



## United States Department of Agriculture

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Agricultural Marketing Service, Specialty Crops Program, Specialty Crops Inspection Division

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### NOTICES TO TRADE

#### **USDA Announces Juice Content Requirements for Imported Grapefruit Juice Will Not Be Enforced for Upcoming Crop Year After March 31, 2023**

<https://www.ams.usda.gov/content/usda-announces-juice-content-requirements-imported-grapefruit-juice-will-not-be-enforced>

**Date:** March 31, 2023

The U.S. Department of Agriculture (USDA) announced that after March 31, 2023, it will not be enforcing the juice content requirements for the 2023-24 season as it works with industry to review the imported grapefruit juice content requirements. While these specific import regulation requirements, issued under Section 608e of the Agricultural Marketing Act of 1937 Act, will not be enforced, all other standards for grade, size, and maturity remain unchanged.

In August 2022, USDA notified the industry that the juice content requirements would be enforced from October 1, 2022, to March 31, 2023, while these requirements were reviewed by the Department. USDA is conducting extensive outreach to citrus industry representatives to develop a permanent solution that will meet the needs of the industry while also addressing trade policy concerns.

More information about the import requirements regulating grapefruit is available on the [Section 8e & Imports webpage for grapefruit](#). More information about federal marketing orders is available on the [Market Development Division webpage](#) or by contacting the Market Development Division at (202) 720-2491.

The Agricultural Marketing Agreement Act of 1937 (AMMA) applies to specific fruit, vegetable, and specialty crop imports into the United States and requires imported products to meet the same or comparable grade, size, quality, and maturity standards as domestic products covered by Federal marketing orders.



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### **DETERMINATION OF MATURITY FOR IMPORTED FRESH GRAPEFRUIT UNDER SECTION 8E**

The following procedures and appendixes will be used in determining maturity for imported fresh Grapefruit inspected under Section 8e.

#### **Lot Configuration**

All imported fresh grapefruit loads presented for Section 8e inspection must be presented, inspected (including determination of maturity), and certified on an individual size basis. While each size will be inspected separately, sizes can be combined into passing and failing lots.

#### **Requirements for Maturity Testing**

All required tests to determine maturity (i.e., juice content, brix to acid ration, etc.) will be performed regardless of a failing result for any individual test.

#### **Equipment**

The following equipment and solutions are required to perform these procedures. Variations are only authorized by the Specialty Crops Inspection (SCI) Division Associate Director of Inspection Operations, or their designee based on an equivalent analysis. The Electric Citrus Juicer and fruit knife are available via the SCI Equipment and Forms Depot. Ordering instructions can be found at the AMS website on the How to Purchase Equipment and Visual Aids page. The remaining equipment and solutions may be procured locally via the SCI Area Office or Fed-State Office.

- Juice extraction equipment having a minimum .25 horsepower, not exceeding 1800 R.P.M., with interchangeable burrs.
- Electronic scale
- Collection pans to catch juice (3)
- .3125N Sodium Hydroxide (NaOH)
- Sharp fruit knife
- Phenolphthalein indicator (1% in 50% ethanol)
- 1000 ml graduated cylinder
- 500 ml graduated cylinder
- Brix hydrometer with thermometer
- 100ml burette with stop cock
- Burette holder (metal stand)
- 100 ml & 250 ml beakers

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- 250 ml Erlenmeyer flask
- Cheese cloth or equivalent
- Permanent marker
- 125 ml amber bottle with eye dropper
- 25 ml pipette and pipette bulb
- Sizing caliper
- Plastic squeeze bottle

### Grapefruit

These procedures were adapted for market inspection sites from the Florida Department of State, Fresh Fruit Maturity Sampling and Testing procedures within [Florida Administrative Code Rule 20-34.006](#) and Florida Citrus Code, Chapter 601, 1995 Edition, Sections 601.16 and 601.17.

