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United States Standards for Grades of Concentrated Lemon Juice for Manufacturing

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This is a reprint of the United States Standards for Grades of Concentrated Lemon Juice for Manufacturing (24 FR 5278) which have been in effect since August 1, 1959 and were updated to modify the format and to correct and align the text as originally published in the CFR.

Voluntary U.S. grade standards are issued under the authority of the Agricultural Marketing Act of 1946, which provides for the development of official U.S. grades to designate different levels of quality. These grade standards are available for use by producers, suppliers, buyers, and consumers. As in the case of other standards for grades of fresh and processed fruits, vegetables, and specialty crops these standards are designed to facilitate orderly marketing by providing a convenient basis for buying and selling, for establishing quality control programs, and for determining loan values.

The U.S. grade standards and inspection instructions for all fresh and processed fruits, vegetables, and specialty crops are available on the internet and upon request at the address below. These documents provide detailed interpretations of the grade standards and provide step-by-step procedures for grading the product.

Grade standards are issued by the U.S. Department of Agriculture (USDA) after careful consideration of all data and views submitted during rulemaking. The Department welcomes suggestions for improving the standards in future revisions. Comments may be submitted to, and copies of standards and inspection instructions obtained from:

Director, Specialty Crops Inspection Division
Specialty Crops Program,
USDA, Agricultural Marketing Service
1400 Independence Avenue, SW, STOP 0240
Washington, D.C. 20250

Authority: 7 U.S.C. 1621-1627.

Note: Compliance with the provisions of these standards shall not excuse failure to comply with the provisions of the Federal Food, Drug, and Cosmetic Act, or with applicable State laws and regulations.

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Product Description and Grades
§52.3951 Product description.

Concentrated lemon juice for manufacturing is the concentrated product obtained from sound, mature lemons. The fruit is prepared by sorting and by washing prior to extraction of the juice. The concentrated lemon juice is prepared and concentrated in accordance with good commercial practice. It may or may not require processing by heat, subsequent refrigeration, or freezing to assure preservation of the product. The finished product may contain added pulp, lemon oil to standardize flavor, and/or chemical preservatives permissible under provisions of the Federal Food, Drug, and Cosmetic Act.

§52.3952 Grades of concentrated lemon juice for manufacturing.

- (a) **U.S. Grade A for Manufacturing** (or **U.S. Fancy for Manufacturing**) is the quality of concentrated lemon juice which shows no material gelation and reconstitutes properly, of which the reconstituted juice possesses a reasonably good color and is practically free from defects; when prepared for flavor evaluation, possesses a reasonably good flavor; and scores not less than 85 points when scored in accordance with the scoring system outlined in this subpart.
- (b) **U.S. Grade C for Manufacturing** (or **U.S. Standard for Manufacturing**) is the quality of concentrated lemon juice which shows no serious gelation and reconstitutes properly, of which the reconstituted juice possesses a fairly good color and is fairly free from defects; when prepared for flavor evaluation, possesses a fairly good flavor; and scores not less than 70 points when scored in accordance with the scoring system outlined in this subpart.
- (c) **Substandard for Manufacturing** is the quality of concentrated lemon juice that fails to meet the requirements of U.S. Grade C for Manufacturing.

Fill of Container

§52.3953 Recommended fill of container.

The recommended fill of container is not incorporated in the grades of the finished product since fill of container, as such, is not a factor of quality for the purposes of these grades. It is recommended that each container be filled with concentrated lemon juice as full as practicable without impairment of quality.

Pulp Requirements

§52.3954 Pulp.

- (a) Pulp is not considered a factor of quality for the purpose of these standards. It is recommended that purchase contracts specify the type and amount of pulp desired in the product. The amount of pulp in the concentrate may be

determined by the methods outlined in this subpart.

Concentration

§52.3955 Degree of concentration.

The degree of concentration of the lemon juice is not considered a factor of quality for the purpose of these standards. It is recommended that the degree of concentration be indicated by the number of grams of anhydrous citric acid contained in each liter of the concentrate.

Factors of Quality

§52.3956 Ascertaining the grade of a sample unit.

(a) **General.** The grade of a sample unit of concentrated lemon juice for manufacturing is ascertained by examining the concentrate, the reconstituted juice, and a sweetened product prepared therefrom; and in addition to considering other requirements outlined in the standards, the following quality factors are evaluated:

(1) **Factors not rated by score points.**

- (i) Degree of gelation;
- (ii) Faculty of reconstituting properly.

