



**United States
Department of
Agriculture**

**Agricultural
Marketing
Service**

**Dairy
Division**

United States Standards for Grades of Butter

Effective August 31, 1989

United States Standards for Butter¹

Definitions

§ 58.2621 *Butter.*

For the purpose of this subpart P “butter” means the food product usually known as butter, and which is made exclusively from milk or cream, or both, with or without common salt, and with or without additional coloring matter, and containing not less than 80 percent by weight of milkfat, all tolerance having been allowed for.

§ 58.2622 *Cream.*

The term “cream” when used in this subpart P means cream separated from milk produced by healthy cows. The cream shall be pasteurized at a temperature of not less than 165°F. and held continuously in a vat at such temperature for not less than 30 minutes; or pasteurized at a temperature of not less than 185°F. for not less than 15 seconds; or it shall be pasteurized by other approved methods giving equivalent results.

U.S. Grades

§ 58.2625 *Nomenclature of U.S. grades.*

The nomenclature of U.S. grades is as follows:

(a) U.S. Grade AA.

(b) U.S. Grade A.

(c) U.S. Grade B.

§ 58.2626 *Basis for determination of U.S. grade.*

The U.S. grade of butter is determined on the basis of classifying first the flavor characteristics and then the characteristics in body, color, and salt. Flavor is the basic quality factor in grading butter and is determined organoleptically by taste and smell. The flavor characteristic is identified and together with its relative intensity is rated according to the

¹Compliance with these standards does not excuse failure to comply with provisions of the Federal Food, Drug and Cosmetic Act.

applicable classification. When more than one flavor characteristic is discernible in a sample of butter, the flavor classification of the sample shall be established on the basis of the flavor that carries the lowest rating (see Table I). Body, color, and salt characteristics are then noted and any defects are disrated in accordance with the established classification (see Table II). The final U.S. grade for the sample is then established in accordance with the flavor classification, subject to disratings for body, color, and salt; when the disratings for body, color, and salt exceed the permitted amount for any flavor classification the final U.S. grade shall be lowered accordingly (see Table III and IV).

§ 58.2627 *Specifications for U.S. grades of butter.*

The specifications for the U.S. grades of butter are as follows:

(a) *U.S. Grade AA.* U.S. Grade AA butter conforms to the following: Possesses a fine and highly pleasing butter flavor. May possess a slight feed and a definite cooked flavor. It is made from sweet cream of low natural acid to which a culture (starter) may or may not have been added. The permitted total disratings in body, color, and salt characteristics are limited to one-half ($\frac{1}{2}$). For detailed specifications and classification of flavor characteristics see Table I, and for body, color, and salt characteristics and disratings see Table II.

(b) *U.S. Grade A.* U.S. Grade A butter conforms to the following: Possesses a pleasing and desirable butter flavor. May possess any of the following flavors to a slight degree: Acid, aged, bitter, coarse, flat, smothered, and storage. May possess feed flavor to a definite degree. The permitted total disratings in body, color, and salt characteristics are limited to one-half ($\frac{1}{2}$), except, when the flavor classification is AA, a disrating total of one (1) is permitted. For detailed specifications and classification of flavor characteristics see Table I, and for body, color, and salt characteristics and disratings see Table II.

(c) *U.S. Grade B.* U.S. Grade B butter conforms to the following: Possesses a fairly pleasing butter flavor. May possess any of the following flavors to a slight degree: Malty, musty, neutralizer, scorched, utensil, weed, and whey. May possess any of the following flavors to a definite degree: Acid, aged, bitter, smothered, storage, and old cream; feed flavor to a pronounced degree. The permitted total disratings in body, color, and salt characteristics are limited to one-half ($\frac{1}{2}$), except, when the flavor classification is AA, a disrating total of one and one-half ($1\frac{1}{2}$) is permitted and when the flavor classification is A, a disrating total on one (1) is permitted. For detailed specifications and classification of flavor characteristics see Table I, and for body, color, and salt characteristics and disratings see Table II.

