United States
Department of
Agriculture

Agricultural
Marketing
Service

Fruit and
Vegetable
Division

Processed
Products
Branch

United States Standards for Grades of Grapefruit Juice and Orange Juice

Effective date November 1, 1972

This is the sixth issue of the United States Standards for Grades of Grapefruit Juice and Orange Juice published in the **FEDERAL REGISTER** of October 6, 1972 (37 FR 21155) to become effective November 1, 1972. This issue supersedes the fifth issue, which has been in effect since July 1, 1969.

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
Fruit and Vegetable Division, AMS
U.S. Department of Agriculture
P.O. Box 96456, Rm. 0709, So. Bldg.
Washington, D.C. 20090-6456

United States Standards for Grades of Grapefruit Juice and Orange Juice

Authority: Agricultural Marketing Act of 1946, Secs. 203, 205, 60 Stat. 1087, as amended, 1090, as amended (7 U.S.C. 1622, 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.

§52.1281 Product description.

(a) Grapefruit Juice and Orange Juice (or Orange Juice and Grapefruit juice), hereinafter referred to as Grapefruit Juice and Orange Juice, is prepared from a combination of unfermented juices obtained from mature fresh grapefruit (Citrus paradisi) and mature sweet oranges (Citrus sinensis). The juice of oranges from the mandarin group (Citrus reticulata), however, may be added in such quantities that not more than 10 percent, by volume, of the orange juice ingredient consists of juice from citrus reticulata. It is recommended that the minor juice ingredient (either orange or grapefruit) provide not less than 25 percent, by weight, of the total soluble fruit solids present in the finished product.

(b) The fruit is prepared and the juice extracted and processed in a manner to assure a clean and wholesome product.

(c) Soluble solids, insoluble solids, Brix-acid ration, and flavor may be adjusted by suitable manufacturing procedures.

(d) The product is processed by appropriate physical means to assure its preservation through normal marketing channels. Such means include, but are not limited to:

(1) **Canning.** Processing with heat so as to assure the preservation of the juice in hermetically sealed containers.

(2) **Refrigerating.** Reducing the temperature of the product so as to extend its market life. The juice may or may not have been subjected to heat prior to refrigerating. It may or may not be packed in hermetically sealed containers.

§52.1282 Types.

The product may be identified as one of the following types:

(a) **Single strength type.** Composed of single strength grapefruit juice and orange juice, with or without added grapefruit juice concentrate and/or orange juice concentrate.

(b) **Reconstituted type.** Composed of grapefruit juice concentrate and orange juice concentrate and water, with or without added single strength grapefruit juice and/or single strength orange juice.

§52.1283 Styles.

(a) Unsweetened.

(b) Sweetened.

§52.1284 Grades.

(a) **U.S. Grade A or U.S. Fancy** is the quality of grapefruit juice and orange juice that:

(1) Shows no coagulation;

(2) Has a good color;

(3) Is practically free from defects;

(4) Has a good flavor; and

(5) Scored not less than 90 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 grapefruit juice and orange juice that:

(1) May show only a slight coagulation;

(2) Has a reasonable good color;

(3) Is reasonably free from defects;

(4) Has a reasonably good flavor; and

(5) Scores not less than 80 points when scored in accordance with the scoring system outlined in this subpart.

(c) Substandard is the quality of grapefruit juice and orange juice that fails to meet the requirements of U.S. Grade B.

§52.1285 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 the container be as full of grapefruit juice and orange juice as practicable and that the product occupy not less than 90 percent of the volume capacity of the container.

§52.1286 Ascertaining the grade.

(a) **General.** Consideration is given to the degree of coagulation, the ratings for the factors which are scored, and the limiting rules which may apply.

(b) **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:

Factors	Points
Color	20
Defects	40
Flavor	40
Total score	100

§52.1287 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, **18 to 20 points** means 18, 19 or 20 points).

§52.1288 Color.