Imported fresh grapefruit under Section 8e are required to be inspected and certified as meeting minimum grade and size requirements. Part of the minimum grade requirement is the fruit must be mature. Grapefruit inspected under Section 8e will be considered mature when:

- Each fruit, after having been severed from the tree, shows a **break in color**, caused solely by nature, with yellow color predominating on not less than 25 percent of the fruit's surface in the aggregate.
- The **juice content** of each fruit is not less than the minimum requirements for the respective fruit size as set forth in 20-34.006.
- The total **soluble solids (Brix)** of the juice is not less than 7.5 percent;
  - Except for the period January 1 through July 31, seedless grapefruit meeting minimum color break, ratio, and juice content requirements of paragraph (a) shall be deemed mature when the total soluble solids (Brix) of the juice is not less than 7 percent.
- The ratio of the total soluble solids (Brix) to anhydrous citric acid (**Brix to Acid Ratio**) meets the requirements of 601.17.
  - Except for the period April 15 through July 31, seedless grapefruit meeting minimum color break, soluble solids, and juice content requirements shall be deemed mature when the ratio of soluble solids to anhydrous citric acid is not less than six to one.

The following procedures describe the processes to determine if the above maturity requirements are met.

Break in Color

Each fruit examined must show a break in color with yellow color predominating on not less than 25 percent of the fruit's surface in the aggregate. Record the number of any fruit that do not meet this requirement on the grading scoresheet or on a similar official record.

If anyone fruit does not meet this requirement the size fails break in color, proceed to Sample Collection for remaining maturity testing.

Sample Collection for Brix, Juice Content, and Brix to Acid Ratio Testing

The number of grapefruit juiced for testing is 10 per size. However, collect 20 in case a backup sample is needed. For the sample collection, select grapefruit examined during the grading process of average size within the load. Samples collected will be used for both the Juice Content and Brix to Acid Ratio tests.

## A. Average Size Determination

Collected grapefruit must be of average size for the designated sizes within the load. To determine the average size set your caliper to the measurements below for the designated size and measuring in the center and at right angles to the blossom-to-stem axis to determine which grapefruit match the listed average diameter.

The average diameter for testing purposes specified by the Florida Department of Citrus Section 20-34.006.3 for the respective sizes shall be as follows:

Size 14 = 5 3/4 inches	Size 32 = 4 1/4 inches	Size 56 = 3 9/16 inches
Size 18 = 5 9/32 inches	Size 36 = 4 1/8 inches	Size 64 = 3 1/2 inches
Size 23 = 4 25/32 inches	Size 40 = 3 15/16 inches	Size 80 = 3 inches
Size 27 = 4 9/16 inches	Size 48 = 3 3/4 inches	

## B. Number of Average Size Grapefruit Selected

The number of average sized grapefruit to be selected is 20 per designated size within the load.

As the sample is being collected use a permanent marker to record the determined average size on each grapefruit and place into a cardboard box, basket, or bag for transport to the testing area. Include any additional lot identifiers (i.e., brands, grower, applicant, etc.) necessary in/on the box, basket, or bag if multiple loads are being sampled and tested.