(d) *General.* Butter of all U.S. grades shall be free of foreign materials and visible mold. Butter possessing a flavor rating of AA and workmanship disratings in excess of one and one-half ($1\frac{1}{2}$) shall be given a flavor rating only; butter possessing a flavor rating of A and workmanship disratings in excess of one (1) shall be given a flavor rating only; and butter possessing a flavor rating of B and workmanship disratings in excess of one-half ($\frac{1}{2}$) shall be given a flavor rating

only.

Table I.--Classification of Flavor Characteristics

Identified flavors ¹	Flavor classification		
	AA	A	B
Feed	S	D	P
Cooked	D	-----	-----
Acid	-----	S	D
Aged	-----	S	D
Bitter	-----	S	D
Coarse	-----	S	-----
Flat	-----	S	-----
Smothered	-----	S	D
Storage	-----	S	D
Malty	-----	-----	S
Musty	-----	-----	S
Neutralizer	-----	-----	S
Scorched	-----	-----	S
Utensil	-----	-----	S
Weed	-----	-----	S
Whey	-----	-----	S
Old cream	-----	-----	D

S--Slight; D--Definite; P--Pronounced.

¹When more than 1 flavor is discernible in a sample of butter, the flavor classification of the sample shall be established on the basis of the flavor that carries the lowest classification.

Table II.--Characteristics and Disratings in Body, Color, and Salt

Characteristics	Disratings		
	S	D	P
Body:			
Short	-----	½	1
Crumbly	½	1	-----
Gummy	½	1	-----
Leaky	½	1	2
Mealy or grainy	½	1	-----
Weak	½	1	-----
Sticky	½	1	-----
Ragged boring	1	2	-----
Color:			
Wavy	½	1	-----
Mottled	1	2	-----
Streaked	1	2	-----
Color specks	1	2	-----
Salt:			
Sharp	½	1	-----
Gritty	1	2	-----

S--Slight; D--Definite; P--Pronounced.

§ 58.2628 *Relation of U.S. grade of butter to the flavor classification as affected by disratings in body, color and salt characteristics.*

(a) The flavor classification and total disratings in body, color, and salt characteristics permitted in each grade are as follows:

Table III

Flavor classification	Total disratings	U.S. grade
AA	$\frac{1}{2}$	AA
AA	1	A
AA	$1\frac{1}{2}$	B
A	1	B
B	$\frac{1}{2}$	B

(b) Examples of the relation of U.S. grades to flavor classification and total disratings in body, color, and salt characteristics:

Table IV

Example No.	Flavor classification	<u>Dis-rating</u> Body	<u>Dis-rating</u> Color	<u>Dis-rating</u> Salt	Total disrating	Permitted total dis-ratings	Disratings in excess of total permitted	U. S. grade
1.	AA	$\frac{1}{2}$	0	0	$\frac{1}{2}$	$\frac{1}{2}$	0	AA
2.	AA	$\frac{1}{2}$	$\frac{1}{2}$	0	1	$\frac{1}{2}$	$\frac{1}{2}$	A
3.	AA	0	1	0	1	$\frac{1}{2}$	$\frac{1}{2}$	A
4.	AA	$\frac{1}{2}$	1	0	$1\frac{1}{2}$	$\frac{1}{2}$	1	B
5.	A	$\frac{1}{2}$	0	0	$\frac{1}{2}$	$\frac{1}{2}$	0	A
6.	A	0	$\frac{1}{2}$	$\frac{1}{2}$	1	$\frac{1}{2}$	$\frac{1}{2}$	B
7.	A	0	1	0	1	$\frac{1}{2}$	$\frac{1}{2}$	B
8.	B	$\frac{1}{2}$	0	0	$\frac{1}{2}$	$\frac{1}{2}$	0	B

§ U. S. Grade not assignable.

(a) Butter which fails to meet the requirements for U. S. Grade shall not be given a U. S. grade.

(b) Butter, when tested, which does not comply with the provisions of the Federal Food, Drug, and Cosmetic Act, including minimum milkfat requirements of 80.0 percent, shall not be assigned a U. S. grade.

(c) Butter produced in a plant found on inspection to be using unsatisfactory manufacturing practices, equipment or facilities, or to be operating under unsanitary plant conditions shall not be assigned a U. S. grade.

