United States Department of Agriculture

Agricultural Marketing Service

Fruit and Vegetable Division

Processed Products Branch

United States Standards for Grades of Frozen Concentrate for Limeade

Effective date September 21, 1968

This is the first issue, as amended, of the United States Standards for Grades of Frozen Concentrate for Limeade published in the FEDERAL REGISTER of August 22, 1968 (33 FR 11881), to become effective September 21, 1968. This issue supersedes the first issue, which has been in effect since November 2, 1956.

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 processed fruits and vegetables, 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 standards also serve as a basis for the inspection and grading of commodities by the Federal inspection service, the only activity authorized to approve the designation of U.S. grades as referenced in the standards, as provided under the Agricultural Marketing Act of 1946. This service, available as on-line (in-plant) or lot inspection and grading of all processed fruit and vegetable products, is offered to interested parties, upon application, on a fee-for-service basis. The verification of some specific recommendations, requirements, or tolerances contained in the standards can be accomplished only by the use of on-line inspection procedures. In all instances, a grade can be assigned based on final product factors or characteristics.

In addition to the U.S. grade standards, grading manuals or instructions for inspection of several processed fruits and vegetables are available upon request for a nominal fee. These manuals or instructions contain detailed interpretations of the grade standards and provide step-by-step procedures for grading the product.

Grade standards are issued by the Department after careful consideration of all data and views submitted, and the Department welcomes suggestions which might aid in improving the standards in future revisions. Comments may be submitted to, and copies of standards and grading manuals obtained from:

Chief, Processed Products Branch
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U.S. Department of Agriculture
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United States Standards for Grades of Frozen Concentrate for Limeade

Section **Page No.**

Authority: The provisions of this subpart issued under sec. 205, 50 stat. 1090, as amended; 7 U.S.C. 1624.

. . . . . .

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.

§52.2521 Product description.

Frozen concentrate for limeade is the product prepared from lime juice and one or more nutritive sweetening ingredients to which may be added oil derived from limes for added flavor, and may or may not contain water in sufficient quantities to standardize the product. The lime juice is produced from fresh, sound, mature, and thoroughly cleansed fruit of one or more of the varieties of the species Citrus aurantifolia. Such juice may be fresh or frozen or may be fresh juice concentrated or frozen concentrated. The concentrate for limeade is processed in accordance with good commercial practice and is frozen and maintained at temperatures sufficient for the preservation of the product. If properly labeled, any artificial color permissible under the provisions of the Federal Food, Drug, and Cosmetic Act may be added.

§52.2522 Grades of frozen concentrate for limeade.

(a) **U.S. Grade A or U.S. Fancy** is the quality of frozen concentrate for limeade which mixes readily into a limeade that possesses an amount of pulp and cloud, so as to substantially reflect the appearance of limeade prepared from freshly expressed lime juice; that possesses a good color; that is practically free from defects; that possesses a good flavor; and that scores not less than 85 points when scored in accordance with the scoring system outlined in this subpart.

(b) **U.S. Grade B or U.S. Choice** is the quality of frozen concentrate for limeade which mixes readily into a limeade that possesses at least a slight, but not an excessive, amount of pulp and cloud so as to reasonably reflect the appearance of limeade prepared from freshly expressed lime juice; that possesses a reasonably good color; that is reasonably free from defects; that possesses a reasonably good flavor; and that scores not less than 70 points when scored in accordance with the scoring system outlined in this subpart.

(c) **Substandard** is the quality of frozen concentrate for limeade that fails to meet the requirements of **U.S. Grade B** or **U.S. Choice**.

§52.2523 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 purpose of these grades. It is recommended that each container be filled as full as practicable with frozen concentrate for limeade.

§52.2524 Ascertaining the grade.

(a) General. The grade of frozen concentrate for limeade is ascertained by considering the factors of quality which are not scored and those which are scored as follows:

(1) Factors which are not scored.

(i) Ease of mixing into limeade.

(ii) Amount of pulp and cloud.

(2) Factors which are scored. 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:

Factor:	**Points**
Color	20
Defects	20
Flavor	60
Total score	100

(b) Determination of scores. The scores for the factors of color, defects, and flavor are determined immediately after the product has been prepared as limeade by thoroughly mixing the frozen concentrate for limeade with a specific volume of water as directed by the manufacturer.

§52.2525 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.)

§52.2526 Color.

