio			
	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47
	Mg.	Mg.	Mg.	Mg.	pH	pH	pH	pH	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.								
Oct. 1-5.....	0.40	0.44	0.33	0.27	2.56	2.52	2.90	2.91	8.33	8.93	8.23	8.85	4.20	2.76	1.99	2.02	2.17	3.24	4.14	4.38	Below	Below	Below	Below
Nov. 1-5.....	.40	.42	.33	.31	2.84	3.12	3.30	3.35	10.13	10.20	8.37	9.54	2.18	1.55	1.62	1.07	4.65	6.58	8.21	8.92	do	do	Above	Above
Nov. 15.....	..44	.33	.30	..	3.12	3.55	3.48	..	10.75	8.73	10.17	..	1.41	.87	.89	..	7.62	10.03	11.43	..	Above	do	do	Do.
Dec. 1-5.....	.48	.43	.33	.29	2.98	3.21	3.77	3.64	11.85	11.10	9.47	11.45	1.67	1.20	.68	.72	7.10	9.25	13.93	15.90	Above	do	do	Do.
Jan. 1-5.....	.48	.42	.28	..	3.12	3.47	3.94	3.86	12.90	12.70	9.74	12.00	1.55	.95	.55	.63	8.32	13.37	17.71	19.05	do	do	do	Do.
Feb. 1-5.....	.45	.39	.....	.25	3.25	3.60	.....	3.94	13.63	13.10	.....	12.98	1.22	.93	.....	.63	11.17	14.09	.....	20.60	do	do	do	Do.

¹ Each figure represents a mean of 100 determinations for 4 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 9.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Dundee, Fla., 1943-47

Picking period	Weights per fruit	Flesh color				Flesh condition				Juice				Flavor			
		1943-1944				1944-1945				1945-1946				1946-1947			
		44	45	46	47	44	45	46	47	44	45	46	47	44	45	46	47
	Gm.	B	D	D	C	OY	O	O	O	YO	YO	YO	YO	YO	YO	YO	YO
Oct. 1-5	78	B	D	D	C	OY	O	O	O	YO	YO	YO	YO	YO	YO	YO	YO
Nov. 1-5	107	E	E	E	C	O	O	O	O	O	O	O	O	O	O	O	O
Nov. 15	111	E	E	E	C	O	O	O	O	O	O	O	O	O	O	O	O
Dec. 1-5	127	L	K	K	H	O	O	O	O	O	O	O	O	O	O	O	O
Jan. 1-5	133	L	L	L	K	O	O	O	O	O	O	O	O	O	O	O	O
Feb. 1-5	125	L+	L	L	L+	O	O	O	O	O	O	O	O	O	O	O	O
Mar. 1-5	126	L+	L	L	L	O	O	O	O	O	O	O	O	O	O	O	O
Apr. 1-5	111	L+	L	L	L	O	O	O	O	O	O	O	O	O	O	O	O
Picking period	Total ash	Ascorbic acid per milliliter				Active acidity				Total solids				Total acid			
		1943-1944				1944-1945				1945-1946				1946-1947			
		44	45	46	47	44	45	46	47	44	45	46	47	44	45	46	47
Oct. 1-5	47	Pct. 0.27	Pct. 0.36	Pct. 0.34	Pct. 0.20	Pct. 0.64	Pct. 0.63	Pct. 0.63	Pct. 0.63	Pct. 8.73	Pct. 7.30	Pct. 7.30	Pct. 7.30	Pct. 8.73	Pct. 7.30	Pct. 7.30	Pct. 7.30
Nov. 1-5	24	30	34	34	29	31	3.06	3.31	3.35	3.06	3.14	3.14	3.14	3.14	3.14	3.14	3.14
Nov. 15	20	34	34	34	29	31	3.06	3.31	3.35	3.06	3.14	3.14	3.14	3.14	3.14	3.14	3.14
Dec. 1-5	28	40	34	34	28	29	3.31	3.49	3.77	3.14	3.14	3.14	3.14	3.14	3.14	3.14	3.14
Jan. 1-5	40	37	37	37	26	30	3.45	3.71	3.94	3.88	3.88	3.88	3.88	3.88	3.88	3.88	3.88
Feb. 1-5	23	34	34	34	23	23	3.63	3.89	4.04	3.88	3.88	3.88	3.88	3.88	3.88	3.88	3.88
Mar. 1-5	25	25	25	25	25	25	3.63	3.89	4.04	3.88	3.88	3.88	3.88	3.88	3.88	3.88	3.88
Apr. 1-5	18	18	18	18	18	18	3.63	3.89	4.04	3.88	3.88	3.88	3.88	3.88	3.88	3.88	3.88
Picking period	Total acid	Solids-acid ratio				Solids-acid ratio				Solids-acid ratio				Solids-acid ratio			
		1943-1944				1944-1945				1945-1946				1946-1947			
		44	45	46	47	44	45	46	47	44	45	46	47	44	45	46	47
Oct. 1-5	3.10	5.33	4.20	5.05	5.05	5.33	4.20	5.05	5.05	5.33	4.20	5.05	5.05	5.33	4.20	5.05	5.05
Nov. 1-5	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52	8.52
Nov. 15	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Dec. 1-5	11.44	12.30	14.95	10.05	10.05	11.44	12.30	14.95	10.05	10.05	11.44	12.30	14.95	10.05	10.05	10.05	10.05
Jan. 1-5	13.73	16.41	18.38	18.38	18.38	13.73	16.41	18.38	18.38	13.73	16.41	18.38	18.38	13.73	16.41	18.38	18.38
Feb. 1-5	17.60	20.95	21.75	21.75	21.75	17.60	20.95	21.75	21.75	17.60	20.95	21.75	21.75	17.60	20.95	21.75	21.75
Mar. 1-5	20.14	31.78	31.78	31.78	31.78	20.14	31.78	31.78	31.78	20.14	31.78	31.78	31.78	20.14	31.78	31.78	31.78
Apr. 1-5	21.61	28.01	28.01	28.01	28.01	21.61	28.01	28.01	28.01	21.61	28.01	28.01	28.01	21.61	28.01	28.01	28.01

1 Each figure represents a mean of 100 determinations for 4 seasons.

2 Each description represents a mean of 25 determinations for 1 season.

3 See U. S. Department of Agriculture color chart (pl. 1).

4 OY, orange yellow; YO, yellow orange; O, orange; P, purplish; S, sweet.

5 Each figure represents a mean of duplicate determinations of composited samples.

TABLE 10.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Windermere, Fla., 1943-46

Picking period	Weight per fruit ¹	Rind color ^{2,3}			Flesh color ^{2,3}			Flesh condition ^{2,3}			Diameter of fruit ²			Rind thickness ²			Juice per 100 gm. of fruit ¹	Flavor ⁴					
																		1943-44		1944-45		1945-46	
		1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46		Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 78	B	C	C	OY	O	O	Ricey	Ricey	Ricey	Mm. 51	Mm. 56	Mm. 55	2	2	2	52	V acid	23	Acid	40	V acid	36
Nov. 1-5	104	D	D	D	OY	O	O	Coarse	Coarse	Coarse	50	58	62	2	2	2	50	Acid	56	Tart	65	Tart	66
Nov. 15	122	J	J	G	O	O	O	do	do	do	66	66	67	2	3	2	51	P tart to S.	81	P tart to S.	73	P tart to S.	79
Dec. 1-5	125	J	J	I	O	O	O	Good	Good	do	66	70	68	2	3	2	49	do	81	do	80	Inspid	84
Jan. 1-5	120	L	L	K	O	O	O	do	(P), good	(P), good	69	70	71	3	3	3	46	do	90	do	85	do	84
Feb. 1-5	122	L+	+	+	O	+	+	do	do	do	70	70	71	3	3	3	46	do	88	do	85	do	84
Mar. 1-5	115	L+	+	+	O	+	+	do	do	do	69	70	71	3	3	3	43	do	85	do	85	do	84
Apr. 1-5	101	L	+	+	O	+	+	(P), dry	do	do	67	70	71	3	3	3	38	Inspid	82	do	85	do	84

Picking period	Total ash ⁵		Ascorbic acid per milliliter ⁵			Active acidity ⁵			Total solids ⁵			Total acid ⁵			Solids-acid ratio			Fruit below solids-acid ratio		
	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46
Oct. 1-5	Pct. 0.32	Pct. 0.23	Mg. 0.25	Mg. 0.30	Mg. 0.26	pH 2.59	pH 3.01	pH 3.10	Pct. 7.90	Pct. 8.68	Pct. 7.93	Pct. 3.35	Pct. 1.37	Pct. 1.47	2.39	6.34	5.30	Pct. 100	Pct. 76	Pct. 84
Nov. 1-5	.35	.32	.26	.26	.26	3.00	3.51	3.52	10.42	9.18	8.71	1.69	.91	.89	6.17	10.09	9.79	84	0	4
Nov. 15	.30	.32	.24	.27	.27	3.56	3.74	3.74	9.43	9.04	8.71	1.10	.76	.67	12.09	13.49	13.49	84	0	4
Dec. 1-5	.32	.31	.28	.24	.26	3.32	3.66	3.79	10.43	9.89	10.75	1.10	.76	.67	9.48	14.33	14.33	84	0	4
Jan. 1-5	.28	.43	.30	.22	.23	3.72	3.94	4.08	12.71	10.72	9.86	1.21	.69	.75	10.50	16.00	20.54	0	0	0
Feb. 1-5	..	..	.21	..	..	3.23	..	..	11.49	..	..	1.21	.67	.48	14.73	..	..	0	0	0
Mar. 1-5	..	..	.21	..	..	3.72	..	..	12.89	..	..	1.21	.67	.48	18.41	..	..	0	0	0
Apr. 1-5	..	..	.16	..	..	3.89	..	..	14.40	..	..	1.21	.67	.48	21.18	..	..	0	0	0