### Testing Procedures

- The number of grapefruit juiced for testing is 10 per size.
  - Each size will be juiced and tested individually.
  - Juice extracted will be used for both the Juice Content and Brix to Acid Ratio tests.
- A. Extraction of the Juice for Testing
1. Weigh the 10 grapefruit for testing and record weight in grams to one decimal place (i.e., 3,123.6 grams) on the grading scoresheet or on a similar official record.
  2. Cut the 10 fruit crosswise between the stem and blossom ends to make two halves.
  3. Place a collection pan under spout of the electronic citrus juicer.
  4. Cover collection pan with cheesecloth to filter pulp or seeds.
  5. Take a fruit half, holding it firmly, press it against the burr of the juicer.
  6. Allow at least one minute of drip time after applying the last fruit half to the juicer.
  7. When all 20 halves have been juiced take the corners of the cheesecloth, place them together, and give a full twist. Hold the cloth in one hand and apply squeezing pressure with the other hand. The pressure, if repeated several times, should separate all the juice from the pulp and seed.
- B. Determination of Juice Content
- There are two methods used, Volume and Weight-to-Weight. Weight-to-Weight will only be used if the Volume method resulted in a failure.
1. Volume Method
    - a. Weigh an empty 1000 ml cylinder to determine the tare weight should the Weight-to-Weight method be necessary. Record the weight in grams to one decimal place on the grading notesheet or on a similar official record.
    - b. Place cylinder into an empty pan. Pan will collect juice that may spill.
    - c. Pour extracted juice from the extraction steps above into cylinder.
    - d. Weigh the cylinder containing the extracted juice (including any spillage in pan) in grams to one decimal place, subtract tare weight of the cylinder and

record the extracted juice weight in grams to one decimal place on the grading notesheet or on a similar official record next to the weight of the 10 grapefruit recorded earlier under Extraction of the Juice for Testing procedure.

- e. Record resulting volume as indicated on the 1000 ml cylinder as cubic centimeters of juice (CCs), on the grading notesheet or on a similar official record. One ml equals one CC.
- f. Compare resulting CCs with the Grapefruit Juice Requirements D.O.C. 20-34.006 volume requirement listed on [Appendix I - FDACS Packinghouse Maturity Chart](#) for the corresponding size and time period.
- g. If result value is less than the value listed on the corresponding FDACS Packinghouse Maturity Chart proceed to the Weight-to-Weight method below.
- h. If result value is equal to or higher than the value listed on the corresponding FDACS Packinghouse Maturity Chart the size meets Juice Content, proceed to Brix determination.

## 2. Weight-to-Weight Method

- a. Use the 10 grapefruit weight determined and recorded during the Extraction of the Juice for Testing procedures and the extracted juice weight determined and recorded during the Volume Method.
- b. Divide the recorded extracted juice weight by the recorded grapefruit weight to determine the percentage of juice.
- c. Compare the percentage of juice value with the Grapefruit Juice Requirements D.O.C. 20-34.006 “% Juice” requirement listed on [Appendix I - FDACS Packinghouse Maturity Chart](#) for the corresponding size and time period.
- d. If percentage of juice value is less than the percentage listed on the corresponding FDACS Packinghouse Maturity Chart for the corresponding size and time period the size fails to meet Juice Content. Proceed to Brix determination procedures below.
- e. If percentage of juice value is equal to or higher than the percentage listed on the corresponding FDACS Packinghouse Maturity Chart for the

corresponding size and time period, the size meets Juice Content. Proceed to Brix determination procedures below.

### C. Brix Determination

1. Using the same juice from the determination of the juice content, place a 500 ml graduated cylinder in an empty collection pan.
  2. Fill cylinder with extracted juice, allowing it to run over if necessary.
  3. Carefully place the brix hydrometer (free from any moisture or dirt) into the cylinder containing the juice. Be sure the pan and cylinder are level, so the hydrometer does not touch the sides of the cylinder.
  4. As you lower the brix hydrometer into the cylinder, give it a slight spin to dislodge any air bubbles.
  5. Allow the brix hydrometer to float in the juice from 3 to 5 minutes.
  6. Take the Brix reading on the hydrometer. Do not attempt to move the cylinder or pan containing the hydrometer to see it better. Ensure reading is taken at eyelevel across a straight line with the surface of the juice in the cylinder. The juice around the stem of the hydrometer will climb up the stem above the surface of the juice in the cylinder leaving a curve in the upper surface. This is called the meniscus. When obtaining the Brix reading, do not read the top of the meniscus, but across the surface of the liquid. In many cases you cannot see through the meniscus. If not, read the top of the meniscus and add one graduation (1/10) to the reading.
  7. Take the temperature reading on the hydrometer by lifting the hydrometer by the stem and bringing the instrument up to eye level. Read the temperature scale in the bulb of the hydrometer and add or subtract the temperature adjustment according to [Appendix II – Table 3: Temperature Correction °Brix to Standard Temperature 20°C](#).
- Note: Do not touch the lower end of the hydrometer before reading it, as this will affect the temperature and will cause inaccurate readings.
8. Record the adjusted Brix percent on the grading notesheet or on a similar official record.
  9. Compare the adjusted Brix percent with the Grapefruit Standards (Intrastate Only) Minimum Total Solids % requirement listed on [Appendix I - FDACS Packinghouse Maturity Chart](#) for the corresponding time period.

