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Division

Processed
Products
Branch

Grading Manual for Canned Fruit Cocktail

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This manual is designed for Processed Products Branch Personnel of the U.S. Department of Agriculture. Its purpose is to give background information and guidelines to assist in the uniform application and interpretation of U.S. grade standards, other similar specifications and special procedures.

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History

Preparation and processing of a mixture of diced fruits originated in the Food Products Laboratory of the University of California between the years 1920 and 1925. The original purpose was to find a favorable outlet for imperfectly shaped pears and peaches sorted out of the regular canning operation. The product would also help to provide a market for surplus seedless grapes. The product was turned over to the industry for development. Consumer acceptance started slowly. Since that time production has increased steadily. Practically all of the total pack of canned fruit cocktail is produced in California near the source of the three main ingredients - peaches, pears and grapes.

Identity

The U.S. Standards for Grades of Canned Fruit Cocktail do not apply to other mixtures of diced or chopped fruits. Canned fruit cocktail is the product represented as defined in the Standard of Identify (21 CFR 145.135 and 145.136) for canned fruit cocktail and canned artificially sweetened fruit cocktail, respectively, issued pursuant to the Food, Drug, and Cosmetic Act.

Canned fruit cocktail is a mixture of five fruit ingredients. The form or shape of the fruit and the proper proportions of the five ingredients have been legally standardized by FDA. Any product which contains less than five fruits, nonspecified fruits, or any nonspecified form or shape of fruit is not legally CANNED FRUIT COCKTAIL.

Product which is offered for inspection as canned fruit cocktail but which fails the criteria for proportions of fruit ingredients should be certified as CANNED MIXED FRUIT. Flag the grade statement with the appropriate statement which indicates failure of proportions of fruit ingredients. See File Code 165-A-1.

The five fruit ingredients are as follows:

1. Peaches. Peaches of any yellow variety may be used. The yellow clingstone is preferred because it has a more attractive appearance and better character after processing. Peaches are diced from pitted, peeled and washed halves.
2. Pears. Diced pears of any variety are permitted. The Bartlett variety is preferred because of its flavor and adaptability to processing. The Hardy variety is used if Bartletts are in short supply.
3. Grapes. FDA Standards of Identify permit whole grapes of any seedless variety, of the species *Vitis vinifera* L. or *Vitis labrusca* L.

4. **Pineapple.** Pineapple in either the form of sectors (tidbits) or dice is permissible. Sectors are preferred. The supply of pineapple is imported. It is packed at the point of origin in No. 10 cans (water pack).
5. **Cherries.** Natural, sweet, light- colored cherries are permitted in fruit cocktail but the approximate half of the **maraschino** is the usual form. Maraschino cherries are artificially colored. The color must be **set** to prevent **running** of the dye and subsequent staining of other fruits in the cocktail. Cherries may also be artificially flavored. However, practically all of the cherries used in fruit cocktail are unflavored. Cherries are purchased in 50 gallon containers from sources in several States, mainly California and Oregon. Recent FDA action has limited the number of approved red coloring agents.

Processing.

Automatic machine filling of fruit cocktail is accomplished by passing a line of empty cans under a **battery** of hoppers or fillers which contain the fruiting ingredients. This is called the **layer pack** system. Each fruit is added to the container as a separate layer. In other operations, pear and peach dice are mixed prior to filling. Electronic counting equipment is often used to add the correct amount of the most expensive ingredients -- pineapple and cherries.

Sirup of the desired Brix is added after filling the containers with fruit. Filled cans are passed under a vacuum siruping machine. Other systems add high-Brix sirup and then add water later before the can is closed.

Closed containers are passed through continuous cookers and coolers. Coolers should expel cans at about 95° to 105° F. This temperature evaporates surface moisture before the cans are stored. Fruit cocktail cased at too high temperature could discolor (darkening of the light-colored ingredients and pinking of pear dice).

Evaluation of Quality Factors.

Assign the score for score point factors (color, uniformity of size, absence of defects, and character) which is the **lowest** score given to any one of the individual fruit ingredients. Each ingredient is permitted the full tolerance but no single ingredient may exceed the allowance.

Clearness of the Packing Liquid.