¹ Each figure represents a mean of 75 determinations for 3

¹ Each figure represents a mean of 75 determinations for 3 seasons.² Each figure or description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 11.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Merritt Island, Fla., 1943-46

Picking period	Weight per fruit 1	Rind color 2 3			Flesh color 2 4			Flesh condition 2 4			Juice per 100 gm. of fruit 1	Juice per fruit 1	Flavor 4					
													1943-44		1944-45		1945-46	
		1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46			Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5.....	Gm.	C	D	D	OY	YO	YO	Riccy	Riccy	Coarse	54	56	V acid.....	27	V acid.....	38	V acid.....	33
Nov. 1-5.....	115	D	E	D	O	O	O	Coarse	Coarse	Good	57	58	Tart.....	60	Tart.....	62	Tart.....	67
Nov. 15.....	128		J	E		O	O		do	do	58	59	P tart.....		P tart.....	71	P tart.....	74
Dec. 1-5.....	133	J	K	F	O	O	O	Good	Good	do	55	56	P tart to S.....	83	P tart to S.....	78	Inspid.....	78
Jan. 1-5.....	138	K	K	L+	O	O	O	do	do	(P) dry.....	53	54	do.....	91	P tart to S.....	86	do.....	77
Feb. 1-5.....	138		L					(P), good.....			48	49	do.....		do.....	87		
Mar. 1-5.....	113		L					do.....			46	48	Inspid.....		Inspid.....	61		
Apr. 1-5.....	102		L					(P), dry.....			38	40	do.....		do.....	74		

Picking period	Total ash 5		Ascorbic acid per milliliter 5				Active acidity 5			Total solids 5			Total acid 5		Solids-acid ratio				Samples below or above solids-acid ratio		
	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46
Oct. 1-5.....	Pd.	Mg.	Mg.	Mg.	pH	pH	pH	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.	2.23	2.88	4.77	4.12	Below.....	Below.....	Below.....
Nov. 1-5.....	0.20	0.32	0.40	0.36	2.58	2.86	2.80	9.13	9.07	9.18	3.17	1.90	2.23	.95	.95	5.91	9.96	8.34	do.....	Above.....	Above.....
Nov. 15.....	.22	.36	.40	.37	2.91	3.27	3.25	9.98	9.46	7.92	1.69	.95	.95	.63		5.91	9.96	8.34	do.....	do.....	Do.....
Dec. 1-5.....				.37		3.30	3.57		9.70	8.03		.92	.63			10.64	12.75		do.....	do.....	Do.....
Jan. 1-5.....	.32	.32	.38	.29	3.32	3.34	3.65	10.10	9.90	8.12	.88	.91	.61	11.48	10.88	13.31	Above.....	do.....	do.....	do.....	Do.....
Feb. 1-5.....	.33	.32	.37	.25	3.55	3.98		11.20	10.12	9.34	.76	.78	.44	14.74	12.97	21.23	do.....	do.....	do.....	do.....	Do.....
Mar. 1-5.....			.40			3.75			13.37			.67				19.96			do.....	do.....	
Apr. 1-5.....			.27			3.87			12.07			.62				19.47			do.....	do.....	
			.23			4.09			13.43			.50				26.80			do.....	do.....	

¹ Each figure represents a mean of 75 determinations for 3 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; YO, yellow orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 12.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Brooksville, Fla., 1943-44, 1944-45, and 1946-47

Picking period	Weight per fruit ¹	Rind color ^{2,3}			Flesh color ^{2,4}			Flesh condition ^{2,4}			Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴					
		1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47			1943-44		1944-45		1946-47	
													Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5 -----	Gm. 82	C	C	C	OY	O	YO	Riccy	Coarse	Coarse	54	55	V acid	23	Acid	41	V acid	32
Nov. 1-5 -----	109	D	E	D	O	O	O	Coarse	Good	do	54	56	Acid	53	Tart	65	Acid	57
Nov. 15 -----	128		I	F		O	O	do	do	Good	57	58			P tart	73	P tart	75
Dec. 1-5 -----	132	K	L	I	O	O	O	Good	do	do	53	55	P tart	79	P tart to S	84	P tart to S	83
Jan. 1-5 -----	133	K	K	L	O	O	O	do	do	do	53	55	P tart to S	91	do	90	do	92
Feb. 1-5 -----	139	L+	K	L+	O	O	O	do	(P), good	(P), good	49	52	do	92	Inspid	81	Inspid	86
Mar. 1-5 -----	127	K	K		O	O		do	do	do	49	51	do	87	do	75	do	
Apr. 1-5 -----	123	K	K		O	O		(P), good	(P), dry	do	41	43	Inspid	67	do	64	do	

Picking period	Total ash ⁵	Ascorbic acid per milliliter ⁵				Active acidity ⁵			Total solids ⁵			Total acid ⁵			Solids-acid ratio			Samples below or above solids-acid ratio		
	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	
		Pct.	Mg.	Mg.	Mg.	pH	pH	pH	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.			
Oct. 1-5 -----		0.26	0.34	0.42	0.28	2.59	2.85	3.02	8.34	8.82	7.93	3.10	2.03	2.03	2.69	4.24	3.91	Below	Below	Below
Nov. 1-5 -----		.26	.38	.41	.33	2.97	3.12	3.33	9.73	10.10	8.79	1.77	1.61	1.09	5.50	3.27	8.06	do	do	do
Nov. 15 -----		.31		.39	.33		3.28	3.46		10.65	8.93		1.15	.95		9.26	9.40	do	Above	Above
Dec. 1-5 -----		.28	.37	.36	.30	3.26	3.48	3.74	10.89	10.80	9.80	1.15	.89	.68	9.47	12.13	14.41	Above	do	Do.
Jan. 1-5 -----		.39	.37	.36	.30	3.42	3.64	3.82	12.00	11.93	11.47	1.00	.82	.72	12.00	14.55	15.93	do	do	Do.
Feb. 1-5 -----			.35	.33	.28	3.52	3.94	3.93	13.70	12.30	12.67	.92	.62	.65	14.89	19.84	19.20	do	do	Do.
Mar. 1-5 -----			.35	.25		3.64	4.24		14.65	12.72		.82	.43		17.87	23.58		do	do	
Apr. 1-5 -----			.32	.22		3.85	4.23		13.29	14.78		.59	.51		22.53	28.98		do	do	

¹ Each figure represents a mean of 75 determinations for 3 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 13.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Dade City, Fla., 1943-45

Picking period	Weight per fruit ¹	Rind color ^{2,3}		Flesh color ^{2,4}		Flesh condition ^{2,4}		Diameter of fruit ²		Rind thickness ²		Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴			
		1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45			1943-44		1944-45	
														Arbitrary standard	Nu-merical rating	Arbitrary standard	Nu-merical rating
Oct. 1-5.....	Gm. 79	C	C	OY	O	Ricey	Coarse	Mm.	Mm.	Mm.	Mm.	Ml. 51	Pct.	V acid.....	23	V acid.....	33
Nov. 1-5.....	109	E	D	O	O	Good	Good	60	64	2	2	52		Acid.....	51	Tart.....	64
Nov. 15.....	123		K		O		do		66		2	50		P tart.....	77	P tart.....	70
Dec. 1-5.....	122	K	L	O	O	Good	do	60	66	2	2	51		P tart.....	77	P tart to S.....	81
Jan. 1-5.....	134	L	L	O	O	do	do	69	69	2	3	50		P tart to S.....	90	do.....	87
Feb. 1-5.....	124	L+	L	O		do	(P), good	70	68	3	3	45		do.....	93	do.....	85
Mar. 1-5.....	103	L+	L	O	O	(P), good	do	68	63	3	3	44		do.....	89	Inspid.....	71
Apr. 1-5.....	98	L	L	O		do	(P), dry	65		2		41	38	Inspid.....	77	do.....	58

Picking period	Total ash ⁵		Ascorbic acid per milliter ⁵		Active acidity ⁵		Total solids ²		Total acid ²		Solids-acid ratio		Fruit below solids-acid ratio		
	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45
Oct. 1-5.....	Pct. 0.20	Mg. 0.30	Mg. 0.40	pH 2.58	pH 2.74	Pct. 8.84	Pct. 9.73	Pct. 3.63	Pct. 2.30			2.44	4.23	Pct. 100	Pct. 100
Nov. 1-5.....	.36	.39	.38	2.88	3.25	10.30	9.63	2.10	1.34			4.90	7.19	100	52
Nov. 15.....	.28		.38		3.27		10.28		1.20				8.57		24
Dec. 1-5.....	.32	.38	.37	3.13	3.42	10.99	11.27	1.41	1.07			7.79	10.53		4
Jan. 1-5.....	.37	.35	.36	3.32	3.50	11.72	11.43	1.14	.86			10.28	13.29	0	0
Feb. 1-5.....	.45	.32	.32	3.49	3.86	13.67	12.16	.99	.71			13.81	17.13	0	0
Mar. 1-5.....	.51	.27	.19	3.29	4.16	13.29	13.20	.92	.57			14.45	23.16	0	0
Apr. 1-5.....	.50	.21	.22	3.68	4.40	13.25	12.12	.83	.43			15.96	28.19	0	0