10. If adjusted Brix percent is less than the percentage listed on the corresponding FDACS Packinghouse Maturity Chart for the corresponding time period, the size fails to meet the Brix requirement. Proceed to Brix to Acid Ratio determination procedures below.
11. If adjusted Brix percent is equal to or higher than the percentage listed on the corresponding FDACS Packinghouse Maturity Chart for the corresponding time period, the size meets Brix requirement. Proceed to Brix to Acid Ratio determination procedures below.

D. Determination of Brix to Acid Ratio

Juice extracted and used for Juice Content will be used for determination of Brix to Acid Ratio.

1. Determination of Brix

Brix percent used to determine Brix to Acid Ratio will be the same value used above in Brix Determination.

2. Determination of Percent Acid

- a. Fill the burette with a solution of 0.3125 N sodium hydroxide (standard alkali) and adjusted to the zero mark.
- b. Using the same juice from the determination of Brix, fill a 25 ml pipette with juice by placing the tip of the pipette about an inch below the surface of the juice until 25 CCs is visible on the indicator line.
- c. With forefinger held firmly to the opening, draw out the juice and release into a flask by rolling the pipette very slowly with the left thumb and index finger, at the same time releasing a little pressure of the right finger. The juice will drop slowly from the tip end.
- d. When the juice is lowered to the mark on the upper stem, stop the flow by tightening the pressure of the right finger.
- e. Transfer juice to the Erlenmeyer flask.
- f. When the pipette is emptied, wipe the tip end against the inside of the flask.
- g. Add 3 to 5 drops of Phenolphthalein test solution to juice.



- h. Place flask underneath burette.
  - i. Carefully agitate the flask by gently swirling the liquid in the flask during the time the sodium hydroxide is dripping into the juice. Slowly continue adding sodium hydroxide by dripping it into the juice until **a distinct break to pink (but not red) endpoint is reached**. This break in color indicates that the acid in the juice has been neutralized by the sodium hydroxide.
  - j. Read the level of the burette to the nearest 0.01 CC and record the value on the grading notesheet or on a similar official record.
  - k. Find this value on [Appendix III – FDACS Conversion](#) Standard Alkali Solution Percent Anhydrous Citric Acid and record the corresponding “Citric Acid Anh. Pct.” value from the chart on the grading notesheet or on a similar official record.
  - l. Record this corresponding percent acid value from the chart on the grading notesheet or on a similar official record.
3. Calculation of Brix to Acid Ratio
- a. With the percent brix (A) and percent acid (B) determined above, divide A by B to get the Brix to Acid Ratio result. Record this ratio on the grading notesheet or on a similar official record.
$$\text{Brix to Acid Ratio} = \frac{\text{Percent Solids/Brix (A)}}{\text{Percent Acid (B)}}$$
Consult [Appendix I - FDACS Packinghouse Maturity Chart](#) under “Grapefruit Standards (Intrastate Only)” to find the “Solids to Acid Min. Ratio” corresponding to the recorded percent brix (A).
  - b. If the calculated ratio is less than the corresponding “Solids to Acid Min. Ratio” the size fails to meet the Brix to Acid Ratio requirement. Proceed to Final Maturity Determination.
  - c. If the calculated ratio is equal to or greater than the corresponding “Solids to Acid Min. Ratio” the size meets the Brix to Acid Ratio requirement. Proceed to Final Determination.