(a) **"A" classification**. Grapefruit juice and orange juice that has a good color may be given a score of 18 to 20 points. **Good color** means that the juice mixture has a yellow-orange color that is bright and typical of the freshly extracted juice of oranges and either white fleshed grapefruit or red or pink fleshed grapefruit, and is free from browning due to scorching, oxidation, caramelization, or other causes.

(b) "B" classification. Grapefruit juice and orange juice that has a reasonably good color may be given a score of 16 or 17 points. Juice that falls into this classification shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule). **Reasonably good color** means that the juice has a fairly typical color that may range from light yellow to light amber, may be dull or show evidence of slight browning, but is not off color.

(c) "SStd" classification. Grapefruit juice and orange juice that fails the color requirements of U.S. Grade B may be given a score of 0 to 15 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.1289 Defects.

(a) General. The factor of defects concerns the degree of freedom from small seeds and seed portions; from discolored specks, harmless extraneous material, and other similar defects; from juice sacs and particles of membrane, core, and peel in excess of that normally present in grapefruit juice and orange juice; and from free and suspended pulp.

(b) "A" classification.

(1) Grapefruit juice and orange juice that is practically free from defects may be given a score of 36 to 40 points.

(2) Practically free from defects means that the juice may not contain more than 12 percent free and suspended pulp as determined by the method outlined in this subpart, and that any other defects present may no more than slightly detract from the appearance or drinking quality of the juice.

(c) "B" classification.

(1) Grapefruit juice and orange juice that is reasonably free from defects may be given a score of 32 to 35 points. Such product shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule).

(2) Reasonable free from defects means that the juice may not contain more than 18 percent free and suspended pulp as determined by the method outlined in this subpart, and that any other defects present may no more than materially detract from the appearance or drinking quality of the juice.

(d) "SStd" classification. Grapefruit juice and orange juice that fails to meet the requirements of U.S. Grade B may be given a score of 0 to 31 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.1290 Flavor.

(a) "A" classification.

(1) Grapefruit juice and orange juice that has a good flavor may be given a score of 36 to 40 points.

(2) **Good flavor** means the following with respect to the method of preservation used:

(i) **Refrigerated juice** or juice not subjected to high temperatures prior to refrigerating: **Good flavor** means a flavor that is fine, distinct, and substantially typical of freshly extracted grapefruit juice and orange juice which is free from off flavors and off odors of any kind;

(ii) **Canned juice** or juice that has been subjected to high temperatures: **Good flavor** means a fine, distinct grapefruit juice and orange juice flavor which is free from off flavors and off odors of any kind; and

(iii) The flavor of all juices may be affected only slightly by the process, the packaging, or storage conditions and the juice complies with the analytical limits listed in Table I

Table I - Analytical Requirements-U.S. Grade A

Type Style	Single strength Unsweetened	 Sweetened	Reconstituted Unsweetened	 Sweetened
Brix (Degrees) Minimum .	10.0°	11.5°	11.0°	12.5°
Brix-Acid Ratio-				
If Brix is less than 11.5°:				
Minimum	9.5:1	.....	9.5:1	.....
Maximum	18.0:1	.....	18.0:1	.....
If Brix is 11.5° or more:				
Minimum	8.5:1	10.5:1	9.5:1	10.5:1
Maximum	18.0:1	18.0:1	18.0:1	18.0:1
Oil-Maximum percent by volume	0.035	0.035	0.035	0.035

(b) "B" classification.

(1) Grapefruit juice and orange juice that has a reasonably good flavor may be given a score of 32 to 35 points. Grapefruit juice and orange juice of this flavor shall not be graded above U.S. Grade B, regardless of the total score for the product (this is a limiting rule).

(2) **Reasonably good flavor** means a flavor less desirable than **good flavor** because of excess bitterness, terpenic, processing, storage, or container flavors but is not seriously objectionable and is free from off flavors and off odors of any kind. Such juice complies with the analytical limits listed in Table II.

