ICE-CREAM & FROZEN DESSERTS

Lesson-21
SENSORY ATTRIBUTES OF ICE CREAM AND FROZEN DESSERTS

21.1 Introduction

Ice cream is a frozen food made of a mixture of dairy products, such as milk, cream, and nonfat milk, combined with sugars, flavoring, fruits and nuts, stabilizers and emulsifiers etc. Different types of ice cream are available in the market including economy, premium, super-premium reduced fat, light, low fat ice cream, mellorine, depending on their composition, soft serve ice cream, sherbets, ice candy and kulfi. All the above products may differ in the type of flavoring, the composition in terms of dairy ingredients and other food solids, and the extent of product overrun. Ice cream is normally judged on the basis of its flavour, body and texture, colour and package and melting. The ideal characteristics of ice cream and requirements for high quality ice cream and frozen desserts are described in this lecture.

21.2 Flavor

High-quality vanilla ice cream should be pleasantly sweet, suggest a creamy background sensation, exhibit a delicate ‘‘bouquet’’ of vanilla flavor, and leave a most pleasant, but brief, rich aftertaste.

The flavor intensity of the vanilla, the sweetener, and the various dairy ingredients should not be so pronounced that, when first tasted, one component of the overall flavor seems to predominate over the others. All of the ingredients should blend to yield a pleasant, balanced flavor.

21.3 Body and Texture

Body and texture are important properties of ice cream and good quality indicators. The associated body and texture defects are evaluated by biting and chewing the product.

As it relates to ice cream, body is best defined as the property or quality of the ice cream as a whole. Texture refers to the parts or structure of ice cream that make up the whole. Both the body and texture of ice cream may be partially determined by applying the senses of touch and sight when the evaluator observes the product’s appearance on dipping. The desired body in ice cream is that which is firm, has substance (has some resistance), responds rapidly to dipping, and is not unduly cold when placed into the mouth. The melted ice cream should resemble the consistency of 40% fat cream.

21.4 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.

21.5 Color and Package

21.5.1 Color

The color of vanilla ice cream or reduced fat ice cream should be attractive, uniform, pleasing, and typical of the specific flavor stated on the label. Colorants may or may not be added to dairy frozen desserts. As long as the shade of color reasonably resembles the natural color (β-carotene pigment) of cream and is neither too pale nor too vivid, color criticisms are generally resisted for vanilla-flavored products

21.5.2 Package

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.

21.6 Other Frozen Dairy Desserts

21.6.1 Low fat ice cream

The sensory properties of low fat ice cream can be evaluated using the ice cream scorecard and scoring guide. Due to the lower milk fat content, low fat ice cream would be expected to lack the typical richness, mouthfeel characteristics, and the overall flavor blend that most ice cream possesses. Also, the body and texture, as expected, can differ considerably from ice cream, due to the lower total solids content of low fat ice cream.

21.6.2 Mellorine

Except for the source and type of fat, this product generally resembles either low fat ice cream (usually) or ice cream in composition. Certain additional defects that may be derived from vegetable or animal fats may be encountered and recorded as appropriate on the scorecard. Flavor defects of main concern in mellorine are the possibilities of oxidation, rancidity, the presence of a distinctive off-flavor derived from the specific fat source, and a lack of flavor or ‘‘blandness’’ (which can be attributed to varied fat sources other than dairy based). The relative hardness and melting properties of the fatty acids that constitute the fat can influence the body and mouthfeel of frozen mellorine (typically vegetable fat and/or other animal fats other than dairy, or in a blend with milk fat).

21.6.3 Fruit Frozen Desserts

The flavor of berries and fruits (strawberries, peaches, etc.) may be imparted to frozen dairy desserts by fresh, frozen, or processed fruits, natural extracts (that sometimes contain other natural flavors), imitation flavors, or various combinations of these. The flavor character, body and texture, and the appearance of the finished product, are influenced by the type of flavoring used. Generally, the flavor of the given ice cream should be reminiscent of sweetened fresh fruit and cream (e.g., strawberries and cream, or peaches and cream). To overcome the problem of seasonality, availability, and perishability of fresh fruit, frozen fruit preparations are commonly used.