Observe the liquid against a white background. This will aid in detecting any **off-color**. Score packing liquid based on its appearance in a 1-1/4 inch diameter glass cylinder. Use a fairly liberal interpretation, especially when the pear ingredient is from ripe fruit. Any dullness of color or any pink tinge from artificially color cherries or improper cooking is more important than the presence of flocculent material.

Specialty packs of fruit cocktail in fruit juices or pulps may produce unclear liquid. Grade it Substandard. Other variations of the packing liquid, such as honey and brown sugar, discolor the liquid and may cause the sample unit to be Substandard.

Color.

The color of each fruit ingredient is based on its typical color in relationship to maturity and proper preparation and processing. Uniformity of color (except artificially colored red cherries) is also considered in scoring the factor of color. Pink staining caused by artificially colored red cherries is considered in addition to the degree of brightness and uniformity of color of each fruit ingredient. If pink tinges should be present from any cause other than from cherries, consider these tinges in evaluating uniformity of color of the individual fruit ingredients affected.

Running of artificial color is usually more noticeable on the pear and pineapple ingredient. Staining may appear immediately after canning but often does not take place until three or four weeks after canning.

Blemished cherries (whether natural or artificially colored) and **unevenly colored** cherries (when artificially colored) are scored as defects and not under the factor of color unless they are **off-color**.

The explanations and percentage allowances in Table I of these instructions are guides only. Score points may be adjusted based on the appearance of the sample unit as a whole. This guide does not reflect the relative degree of the many possible color variations.

Staining From Artificially Colored Cherries.

Individual units of fruit cocktail affected by pink staining are scoreable when the stains (singly or in combination on a unit) exceed in the aggregate the area of a circle $\frac{3}{16}$ inch in diameter. Further adjustment in applying the percentage allowances should be based on the overall appearance of the sample unit as it is affected by staining -- very light pink; uniform intensity; depth or extent; dark pink or deep intensity, etc.

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Table I
Scoring Guide for Color

Grade	Score	Color of Each Fruit Component	Pink Staining of Individual Fruit Units (% by wt. of dr. wt.)
A	20	Bright; practically uniform; characteristic of top "A" or equivalent color for maturity.	No scoreable staining.
	19	Bright; practically uniform; characteristic of minimum "A" or equivalent color for maturity.	No scoreable staining.
	18	Bright; practically uniform; characteristic of top "B" or equivalent color for maturity; no dullness.	1% to 5% inclusive may have scoreable staining, provided appearance is not more than slightly affected.
	17	Bright; practically uniform; characteristic of minimum "B" or equivalent color for maturity; no dullness. May include 2%, by weight of grade C color.	6% to 10%, inclusive may have scoreable staining, provided, appearance is not more than slightly affected.
B <u>1/</u>	16	Reasonably bright; reasonably uniform; characteristic of top "C" or equivalent color for maturity.	11% to 15% inclusive may have scoreable staining, provided, appearance is not materially affected.
	15	Reasonably bright; reasonably uniform; characteristic of mid "C" or equivalent color for maturity; may be slightly dull but not off-color .	16% to 20% inclusive may have scoreable staining, provided, appearance is not materially affected.
	14	Reasonably bright; reasonably uniform; characteristic of minimum "C" or equivalent color for maturity; may be slightly dull but not off-color . May include 5%, by weight, Substandard color.	16% to 20% inclusive may have scoreable staining, provided, appearance is not materially affected.
SStd <u>2/</u>	13 or less	Fails to meet foregoing color for any single fruit component or if any of the fruit components are definitely dull or off-color .	More than 20% scoreable staining or the extent appearance is definitely affected materially.

1/ Canned fruit cocktail that is grade B because of staining or dullness (partial limiting rule) shall not be graded above U.S. Grade B, regardless of the total score.

2/ Canned fruit cocktail that falls in the SStd classification shall not be graded above SStd, regardless of the total Score.

Note: U.S. Grade B fruit cocktail must contain at least minimum U.S. Grade B color grapes.

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Uniformity of Size.

Size requirements for diced units.

The cut edge of a diced unit should not exceed $\frac{3}{4}$ inch or be small enough to pass through a $\frac{5}{16}$ inch square opening. Approximate diamond-shaped units which meet this requirement are considered diced units. Units which appear to be chopped and irregularly-shaped chips are not considered diced. Diced units joined together because of incomplete dicing are measured as one unit. If the joined edge of the incompletely diced unit exceeds $\frac{3}{4}$ inch, include it with that portion which fails maximum size allowance.