¹ Each figure represents a mean of 50 determinations for 2 seasons.² Each figure or description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 14—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Dade City, Fla., 1945-47

Picking period	Weight per fruit ¹	Rind color ^{2,3}		Flesh color ^{2,4}		Flesh condition ^{2,4}		Diam- eter of fruit ¹ (1945-46)	Rind thick- ness ¹ (1945-46)	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴			
												1945-46		1946-47	
		1945-46	1946-47	1945-46	1946-47	1945-46	1946-47					Arbitrary standard	Numer- ical rating	Arbitrary standard	Numer- ical rating
Oct. 1-5.....	Gm. 72	C	C	O	YO	Coarse.....	Coarse.....	Mm. 50	Mm. 2	Ml. 53	Pct. 56	V acid.....	28	V acid.....	39
Nov. 1-5.....	101	D	D	O	YO	Good.....	do.....	51	2	55	61	Acid.....	59	Tart.....	62
Nov. 15.....	110	G	E	O	O	do.....	Good.....	52	3	55	59	P tart.....	76	P tart.....	78
Dec. 1-5.....	131	I	J	O	O	do.....	do.....	50	3	50	53	do.....	78	P tart to S.....	80
Jan. 1-5.....	128	K	L	O	O	(P), good.....	(P), good.....	46	3	49	54	P tart to S.....	87	Insipid.....	84
Feb. 1-5.....	125		L+		O	(P), dry.....	(P), dry.....			47	49			do.....	74

Picking period	Ascorbic acid per milliliter ⁴		Active acidity ⁴		Total solids		Total acid		Solids-acid ratio		Fruit below solids- acid ratio (1945-46)	Samples below or above solids-acid ratio (1946-47)
	1945-46	1946-47	1945-46	1946-47	1945-46 ²	1946-47 ²	1945-46 ²	1946-47 ²	1945-46	1946-47		
Oct. 1-5.....	Mg. 0.31	Mg. 0.27	pH 3.01	pH 3.12	Pct. 9.12	Pct. 8.18	Pct. 2.23	Pct. 1.46	4.09	5.60	Pct. 100	Below.
Nov. 1-5.....	.27	.28	3.26	3.63	8.11	8.87	1.28	.73	6.34	12.15	72	Above.
Nov. 15.....	.28	.31	3.68	3.62	8.86	9.60	.91	.68	9.74	14.12	12	Do.
Dec. 1-5.....	.28	.30	3.58	3.84	9.29	10.25	.83	.66	11.19	15.53	0	Do.
Jan. 1-5.....	.25	.31	3.85	3.90	9.88	12.09	.66	.58	14.97	20.84	0	Do.
Feb. 1-5.....		.29		3.96		13.77		.63		21.56		Do.

¹ Each figure represents a mean of 50 determinations for 2 seasons.² Each figure or description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 15.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Waverly, Fla., 1943-45

TABLE 16. Seasonal changes in

Picking period	Weight per fruit ¹	Rind color ^{2,3}		Flesh color ^{2,4}		Flesh condition ^{2,4}		Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴			
		1943-44	1944-45	1943-44	1944-45	1943-44	1944-45			1943-44		1944-45	
										Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
	<i>Gm.</i>							<i>Ml.</i>	<i>Pct.</i>				
Oct. 1-5.....	70	C	C	OY	YO	Ricey.....	Ricey.....	51	52	V acid.....	24	V acid.....	27
Nov. 1-5.....	108	D	E	O	O	Coarse.....	Coarse.....	55	56	Acid.....	57	Acid.....	58
Nov. 15.....	117		E		O		do.....	53	55			P tart.....	71
Dec. 1-5.....	120	K	G	O	O	Good.....	Good.....	54	56	P tart to S.....	83	do.....	78
Jan. 1-5.....	126	K	L	O	O	do.....	do.....	52	54	do.....	91	P tart to S.....	87
Feb. 1-5.....	129	L+	L	O	O	do.....	(P), good.....	50	52	do.....	89	Insipid.....	83
Mar. 1-5.....	114	L+	L	O	O	(P), good.....	(P), dry.....	45	49	do.....	90	do.....	75
Apr. 1-5.....	111	L+	L	O		do.....	do.....	43	45	Insipid.....	82	do.....	69

Picking period	Ascorbic acid per milliliter ¹		Active acidity ²		Total solids ²		Total acid ²		Solids-acid ratio		Samples below or above solids-acid ratio	
	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45
	<i>Mg.</i>	<i>Mg.</i>	<i>pH</i>	<i>pH</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>				
Oct. 1-5.....	0.31	0.35	2.58	2.71	8.33	8.03	3.46	3.01	2.41	2.67	Below.....	Below.
Nov. 1-5.....	.36	.35	3.00	3.29	9.97	8.85	1.62	1.37	6.15	6.46	do.....	Do.
Nov. 15.....		.34		3.38		9.40		1.10		8.55	do.....	Above.
Dec. 1-5.....	.35	.34	3.26	3.55	10.10	9.40	1.13	.89	8.94	10.56	Above.....	Do.
Jan. 1-5.....	.32	.34	3.52	3.76	11.40	10.80	.87	.75	13.10	14.40	do.....	Do.
Feb. 1-5.....	.31	.28	3.62	3.82	12.13	11.34	.73	.75	16.62	15.12	do.....	Do.
Mar. 1-5.....	.23	.20	3.87	4.27	14.60	10.92	.67	.51	21.79	21.41	do.....	Do.
Apr. 1-5.....	.17	.17	3.75	4.15	12.82	12.72	.64	.58	20.03	21.93	do.....	Do.

¹ Each figure represents a mean of 50 determinations for 2 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. I).⁴ OY, orange yellow; YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 16.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Dundee, Fla., 1944-45 and 1946-47

Picking period	Weight per fruit ¹	Rind color ^{2,3}		Flesh color ^{2,4}		Flesh condition ^{2,4}		Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴			
		1944-45	1946-47	1944-45	1946-47	1944-45	1946-47			1944-45		1946-47	
										Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
	<i>Gm.</i>							<i>Ml.</i>	<i>Pct.</i>				
Oct. 1-5.....	68	C	C	YO	YO	Ricey.....	Coarse.....	53	55	V acid.....	28	V acid.....	30
Nov. 1-5.....	80	E	D	O	YO	Coarse.....	do.....	55	57	Tart.....	60	Acid.....	53
Nov. 15.....	107	E	E	O	O	Good.....	Good.....	55	56	do.....	64	P tart.....	71
Dec. 1-5.....	118	J	I	O	O	do.....	do.....	53	55	P tart.....	76	P tart to S.....	81
Jan. 1-5.....	123	K	K	O	O	do.....	do.....	54	56	P tart to S.....	86	do.....	92
Feb. 1-5.....	137	L	L+	O	O	(P), dry.....	(P), good.....	50	52	Inspid.....	74	do.....	86
Mar. 1-5.....	109	L				do.....		43	44	do.....	66		
Apr. 1-5.....	95	K				do.....		40	42	do.....	70		

Picking period	Total ash ⁵	Ascorbic acid per milliliter ⁵		Active acidity ⁵		Total solids ⁵		Total acid ⁵		Solids-acid ratio		Samples below or above solids-acid ratio	
	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47
	<i>Pct.</i>	<i>Mg.</i>	<i>Mg.</i>	<i>pH</i>	<i>pH</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>	<i>Pct.</i>				
Oct. 1-5.....	0.26	0.28	0.31	2.84	2.76	8.09	9.13	2.47	2.73	3.28	3.34	Below.....	Below.
Nov. 1-5.....	.23	.29	.36	3.27	3.08	8.67	9.82	1.31	1.57	6.02	6.25	do.....	Do.
Nov. 15.....	.28	.28	.36	3.45	3.22	9.40	10.00	1.03	1.21	9.13	8.26	Above.....	Above.
Dec. 1-5.....	.27	.34	.36	3.51	3.44	10.12	10.80	.92	.94	11.00	11.49	do.....	Do.
Jan. 1-5.....	.32	.31	.33	3.71	3.64	10.17	11.57	.77	.78	13.21	14.83	do.....	Do.
Feb. 1-5.....		.21	.25	3.92	3.77	11.27	12.57	.80	.68	14.09	18.49	do.....	Do.
Mar. 1-5.....		.15		4.11		10.93		.67		16.31		do.....	
Apr. 1-5.....		.11		4.17		12.83		.67		19.15		do.....	