Table II - Analytical Requirements-U.S. Grade B

Type	Single strength		Reconstituted	
Style	Unsweetened	Sweetened	Unsweetened	Sweetened
Brix (Degrees) Minimum	9.5°	11.5°	11.0°	12.5°
Brix-Acid Ratio:				
Minimum	8.0:1	10.5:1	9.0:1	10.5:1
Maximum	None	None	None	None
Oil-Maximum percent by volume	0.055	0.055	0.055	0.055

(c) "SStd" classification. Grapefruit juice and orange juice that fails the requirements of the U.S. Grade B classification may be given a score of 0 to 31 points and shall not be graded above Substandard, regardless of the total score for the product (this is a limiting rule).

§52.1291 Definitions of terms and methods of analysis.

(a) Brix. Brix means the degrees Brix of the juice when tested with a Brix hydrometer calibrated at 20° C. (68° F.) and to which any applicable temperature correction has been made. The degrees Brix may be determined by any other method which gives equivalent results.

(b) Acid. Acid means the grams of total acidity, calculated as anhydrous citric acid, per 100 grams of juice, Total acidity is determined by titration with standard sodium hydroxide solution, using phenolphthalein as indicator.

(c) Brix-Acid ratio. Brix-Acid ratio is the ratio of the degrees Brix of the grapefruit juice and orange juice to the grams of anhydrous citric acid per 100 grams of the juice.

(d) Free and suspended pulp. Free and suspended pulp means the percentage of pulp determined by the following method: Graduated centrifuge tubes with a capacity of 50 ml. are filled with juice and places in a suitable centrifuge. The speed is adjusted, according to diameter, as indicated in Table No. III, and the juice is centrifuged for exactly 10 minutes. As used in this subparagraph, **diameter** means the overall distance between the bottoms of opposing centrifuge tubes in operation position. After centrifuging, the milliliter reading at the top of the layer of pulp in the tube is multiplied by 2 to give the percentage of pulp.

Table III

Diameter (inches)	Appproximate 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

(e) Recoverable oil is determined by the following method:

(1) 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.[1] 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., dlimonene. The solutions are stable for 6 months.

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

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

Methyl orange indicator-0.1 percent in water.

(2) Apparatus.

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

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.

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

(3) Determination

(i) 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.

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

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[1]**AOAC** refers to the Official Methods of Analysis published by the Association of Official Analytical (formerly Agricultural) Chemists. Copies may be obtained from the Association at Box 540, Benjamin Franklin Station, Washington, D.C. 20044.

(iii) 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).

(iv) 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.

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

(vi) Multiply the remainder by 0.004 to obtain the percent recoverable oil by volume in the juice sample.

§52.1292 Ascertaining the grade of a lot.

The grade of a lot of grapefruit juice and orange juice 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 through 52.83).

§52.1293 Score sheet.

Size and kind of container		
Container Mark		
Cans		
or		
Cases		
Identification		
Label (including ingredient statement, if any)		
Liquid measure (fluid ounces)		
Vacuum (inches)		
Style		
Brix (degrees)		
Acid (grams/100gms: calculated as anhydrous citric acid)		
Brix-acid ratio (:1)		
Pulp (free and suspended) (%)		
Recoverable oil (% by Volume)		
Degree of coagulation (None), (Slight), or (Serious)		
Scoring Factors	Score Points	
Color	20	"A" 18-20 "B" 16-17 1/ "SStd" 0-15 1/
Defects	40	"A" 36-40 "B" 32-35 1/ "SStd" 0-15 1/
Flavor	40	"A" 36-40 "B" 32-35 1/ "SStd" 0-31 1/
Total Score	100	
Grade		

1/ Indicates limiting rule.