### Final Maturity Determination

The lot will be mature when:

- Each fruit, after having been severed from the tree, shows a break in color, caused solely by nature, with yellow color predominating on not less than 25 percent of the fruit's surface in the aggregate;
- The juice content of each fruit is not less than the minimum requirements for the respective fruit size as set forth in 20-34.006.
- The total soluble solids (Brix) of the juice is not less than 7.5 percent.
  - Except for the period January 1 through July 31, seedless grapefruit meeting minimum color break, ratio, and juice content requirements of paragraph (a) shall be deemed mature when the total soluble solids (Brix) of the juice is not less than 7 percent.
- The ratio of the total soluble solids (Brix) to anhydrous citric acid (Brix to Acid Ratio) meets the requirements of 601.17.

Except for the period April 15 through July 31, seedless grapefruit meeting minimum color break, soluble solids, and juice content requirements shall be deemed mature when the ratio of soluble solids to anhydrous citric acid is not less than six to one.

Sizes that do not meet all the requirements above are not mature and will not meet a U.S. grade and will not meet U.S. Import Requirements under Section 8e of the Agriculture Marketing Agreement Act of 1937 as amended.

Lots failing these maturity requirements will not be retested. Failing lots that have been reconditioned and represented for inspection must meet the original maturity requirements and pass the original maturity tests. Appealed lots can not be restricted to maturity only and must meet all original maturity requirements and pass all original maturity tests.

Sizes can be combined into passing and failing lots based on grade statements.

### **Care and Calibration of Equipment**

Instruments and equipment should not be washed or come in contact with tap water while testing. The hydrometer cylinder, graduate cylinders, flasks, and pans should be well drained before testing the next lot of fruit. They should be washed at the close of the day's work with a clean brush and water and turned over to drain. (Do not use soap)

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Refer to the CALIBRATION OF EQUIPMENT section of this manual (Technical Procedures Manual) for proper use of distilled water for the equipment used.

Calibrate the scale according to the INSPECTION EQUIPMENT section of the General Market Manual.

APPENDIX I - FDACS PACKING HOUSE MATURITY CHART

Link to Electronic Version

PACKING HOUSE MATURITY CHART

Florida Department of Agriculture & Consumer Services

Table with 5 main columns: TANGELO STANDARDS, \* ORANGE STANDARDS, C.A.C.'s MINIMUM MATURITY FOR GRAPEFRUIT, GRAPEFRUIT JUICE REQUIREMENTS, and TANGERINE STANDARDS. Includes detailed maturity data, juice requirements, and footnotes.

**APPENDIX II – TABLE 3: TEMPERATURE CORRECTION °BRIX TO STANDARD TEMPERATURE 20°C; SP-99, QUALITY TESTS FOR FLORIDA CITRUS, UNIVERSITY OF FLORIDA, INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES, 1995**

**Table 3.** Temperature Correction for °Brix to Standard Temperature 20°C.<sup>1</sup>

Temperature °C	Correction Factor °Brix	Temperature °C	Correction Factor °Brix
10.0	-0.45	24.0	+0.25
10.5	-0.45	24.5	+0.25
11.0	-0.40	25.0	+0.30
11.5	-0.40	25.5	+0.35
12.0	-0.40	26.0	+0.35
12.5	-0.35	26.5	+0.40
13.0	-0.35	27.0	+0.45
13.5	-0.30	27.5	+0.45
14.0	-0.30	28.0	+0.50
14.5	-0.25	28.5	+0.55
15.0	-0.25	29.0	+0.55
15.5	-0.25	29.5	+0.60
16.0	-0.20	30.0	+0.65
16.5	-0.20	30.5	+0.70
17.0	-0.15	31.0	+0.70
17.5	-0.15	31.5	+0.75
18.0	-0.10	32.0	+0.80
18.5	-0.10	32.5	+0.85
19.0	-0.05	33.0	+0.85
19.5	-0.05	33.5	+0.90
20.0	0.00	34.0	+0.95
20.5	+0.05	34.5	+1.00
21.0	+0.05	35.0	+1.05
21.5	+0.10	35.5	+1.10
22.0	+0.10	36.0	+1.10
22.5	+0.15	36.5	+1.15
23.0	+0.15	37.0	+1.20
23.5	+0.20	37.5	+1.25