¹ Each figure represents a mean of 50 determinations for 2 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 17.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Dade City, Fla., 1943-45

Picking period	Weight per fruit ¹	Rind color ^{2,3}		Flesh color ^{2,4}		Flesh condition ^{2,4}		Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴			
		1943-44	1944-45	1943-44	1944-45	1943-44	1944-45			1943-44		1944-45	
										Arbitrary standard	Numer- ical rating	Arbitrary standard	Numer- ical rating
Oct. 1-5	Gm. 82	C	D	OY	O	Ricey	Coarse	Ml. 55	Pct. 57	V acid	25	Acid	44
Nov. 1-5	112	D	E	O	O	Coarse	do	55	57	Acid	59	Tart	66
Nov. 15	122		I		O		Good	56	57			P tart	76
Dec. 1-5	131	L	K	O	O	Good	do	55	57	P tart to S	85	P tart to S	80
Jan. 1-5	135	K	L	O	O	do	do	52	54	do	91	do	84
Feb. 1-5	124	L+	L	O		do	(P), dry	47	54	do	89	Insipid	83
Mar. 1-5	131	K		O		(P), good		51	53	do	87		
Apr. 1-5	120	L+		O		do		40	52	Insipid	77		

Picking period	Ascorbic acid per milliliter ⁵		Active acidity ⁵		Total solids ⁵		Total acid ⁵		Solids-acid ratio		Samples below or above solids-acid ratio	
	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45	1943-44	1944-45
Oct. 1-5	Mg. 0.29	Mg. 0.32	pH 2.62	pH 2.99	Pct. 8.09	Pct. 8.13	Pct. 2.82	Pct. 1.62	2.87	5.02	Below	Below.
Nov. 1-5	.35	.31	3.06	3.42	9.43	9.40	1.44	.98	6.55	9.59	do	Above.
Nov. 15		.30		3.55		9.90		.81		12.22	do	Do.
Dec. 1-5	.35	.28	3.33	3.73	11.34	9.40	.98	.60	11.57	14.24	Above	Do.
Jan. 1-5	.35	.30	3.51	3.80	12.00	11.02	.89	.67	13.45	16.45	do	Do.
Feb. 1-5	.20	.30	3.63	4.10	12.78	10.75	.75	.47	17.04	22.87	do	Do.
Mar. 1-5	.24		3.76		14.00		.74		18.92		do	
Apr. 1-5	.27		3.71		13.29		.71		18.72		do	

¹ Each figure represents a mean of 50 determinations for 2 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 18.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Davenport, Fla., 1945-46

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,2}	Flesh condition ^{1,2}	Diameter of fruit ¹	Rind thickness ¹	Juice per 100 gm. of fruit ¹	Flavor ³		Total ash ⁴	Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ¹	Total acid ¹	Solids-acid ratio	Fruit below solids-acid ratio
								Arbitrary standard	Numerical rating							
Oct. 1-5.....	Gm. 78	D	O	Coarse.....	Mm. 54	Mm. 2	Ml. 50	V acid.....	35	Pct. 0.22	Mg. 0.37	pH 2.90	Pct. 8.56	Pct. 2.06	4.16	Pct. 100
Nov. 1-5.....	101	D	O	Good.....	60	2	52	Tart.....	65	.27	.36	3.26	8.51	1.16	7.34	72
Nov. 15.....	114	E	O	do.....	65	2	51	P tart.....	75		.37	3.52	9.21	.85	10.84	0
Dec. 1-5.....	140	I	O	do.....	71	3	48	P tart to S.....	81	.26	.33	3.74	9.40	.66	14.24	0
Jan. 1-5.....	141	K	O	(P), good.....	72	3	44	Insipid.....	77	.36	.31	3.83	9.96	.56	17.79	0

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 19.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Lake Wales, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,2}	Flesh condition ^{1,2}	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ³		Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ¹	Total acid ¹	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating						
Oct. 1-5.....	Gm. 72	O	YO	Coarse.....	Ml. 56	Pct. 57	V acid.....	34	Mg. 0.28	pH 2.85	Pct. 8.15	Pct. 2.31	3.53	Below.
Nov. 1-5.....	95	D	YO	do.....	59	61	Acid.....	58	.31	3.35	8.84	1.11	7.96	Do.
Nov. 15.....	109	E	O	Good.....	59	60	P tart.....	73	.30	3.37	8.87	1.04	8.53	Do.
Dec. 1-5.....	129	F	O	do.....	53	55	P tart to S.....	81	.26	3.74	9.80	.56	17.50	Do.
Jan. 1-5.....	115	J	O	do.....	56	58	do.....	86	.26	3.85	10.75	.66	16.29	Do.
Feb. 1-5.....	136	L+	O	(P), good.....	50	52	Insipid.....	78	.25	3.98	11.93	.58	20.57	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 20.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Alturas, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,3}	Flesh condition ^{1,3}	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ³		Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating						
Oct. 1-5	Gm. 71	C	YO	Coarse	Ml. 54	Pct. 56	Acid	41	Mg. 0.25	pH 3.04	Pct. 7.90	Pct. 1.70	4.65	Below.
Nov. 1-5	90	C	O	do	57	59	Tart	60	.26	3.60	8.30	.84	9.88	Above.
Nov. 15	99	D	O	Good	58	60	P tart	72	.26	3.67	8.77	.76	11.54	Do.
Dec. 1-5	113	F	O	do	52	54	do	79	.25	3.82	9.61	.62	15.50	Do.
Jan. 1-5	118	J	O	do	54	56	Insipid	82	.25	3.95	10.07	.57	17.67	Do.
Feb. 1-5	117	L+	---	(P), good	50	52	do	67	.24	4.02	11.40	.58	19.66	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; P, pleasantly.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 21.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Vero Beach, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,3}	Flesh condition ^{1,3}	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ³		Total ash ⁴	Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating							
Oct. 1-5	Gm. 65	C	YO	Ricey	Ml. 54	Pct. 55	V acid	37	Pct. 0.28	Mg. 0.23	pH 3.02	Pct. 8.03	Pct. 1.76	4.50	Below.
Nov. 1-5	80	D	YO	do	53	55	Acid	59	.25	.26	3.33	8.92	1.02	8.75	Above.
Nov. 15	110	E	YO	Coarse	55	57	P tart	75	.32	.25	3.64	8.90	.73	12.19	Do.
Dec. 1-5	112	F	O	do	52	54	do	76	.26	.21	3.88	9.25	.57	16.23	Do.
Jan. 1-5	117	J	O	Good	52	53	Insipid	85	.36	.23	4.05	9.57	.46	20.80	Do.
Feb. 1-5	129	L+	---	(P), dry	45	47	do	61	---	.19	4.25	9.97	.41	24.32	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 22.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Brooksville, Fla., 1945-46

Picking period	Weight per fruit ¹	Rind color ¹	Flesh color ¹	Flesh condition ¹	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ¹		Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating						
	<i>Gm.</i>				<i>Ml.</i>	<i>Pct.</i>			<i>Mg.</i>	<i>pH</i>	<i>Pct.</i>	<i>Pct.</i>		
Oct. 1-5.....	83	D	YO	Coarse.....	55	59	Acid.....	41	0.34	3.00	8.23	1.56	5.28	Below.
Nov. 1-5.....	106	D	YO	do.....	59	60	Tart.....	67	.33	3.33	8.20	1.00	8.20	Above.
Nov. 15.....	107	H	O	Good.....	56	58	P tart.....	79	.33	3.56	9.60	.79	12.15	Do.
Dec. 1-5.....	128	K	O	do.....	54	56	P tart to S.....	89	.32	3.71	10.12	.69	14.67	Do.
Jan. 1-5.....	135	L+	O	(P), dry.....	48	51	do.....	87	.30	3.96	10.09	.49	20.59	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 23.—Seasonal changes in physical characters and chemical constituents of tangerines on rough lemon rootstock at Brooksville, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ¹	Flesh color ¹	Flesh condition ¹	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ¹		Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating						
	<i>Gm.</i>				<i>Ml.</i>	<i>Pct.</i>			<i>Mg.</i>	<i>pH</i>	<i>Pct.</i>	<i>Pct.</i>		
Oct. 1-5.....	78	D	YO	Coarse.....	52	54	V acid.....	29	0.37	2.83	8.68	2.51	3.46	Below.
Nov. 1-5.....	106	D	YO	do.....	59	60	Acid.....	57	.39	3.33	8.92	1.09	8.18	Above.
Nov. 15.....	122	E	O	Good.....	55	57	P tart.....	75	.37	3.47	9.35	.88	10.63	Do.
Dec. 1-5.....	137	J	O	do.....	52	54	P tart to S.....	86	.38	3.62	10.75	.75	14.33	Do.
Jan. 1-5.....	129	L	O	do.....	54	56	do.....	87	.35	3.80	11.49	.70	16.41	Do.
Feb. 1-5.....	141	L+	O	(P), good.....	48	50	Insipid.....	82	.33	3.98	13.17	.63	20.90	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 25.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Dade City, Fla., 1945-47