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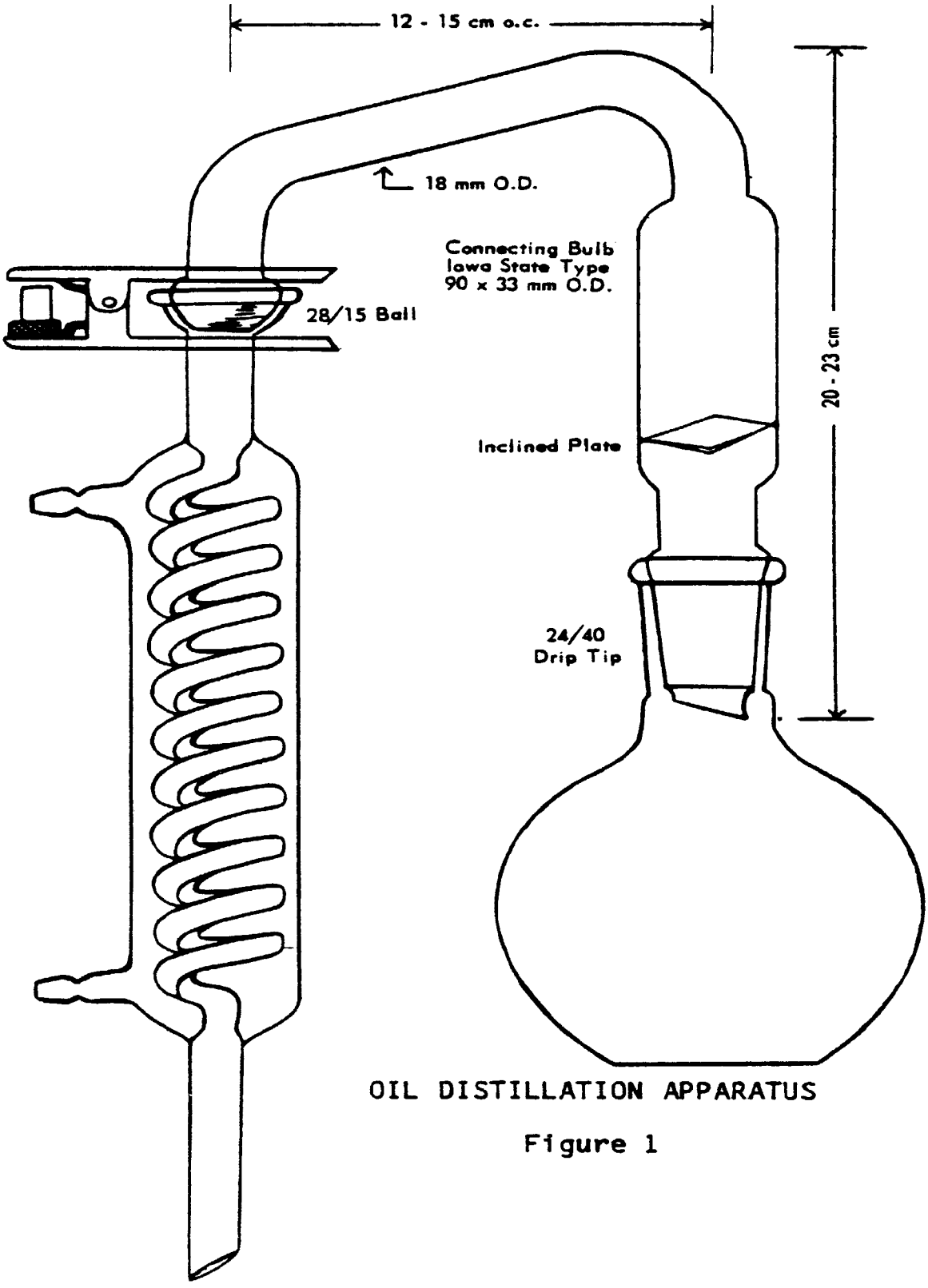

OIL DISTILLATION APPARATUS

Figure 1