Size requirements for whole grapes.

Uniformity of size of whole grapes is based on the weight relationship of the largest grape to the smallest grape. Weight varies approximately with the cube of the diameter. An increase of $\frac{1}{8}$ inch (from $\frac{1}{2}$ to $\frac{5}{8}$ inch) almost doubles the weight (1.95 times). It is expected that 95%, or more, of the grapes will be uniform in size. Disregard occasional small or large grapes, not to exceed 5%, by count. Score the remaining 95% for uniformity of size. Some processors use large grapes in one item and small grapes in another item. Whole grapes are scored for uniformity of size and not for specific size.

Size requirements for cherry halves.

Use only intact cherry halves to determine uniformity of size. Uniformity of size is based on the longest dimension of the cut surface of the **largest** appearing half in relationship to the longest dimension of the cut surface of the **smallest** appearing half.

Method for determining the size of diced units.

Manual sorting of small dice or chips that pass through a $\frac{5}{16}$ inch square opening is slow. For practical inspection purposes, the following procedure will produce reasonable results.

1. Use a 8 inch diameter sieve with wire-cloth screen of $\frac{5}{16}$ inch (or 0.312 inch) square openings. This sieve should nest between the two standard 8-inch, 8-mesh sieves;
2. Place 10 to 15 ounces of the dice on the $\frac{5}{16}$ inch sieve. Nest this sieve between the two 8-inch 8-mesh sieves;

3. Submerge in water and float the chips through. Avoid sudden breaking of the surface of the water with the screen during this process. Allow enough time to permit all chips to pass through the screen. After washing the small chips through onto the 8-mesh sieve, pick out all dice over 3/4 inch in any edge dimension and add to the chips;
4. Weigh the separated portions that fail requirements and the portion that meets the requirements. From the total weight of these drained portions, calculate the percentage, by weight, of pieces that are smaller than 5/16 inch and those that are more than 3/4 inch in any edge dimension;
5. Use a gram scale or a scale calibrated to 1/10 ounce for the determination; and
6. Consider 1/3 to 1/2 of the sample units as a sufficient number of size determinations unless a problem exists.

Assigning score points for uniformity of size.

Assign the score for uniformity of size which is the **lowest** score given to any one of the individual fruit ingredients. Each ingredient is permitted the full tolerance but no single ingredient may exceed the allowance. Allowances permitted in the dimensions of diced units and sectors are based on each fruit ingredient and not on an aggregate of all the ingredients (peach, pear, and pineapple). Peach and pear dice may be combined as a short cut (about half and half), provided, that uniformity of size appears about the same for both ingredients. Off-size dice shall not exceed 20%, by weight, of each ingredient. Use Table II as a working guide in allocation of score points for uniformity of size.

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TABLE II

Guide for Assigning Score Points for Uniformity of Size

Grade Classification	Score	Peach	Pear	(Diced) Pineapple	(Sectors) Pineapple	(Whole) Grapes	(Halves) Cherries-Intact
Grade A		Maximum percent, by weight, of each fruit ingredient that may fail the required dimensions.				Maximum weight variation: Largest to smallest whole grape (in 95%, by count, of the most uniform).	Maximum dimension variation: longest cut surface (of largest cherry to the smallest cherry).
	20	4%	4%	4%	4%	Practically none	Practically none
	19	6%	6%	6%	6%	2 times smallest	25%
	18	8%	8%	8%	8%	3 times smallest	33 1/3%
	17	10%	10%	10%	10%	3 times smallest	33 1/3%
Grade B	16	12%	12%	12%	12%	4 times smallest	50%
	15	15%	15%	15%	15%	4 times smallest	50%
		If any one of the fruit ingredients exceeds 15%, by weight, the product shall not be graded above grade B, regardless of the total score (this is a partial limiting rule).					
	14	20%	20%	20%	20%	4 times smallest	50%
Substandard	13 or less	over 20 %	over 20%	over 20%	over 20%	if exceeds above	if exceeds above
		and BELOW STANDARD IN QUALITY					

Absence of Defects.

Blemished Units.

Peach and Pear Units.