21.6.4 Nut Frozen Desserts

Walnuts, almonds, peanuts, and pistachio nuts are among the most popular nuts added to ice cream.

Generally, ice cream is flavored with either an appropriate background flavor for the nuts (butter pecan, chocolate almond, etc.) or a concentrate of the same basic nut flavor (e.g., pistachio, black walnut). The degree and the method of roasting the nuts (light or heavy roast; dry or butter roasted) provide interesting variables that manifest themselves in the sensory properties of the ice cream. The initial quality and freshness of the nuts must be good; no deterioration should occur as a result of storage. Since some types of nuts contain a high proportion of unsaturated oil, they can be highly susceptible to auto-oxidation. Some nuts (walnuts and hazelnuts) are also prone to the development of hydrolytic rancidity due to the presence of lipolytic enzymes. The nuts should retain their firmness, crispness, and freshness in the frozen product.

21.6.5 Variegated Frozen Desserts

A variegated ice cream should basically emulate an ice cream sundae, although the flavored syrup, sauce, or puree is dispersed throughout the product. The flavoring (or slurry) syrup is usually pumped directly into the ice cream as it emerges from the ice cream freezer; the variegating substance is intended to form a definite pattern within the product. Although some indication of the regularity or uniformity of the variegation pattern is obtained in the course of normal sampling of the ice cream, a more objective visual impression can usually be realized by examining both exposed surfaces, after cutting through the center of the container. Sometimes, several cross-sectional cuts may have to be made to properly assess the distribution or the ‘‘pattern’’ of the variegating material with the frozen product. Typically, the ribbon of syrup should be of medium thickness, and the pattern should essentially reach into all segments of the container. Other quality criteria include the flavor and consistency of the variegating syrups used in the ice cream. The syrup should not ‘‘settle out’’ or mix with the ice cream, but simultaneously, it should not be overly hard, gummy, crusty, or icy.

21.6.6 Soft-Serve Frozen Desserts

These products (usually low fat ice cream or frozen yogurt) are commonly dispensed from a softy freezer for immediate consumption by the consumer. Since the serving temperature is about –7.2C, the hardening step is omitted, which eliminates the ‘‘damaging effects’’ of slow freezing and subsequent temperature fluctuations. As a result, soft serve should generally exhibit creamy, smooth mouthfeel properties, as well as provide excellent ‘‘flavor release.’’ Generally, the same requirements apply to the flavor of soft-serve as to the corresponding hard-frozen product (low-fat ice cream or frozen yogurt). Most of the body and texture criteria also apply, except that the desired or optimum characteristics should be partially redefined. The body should be fairly resistant and firm (to retain shape on a cone), but obviously not as firm as that of hardened products, which are stored and consumed at much lower temperatures (-13 ºC).

The desirable characteristics of soft serve can be summarized as follows:• A desirable flavor blend and absence of off-flavors.

- Smooth texture: small ice crystals; no lactose crystals; no butter granules; and no excessive coldness.
- Dry appearance; a pleasing color.
- Some modest resistance to melting.
- A reasonably firm, resistant body.
- A neatly shaped serving portion that maintains its shape for a reasonable time before consumption.

21.6.7 Sherbet

Though poor quality dairy ingredients may cause an off-flavor in sherbets, low concentration of total milk

solids (less than 5%) somewhat reduces this likelihood. In fruit sherbet, the quality is usually determined by the overall flavor blend of sweetness, tartness, fruit flavor intensity, and by how closely the given fruit flavoring emulates the true fruit flavor at its peak of quality. In non-fruit sherbet, quality differs with each specific flavoring; therefore, only a vague, general statement pertaining to the desired flavor can be made. In non-fruit sherbets, the flavoring and the sherbet base (mix) should be free of perceptible defects, and the frozen product should have a pleasing flavor blend.