<sup>1</sup> For hydrometers calibrated to 17.5°C, shift the values in this table by 2.5°C so that the zero correction factor corresponds to 17.5°C.

**APPENDIX III – FDACS CONVERSION STANDARD ALKALI SOLUTION PERCENT ANHYDROUS CITRIC ACID**

**Conversion standard (0.3125N) alkali solution percent anhydrous citric acid.**

Standard (0.3125 N) Alkali C. C.	Citric Acid Anh. Pct.	Standard (0.3125 N) Alkali C. C.	Citric Acid Anh. Pct.	Standard (0.3125 N) Alkali C. C.	Citric Acid Anh. Pct.
1.0	.06	7.8	.60	12.5	.96
2.0	.15	7.9	.61	12.6	.97
2.5	.19	8.0	.615	12.7	.98
3.0	.23	8.1	.62	12.8	.985
3.5	.27	8.2	.63	12.9	.99
3.6	.28	8.3	.64	13.0	1.00
3.7	.285	8.4	.645	13.1	1.01
3.8	.29	8.5	.65	13.2	1.015
3.9	.30	8.6	.66	13.3	1.02
4.0	.31	8.7	.67	13.4	1.03
4.1	.315	8.8	.68	13.5	1.04
4.2	.32	8.9	.685	13.6	1.045
4.3	.33	9.0	.69	13.7	1.05
4.4	.34	9.1	.70	13.8	1.06
4.5	.345	9.2	.71	13.9	1.07
4.6	.35	9.3	.715	14.0	1.08
4.7	.36	9.4	.72	14.1	1.085
4.8	.37	9.5	.73	14.2	1.09
4.9	.38	9.6	.74	14.3	1.10
5.0	.385	9.7	.745	14.4	1.11
5.1	.39	9.8	.75	14.5	1.115
5.2	.40	9.9	.76	14.6	1.12
5.3	.41	10.0	.77	14.7	1.13
5.4	.415	10.1	.78	14.8	1.14
5.5	.42	10.2	.785	14.9	1.145
5.6	.43	10.3	.79	15.0	1.15
5.7	.44	10.4	.80	15.1	1.16
5.8	.445	10.5	.81	15.2	1.17
5.9	.45	10.6	.815	15.3	1.18
6.0	.46	10.7	.82	15.4	1.185
6.1	.47	10.8	.83	15.5	1.19
6.2	.48	10.9	.84	15.6	1.20
6.3	.485	11.0	.845	15.7	1.21
6.4	.49	11.1	.85	15.8	1.215
6.5	.50	11.2	.86	15.9	1.22
6.6	.51	11.3	.87	16.0	1.23
6.7	.515	11.4	.88	16.1	1.24
6.8	.52	11.5	.885	16.2	1.245
6.9	.53	11.6	.89	16.3	1.25
7.0	.54	11.7	.90	16.4	1.26
7.1	.545	11.8	.91	16.5	1.27
7.2	.55	11.9	.915	16.6	1.275
7.3	.56	12.0	.92	16.7	1.28
7.4	.57	12.1	.93	16.8	1.29
7.5	.58	12.2	.94	16.9	1.30
7.6	.585	12.3	.945	17.0	1.31
7.7	.59	12.4	.95	17.1	1.315

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