(2) **Factors rated by score points.** The relative importance of each factor which is scored is expressed numerically on the scale of 100. The maximum number of points that may be given such factors are:

Factors	Points
Color	40
Defects	20
Flavor	40
Total Score	100

§52.3957 Ascertaining the rating for the factors which are scored.

The essential variations within each factor which is scored are so described that the value may be ascertained for each factor and expressed numerically. The numerical range within each factor which is scored is inclusive. (For example, **17 to 20 points** means 17, 18, 19, or 20 points.)

§52.3958 Color.

- (a) Color of the product is evaluated by observing the reconstituted juice in a glass test tube one inch in diameter by six inches deep; observation to be made through the side of the tube.
- (b) **"A-Mfg." classification.** Concentrated lemon juice of which the reconstituted juice possesses a reasonably good color may be given a score of 34 to 40 points. **Reasonably good color** means that the color is reasonably bright and typical of properly processed lemon juice and is practically free from browning caused by scorching, oxidation, storage conditions, or other causes.
- (c) **"C-Mfg." classification.** If the reconstituted juice possesses a fairly good color a score of 28 to 33 points may be given. Concentrated lemon juice that falls into this classification shall not be graded above U.S. Grade C for Manufacturing, regardless of the total score for the product (this is a limiting rule). **Fairly good color** means a color that may be only fairly bright and is typical of reconstituted lemon juice that is reasonably free from browning due to scorching, oxidation, improper storage, or other causes.
- (d) **"SStd-Mfg." classification.** Concentrated lemon juice that fails to meet the requirements of paragraph (c) of this section may be given a score of 0 to 27 points and shall not be graded above Substandard for Manufacturing, regardless of the total score for the product (this is a limiting rule).

§52.3959 Defects.

- (a) The factor of defects refers to the degree of freedom from particles of seed, dark specks, particles of peel and other defects which affect the utility of the product.
- (b) **"A-Mfg." classification.** Concentrated lemon juice of which the reconstituted juice is practically free from defects may be given a score of 17 to 20 points. **Practically free from defects** means that any defects present do not more than slightly affect the appearance or utility of the product.
- (c) **"C-Mfg." classification.** If the reconstituted juice is fairly free from defects a score of 14 to 16 points may be given. Concentrated lemon juice that falls into this classification shall not be graded above U.S. Grade C for Manufacturing, regardless of the total score for the product (this is a limiting rule). **Fairly free from defects** means that any defects present do not seriously affect the appearance or utility of the product.
- (d) **"SStd-Mfg." classification.** Concentrated lemon juice that fails to meet the requirements of paragraph (c) of this section may be given a score of 0 to 13 points and shall not be graded above Substandard for Manufacturing, regardless of the total score for the product (this is a limiting rule).

§52.3960 Flavor.

- (a) The flavor of the product is evaluated after preparing as follows:

Concentrated Lemon Juice Diluted to 5.7 grams acid/100 ml	30 ml.
Sugar	26 ml.
Water	160 ml.

- (b) **"A-Mfg." classification.** Concentrated lemon juice of which the prepared product possesses a reasonably good flavor may be given a score of 34 to 40 points. **Reasonably good flavor** means that the flavor is typical of such a product prepared from properly processed concentrated lemon juice and is free from terpenic, oxidized, rancid or other similar flavors and is free from abnormal flavors of any kind.
- (c) **"C-Mfg." classification.** If the prepared product possess a fairly good flavor a score of 28 to 33 points may be given. Concentrated lemon juice that falls into this classification shall not be graded above U.S. Grade C for Manufacturing, regardless of the total score for the product (this is a limiting rule). **Fairly good flavor** means a normal lemon flavor which is fairly free from terpenic, oxidized or other similar flavors and is free from abnormal flavors of any kind.
- (d) **"SStd-Mfg." classification.** Concentrated lemon juice that fails to meet the requirements of paragraph (c) of this section may be given a score of 0 to 27 points and shall not be graded above Substandard for Manufacturing, regardless of the total score for the product (this is a limiting rule).

Explanations and Methods of Analyses

§52.3961 Definition of terms.

- (a) **Reconstituted juice.** **Reconstituted juice** means the product obtained by thoroughly mixing the concentrated lemon juice with a volume of distilled water so that the concentration is reduced to approximately 5.7 grams acid per 100 ml.
- (b) **Acid.** **Acid** means the number of grams of total acidity, calculated as anhydrous citric in a specified volume of concentrated lemon juice or reconstituted juice. Total acidity is determined by titration with standard sodium hydroxide solution, using phenolphthalein as indicator.
- (c) **Reconstitutes properly.** **Reconstitutes properly** means that the concentrate dissolves readily in water.