21.6.8 Frozen Novelties

A number of frozen novelties may be made of ice cream, low fat ice cream, mellorine, sherbet, sorbet, ice, frozen yogurt, pudding, or combinations of several of these. They may be in many forms, such as bars (with or without a stick), coated or uncoated, ‘‘sandwiches,’’ pre-packaged cones, and other numerous forms. The flavor, body and texture of these types of products should be evaluated just as critically as their packaged counterparts, but there are some unique, potential problem areas that should be identified.

A listing of some of the more common quality problems of various types of frozen novelties that require special attention include:• Incomplete coverage with coatings

- Coating too far down the stick
- Incorrect volume
- Coating too thick/ thin
- Cracked/slipped coating
- Overrun too high/low
- Defective flavor
- Defective texture
- Sticking/damaged wrappers
- Broken sticks
- Sugar ‘‘bleeding’’ from bars
- ‘‘Soggy’’ wafers or cones (lack crispness)
- Brine contamination.
- High coliform count

21.7 Ice Cream Scorecard

Score cards are helpful in measuring ice cream quality where it is required to judge the quality of products based on established ideal characteristics. The score card had various category criticisms for flavor, body and texture, color appearance and package, melting quality, and bacterial content. The card has two category criticisms, flavor plus body and texture.

The suggested score card for evaluation of ice cream according to Indian standard (IS:15349:2003) is given below:

Table-21.1: Score card for ice cream

Name Date:

Batch no. or code no. Time:

Score the sample using the guidelines given below for deducting for perceived defect

Sr.No.	Characteristic	Max. score	Sample score
1	Flavour	50	
2	Body and texture	40	
3	Colour and appearance	10	
4.	Package	5	

Guidelines for deducing points

Sl. No.	Characteristic	Defects	Degree of defects		
			Slight	Definite	Pronounced
1.	Flavour	Bitter, fermented, flat, foreign, highly acidic, metallic, mouldy, lacks sweetness, oily, old ingredient, oxidized, rancid, salty, sour, yeasty	8	12	18
2.	Body and texture	Buttery, coarse, crumbly, curdy, fluffy, grainy, greasy, icy, low melting resistance, sandy, soggy, spongy	7	11	17
3.	Colour and appearance	Dull, mouldy, foreign particles	1	2	5
4.	Package	Improperly sealed spoiled, soiled	1	2	3

The scoring guides that accompany the scorecard will be given in practical exercises. Scoring guides are useful in training new evaluators and in promoting standardization of judgments among different evaluators.

The scor card suggested by American Dairy Science Association (ADSA) is shown in Table-21.2.

Table-21.2:The ADSA score card for ice cream

Criticism		1	2	3	4	5
Flavour -10	**Score**					
No criticism = 10 **Unsalable = 0** **Normal range = 1-10**	**Flavouring system** - lacks fine flavour - lacks flavouring - too high flavour - unnatural flavour					
	Sweeteners - lacks sweetness					

	- too sweet - syrup flavour -					
	Processing - cooked					
	Dairy ingredients - acid - salty - lacks freshness - old ingredient - oxidized - metallic - rancid - whey -					
	Others - storage (absorbed) - stabilizer/ emulsifier - neutralizer - foreign -					
Body and texture- 5	**Score**					
No criticism = 5 **Unsalable = 0** **Normal range = 1-5**	- coarse/icy - crumbly - fluffy - gummy - soggy - weak -					
Colour, appearance and package -5	**Score**					
No criticism = 5 **Unsalable = 0** **Normal range = 1-5**	- dull colour - non-uniform colour - too high colour - too pale colour - unnatural colour					
Melting quality- 3	**Score**					
No criticism = 3 **Unsalable = 0** **Normal range = 1-3**	- curdy - does not melt - flaky - foamy - watery					

	watery - wheyed off -					
Bacterial content- 2	**Score**					
	- standard plate count - coliform count -					
Total 25	Total score of each sample					

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