Picking period	Rind color ¹				Flesh color ²				Flesh condition ³				Diameter of fruit ²				Rind thickness ²				Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴							
	Weight per fruit ¹																						1943-44		1944-45		1945-46		1946-47	
																							Arbitrary standard		Arbitrary rating		Arbitrary standard		Arbitrary rating	
	1943-44				1944-45				1945-46				1946-47				1943-44						Numerical rating		Numerical rating		Numerical rating		Numerical rating	
	Gm.	C	C	C	O Y	O	O	O	Ricey	Coarse	Coarse	Coarse	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Ml.	Pct.	V acid	27	V acid	35	V acid	35	V acid	30		
Oct. 1-5	76	C	C	C	O	O	O	O	Ricey	Coarse	Coarse	Coarse	59	54	57	2	2	2	53	55	V acid	27	V acid	35	V acid	35	V acid	30		
Nov. 1-5	101	D	D	D	O	O	O	O	Coarse	do	Good	do	59	62	62	2	2	2	54	61	V acid	54	V acid	71	V acid	70	V acid	76		
Nov. 15	110	K	G	E	O	O	O	O	Good	do	do	do	65	68	62	2	3	3	53	56	P tart to S.	81	P tart to S.	78	P tart to S.	83	P tart to S.	88		
Dec. 1-5	126	K	L	I	O	O	O	O	Good	do	do	Good	65	66	71	2	3	3	51	52	do	92	do	87	do	90	do	92		
Jan. 1-5	129	L	L	K	L	O	O	O	do	do	(P), good	do	67	68	73	2	3	3	50	55	do	92	P tart to S.	87	do	90	do	92		
Feb. 1-5	118	L+	L	L	L+	O	O	O	do	(P), good	do	(P), good	68	65		2	3	3	49	53	do	93	do	89	do	90	do	92		
Mar. 1-5	111	L+	L	L		O	O		(P), good	do	do	do	68	62		2	3	3	45	50	do	94	Inspid.	77	do	80	do	82		
Apr. 1-5	112	L	L			O	O		do	(P), dry	do	do	69			3			46	45	do	50	do	66	do	66	do	68		

Picking period	Total ash ²		Ascorbic acid per milliliter ¹				Active acidity ³				Total solids				Total acid				Solids-acid ratio				Fruit below solids-acid ratio				Samples below or above solids-acid ratio (1945-47)				
			1944-45	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47
	Pct.	Mg.	Mg.	Mg.	Mg.	pH	pH	pH	pH	Pct.	Pd.	Pd.	Pd.	Pd.	Pct.	Pd.	Pd.	Pd.	Pct.	Pd.	Pd.	Pd.	Pct.	Pd.	Pd.	Pd.	Pct.	Pd.	Pd.	Pd.	Pd.
Oct. 1-5	0.20	0.33	0.41	0.33	0.28	2.58	2.68	2.98	2.91	5.54	10.30	8.34	8.90	3.44	2.57	1.92	2.17	2.57	4.01	4.34	4.10	100	100	100	100	100	100	100	100	100	Below.
Nov. 1-5	.30	.38	.37	.31	.32	2.56	3.13	3.24	3.38	10.38	10.64	8.87	9.67	2.02	1.52	1.28	1.04	1.14	7.00	6.93	9.30	96	56	64	64	64	64	64	64	64	Above.
Nov. 15	.25		.38	.34	.32		3.17	3.27	3.38		11.05	10.16	10.12		1.28	1.23	1.02		5.63	8.26	9.92		12	28	28	28	28	28	28	28	Do.
Dec. 1-5	.29	.41	.38	.32	.32	3.08	3.32	3.51	3.67	11.91	11.49	10.02	10.73	1.39	1.13	.89	.77	8.57	10.17	11.26	13.94	4	0	0	0	0	0	0	0	0	Do.
Jan. 1-5	.28	.39	.33	.27	.32	3.27	3.40	3.63	3.63	13.16	12.05	10.51	12.17	1.15	.94	.68	.79	11.44	12.82	15.90	15.41	0	0	0	0	0	0	0	0	0	Do.
Feb. 1-5	.37	.37	.24		.30	3.34	3.58		3.72	14.56	13.35		13.72	1.11	.92		.76	13.12	14.51		18.05	0	0	0	0	0	0	0	0	0	Do.
Mar. 1-5	.41	.28	.16			3.30	3.79			14.72	13.57			.99	.71			14.87	19.11			0	0	0	0	0	0	0	0	0	Do.
Apr. 1-5	.39	.23	.12			3.48	3.98			16.43	13.12			.90	.61			18.26	21.51			0	0	0	0	0	0	0	0	0	Do.

¹ Each figure represents a mean of 100 determinations for 4 seasons.² Each figure or description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ O Y, orange yellow; Y O, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 26.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Merrill Island, Fla., 1943-47

Picking period	Weight per fruit ¹	Rind color ^{2,3}				Flesh color ^{2,4}				Flesh condition ^{2,4}				Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴									
		1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47			Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	1945-46	Arbitrary standard	Numerical rating	1946-47	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 72	C	C	D	C	OY	O	YO	YO	Ricey	Coarse	Coarse	Coarse	Coarse	Ml. 54	Pct. 56	V acid	26	Acid	47	45	V acid	28	V acid	35
Nov. 1-5	96	D	E	E	C	O	O	O	O	Coarse	Good	do	do	do	56	57	Acid	47	Tart	75	66	Tart	65	Tart	61
Nov. 15	113	I	I	H	F	O	O	O	O	do	do	do	do	do	56	58	P tart	80	P tart	83	75	P tart	77	P tart	79
Dec. 1-5	110	K	K	K	I	O	O	O	O	Good	do	do	do	do	53	55	P tart to S.	89	P tart to S.	83	83	P tart to S.	87	P tart to S.	87
Jan. 1-5	125	L	K	L+	L+	O	O	O	O	do	do	(P), good	(P), good	do	52	54	do	93	do	89	do	88	do	87	
Feb. 1-5	121	L+	L		L+	O	O			do	(P), good		do	do	47	50	Inspid.	91	Inspid.	84			Inspid.	82	
Mar. 1-5	105	L+	L			O	O			(P), good	(P), dry				47	50	do	84	do		65				
Apr. 1-5	94	L+	K			O				(P), dry	do				44	44	Inspid.	82	do		54				

Picking period	Ascorbic acid per milliliter ⁴				Active acidity ³				Total solids ⁴				Total acid ⁴				Solids-acid ratio				Samples below or above solids-acid ratio			
	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47
Oct. 1-5	Mg. 0.30	Mg. 0.32	Mg. 0.35	Mg. 0.36	pH 2.59	pH 3.04	pH 2.80	pH 2.83	Pct. 8.73	Pct. 8.73	Pct. 8.98	Pct. 9.33	Pct. 3.90	Pct. 1.64	Pct. 2.57	Pct. 2.21	2.24	5.32	3.49	4.22	Below	Below	Below	Below
Nov. 1-5		.33	.35	.35	2.92	3.41	3.19	3.32	10.12	9.50	9.40	9.47	2.05	1.02	1.26	1.18	4.94	9.31	7.46	8.03	do	Above	Above	Above
Nov. 15		.33	.36	.31		3.48	3.37	3.52		9.87	9.98	10.07		.85	1.05	.86		11.61	9.50	11.71	do	do	do	Do.
Dec. 1-5	.39	.27	.35	.26	3.15	3.54	3.49	3.92	11.40	12.05	10.37	10.13	1.31	.74	.88	.57	8.70	16.28	11.78	17.77	Above	do	do	Do.
Jan. 1-5	.35	.28	.27	.29	3.35	3.78	3.59	3.98	12.00	11.44	10.57	11.27	1.10	.58	.59	.52	10.91	19.72	17.92	21.67	do	do	do	Do.
Feb. 1-5	.29	.27		.27	3.50	3.94		4.08	13.00	12.75		11.92	.97	.59		.49	13.40	21.61		24.33	do	do	do	Do.
Mar. 1-5	.22	.17			3.75	4.37			12.65	10.10			.74	.40			17.09	25.25			do	do	do	
Apr. 1-5	.19	.15			3.75	4.48			14.77	9.37			.74	.33			19.96	28.39			do	do	do	

¹ Each figure represents a mean of 100 determinations for 4 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 27.—Seasonal changes in physical characters and chemical constituents of langerines on sour orange rootstock at Sharpes, Fla., 1943-47

Picking period	Weight per fruit ¹	Rind color ²				Flesh color ²				Flesh condition ²				Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴							
		1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47			1943-44		1944-45		1945-46		1946-47	
																Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 76	C	D	D	C	YO	YO	YO	YO	Ricey	Ricey	Coarse	Coarse	Ml. 55	Pct. 57	V acid	23	V acid	38	V acid	35	V acid	31
Nov. 1-5	190	G	E	E	C	O	O	O	O	Coarse	Coarse	Good	Good	58	59	Acid	53	Tart.	65	P tart	70	Acid	57
Nov. 15	21		I	H	E		O	O	O			do.	do.	56	58			P tart.	75	P tart to S.	80	P tart	78
Dec. 1-5	132	K	L	L	H	O	O	O	O	Good	do	do	do	54	56	P tart	77	do	79	do	88	P tart to S.	87
Jan. 1-5	132	L	K	L+	L+	O	O	O	O	do	do	(P), good	do	52	55	P tart to S.	90	P tart to S.	89	do	92	do	89
Feb. 1-5	140	L+	L		L+	O	O		O	do	(P), good		(P), good	47	49	do	90	Insipid	82			Insipid	82
Mar. 1-5	128	L+	L			O				(P), good	(P), dry			47	49	do	85	do	64				
Apr. 1-5	127	L				O				do				44	46	Insipid	77						