(d) When the butter has been produced in a plant which has not been surveyed and approved for inspection or grading service.

§ 58.2635 *Explanation of terms.*

(a) *With respect to flavor intensity and characteristics--*(1) *Slight.* An attribute which is barely identifiable and present only to a small degree.

(2) *Definite.* An attribute which is readily identifiable and present to a substantial degree.

(3) *Pronounced.* An attribute which is markedly identifiable and present to a large degree.

(4) *Aged.* Characterized by lack of freshness.

(5) *Bitter.* Astringent, similar to taste of quinine and produces a puckery sensation.

(6) *Acid.* Lacks a delicate flavor or aroma and is associated with an acid condition but there is no indication of sourness.

(7) *Cooked.* Smooth, nutty-like character resembling a custard flavor.

(8) *Cooked (coarse).* Lacks a fine, delicate, smooth flavor.

(9) *Feed.* Aromatic flavor characteristic of the feeds eaten by cows.

(10) *Flat.* Lacks natural butter flavor.

(11) *Malty.* A distinctive, harsh flavor suggestive of malt.

(12) *Musty.* Suggestive of the aroma of a damp vegetable cellar.

(13) *Neutralizer.* Suggestive of a bicarbonate of soda flavor or the flavor of similar compounds.

(14) *Old Cream.* Aged cream characterized by lack of freshness and imparts a rough aftertaste on the tongue.

(15) *Scorched.* A more intensified flavor than coarse and imparts a harsh aftertaste suggestive of excessive heating.

(16) *Smothered.* Suggestive of improperly cooled cream.

(17) *Storage.* Characterized by a lack of freshness and more intensified than “aged” flavor.

(18) *Utensil.* A flavor suggestive of unclean cans, utensils and equipment.

- (19) *Weed*. Aromatic flavor characteristic of the weeds eaten by cows.
- (20) *Whey*. A flavor and aroma characteristic of cheese whey.

(b) *With respect to body*--(1) *Crumbly*. When a “crumbly” body is present the particles lack cohesion. The intensity is described as “slight” when the trier plug tends to break and the butter lacks plasticity; and “definite” when the butter breaks roughly or crumbles.

(2) *Gummy*. Gummy-bodied-butter does not melt readily and is inclined to stick to the roof of the mouth. The intensity is described as “slight” when the butter tends to become chewy and “definite” when it imparts a gum-like impression in the mouth.

(3) *Leaky*. A “leaky” body is present when on visual examination there are beads of moisture on the surface of the trier plug and on the back of the trier or when slight pressure is applied to the butter on the trier plug. The intensity is described as “slight” when the droplets or beads of moisture are barely visible and about the size of a pinhead; “definite” when the moisture drops are somewhat larger or the droplets are more numerous and tend to run together; and “pronounced” when the leaky condition is so evident that drops of water drip from the trier plug.

(4) *Mealy or grainy*. A “mealy” or “grainy” condition imparts a granular consistency when the butter is melted on the tongue. The intensity is described as “slight” when the mealiness or graininess is barely detectable on the tongue and “definite” when the mealiness or graininess is readily detectable.

(5) *Ragged boring*. A “ragged boring” body, in contrast to solid boring, is when a sticky-crumbly condition is present to such a degree that a full trier of butter cannot be drawn. The intensity is described as “slight” when there is a considerable adherence of butter to the back of the trier and “definite” when it is practically impossible to draw a full plug of butter.

(6) *Short*. The texture is short-grained, lacks plasticity and tends toward brittleness. The intensity is described as “slight” when the butter lacks pliability and tends to be brittle; “definite” when sharp and distinct breaks form as pressure is applied against the butter plug; and “pronounced” when sharp and distinct breaks form in the butter surface when the trier is inserted, or when segments of the butter plug separate along fracture lines.

(7) *Sticky*. When a “sticky” condition is present, the butter adheres to the trier as a smear and possesses excessive adhesion. The intensity is described as “slight” when the smear is present only on a portion of the back of the trier and “definite” when the trier becomes smeary throughout its length.