There is a **twilight zone** between the U.S. standards and the FDA standards. It is possible for fruit cocktail to be Substandard and **not** fail FDA standards.

Weight very closely correlates with count when dicing is reasonably uniform. For practical purposes in scoring blemished peach and pear units, use either weight or count -- the one that is most convenient. In borderline situations, use **weight** to determine the U.S. grade but use **count** to determine FDA **BELOW STANDARD IN QUALITY**. FDA Standards of Quality for fruit cocktail are in 21 CFR, Part 145.

Score calyxes, interior stems and core material collectively (the defects may occur singly or in combination). This will permit more of one kind of defect to occur in the absence of others. Score 1/2 calyx or more as one calyx.

Allowance {	Grade A - 1 per 60 ounce net weight (total contents).
	Grade B - 1 per 30 ounces net weight (total contents)

Grapes.

A **blemished grape** means any discolored area on or in the grape which singly or in aggregate materially affects the appearance of the grape

Crushed or broken grapes. The definition of **crushed** or **broken** grape is further described as follows:

A **crushed** grape is a grape that is so severely crushed that it possesses an obviously mashed or mutilated appearance

A **broken** grape is a grape which has been severed into separate parts or split completely so as to present an open hinge-like appearance with the unit held together by only the external skin and closely adhering flesh.

Portions or fragments of grapes that are the equivalent of one grape are considered as one grape in determining compliance with percentages by count of grapes. Cracked grapes without discoloration that are less severe than outlined under **broken** grapes are considered as processing cracks and are not scored as defects. Score grapes with processing cracks under the factor of **character**. Don't score grapes that are cracked, crushed, or broken by handling during grading.

Capstems.

FDA allowances cover only grapes with **attached** capstems. Loose capstems may be equally as objectionable. Score loose capstems on an appearance basis and consider attached capstems at the same time. If there are practically no grapes with attached capstems, allow more loose capstems. Allow fewer loose capstems if attached capstems are near the maximum allowance. Don't be overly technical. Grade the fruit cocktail Substandard

only when the maximum of 10%, by count, of grapes with attached capstems is exceeded throughout most of the sample units.

Use the following working guide on either official sample units or unofficially submitted samples:

Practically free from loose capstems - Allow capstems (both loose and attached) totalling no more than 15% of the number of grapes, including no more than 10% of the grapes which may have attached capstems.

Reasonably free from loose capstems - Allow capstems (both loose and attached) totalling an average of 20% of the number of grapes including an average of no more than 10% of the grapes which may have attached capstems. No individual container in a lot may have more than 30% (both loose and attached) including not more than 20% which may have attached capstems.

Peel.

The FDA standards base peach peel and pear peel on **peel per pound** of drained peach and pear ingredient plus a proportional weight of packing liquid. The U.S. standards for grade B fruit cocktail permit 1/4 square inch of peach and/or pear peel for each pound of net contents. Not more than 1/4 square inch of pear and/or peach peel may be present in each 16 ounces of fruit cocktail. This **does not** mean that a total of 1/4 square inch each of peach peel and pear peel for a total of 1/2 square inch may be present.

Pit material and pear seed.

The U.S. standards do not have a specific allowance for pit material. The FDA standards require that the peaches and cherries be pitted; and that the pears be cored. Avoid being overly technical. Permit a slight amount of pit material or a few pear seeds.

Score only definitely hard pit material as pieces of pit. If the pieces are sharp, deeply imbedded in the fruit tissue, or injurious to health, disregard the allowance in the working guide.

Consider each whole pit as 1 piece. When 2 or more pieces of pit are attached to a single unit of fruit, score as 1 piece.

Consider each pear seed, or the equivalent in pieces as one seed.

Use the following as a working guide only:

Grades A and B	Officially drawn		Unofficially Submitted
	Individual container	Sample Average	Individual container
Pits or portions thereof; and/or pear seeds.	(maximum) 7 per #10 3 per #3 cyl 2 per #2½ and smaller	(maximum) 1 per 50 ounces net weight	(maximum) 2 per #10 1 per can smaller than #10

Broken Cherry Halves.

The U.S. standards define a broken cherry half as, **any portion of a cherry that is definitely less than an apparent half or a definitely mutilated cherry half.** Avoid being overly technical. Broken cherries occur under good commercial practice. Consider as one unit (or one approximate half), broken pieces that in the aggregate approximate one-half cherry. The grade A allowance for broken cherry halves is further limited to not more than an **average of 5%, by count.** This average applies to officially drawn and unofficially submitted containers.