Picking period	Ascorbic acid per milliliter ³				Active acidity ³				Total solids ³				Total acid ³				Solids-acid ratio				Samples below or above solids-acid ratio			
	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47
Oct. 1-5	Mg. 0.35	Mg. 0.38	Mg. 0.38	Mg. 0.31	pH 2.53	pH 2.87	pH 2.80	pH 2.91	Pct. 9.33	Pct. 9.12	Pct. 9.23	Pct. 8.93	Pct. 3.99	Pct. 1.96	Pct. 1.99	Pct. 2.15	2.34	4.65	4.64	4.15	Below	Below	Below	Below
Nov. 1-5	.44	.37	.37	.35	2.75	3.26	3.19	3.18	10.73	9.92	9.85	9.67	2.46	1.17	1.21	1.37	4.36	8.48	8.14	7.06	do	Above	Above	Do.
Nov. 15		.39	.38	.33		3.22	3.40	3.40		10.65	10.03	10.12		1.08	1.00	.94		9.86	10.03	10.77	do	do	do	Above
Dec. 1-5	.45	.37	.36	.27	3.12	3.29	3.48	3.77	11.90	10.70	10.82	10.23	1.38	.94	.87	.62	8.62	11.38	12.44	16.50	Above	do	do	Do.
Jan. 1-5	.43	.33	.35	.33	3.32	3.73	3.66	3.88	12.65	11.12	12.07	11.97	1.17	.72	.76	.63	10.81	15.44	15.88	19.00	do	do	do	Do.
Feb. 1-5	.36	.28		.26	3.56	4.20		4.00	12.80	12.62		11.87	.79	.45		.53	16.20	28.04		22.40	do	do	do	Do.
Mar. 1-5	.32	.27			3.72	3.90			14.25	12.19			.72	.62			19.79	19.66			do	do	do	
Apr. 1-5	.25				3.78				14.90				.63				23.65				do			

¹ Each figure represents a mean of 100 determinations for 4 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 28.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Winter Haven, Fla., 1943-46

Picking period	Weight per fruit ¹	Rind color ^{2,3}			Flesh color ^{2,3}			Flesh condition ^{2,3}			Diameter of fruit ²			Rind thick-ness ²			Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴					
		1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46			Arbi-trary stand-ard	Num-erical rat-ing	Arbi-trary stand-ard	Num-erical rat-ing	Arbi-trary stand-ard	Num-erical rat-ing
Oct. 1-5	Gm.	C	C	C	YO	YO	O	Coarse	Riccy	Coarse	Mm.	Mm.	Mm.	Mm.	Mm.	Mm.	Ml.	Pd.	V acid	26	V acid	28	V acid	32
Nov. 1-5	96	D	D	E	O	O	O	Good	Good	do	51	52	53	2	2	2	51		Acid	53	Acid	50	Tart.	64
Nov. 15	112		H	G	O	O	O		do	Good	64	64	64	2	3	2	53		P tart.	70	P tart.	64	P tart.	76
Dec. 1-5	116	K	L	J	O	O	O	Good	do	do	62	65	67	2	2	2	52		P tart.	79	P tart.	77	P tart.	83
Jan. 1-5	123	L	L	K	O	O	O	do	do	do	66	64	71	2	3	3	47		P tart to S.	91	P tart to S.	83	do	90
Feb. 1-5	113	L	L		O	O		do	(P), good		67	65		2	3		45		do	93	do	87		
Mar. 1-5	110	L+	K		O	O		(P), good	do		66	65		2	3		47		do	93	do	83		
Apr. 1-5	92	L	K		O	O		do	(P), dry		64			2			47	50	do	93	Insipid	78		

Picking period	Total ash ⁵		Ascorbic acid per milliliter ⁵			Active acidity ⁵			Total solids ⁵			Total acid ⁵			Solids-acid ratio			Fruit below solids-acid ratio		
	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46
Oct. 1-5	Pd.	Pd.	Mg.	Mg.	Mg.	pH	pH	pH	Pd.	Pd.	Pd.	Pd.	Pd.	Pd.				Pd.	Pd.	Pd.
Oct. 1-5	0.23	0.30	0.31	0.37	0.35	2.58	2.77	2.94	9.72	9.81	9.30	3.55	2.76	2.70	2.74	3.55	3.44	100	100	100
Nov. 1-5	.32	.44	.42	.39	.37	2.92	3.13	3.22	12.45	10.35	10.29	2.12	1.86	1.40	5.87	5.50	7.35	84	92	56
Nov. 15	.26			.41	.37		3.08	3.60		10.41	10.26		1.64	1.13		6.35	9.08		80	8
Dec. 1-5	.32	.36	.44	.40	.39	3.07	3.18	3.60	13.50	11.48	11.53	1.63	1.37	1.07	8.28	8.38	10.78	8	4	0
Jan. 1-5	.30	.44	.43	.40	.33	3.25	3.33	3.74	15.52	11.58	11.73	1.37	1.26	.80	11.33	9.43	14.66	0	0	0
Feb. 1-5	.36		.41	.31		3.26	3.51		15.58	12.38		1.34	1.10		11.63	11.25		0	0	
Mar. 1-5	.39		.27	.29		3.57	3.71		16.03	12.84		1.08	.85		14.84	15.11		0	0	
Apr. 1-5	.42		.21	.19		3.51	3.86		18.14	13.32		1.01	.87		17.96	15.31		0	0	

¹ Each figure represents a mean of 75 determinations for 3 seasons.

² Each figure or description represents a mean of 25 determinations for 1 season.

³ See U. S. Department of Agriculture color chart (pl. 1).

⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.

⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 29.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Merritt Island, Fla., 1943-46

Picking period	Weight per fruit ¹	Rind color ^{2,3}			Flesh color ^{2,4}			Flesh condition ^{2,4}			Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴					
		1943-44	1944-45	1945-46	1943-44	1944-45	1945-46	1943-44	1944-45	1945-46			1943-44		1944-45		1945-46	
													Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 80	C	D	D	YO	YO	YO	Riccy	Coarse	Coarse	Ml. 54	Pd. 55	V acid	28	V acid	36	V acid	32
Nov. 1-5	107	E	E	E	O	O	O	Coarse	Good	Good	58	59	Acid	56	Tart	65	Tart	68
Nov. 15	118		I	F		O	O		do.	do.	56	58			P tart	75	P tart	76
Dec. 1-5	130	L	K	L	O	O	O	Good	do.	do.	53	55	P tart to S.	81	P tart to S.	83	P tart to S.	81
Jan. 1-5	128	L	K	L+	O	O	O	do.	do.	(P), dry	53	55	do.	92	do.	92	Insipid	81
Feb. 1-5	129		K			O			(P), good		52	54			do.	88		
Mar. 1-5	122		K			O			do.		49	51			Insipid	70		
Apr. 1-5	123		K			O			(P), dry		45	47						

Picking period	Total ash ⁵		Ascorbic acid per milliliter ⁵				Active acidity ⁵			Total solids ⁵			Total acid ⁵			Solids-acid ratio			Samples below or above solids-acid ratio		
	1915-46		1913-44	1944-45	1945-46	1943-44	1944-45	1915-46	1913-44	1944-45	1945-46	1943-44	1944-45	1915-46	1943-44	1944-45	1945-46	1913-44	1944-45	1945-46	
	Pct.	Mg.	Mg.	Mg.	pH	pH	pH	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.							
Oct. 1-5	0.20	0.42	0.45	0.44	2.58	2.77	2.75	9.92	10.12	9.83	2.97	2.48	2.35	3.34	4.08	4.18		Below	Below	Below	
Nov. 1-5	.22	.45	.44	.38	2.78	3.23	3.11	10.98	10.21	8.87	2.18	1.12	1.17	5.04	9.12	7.58		do.	Above	do.	
Nov. 15			.44	.38		3.16	3.31		11.20	9.43		1.21	1.02		9.26	9.25		do.	do.	do.	
Dec. 1-5	.28	.48	.44	.35	3.07	3.30	3.59	12.00	11.45	9.47	1.33	1.00	.69	9.02	11.45	13.72		Above	do.	do.	
Jan. 1-5	.33	.44	.43	.31	3.25	3.47	3.78	13.10	12.17	10.84	1.13	.81	.60	11.59	14.49	18.07		do.	do.	do.	
Feb. 1-5			.32			3.79			12.62			.66			19.12			do.	do.	do.	
Mar. 1-5			.33			3.72			14.07			.69			20.39			do.	do.	do.	
Apr. 1-5			.22			4.12			14.18			.43			32.98			do.	do.	do.	

