ICE-CREAM & FROZEN DESSERTS

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Module 8. Defects in ice cream

Lesson 23
DEFECTS IN ICE CREAM- COLOUR AND APPEARANCE, PACKAGE AND MELTING QUALITY

23.1 Colour and Appearance Defects

23.1.1 Gray, dull

Though infrequently encountered any more, a gray, dull colour is easily recognized by its ‘‘dead,’’ so ice cream suggests lack of cleanliness in manufacture and, therefore, it is one of the more serious and objectionable colour defects.

If the gray colour is caused by the use of flavoring with ground vanilla beans, which may be apparent by the presence of small pepper-like particles of the ground bean, the colour should not be criticized. Ice cream that displays ground particles of vanilla bean (often labeled ‘‘Vanilla Bean’’) is in demand by some consumers and may be preferred in some locales.

23.1.2 Not uniform

Lack of colour uniformity in vanilla ice cream is comparatively uncommon but may be easily recognized when it occurs. Although the most appealing colour for vanilla ice cream may be a moderate creamy shade of white, certain portions may be darker or lighter than others. Particularly, this may be true of the top or bottom surface or portions next to the side of the container where some desiccation may have occurred.

This defect is often associated with age (extended product storage). If the colour uniformity defect is restricted to the surface layer (which is usually discarded when taking samples), it is not considered serious. At times, streaks or waves of different colour may be encountered throughout the mass of a vanilla ice cream. This can be caused by varying overruns attained from multi-barrel freezers or may derive from different freezers that have a common discharge. Sometimes, a non-uniform colour may originate from successive changes in the flavor source (and associated colour) throughout the freezing and packaging process.

23.1.3 Too high/vivid

A high colour level is often objectionable because it appears unattractive and often connotes an‘‘artificial’’ impression. Although individual preferences for colour vary,evaluators have a general tendency to downgrade products that have an obvious,excessive intensity of colour. Such a product conveys the idea of cheapness,imitation, poor workmanship, or a general lack of understanding and care on the part of the manufacturer.

23.1.4 Too pale/chalky/lacking colour

A pale, chalky, or snow-like colour is the opposite of too high colour. This defect is not particularly serious, although a lighter coloured product may not have as much eye appeal as a creamy shade of white colour. However, uncoloured ice cream, especially vanilla,should not necessarily be criticized for lack of colour. For special markets,ice cream without any form of added colour is a must; many products meet that marketing objective and it does not seem logical to penalize the colour in those circumstances.

23.1.5 Unnatural colour

Unnatural colour of ice cream should be recognized at a glance; the product appearance is not ‘‘in keeping’’ with the impression conveyed by cream (or milk fat). An unnatural colour may be any shade of yellow, orange, or tan– colours that do not correspond to the true colour characteristics of milk fat. Some more common off shades of colour in vanilla ice cream include lemon yellows, light green yellows, orange yellows, and occasionally red yellows or tan browns. Unnatural colour may also arise from the use of extensive amounts of annatto-coloured Cheddar cheese whey solids, of product rerun, re-melted ice cream, or commingling of successive freezer runs of product (that have contrasting colours). The criticism for unnatural colour is a broad designation.

‘‘Unnatural’’colour might also describe an ice cream whose colour is gray, dull, high,vivid, pale, chalky, or non uniform. Generally, the several colour defects of vanilla ice cream do not occur at the ‘‘serious’’ level. Since different types of lighting will significantly affect colour characteristics as viewed by human subjects, the type of light employed during examinations should certainly be standardized.

23.2 Package Defects

The ideal frozen dessert package or container should be clean, undamaged, full, neat, attractive (pleasant eye appeal), and protective of the product.

Multiuse containers (if used) should be free of dents, rust, paint, battered edges, or rough, irregular surfaces. In general, ice cream packages should reflect neatness and cleanliness throughout, giving the consumer the impression that by use of a clean, well-formed container, the manufacturer is definitely interested in supplying a high-quality product. Some more common package defects that may be encountered are a slack-filled container, bulging container, improperly sealed container, ill-shaped retail packages or product

adhering to the outside of the container, ink smears, lack of a parchment liner on the top of bulk containers, and a container that is soiled, rusty, or damaged (the last two defects pertain to refillable containers).

These packaging defects, when they occur, are generally so obvious that additional descriptors or discussion hardly seems necessary. Encountering a high proportion of defectively packaged products from a production run is most unlikely, but such a problem might occur in the absence of adequate supervision. Just a few defective packages or containers present a problem of some magnitude because consumers will simply not select and purchase damaged units of products from the retail ice cream cabinet. Thus, evaluators must keep in mind that defective containers generally render a product unsalable.

23.3 Melting Quality

High-quality ice cream should show little resistance toward melting when a dish is exposed to room temperature for at least 10–15 min. During the melting phase, the mix should flow from the center (high) portion of the scooped ice cream. The melted product should be expected to form a smooth, uniform, and homogeneous liquid in the dish. Generally, ice creams with low overrun melt more rapidly than those with high overrun. The defects of melting quality frequently observed in ice cream judging will be elaborated.

The melting quality may be observed by placing a scoop full of the sample on a dish and noting its meltdown response from time to time, as the other sensory qualities are being examined. Although fiber dishes may be used, petri dishes seem to permit more accurate observation of the melted ice cream; the contrast between the product and the dish background is greater.

While evaluating the melting quality of ice cream some precautions are necessary:

1. Select a uniformly heated,well-lit area for placing and observing the samples (~23°C).

2. Set the sample out for meltdown at the beginning of the judging (if feasible).

3. Absolutely, avoid dipping some of the samples with a warm dipper and others with a cold dipper.

4. Be sure that the sizes of the reasonably small samples used for the meltdown test are uniform in volume (use the same scoop or spoon for each sample).