Assigning score points.

Assign the score for defects which is the **lowest score given to any one of the fruit ingredients.** Each ingredient is permitted the full allowance but no single ingredient may exceed the allowance.

Character.

The factor of character covers texture and tenderness of the fruit ingredients. Judge texture and tenderness on the basis of the particular style of the fruit ingredient after preparation and processing. Assign the score point for character which is the **lowest score given to any one of the fruit ingredients.**

Grade A.

The texture of the pears and peaches should be equal to or better than grade B character for canned diced pears and peaches. Peach units, for example need to have only fairly well defined edges. When Freestone peaches are used, allow a liberal interpretation of **fairly well defined edges**. Cherry halves seldom present a problem from the standpoint of character and need be only **reasonably firm**.

Pineapple must be grade A

Peaches permit 5 percent, by weight, of peach ingredient excessively frayed, mushy, or not tender.

Pears permit 5 percent, by weight, of pear ingredient to be fairly good character due to firmness or graininess.

Grapes Must be reasonably plump and firm. Permit 2 percent, by count, flabby grapes. A **flabby grape** is defined as a grape where the skin is intact and not broken, but the interior portion of the grape is missing to the extent that the grape has a deflated or sunken appearance.

Grade B.

The texture of the pears and peaches should be equal to or better than grade C character for canned diced pears and peaches. When pears of marked graininess are used, score character as grade B.

Pineapple must be grade B or better.

Peaches permit 10 percent, by weight, to be excessively frayed, mushy, or firm so as not to be tender.

Pears permit 10 percent, by weight, to be excessively firm.

Grapes permit 10 percent, by weight, to be flabby grapes.

Substandard

Contains any fruit ingredient that consists predominantly of excessively hard or soft units.

Flavor and Odor.

Normal flavor and odor is a requirement of grades A and B. It is necessary to make allowance for each specialty pack of fruit cocktail that varies from the regular sirup pack. These variations of the packing liquid might include some of the following: water, fruit juice and/or pulp, corn sweetener, nonnutritive or artificial sweetener, honey and/or brown sugar.

Excessive nonnutritive or artificial sweetener might impart an objectionable **sharp, bitter, or acid** flavor.

Sample units that are objectionable in flavor for any reason, but edible, are **Substandard**. Inedible sample units are considered **worse-than-a-deviant**.

Weight of Solid Fruit Ingredient.

Drained weights in the U.S. standards for canned fruit cocktail are not **recommended** as in many other U.S. standards. They are based on the FDA Standard of Fill of Container for canned fruit cocktail and are mandatory. Drained fruit ingredient which is less than 65% of the water capacity is **BELOW STANDARD IN FILL**.

Brix.

Make Brix determinations on the liquid or comminuted contents of canned fruit cocktail, regardless of the kind of packing liquid -- nutritive or nonnutritive sweeteners. Also record the facts concerning added nonnutritive sweeteners.

Determination of Proportions of Fruit Ingredients.

Legally, canned fruit cocktail must meet FDA Standards of Identity. Each fruit ingredient must meet proportion (count and/or percentage by weight) and style (form of fruit, such as dice, sector, or half) requirement.

Highspeed caning equipment, under the best manufacturing practices, will not assure correct proportions of fruit ingredients in all containers. If a failure occurs, it usually involves the most expensive ingredients -- pineapple and cherries. The most expensive ingredients are usually added in such quantities to just barely meet minimum requirements.

Pineapple and cherry units.

The FDA requirement for pineapple and cherry units is to assure that at least the number of units stated in an approximate serving of 4.5 ounces (128 grams), regardless of the size of the container or compliance with the proportions, by weight, meet a specific minimum count. The minimum count requirement for pineapple and cherry units is calculated by dividing the net contents of the container by 4.5 ounces. Any remainder, after dividing, that is greater than 2 ounces is considered as a full 4.5 ounces. To avoid being overly technical, follow the guide in Table IV.

Regardless of the count, pineapple and cherry units must also meet the required proportion by weight. A failure could occur if the size of cherries changes from large to small and no subsequent adjustment is made in the filling equipment.