(8) *Weak*. A “weak” body lacks firmness and tends to be spongy. The intensity is described as “slight” when the plug of butter, under slight pressure, tends to depress easily and definitely lacks firmness and compactness.

(c) *With respect to color*--(1) *Mottled*. “Mottles” appear as a dappled condition with spots of lighter and deeper shades of yellow. The intensity is described as “slight” when the small spots of different shades of yellow, irregular in shape, are barely discernible on the plug of butter and “definite” when the mottles are readily discernible on the plug of butter.

- (2) *Specks*. “Specks” usually appear in butter as small white or dark yellow particles; they

may be of variable size. The intensity is described as “slight” when the particles are few in number and “definite” when they are noticeable in large numbers.

(3) *Streaked*. “Streaked” color appears as light colored portions surrounded by more highly colored portions. The intensity is described as “slight” when only a few are present and “definite” when they are more numerous on the trier plug.

(4) *Wavy*. “Wavy” color in butter is an unevenness in the color that appears as waves of different shades of yellow. The intensity is described as “slight” when the waves are barely discernible and “definite” when they are readily noticeable on the trier plug.

(d) *With respect to salt*--(1) *Sharp*. “Sharp” salt is characterized by taste sensations suggestive of salt. The intensity is described as “slight” when the salt taste predominates in flavor; and “definite” when the salt taste distinctly predominates in flavor.

(2) *Gritty*. A “gritty” salt condition is detected by the sandlike feel of grains of undissolved salt on the tongue or between the teeth when the butter is chewed. The intensity is described as “slight” when only a few grains of undissolved salt are detected and “definite” when the condition is more readily noticeable.

Determining the Flavor of Butter and the Probable Causes of Certain Characteristics in Butter

General - Basically the quality of the finished butter can be no higher than the quality of the raw milk and cream from which it is made. Careful grading and segregation of the milk and cream received is very important. Also, poor workmanship can result in disratings that can cause the butter to be down-graded and detract from the flavor and stability of the finished product. Therefore, it is important that close attention be given to the workmanship factors, especially to those conditions which influence spreadability and product stability. Plants should carefully examine each churning of butter after the butter has been properly chilled for 48 hours.

Determining the Flavor of Butter - The flavor (taste and odor) of butter is determined primarily by the senses of taste and smell.

The proper procedure in grading butter is first to use the sense of smell to determine aroma, and then the sense of taste to confirm and establish the character, probable origin, and degree of development of each flavor present. By carefully discerning the taste, odor and aroma characteristics of the sample, the grader is able to properly identify and classify the flavor.

The taste buds of the tongue vary in their response to the four basic tastes (sweet, sour, salt and bitter). The sweet taste may be generally noted at the tip of the tongue, sour along the sides, salt along the side and tip, and bitter at the base.

The centers for determining odor are in the uppermost regions of the nasal cavity. For this

reason, to get the maximum benefit of the odor part of butter flavor, note its odor by inhaling slowly and deeply after you warm the sample in your mouth.

The temperature of the butter at the time of grading is important in determining the true characteristics of the butter. The temperature of the butter should preferably range from 45° F to 55° F. A temperature of about 70° F should be provided in the grading room; it should not be below 60° F. The room should also be free of off-odors.

Probable Causes of Certain Characteristics in Butter

Flavor Characteristics -

(1) *Acid* - Associated with moderate acid development in the milk or cream, or excessive ripening of the cream.

(2) *Aged* - Associated with short or extended holding periods of butter. The holding temperature will affect the rate of development of this flavor. May also occur if high quality raw material is not properly handled and promptly processed so that the flavor loses its freshness.

(3) *Bitter* - Attributable to the action of certain microorganisms or enzymes in the cream before churning, certain types of feeds and late lactation.

(4) *Cooked* - Associated with using high temperatures in pasteurization of sweet cream.

(5) *Coarse* - Associated with using high temperatures in pasteurization of cream with slight acid development.

(6) *Feed* - Attributable to feed eaten by cows and the flavors being absorbed in the milk and carried through into the butter. Most dry feeds (like hay or concentrates), silage, green alfalfa, and various grasses produce feed flavors in butter. Silage flavor may vary in degree and character depending on the time of feeding, extent of fermentation and kind of silage.