(a) **"A" classification.** Frozen concentrate for limeade which, when prepared as limeade, possesses a good color may be given a score of 17 to 20 points. **Good color** means a good bright characteristic color that reflects the appearance of limeade prepared from freshly expressed lime juice; or, if artificially colored, possesses a bright attractive light green color typical of artificially colored limeade.

(b) **"B" classification.** If the frozen concentrate for limeade, when prepared as limeade, possesses a reasonably good color, a score of 14 to 16 points may be given. Frozen concentrate for limeade that falls into this classification shall not be graded above **U.S. Grade B** or **U.S. Choice,** regardless of the total score for the product (this is a limiting rule). **Reasonably good color** means a characteristic color that reflects to a reasonable extent the color of limeade prepared from freshly expressed lime juice and is not dark or otherwise discolored for any reason; or, if artificially colored, possesses a reasonably bright color typical of artificially colored limeade.

(c) **"SStd" classification.** If the limeade fails to meet the requirements of paragraph (b) of this section, a score of 0 to 13 points may be given. Frozen concentrate for limeade that falls into this classification shall not be graded above **Substandard** regardless of the total score for the product (this is a limiting rule).

§52.2527 Defects.

(a) **General.** The factor of defects refers to the degree of freedom from seeds or portions of seeds, from harmless extraneous material, from objectionable material and from other defects not specifically mentioned that affect the appearance or drinking quality of the product.

(1) **Harmless extraneous material** includes, but is not limited to, particles of seeds, rag, peel and pulp that will pass through round perforations not exceeding 1/8 inch in diameter.

(2) **Seeds or portions of seeds** means:

(i) Any intact seed; or

(ii) Any portion of a seed that will not pass through round perforations 1/8 inch in diameter.

(b) **"A" classification.** Frozen concentrate for limeade which, when prepared as limeade, is practically free from defects may be given a score of 17 to 20 points. **Practically free from defects** means that there may be present not more than an average of one seed or portion of seed for each quart of prepared limeade; and that the appearance and drinking quality of the limeade is not materially affected by the presence of seeds, portions of seeds, objectionable material, harmless extraneous material, any other defects not specifically mentioned, or any combination thereof.

(c) **"B" classification.** If the limeade is reasonably free from defects, a score of 14 to 16 points may be given. Frozen concentrate for limeade that falls into this classification shall not be graded above **U.S. Grade B or U.S. Choice** regardless of the total score for the product (this is a limiting rule). **Reasonably free from defects** means that there may be present not more than an average of two seeds or portions of seeds for each quart of limeade; and that the appearance and drinking quality of the limeade is not seriously affected by the presence of seeds, portions of seeds, objectionable material, harmless extraneous material, any other defects not specifically mentioned, or any combination thereof.

(d) **"SStd" classification.** If the limeade fails to meet the requirements of paragraph (c) of this section a score of 0 to 13 points may be given. Frozen concentrate for limeade that falls into this classification shall not be graded above **Substandard** regardless of the total score for the product (this is a limiting rule).

§52.2528 Flavor.

(a) **"A" classification.** Frozen concentrate for limeade which, when prepared as limeade, possesses a good flavor may be given a score of 51 to 60 points. **Good flavor** means a fine, distinct, and substantially typical flavor of limeade prepared from freshly expressed lime juice and which flavor is free from terpenic, oxidized, rancid, or other off flavors. To score in this classification, the limeade shall test not less than 10.5 degrees Brix; shall contain not less than 0.7 gram of acid per 100 mL. of the limeade; may not contain more than 0.025 mL. or less than 0.008 mL. of recoverable oil per 100 mL. of the limeade; and the Brix-acid ratio shall not exceed 18:1.

(b) **"B" classification.** If the prepared limeade possesses a reasonably good flavor a score of 42 to 50 points may be given. Frozen concentrate for limeade that falls into this classification shall not be graded above **U.S. Grade B or U.S. Choice** regardless of the total score for the product (this is a limiting rule). **Reasonably good flavor** means a fairly typical flavor of limeade prepared from freshly expressed lime juice and which flavor is practically free from terpenic, oxidized, rancid, or other off flavors and is free from abnormal flavors of any kind. To score in this classification, the limeade shall test not less than 10.5 degrees Brix; shall contain not less than 0.7 gram of acid per 100 mL. of the limeade; may not contain more than 0.035 mL. or less than 0.008 mL. of recoverable oil per 100 mL. of the limeade; and the Brix-acid ratio shall not exceed 18:1.