¹ Each figure represents a mean of 75 determinations for 3 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 30.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Brooksville, Fla., 1943-44, 1944-45, and 1946-47

Picking period	Weight per fruit ¹	Rind color ^{2,3}			Flesh color ^{2,4}			Flesh condition ^{2,4}			Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴					
		1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47			1943-44		1944-45		1946-47	
													Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 78	C	C	C	OY	O	YO	Riccy	Coarse	Coarse	Ml. 54	Pct. 55	V acid	22	V acid	32	V acid	30
Nov. 1-5	105	D	E	C	YO	O	O	Coarse	do	do	57	59	Acid	49	Acid	57	Acid	58
Nov. 15	118		J	F		O	O		Good	Good	56	58			P tart	70	P tart	72
Dec. 1-5	127	L	K	J	O	O	O	Good	do	do	55	57	P tart to S.	82	P tart to S.	81	P tart to S.	84
Jan. 1-5	124	L	L	L+	O	O	O	do	do	do	54	56	do	92	do	92	do	91
Feb. 1-5	124	L+	L	L+	O	O	O	(P), good	do	(P), good	52	54	do	93	do	90	do	90
Mar. 1-5	118	L+	K		O	O		do	(P), good	(P), good	44	53	do	93	do	85		
Apr. 1-5	124	L	K		O	O		do	(P), dry		45	45	Insipid	75	Insipid	72		

Picking period	Total ash ⁵	Ascorbic acid per milliliter ⁵			Active acidity ⁵			Total solids ⁵			Total acid ⁵			Solids-acid ratio			Samples below or above solids-acid ratio		
	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47
Oct. 1-5	Pct. 0.28	Mg. 0.34	Mg. 0.39	Mg. 0.30	pH 2.58	pH 2.77	pH 2.85	Pct. 8.84	Pct. 8.87	Pct. 8.24	Pct. 3.55	Pct. 2.28	Pct. 2.48	2.49	5.89	3.32	Below	Below	Below
Nov. 1-5	.27	.40	.39	.24	2.88	3.18	3.32	9.98	10.01	8.95	1.97	1.38	1.18	5.07	7.25	7.58	do	do	Above
Nov. 15	.32		.39	.31		3.20	3.38		11.20	9.32		1.26	1.04		8.89	8.96	do	Above	Do
Dec. 1-5	.29	.39	.41	.40	3.14	3.29	3.61	11.70	11.30	11.57	1.37	1.07	.89	8.54	10.56	13.00	Above	do	Do
Jan. 1-5	.40	.38	.37	.39	3.39	3.56	3.63	12.65	13.13	13.47	1.09	.92	.99	11.61	14.27	13.61	do	do	Do
Feb. 1-5		.37	.36	.35	3.49	3.72	3.73	13.90	13.70	15.20	.93	.77	.90	14.95	17.79	16.89	do	do	Do
Mar. 1-5		.29	.24		3.64	3.88		15.05	14.72		.80	.66		18.81	22.30		do	do	
Apr. 1-5		.18	.22		3.75	4.07		14.60	14.83		.61	.55		23.93	26.96		do	do	

¹ Each figure represents a mean of 75 determinations for 3 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ OY, orange yellow; YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 31.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Dundee, Fla., 1944-45 and 1946-47

Picking period	Weight per fruit ¹	Rind color ²		Flesh color ³		Flesh condition ⁴		Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴			
		1944-45	1946-47	1944-45	1946-47	1944-45	1946-47			1944-45		1946-47	
										Arbitrary standard	Numer- ical rating	Arbitrary standard	Numer- ical rating
Oct. 1-5.....	Gm. 69	C	C	YO	YO	Coarse.....	Ricey.....	Ml. 56	Pct. 68	V acid.....	28	V acid.....	32
Nov. 1-5.....	91	E	C	O	YO	Good.....	Coarse.....	57	68	Acid.....	51	Acid.....	57
Nov. 15.....	103	E	D	O	O	do.....	do.....	55	56	Tart.....	62	P tart.....	72
Dec. 1-5.....	113	J	G	O	O	do.....	Good.....	54	56	do.....	68	P tart to S.....	85
Jan. 1-5.....	120	L	K	O	O	do.....	do.....	53	55	P tart to S.....	84	do.....	92
Feb. 1-5.....	137	L	L+	O	O	(P), good.....	(P), good.....	50	52	do.....	84	Insipid.....	83
Mar. 1-5.....	121	L				do.....		49	51	do.....	82		
Apr. 1-5.....	109	L				(P), dry.....		42	44	Insipid.....	78		

Picking period	Total ash ¹	Ascorbic acid per milliliter ²		Active acidity ³		Total solids ⁴		Total acid ⁵		Solids-acid ratio		Samples below or above solids-acid ratio	
	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47	1944-45	1946-47
Oct. 1-5.....	Pct. 0.29	Mg. 0.38	0.38	pH 2.71	2.86	Pct. 8.24	9.10	Pct. 2.89	2.46	2.85	3.70	Below.....	Below.
Nov. 1-5.....	.26	.38	.29	3.04	3.30	9.27	9.50	1.75	1.17	5.30	8.12	do.....	Above.
Nov. 15.....	.30	.37	.29	3.12	3.33	10.00	9.57	1.41	1.11	7.09	8.62	do.....	Do.
Dec. 1-5.....	.28	.38	.31	3.24	3.62	10.10	10.88	1.20	.78	8.42	13.95	Above.....	Do.
Jan. 1-5.....	.35	.37	.28	3.44	3.92	11.32	11.32	1.03	.60	10.99	18.87	do.....	Do.
Feb. 1-5.....		.31	.25	3.64	3.89	12.07	12.60	.90	.60	13.41	21.00	do.....	Do.
Mar. 1-5.....		.23		3.76		13.54		.80		16.93		do.....	
Apr. 1-5.....		.16		4.01		13.43		.65		20.66		do.....	

¹ Each figure represents a mean of 50 determinations for 2 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 32.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Vero Beach, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,3}	Flesh condition ^{1,3}	Juice pe: 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ¹		Total ash ⁴	Ascor- bic acid per milli- liter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids- acid ratio	Samples below or above solids- acid ratio
							Arbitrary standard	Nu- merical rating							
	Gm.				Ml.	Pct.			Pct.	Mg.	pH	Pct.	Pct.		
Oct. 1-5.....	70	C	YO	Coarse.....	50	51	V acid.....	30	0.33	0.27	2.93	8.80	2.10	4.19	Below.
Nov. 1-5.....	88	E	O	do.....	60	61	Acid.....	55	.31	.42	3.23	9.87	1.36	7.26	Do.
Nov. 15.....	116	G	O	Good.....	56	58	P tart.....	79	.33	.35	3.43	10.12	.97	10.43	Above.
Dec. 1-5.....	127	H	O	do.....	51	53	P tart to S.....	87	.32	.37	3.64	10.83	.78	13.88	Do.
Jan. 1-5.....	125	K	O	do.....	56	58	do.....	90	.39	.34	3.92	11.47	.62	18.50	Do.
Feb. 1-5.....	142	L+	O	(P), good.....	49	50	Insipid.....	71	.....	.28	4.02	12.10	.52	23.27	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 33.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Rockledge, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,3}	Flesh condition ^{1,3}	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ¹		Ascor- bic acid per milli- liter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids- acid ratio	Samples below or above solids-acid ratio
							Arbitrary stand- ard	Numer- ical rat- ing						
	Gm.				Ml.	Pct.			Mg.	pH	Pct.	Pct.		
Oct. 1-5.....	54	B	OY	Coarse.....	52	54	V acid.....	27	0.28	2.73	9.23	3.21	2.88	Below.
Nov. 1-5.....	69	E	O	do.....	58	60	Acid.....	59	.36	3.04	9.67	1.73	5.59	Do.
Nov. 15.....	93	E	O	Good.....	56	58	P tart.....	72	.34	3.26	9.97	1.13	8.82	Above.
Dec. 1-5.....	111	G	O	do.....	54	55	P tart to S.....	86	.32	3.67	10.63	.69	15.41	Do.
Jan. 1-5.....	114	K	O	(P), good.....	55	57	do.....	87	.28	3.91	11.27	.55	20.49	Do.
Feb. 1-5.....	116	L+	O	do.....	52	55	Insipid.....	82	.23	3.98	12.46	.54	23.07	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ OY, orange yellow; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 34.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Brooksville, Fla., 1946-47

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,3}	Flesh condition ^{1,3}	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ³		Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating						
Oct. 1-5.....	Gm. 68	C	YO	Coarse.....	Ml. 53	Pct. 55	V acid.....	26	Mg. 0.36	pH 2.65	Pct. 8.85	Pct. 3.33	2.66	Below.
Nov. 1-5.....	101	E	O	do.....	59	61	Acid.....	56	.41	3.11	9.47	1.51	6.27	Do.
Nov. 15.....	109	F	O	Good.....	56	58	P tart.....	73	.39	3.23	10.07	1.22	8.25	Above.
Dec. 1-5.....	128	K	O	do.....	52	54	P tart to S.....	87	.37	3.51	10.93	.89	12.28	Do.
Jan. 1-5.....	119	L+	O	(P), good.....	55	58	do.....	92	.41	3.55	12.77	.89	14.35	Do.
Feb. 1-5.....	123	L+	O	do.....	48	50	do.....	87	.32	3.65	14.17	.88	16.10	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 35.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Spring Lake, Fla., 1944-45

Picking period	Weight per fruit ¹	Rind color ^{1,2}	Flesh color ^{1,3}	Flesh condition ^{1,3}	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ³		Ascorbic acid per milliliter ⁴	Active acidity ⁴	Total solids ⁴	Total acid ⁴	Solids-acid ratio	Samples below or above solids-acid ratio
							Arbitrary standard	Numerical rating						
Oct. 1-5.....	Gm. 88	O	O	Coarse.....	Ml. 55	Pct. 57	V acid.....	39	Mg. 0.40	pH 2.86	Pct. 8.87	Pct. 2.03	4.37	Below.
Nov. 1-5.....	114	E	O	Good.....	55	57	Tart.....	63	.38	3.17	10.75	1.41	7.62	Above.
Nov. 15.....	119	J	O	do.....	55	57	P tart.....	75	.39	3.20	11.30	1.28	8.83	Do.
Dec. 1-5.....	132	L	O	do.....	55	57	P tart to S.....	84	.41	3.32	11.50	1.09	10.55	Do.
Jan. 1-5.....	134	L	O	do.....	51	53	do.....	92	.36	3.58	12.63	.91	13.88	Do.
Feb. 1-5.....	135	L	O	do.....	51	54	do.....	91	.33	3.74	13.80	.80	17.25	Do.
Mar. 1-5.....	115	L	O	(P), good.....	49	52	do.....	88	.20	3.93	14.72	.70	21.03	Do.
Apr. 1-5.....	93	L	O	(P), dry.....	47	50	do.....	83	.16	4.07	16.03	.66	24.29	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 36.—Seasonal changes in physical characters and chemical constituents of tangerines on sour orange rootstock at Brooksville, Fla., 1945-46