(7) *Flat* - Attributable to excessive washing of the butter or to a low percentage of fats or volatile acids and other volatile products that help to produce a pleasing butter flavor.

(8) *Malty* - Attributable to the growth of the organism *Streptococcus lactic* var. *maltigenes* in milk or cream. It is often traced to improperly washed and sanitized utensils in which this organism has developed.

(9) *Musty* - Attributable to cream from cows grazing on slough grass, eating musty or moldy feed (hay and silage) or drinking stagnant water.

(10) *Neutralizer* - Attributable to excessive or improper use of alkaline products to reduce the acidity of the cream before pasteurization.

(11) *Old Cream* - Attributable to aged cream, or inadequate or improper cooling of the cream. This flavor may be accentuated by unclean utensils and processing equipment.

(12) *Scorched* - Associated with using excessively high temperatures in pasteurization of cream with developed acidity, prolonged holding times in forewarming vats or when using vat pasteurization. Also associated with vat pasteurization without adequate agitation.

(13) *Smothered* - Attributable generally to improper handling and delayed cooling of the cream.

(14) *Storage* - Associated with extended holding periods of butter for several months or

longer.

(15) *Utensil* - Attributable to handling or storing milk or cream in equipment which is in poor condition or improperly sanitized.

(16) *Weed* - Attributable to milk or cream from cows which have been fed on weed-infested pastures or weedy hay.

(17) *Whey* - Attributable to the use of whey cream or the blending of cream and whey cream for buttermaking.

Body Characteristics -

General - Butterfat in butter is a mixture of various triglycerides of different melting points and appears in the form of fat globules and free fat. In both of these forms, part of the fat is crystalline and part liquid. Some fats are solid at temperatures up to 100° F or even higher, others are still liquid at temperatures far below the freezing point. Butter, at the temperature at which it is usually handled, is always a mixture of crystallized and liquid fat. The variations in the composition of milkfat thus have a great influence upon the body and spreadability of butter. In the summer when milkfat contains more liquid or soft fat, butter tends to be weak and leaky. In the winter when the milkfat contains more solid fat, butter tends to be hard and brittle, resulting in unsatisfactory spreadability. The ratio between the crystalline and liquid fat particles depends upon the composition of the milkfat (varying with the season of the year), manufacturing methods, and the temperature of the butter. Close attention needs to be given to tempering the cream, temperature of churning, washing and working of the butter as the seasons of the year change. This is important in maintaining a uniform firm waxy body possessing food spreadability.

Butter with a firm waxy body has an attractive appearance, has granules that are close knit, cuts clean when sliced, and has good spreadability. The trier sample from such butter will show this clean cut, smooth, waxy appearance.

The temperature of the butter at the time of grading is important in determining the true characteristics of body and should be between 45° F and 55° F.

Body in butter is considered from the standpoint of its characteristics or defects. Defects in body are disrated according to degree of intensity.

(1) *Crumbly (Lacks cohesion)* - Attributable to a high proportion of fat crystals in the free fat. Such a condition is associated with higher melting point fats resulting from feeding certain dry feeds like cottonseed meal, and also is associated with cows in late lactation. Cooling cream rapidly helps to form small globules or particles. If enough liquid fat is available, the butter will not crumble. It will crumble if crystals are large and there is no liquid fat. Cooling cream to too low a temperature for a long period during fall and winter months also may cause crumbliness. Lower wash water temperature (10° F to 20° F below the temperature of the buttermilk) will help to correct crumbliness.

Butter with a normal body may appear crumbly at a low temperature, while a crumbly butter may appear to have a normal body at a higher temperature.

(2) *Gummy (Sticky mouth feel)* - Attributable to the presence of a high percentage of high-melting-point fats. Feeding cottonseed meal or whole cottonseed in quantities large enough to

supply the bulk of the protein in a ration will result in a high proportion of high-melting-point fats and a hard-bodied butter. Such cream requires slower cooling, higher churning temperatures, higher temperature wash water, and longer working time.