(c) **"SStd" classification.** If the prepared limeade fails to meet the requirements of paragraph (b) of this section, a score of 0 to 41 points may be given. Frozen concentrate for limeade that falls into this classification shall not be graded above **Substandard** regardless of the total score for the product (this is a limiting rule).

§52.2529 Definition of terms.

(a) **Brix** means the degrees Brix of the limeade when tested with a Brix hydrometer calibrated at 20 degrees C. (68 degrees F.). If used in testing limeade at a temperature other than 20 degrees C. (68 degrees F.) the applicable temperature correction shall be made to the reading of the scale as prescribed in **Official Methods of Analysis of the Association of Official Analytical Chemists (AOAC).** The degrees Brix of limeade may be determined by any other method which gives equivalent results.

(b) **Acid** means the grams of acid (calculated as anhydrous citric acid) per 100 mL. of the prepared limeade determined by titration with standard sodium hydroxide solution using phenolphthalein as an indicator.

(c) **Brix-acid ratio** means the ratio between the degrees Brix as determined in this section and the acid in grams per 100 mL. of limeade.

(d) **Dilution factor** is the value obtained by dividing a volume of limeade by the volume of concentrate for limeade used in its preparation when such limeade is prepared in accordance with the manufacturer's directions.

§52.2530 Explanation of analyses.

Recoverable oil is determined by the following method:

(a) Reagents.

Standard bromide-bromate solution - prepared and standardized to 0.099N in accordance with Chapter 42. Standard Solutions in the current edition of the **AOAC**. For use, add 1 volume of standard solution to 3 volumes of water to make 0.0247N solution. 1 mL of 0.0247N solution supplies bromine to react with 0.00085g., or 0.0010 mL., of d-limonene. The solutions are stable for 6 months.

2-Propanol - Reagent grade, **American Chemical Society (ACS)**.

Dilute hydrochloric acid - prepared by adding 1 volume of concentrated acid to 2 volumes of water.

Methyl orange indicator - 0.1 percent in water.

(b) Apparatus.

(1) Electric heater - with recessed refractory top, 500-750 watts.

(2) Still, all glass - 500 mL. distillation flask with 24/40 standard taper neck; 200 mm. Graham condenser with 28/15 receiving socket and drip tip; connecting bulb and adapter as shown in Figure 1.

(3) Burette-10 mL. or 25 mL. graduated to 0.1 mL., with easily controllable flow to permit both rapid and dropwise titration.

(c) Determination.

(1) Pipette 25 mL. of well-mixed sample (juice or reconstituted juice) into the distillation flask containing carborundum chips or glass beads, and add 25 mL. of 2-Propanol.