Picking period	Weight per fruit ¹	Rind color ¹	Flesh color ¹	Flesh condition ¹	Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ²		Ascor- bic acid per mill- liter ³	Active acid- ity ⁴	Total solids ⁴	Total acid ⁴	Solids- acid ratio	Samples below or above solids-acid ratio
							Arbitrary stand- ard	Numer- ical rating						
	<i>Gm.</i>				<i>Ml.</i>	<i>Pct.</i>			<i>Mg.</i>	<i>pH</i>	<i>Pct.</i>	<i>Pct.</i>		
Oct. 1-5.....	91	D	YO	Coarse.....	52	53	Acid.....	40	0.40	2.89	8.73	1.85	4.72	Below.
Nov. 1-5.....	105	E	O	do.....	57	59	P tart.....	71	.40	3.30	9.50	1.12	8.48	Above.
Nov. 15.....	119	K	O	Good.....	56	55	P tart to S.....	86	.41	3.41	11.30	.96	11.77	Do.
Dec. 1-5.....	133	L	O	do.....	55	57	do.....	92	.40	3.59	11.32	.75	15.09	Do.
Jan. 1-5.....	130	L+	O	(P), good.....	50	52	do.....	93	.36	3.82	11.89	.60	19.82	Do.

¹ Each figure or description represents a mean of 25 determinations for 1 season.² See U. S. Department of Agriculture color chart (pl. 1).³ YO, yellow orange; O, orange; (P), puffy; P, pleasantly; S, sweet.⁴ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 37.—Seasonal changes in physical characters and chemical constituents of tangerines on Cleopatra rootstock at Windermere, Fla., 1943-47

Picking period	Weight per fruit ¹	Rind color ^{2,3}				Flesh color ^{2,4}				Flesh condition ^{2,4}				Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴							
																1943-44		1944-45		1945-46		1946-47	
		1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47			Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 75	C	D	D	C	YO	O	YO	YO	Riccy	Coarse	Coarse	Coarse	Ml. 54	Pct. 56	V acid	27	Acid	43	V acid	36	V acid	31
Nov. 1-5	103	D	E	D	C	O	O	YO	O	Coarse	do	Coarse	do	56	58	Tart	60	Tart	66	Tart	69	Tart	62
Nov. 15	113		J	G	E		O	O	O		Good	Good	Good	56	58			P tart	75	P tart to S.	82	P tart	77
Dec. 1-5	118	K	K	J	J	O	O	O	O	Good	do	do	do	54	56	P tart to S.	83	P tart to S.	85	do	89	P tart to S.	88
Jan. 1-5	133		L	L+	L		O	O	O		do	(P), good	(P), good	52	53			do	90	Insipid	81	do	93
Feb. 1-5	127		L		L+		O	O	O		(P), good	do	do	50	52			do	89			do	90
Mar. 1-5	109		L								do			47	49			Insipid	72				
Apr. 1-5	97		L								(P), dry			40	42			do	61				

Picking period	Ascorbic acid per milliliter ¹				Active acidity ³				Total solids ³				Total acid ³				Solids-acid ratio				Samples below or above solids-acid ratio			
	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47	1943-44	1944-45	1945-46	1946-47
	Mg.	Mg.	Mg.	Mg.	pH	pH	pH	pH	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.								
Oct. 1-5	0.29	0.29	0.33	0.31	2.58	3.10	2.90	2.94	8.53	8.18	8.63	9.18	3.59	1.42	1.87	1.98	2.38	5.76	4.61	4.64	Below	Below	Below	Below
Nov. 1-5	.32	.28	.33	.38	2.98	3.49	3.28	3.25	10.12	9.30	9.00	10.17	1.68	.95	1.11	1.18	6.02	9.79	8.11	8.62	do	Above	Above	Above
Nov. 15	.20	.33	.38			3.51	3.56	3.33		9.92	10.10	10.47		.87	.82	.99		11.40	12.32	10.58	do	do	do	do
Dec. 1-5	.33	.28	.33	.37	3.27	3.63	3.72	3.63	11.25	10.25	10.87	11.33	1.07	.78	.70	.74	10.51	13.14	15.53	15.31	Above	do	do	do
Jan. 1-5	.25	.25	.35			3.83	4.10	3.79		11.34	11.34	12.17		.67	.44	.63		16.93	25.77	19.32	do	do	do	do
Feb. 1-5	.22		.30			3.93		3.80		12.17		13.11		.61		.64		19.95	20.48		do	do	do	do
Mar. 1-5	.15					4.17				13.01				.55				23.65			do	do	do	do
Apr. 1-5	.11					4.33				11.97				.43				27.84			do	do	do	do

¹ Each figure represents a mean of 100 determinations for 4 seasons.

² Each description represents a mean of 25 determinations for 1 season.

³ See U. S. Department of Agriculture color chart (pl. 1).

⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.

⁵ Each figure represents a mean of duplicate determinations on composited samples.

TABLE 38.—Seasonal changes in physical characters and chemical constituents of tangerines on Cleopatra rootstock at Dade City, Fla., 1943-44, 1944-45, and 1946-47

Picking period	Weight per fruit ¹	Rind color ^{2 3}			Flesh color ^{2 4}			Flesh condition ^{2 4}			Juice per 100 gm. of fruit ¹	Juice per fruit ¹	Flavor ⁴					
													1943-44		1944-45		1946-47	
		1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47			Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating	Arbitrary standard	Numerical rating
Oct. 1-5	Gm. 72	C	C	C	YO	O	YO	Coarse	Ricey	Coarse	55	57	V acid	24	Acid	42	V acid	33
Nov. 1-5	102	E	E	E	YO	O	O	do	Coarse	do	57	59	Acid	53	Tart	67	Acid	59
Nov. 15	111		J	G		O	O		Good	Good	57	59			P tart	77	P tart	78
Dec. 1-5	122	L	L	K	O	O	O	Good	do	do	53	55	P tart to S	83	P tart to S	84	P tart to S	93
Jan. 1-5	125	L	K	L+	O	O	O	do	do	do	54	57	do	94	do	92	do	96
Feb. 1-5	130	L+	K	L+	O	O	O	do	do	do	55	57	do	95	do	95	do	93
Mar. 1-5	120	L+	J		O	O		do	(P), good	do	52	55	do	97	do	93		
Apr. 1-5	128	L+	K		O	O		do	do	do	51	54	do	92	do	90		

Picking period	Total ash ⁵	Ascorbic acid per milliliter ¹				Active acidity ³			Total solids ³			Total acid ⁶			Solids-acid ratio			Samples below or above solids-acid ratio		
	1944-45	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	1943-44	1944-45	1946-47	
Oct. 1-5	Pct. 0.17	Mg. 0.38	Mg. 0.42	Mg. 0.33	pH 2.50	pH 2.84	pH 2.69	Pct. 8.84	Pct. 9.34	Pct. 8.93	Pct. 3.37	Pct. 2.02	Pct. 2.71	2.62	4.62	3.30	Below	Below	Below	
Nov. 1-5	.35	.46	.42	.41	2.80	3.30	3.18	10.33	10.80	10.22	2.03	1.15	1.30	5.09	9.39	7.86	do	Above	Above	
Nov. 15	.24		.41	.39		3.25	3.26		11.35	10.97		1.16	1.05		9.78	10.45	do	do	do	
Dec. 1-5	.26	.40	.39	.38	3.09	3.33	3.63	11.89	11.45	11.93	1.38	1.07	.82	8.62	10.70	14.55	Above	do	do	
Jan. 1-5	.28	.46	.42	.34	3.24	3.54	3.71	12.90	12.72	13.27	1.20	.92	.75	10.75	13.83	17.69	do	do	do	
Feb. 1-5	.32	.43	.41	.28	3.34	3.69	3.78	14.73	13.80	14.11	1.01	.85	.68	14.58	16.24	20.75	do	do	do	
Mar. 1-5	.41	.35	.27		3.50	3.87		15.10	13.67		.83	.67		18.19	20.40		do	do	do	
Apr. 1-5	.38	.29	.20		3.57	3.93		15.14	14.88		.71	.62		21.32	24.00		do	do	do	

¹ Each figure represents a mean of 75 determinations for 3 seasons.² Each description represents a mean of 25 determinations for 1 season.³ See U. S. Department of Agriculture color chart (pl. 1).⁴ YO, yellow orange; O, orange; (P), puffy; V, very; P, pleasantly; S, sweet.⁵ Each figure represents a mean of duplicate determinations on composited samples.

END