5. Always use a flat-bottom dish (not a cup), so the melted ice cream is free to spread out.

6. Once melting has started, do not disturb the samples by tilting or swirling the containers.

7. Observe the melting quality at various stages of melting and score on the basis of the scheme suggested in the scorecard.

23.3.1 Does not melt/ delayed melting

This defect is easily recognized since the ice cream retains (or tends to retain) its original shape after it has been exposed to ambient temperature for a period in excess of 10–15 min.

This defect is related to the use of an excess of certain stabilizers and emulsifiers, high overrun, the age of the ice cream, and several processing and product composition interactions that promote formation of a highly stable gel(even when the temperature is above the freezing point). This attribute is considered objectionable to some, as it conveys the impression that excessive amounts of product thickeners were used. However, in other cases, this attribute is an objective.

23.3.2 Flaky/lacks uniformity

This defect may be noted when the sample is about half-melted, but it is more noticeable when the sample has completely melted. Flakiness is shown by a feathery, light-coloured scum formation on the surface. Sometimes it resembles a fragment of crust. Usually,no indication of wheying off (water separation) accompanies the defect.Furthermore, it is not particularly objectionable. However, it does not give an impression of ideal white, and attractive appearance; the product is also not uniform or homogeneous in appearance.

23.3.3 Foamy/frothy

A foamy meltdown is usually only noted when the sample is completely melted. Ice cream that exhibits many small, fine bubbles upon melting is not commonly criticized, but a sample that demonstrates a mass of large bubbles, 0.3–0.5 cm (1/8–3/16 inches) in diameter, is criticized.

The meltdown should be uniform and attractive; this is not the case when large air bubbles or excessive foam occur. The consumer may associate the presence of foam with excessive overrun,even though this defect may not be associated with high overrun, but more often(or rather) with some of the particular constituents used in the mix.

23.3.4 Curdy

A meltdown with a curd-like appearance lacks product uniformity and is, for the most part, unattractive. The melted ice cream appears flaky; it separates from the mass in small distinct pieces rather than leaving the impression of a creamy fluid. The surface layer may exhibit formation of dry, irregular curd particles. To the layman, this defect suggests souring of the milk or cream, although the cause is usually another matter. Any conditions that lead to the destabilization of proteins are potential causes of this defect in frozen dairy desserts.

A combination of factors may be responsible, including (1) high acidity; (2) the salt balance (related to calcium and magnesium salts); (3) age of the ice cream;(4) certain adverse processing conditions (involving temperature, time, and method of heating, homogenization pressure and temperature, and rate of freezing and hardening); and (5) the type and concentration of stabilizers and emulsifiers.

The meltdown characteristics and the formation of curdy/flaky appearance are influenced by the protein stability, fat agglomeration, and air cell size. In the industrial processing of ice cream, formulations and processing can be modified to increase the availability of surface-active proteins for foam stabilization. Partially coalesced three-dimensional network formed by the fat globules with air and ice is in part responsible for the melt resistance and smoother texture of the frozen dessert. Presence of surface-active proteins will stabilize the weak fat–serum interface first. Increased emulsification results in depletion of protein from the fat molecule that increases fat destabilization, hence decreases melting rate and enhanced shape retention during the melting process. Stabilizers increase the resistance of the frozen product to meltdown by decreasing the mobility of water through increasing the viscosity of the serum phase. This has been previously explained in the separate section on emulsifiers and stabilizers. Except for viscosity, all of the factors listed above, either independently or in combination, affect fat agglomeration. Substantial fat agglomeration is responsible for the ‘‘slow melt,’’ and/or an unattractive dry, ‘‘flaky’’ surface of the melted product. Protein destabilization will result in melting throughout and hence ‘‘curdy’’ice cream. This defect can be prevented by minimizing the temperature abuse.

23.3.5 Wheying-off

Wheying-off (syneresis) may usually be noted by the appearance of a bluish fluid leaking from the melting ice cream at the initiation of the meltdown test. If the sample is disturbed during melting or the observation is delayed, it may be difficult to see this condition. Whey separation may be noted in some ice cream and reduced fat ice cream mixes even before they are frozen. This is a common complaint of operators of soft-serve freezers who buy their mix from a wholesale manufacturer. These mixes tend to be stored longer and are subjected to more abuse than those mixes that are made and frozen within the same plant.

Factors contributing to the difficulty include (1) the salt balance of milk ingredients, (2) the mix composition (a product with a high protein-in-water concentration can be expected to be less stable than one with a lower concentration), (3) certain adverse processing conditions, (4) and the extent of abuse (excessive agitation, air incorporation, and ‘‘heat shock’’).

Separation is a natural phenomenon occurring in soft-serve ice cream mixes; increasing the amount of whey proteins, while maintaining the same protein content, and the use of k-carageenan at >0.015% in the mix prevent visible separation,although it still occurs on the microscopic level. Locust bean gum and sodium caseinate are incompatible, and undergo

phase separation on a microscopic level. k-carrageenan has a much weaker stabilizing effect upon soft-serve ice cream emulsions formulated with sodium caseinate and locust bean gum, compared to skim milk powder emulsions stabilized with locust bean gum.

23.3.6 Watery/Low melting resistance

This defect is not consistent with the characteristics of the highest quality ice cream. As the terms suggest, the sample melts quickly and the resultant meltdown has a thin, watery consistency.

This defect is commonly associated with low solids or low stabilizer levels in the mix and may often be associated with a coarse, weak-bodied ice cream or ice milk. Curdiness and delayed melting are the two of the most common meltdown defects; they may occur simultaneously. Whey separation may be observed frequently, since protein destabilization is a common problem.

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