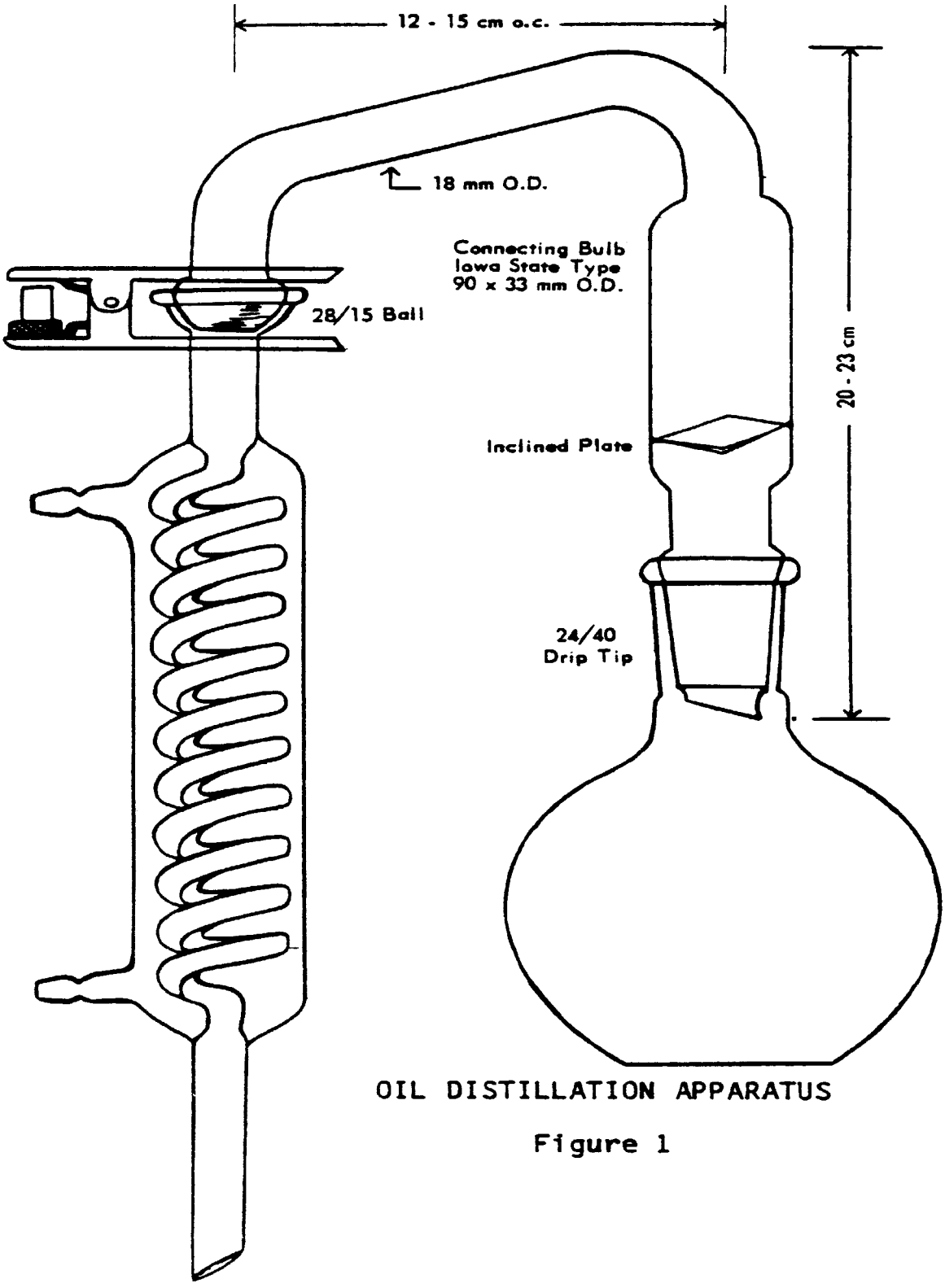
(2) Distill into a 150 mL. beaker. Continue distilling until solvent ceases to reflux then remove the flask from the heater.

(3) Add 10 mL. of dilute hydrochloric acid and 1 drop of indicator. (An alternative method would be to prepare a solution containing 5 mL. of indicator and 1,000 mL. of dilute hydrochloric acid-then add 10 mL. of this acid-indicator mix to the 150 mL. beaker).

(4) Titrate with the dilute bromate solution while stirring. The major portion of the titrant may be added rapidly, but the endpoint must be approached at about 1 drop per second. Disappearance of color indicates the endpoint.

(5) Determine the reagent blank by titrating three separate mixtures of 25 mL. 2-Propanol and 10 mL. of dilute hydrochloric acid with indicatior without refilling the burette. Divide the total mL. of titrant used by three to obtain the average blank. Subtract the average blank thus obtained from the mL. of the titrant used to titrate the distillate.

(6) Multiply the remainder by 0.004 to obtain the percent recoverable oil by volume in the limeade.



OIL DISTILLATION APPARATUS

Figure 1

§52.2531 Ascertaining the grade of a lot.

The grade of a lot of the frozen concentrate for limeade covered by these standards is determined by the procedures set forth in the **Regulations Governing Inspection and Certification of Processed Fruits and Vegetables, Processed Products Thereof, and Certain Other Processed Food Products** (7 CFR 52.1 to 52.83).

§52.2532 Score sheet for frozen concentrate for limeade.

Size and kind of container . . . . .
Container mark or identification . . . . .
Label (including dilution factor) . . . . .
Liquid measure (fluid ounces) . . . . .
Brix of the limeade . . . . .
Anhydrous citric acid in the limeade (grams/100 mL) . . . . .
Brix-acid ratio . . . . .
Recoverable oil (mL/100 mL of the limeade) . . . . .
Reconstitutes properly (yes) (no) . . . . .

Factors	Score Points		
Color	20	"A" "B" "SStd"	17-20 14-16 1/ 0-13 1/
Defects	20	"A" "B" "SStd"	17-20 14-16 1/ 0-13 1/
Flavor	60	"A" "B" "SStd"	51-60 42-50 1/ 0-41 1/
Total Score	100		
U.S. Grade			

1/ Indicates limiting rule.

Effective date. The amendments to each affected grade standard shall become effective 30 days after publication hereof in the **FEDERAL REGISTER**.

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G.R. Grange,
Deputy Administrator,
Agricultural Marketing Service

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