



## DAIRY SECTOR FACT SHEET ON PROBABLE CAUSES OF CERTAIN CHARACTERISTICS IN BUTTER <sup>1</sup>

### Flavour Characteristics

- ▶ **Acid** - Associated with moderate acid development in the milk or cream, or excessive ripening of the cream.
- ▶ **Aged** - Associated with short or extended holding periods of butter. The holding temperature will affect the rate of development of this flavour. May also occur if high quality raw material is not properly handled and promptly processed so that the flavour loses its freshness.
- ▶ **Bitter** - Attributable to the action of certain micro-organisms or enzymes in the cream before churning, certain types of feeds and late lactation.
- ▶ **Cooked** - Associated with using high temperatures in pasteurization of sweet cream.
- ▶ **Coarse** - Associated with using high temperatures in pasteurization of cream with slight acid development.
- ▶ **Feed** - Attributable to feed eaten by cows and the flavours 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 flavours in butter. Silage flavour may vary in degree and character depending on the time of feeding, extent of fermentation and kind of silage.
- ▶ **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 flavour.
- ▶ **Malty** - Attributable to the growth of the organism *Streptococcus lactis* var. *maltigenes* in milk or cream. It is often traced to improperly washed and sanitized utensils in which this organism has developed.
- ▶ **Musty** - Attributable to cream from cows grazing on slough grass, eating musty or mouldy feed (hay and silage) or drinking stagnant water.
- ▶ **Neutralizer** - Attributable to excessive or improper use of alkaline products to reduce the acidity of the cream before pasteurization.
- ▶ **Old Cream** - Attributable to aged cream, or inadequate or improper cooling of the cream. This flavour may be accentuated by unclean utensils and processing equipment.
- ▶ **Scorched** - Associated with using excessively high temperatures in pasteurization of cream with developed acidity, prolonged holding times in pre-warming vats or when using vat pasteurization. Also associated with vat pasteurization without adequate agitation.
- ▶ **Smothered** - Attributable generally to improper handling and delayed cooling of the cream.
- ▶ **Storage** - Associated with extended holding periods of butter for several months or longer.
- ▶ **Utensil** - Attributable to handling or storing milk or cream in equipment which is in poor condition or improperly sanitized.
- ▶ **Weed** - Attributable to milk or cream from cows which have been fed on weed infested pastures or weedy hay.

- ▶ **Whey** - Attributable to the use of whey cream or the blending of cream and whey cream for butter making.

### Body Characteristics

Butter fat 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 milk fat thus have a great influence upon the body and spreadability of butter. In the summer, when milk fat contains more liquid or soft fat, butter tends to be weak and leaky. In the winter, when the milk fat 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 milk fat (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 rated according to degree of intensity.

- ▶ **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.
- ▶ **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.

- ▶ **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.
- ▶ **Mealy or grainy (a grainy feel on the tongue similar to cornmeal)** - Attributable to oiling-off of the milk fat at some stage of the butter making 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.
- ▶ **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.
- ▶ **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.
- ▶ **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.
- ▶ **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.

## Colour characteristics

- ▶ **General** - The natural colour of butter varies according to seasonal and regional conditions. The colour of butter is considered defective when it is uneven or lacks uniformity within the same churning or package.
- ▶ **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 colour 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 cause a mottled condition.
- ▶ **Specks (small white or dark yellow particles)** - Attributable to small particles of colouring 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 colour which has precipitated because of age or freezing.
- ▶ **Streaks (light colour surrounded by more highly coloured 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.
- ▶ **Wavy (unevenness of colour)** - 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

- ▶ 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.
- ▶ **Sharp salt** - Attributable to the use of too much salt or lack of sufficient working to obtain thorough distribution of salt and water.
- ▶ **Gritty** - Attributable to the use of too much salt or undissolved salt due to insufficient working of the butter.

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<sup>1</sup> United States Standards for Grades of Butter (1989). Agricultural Marketing Service, Dairy Division United States Department of Agriculture (USDA), USA.