Peach, pear, and grape units.

The FDA requirement for peach, pear, and grape units is percent by weight. Table III outlines this requirement.

Procedure for Officially Drawn Sample Units.

Each Sample Unit:

1. Count all pineapple and cherry units and record the count on the score sheet; and
2. Compute the average count of pineapple and the average count of cherry units per container (sample average).

Compliance criteria: The number of containers that fail to meet the requirements of Table IV does not exceed the acceptance number specified in the sampling plans in the **Regulations**.

Representative Sample Units:

1. Select at random the number of containers from the sample equal to the acceptance number specified in the sampling plans in the **Regulations**;
2. Separate each fruit ingredient;
3. Weigh and record the weight of each fruit ingredient;
4. Total the weights of all of the fruit ingredients in each container (do not use the original drained weight value); and
5. Compute the percent by weight of each fruit ingredient in the container.

Compliance Criteria:

1. None of the containers fail to meet the requirements of **Good Commercial Practice** of Table III; and
2. The average of the random sample units meets FDA requirements for proportions of ingredients, by weight.

Table III

Fruit Ingredients	FDA Requirements		Good Commercial Practice
	Not Less Than	Not More Than	
	By Weight		
Peaches (Diced)	30%	50%	20% to 60%
Pears (Diced)	25%	45%	15% to 55%
Pineapple (Sectors or Diced)	6%	16%	Not more than the deviant rate may fail the specified count in Table IV
	(Not less than 2 sectors or 3 dice for each 4.5 oz of product and each fraction thereof greater than 2 ounces		
Grapes (Seedless)	6%	20%	3% to 30%
Cherries	2% Not less than 1 approximate half for each 4.5 oz of product, and each fraction thereof greater than 2 ounces	6%	Not more than the deviant rate may fail the specified count in Table IV

Table IV

Container Size	Minimum Count Pineapple/Cherry		
	Pineapple Sectors	Pineapple Dice	Cherry Halves <u>1/</u>
(Based on declared contents)			
8Z; Buffet	4	6	2
300 (labeled up to and including 15.5 oz.)	6	9	3
#1 Tall; 303; #2; and 300 (Labeled exceeding 15.5 oz)	8	12	4
2-1/2	14	21	7
10	48	72	24

1/ Approximate half = broken pieces that in aggregate approximate one-half cherry.

Alternate Average Weight Method for In-Plant Inspection.

1. Select a sample unit approximately every two hours during production or whenever the size of the cherry or pineapple ingredient is changed;
2. Weigh 100 units each of cherries and pineapple. Divide by 100 to obtain the average weight of cherry and pineapple units. Record the average weight for each of these ingredients;
3. Record the count of cherry and pineapple units in individual containers, aggregate broken pieces and count to the nearest one-half unit;
4. Calculate the average count of each ingredient;
5. Calculate the ingredient weight for each container by multiplying the average unit weight in 2 (above), by the count in 3 (above); and
6. Calculate the ingredient weight for the production shift by multiplying the average unit weight in 2 (above), by the average count in 4 (above).

Score sheets or other records should indicate the use of this method. Record **Ave. Wt. Method** in a conspicuous area of the records.

THIS METHOD DOES NOT EXCUSE THE PROCESSOR FROM MEETING FDA REQUIREMENTS FOR PROPORTION OF INGREDIENTS.

Procedure for Unofficial Samples.

Each Sample Unit:

1. Count all pineapple and cherry units and record the count on the score sheet; and
2. Compute the average count of pineapple, and the average count of cherry units for each 4.5 ounces of product for each individual can. (Do not average containers, if more than one container is examined).

Compliance criteria: Each container must meet FDA requirements.

Worst Sample Unit (If More than One Container is Inspected):

1. Select the container which appears to be least uniform as to proportion of ingredients;
2. Separate each fruit ingredient;
3. Weigh and record the weight of each fruit ingredient;
4. Total the weights of all the fruit ingredients in the container (do not use the original drained weight value); and
5. Compute the percent by weight of each fruit ingredient in the container.

Compliance criteria: If the container selected as least uniform as to proportions of ingredients **meets** FDA requirements, further checking of any additional containers **is not** necessary.

If the worst container **fails** requirements, further checking of any additional containers **is** necessary. (Do not average containers. Each unofficial container must stand on its own).