- (d) **Pulp. Pulp** means light membranous materials and fine centrifuged pulp and other similar lemon fruit material, defined and ascertained as follows:
- (1) **Light membranous materials. Light membranous materials** means pulp including juice sacs but exclusive of peel particles, that is recoverable by the following method:
- (i) **Equipment.** United States Standard No. 20 Circular Sieve 8-inches in diameter containing 20 meshes to the inch (0.0331 inch ± 5 percent) square openings; graduated cylinder or centrifuge tube; spatula.
- (ii) **Procedure.**
- (a) Pour one liter of the product through the sieve with the aid of a gentle stream of tap water;
- (b) Rinse the retained pulp with a gentle stream of tap water only until all of the product is removed from the pulp;
- (c) Dry and gather the pulp into a ball by shaking the sieve back and forth;
- (d) As soon as the pulp has been gathered into a ball, place it into a suitable dry graduated cylinder or centrifuge tube and settle by tapping lightly in the palm of one's hand. If air pockets remain a thin spatula may be used to effect their removal;
- (e) The number of milliliters of pulp divided by ten is the percent by volume of **light membranous material**;
- (f) If the light membranous material so recovered exceeds 100 milliliters or will not dry and gather into a small ball, discard results and repeat the test using a sample so reduced in size as to yield less than 100 milliliters of such material which will so dry and gather. Calculate the percent of light membranous materials as follows:

$$\text{Percent of light membranous materials by volume} = \frac{\text{ml. recovered material} \times 100}{\text{ml. of sample}}$$

- (2) **Fine centrifuged pulp. Fine centrifuged pulp** means pulp that settles out on centrifuging by the following method:

- (i) Remove the light membranous material from the sample of reconstituted juice by pouring it through a No. 20 sieve, and
- (ii) Fill graduated centrifuge tubes, of a capacity 50 ml., with the sieved reconstituted lemon juice and place in a suitable centrifuge. Adjust the speed as nearly as possible according to diameter as indicated in Table I and centrifuge for exactly 10 minutes. As used herein, **diameter** means the overall distance between the bottoms of opposing centrifuge tubes in operating position. After centrifuging, the milliliter reading at the top of the layer of pulp in the tube is multiplied by two to give the percentage of pulp.

Table I¹

Diameter (inches)	Revolutions per Minute
10	1,609
10-1/2	1,570
11	1,534
11-1/2	1,500
12	1,468
12-1/2	1,438
13	1,410
13-1/2	1,384
14	1,359
14-1/2	1,336
15	1,313
15-1/2	1,292
16	1,271
16-1/2	1,252
17	1,234
17-1/2	1,216
18	1,199
18-1/2	1,182
19	1,167
19-1/2	1,152
20	1,137

¹ This table, calculated from the formula $R.C.F. = 0.0001118N^2r$, provides a Relative Centrifugal Force of 364.6 times gravity.

Lot Inspection and Certification**§52.3962 Ascertaining the grade of a lot.**

The grade of a lot of concentrated lemon juice for manufacturing covered by these standards is determined by the procedures set forth in the Regulations Governing Inspection and Certification of Processed Fruit and Vegetables, Processed Products Thereof, and Certain other Processed Food Products (§§ 52.1 to 52.87).

Score Sheet**§52.3963 Score sheet for concentrated lemon juice for manufacturing.**

Size and kind of container			
Container mark or identification			
Label (including concentration)			
Liquid measure (fluid ounces)			
Net weight			
Anhydrous citric acid in concentrate (grams/liter)			
Reconstitutes properly: (Yes) (No)			
Factors		Score points	
Color	40	"A-Mfg."	34 - 40
		"C-Mfg."	28-33 <u>1/</u>
		"SStd-Mfg."	0-27 <u>1/</u>
Defects	20	"A-Mfg."	17-20
		"C-Mfg."	14-16 <u>1/</u>
		"SStd-Mfg."	0-13 <u>1/</u>
Flavor	<u>40</u>	"A-Mfg."	34-40
		"C-Mfg."	28-33 <u>1/</u>
		"SStd-Mfg."	0-27 <u>1/</u>
Total score	100		
Percent of light membranous materials			
Percent of fine centrifuged pulp			
U.S. Grade for manufacturing			

1/ Indicates limiting rule.