(3) *Leaky (Free moisture on the butter surface)* - Attributable generally to insufficient working, resulting in incomplete incorporation of the water. The water droplets are not reduced sufficiently in size to be well distributed throughout the mass of the butter. When the fat is soft and the granules are not sufficiently firm at the start of the working process, they mass together too quickly and do not offer enough resistance to break up the water in the butter. An uneven salt distribution may also cause migration of moisture in the butter.

(4) *Mealy or grainy (A grainy feel on the tongue similar to cornmeal)* - Attributable to oiling-off of the milkfat at some stage of the buttermaking process, improper melting of frozen cream, or improper neutralization of sour cream. The oiled-off fat, upon being cooled, crystallizes into small particles which cannot be worked into a smooth texture.

(5) *Ragged boring (Unable to draw a smooth full trier of butter)* - Attributable to certain types of dry feeds, especially when such feeds are not offset by succulent feeds. It is caused by a combination of the factors that are generally associated with crumbliness and stickiness, particularly when the melting point of the continuous (non-globular) fat phase of butter is unusually high. Although this condition is related to crumbliness and stickiness, it differs in appearance as the butter tends to roll on the trier. It may be minimized by procedures which permit the fat in the cream to crystallize at relatively high temperatures and by rapid chilling of the fat after the butter granules have formed.

(6) *Short (Lacks plasticity and tends towards brittleness)* - Attributable to predominance of high-melting-point fats with relatively small fat globules; and comparatively low curd content of the butter. Certain types of manufacturing processes where partial or total melting of the fat takes place and normal granules are not produced, usually result in a short and brittle bodied butter. Too rapid cooling to too low a temperature may also be a factor.

(7) *Sticky (Butter adheres to the trier as a smear)* - Associated with dry feeds and late lactation period and predominance of high-melting-point fats. This defect may result from not having the correct proportion of liquid and solid fat in the butter as well as the proper proportion of large and small crystals of fat. The condition may be accentuated by too rapid cooling, cooling of the cream to too low a temperature or overworking the butter.

(8) *Weak (Lacks firmness)* - Attributable to churning cream which has not been cooled to a low enough temperature or not held long enough at a low temperature following pasteurization to properly firm the granules. May also be caused by churning at too high a temperature, incorporating too much air into the butter during churning and working, or overworking.

Color characteristics -

General - The natural color of butter varies according to seasonal and regional conditions. The color of butter is considered defective when it is uneven or lacks uniformity within the same churning or package.

(1) *Mottled (Spots of lighter and deeper shades of yellow)* - Attributable to insufficient

working of the butter, resulting in an uneven distribution of salt and moisture. Diffusion of the moisture towards the undissolved salt or areas of high salt concentration causes the irregular color spots. Churning at too high a temperature resulting in soft granules that do not have sufficient resistance to stand the necessary amount of working may also cause a mottled condition.

(2) *Specks (Small white or dark yellow particles)* - Attributable to small particles of coloring or coagulated casein. White specks present may be small particles of curd formed during heating of improperly neutralized sour cream or from partial coagulation caused by sweet-curdling organisms during pasteurization. The addition of a coarse-bodied starter may also be a contributing factor. Yellow specks may result from the use of butter color which has precipitated because of age or freezing.

(3) *Streaks (Light color surrounded by more highly colored portions)* - Attributable to insufficient working of the butter, faulty mechanical condition of the churn causing uneven working of butter, and addition of butter or butter remnants from previous churnings.

(4) *Wavy (Unevenness of color)* - Attributable to insufficient working, resulting in an uneven distribution of the water and salt in the butter. May also be caused by faulty mechanical condition of the churn and addition of butter or butter remnants from previous churnings.

Salt characteristics -

General - In grading butter, the factor of salt is considered from the standpoint of the degree of salt taste (sharpness) and whether it is completely dissolved (gritty). A range in the salt content or salty taste of butter is permitted without considering it a defect. This range provides for the various market preferences for salt taste in butter. Uniformity of salt content between churnings from the same factory is desirable.

(1) *Sharp salt* - Attributable to the use of too much salt or lack of sufficient working to obtain thorough distribution of salt and water.

(2) *Gritty* - Attributable to the use of too much salt or undissolved salt due to insufficient working of the butter.