

ICE-CREAM & FROZEN DESSERTS



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Module 3. Ingredients in ice cream and frozen desserts

Lesson 6 DAIRY INGREDIENTS IN ICE CREAM

6.1 Introduction

Ice cream is made utilizing both dairy as well as non-dairy food ingredients. Each type of ingredient has its own significance in ice cream. There are several fat and SNF sources that can be utilized in preparing the ice cream mix. However, the properties of ice cream mix may change depending on the composition and heat treatment that the milk solids had undergone in preparing such dairy ingredient. The role played by milk fat and milk SNF is detailed hereunder.

6.2 Milk Fat

Imparts a characteristics richness and mellows the flavour of ice cream. It tends to retard the rate of whipping. Lecithin contained in milk fat has important contribution to the flavour and tactual qualities of ice cream. It contributes to smoothness of texture and contributes to body and melting resistance of the product. It does not lower the Freezing point (FP) of mix.

High fat content may limit consumption by increasing the calorific value and cost; and satisfies appetite more readily.

6.3 Milk SNF

It is high in food value, inexpensive and has a role in enhancing its palatability.

MSNF increases viscosity and resistance to melting, but also lowers the F.P. Lactose adds slightly to the sweet taste and minerals tend to have a slightly salty taste. Proteins help to make ice cream more compact and smooth.

The amount of MSNF generally varies inversely with the fat content of the mix and ranges from 7.5-8.0% in an 18% fat ice cream to 14.0% in a 4% fat ice milk mix. Indian PFA regulation does not permit less than 10.7% SNF by specifying a minimum of 3.5% protein content. The limiting factor for MSNF is occurrence of 'sandiness' defect in ice cream. As a thumb rule, the MSNF should not be more than 15.6-18.5% of the TS in the mix; based on the turnover (slow or rapid).

6.4 Sources of Milk Fat

Table 6.1 Sources of milk fat in ice cream

Fat Sources	Characteristics	Specifications
Sweet cream	Most desirable concentrated source of butterfat. Contributes to ease of emulsion	40% fat, Not more than 0.15% T.A. free from off

	<p>butterfat. Contributes to ease of emulsion due to presence of milk fat globule membrane vs. products like white butter, Anhydrous Milk Fat, etc.</p>	<p>0.15% LA, free from oil flavours and odors</p>
Frozen cream	<p>Use of 10% by weight of cane sugar before freezing the cream is beneficial – improved keeping quality, retains its flavor better, melts more quickly and with less fat separation. Produces mix with higher whipping ability.</p> <p>Disadvantage: Additional capital tied up.</p>	<p>Storage at $< -23.3^{\circ}\text{C}$ desirable, do not hold more than 6 months. Presence of Cu, Fe, Bronze may lead to tallowy, metallic flavour during storage.</p>
Plastic cream	<p>Similar in consistency to butter at ordinary temperatures. Product is stored and handled commercially like butter.</p> <p>Mixes made using this may show some oiling off and possess slightly lower whipping properties.</p>	<p>Has about 80% milk fat.</p>
Unsalted butter	<p>Next to sweet cream in importance</p> <p>Higher shelf life than cream, transported at lower cost.</p> <p>Any off-flavour in butter may carry over into the mix.</p>	<p>Has minimum 80% milk fat.</p> <p>Compared to cream, use of white butter produces less desirable freezing properties due to low content of lecithin in butter.</p>
Anhydrous Milk Fat	<p>Pre-emulsifying before homogenization of mix is advisable.</p>	<p>Has less than 0.1% moisture; good shelf life if nitrogen gas packed.</p>
Other fat sources	<p>Concentrated sweetened cream, Special heat treated milk fat, Butter sucrose, Butter-sucrose-powder mix products</p>	

6.5 Sources of Solids-Not-Fat

Table 6.2 Sources of milk solids not fat in ice cream

SNF Sources	Characteristics	Specifications
Fresh skim milk	Cheap source of MSNF. Should have normal acidity and clean flavour	-
Condensed skim milk	Plain condensed skim milk is used more frequently than other condensed milk products.	Milk fat- Max. 0.5% Total milk solids- Min. 20%
Spray dried skim milk powder	It should have fine flavour, light in color, free from darkened particles, fluffy and easily soluble. Types that can have impact include (a) low-heat, (b) medium-heat and (c) high-heat powders. High heat powder is desirable from body-texture, whipping, resistance to heat shock storage and melting properties.	Moisture- Max. 4% Milk fat- Max. 1.5%, Acidity- Max. 1.5% LA.
Spray dried whole milk powder	Not widely used since it can undergo off-flavour development during storage, especially if not packaged in an atmosphere of nitrogen.	Moisture- Max. 4% Milk fat- Min. 26.0% Acidity- Max. 1.2% LA.
Sweet cream buttermilk	Contributes to richness of flavour. It has beneficial effect on whipping ability of mix. Lecithin content of buttermilk ranges between 0.1-0.2 %.	Especially suited to low fat ice cream or ice cream made using white butter as fat source.
Sweetened condensed whole(SCM)/skim milk	High shelf life vs. plain condensed milks, but may pose difficulty in handling since it is thick and viscous. Exercise caution in using SCM with 'sugar down' defect.	Milk fat- Min. 9.0% TMS- Min. 31.0%, Sugar- Min. 40.0% (SCWM) Milk fat- Max. 0.5%,

		TMS- Min. 26.0%, Sugar- Min. 40.0%
Evaporated milk	Used to limited extent. Imparts a cooked flavour and caramelized color. It is costly milk solid.	Improves whipping ability due to high heat treatment and homogenization meted
Superheated condensed skim milk	Made by heating already condensed product to a high temperature, which increases its viscosity. They result in mixes with higher viscosity, whipping properties, more resistant body and smooth texture.	Can be judiciously used by manufacturers who omit stabilizers.
Sweet cream buttermilk powder	Keeping quality problem similar to WMP due to high fat (~ 10%). Improved whipping properties owing to presence of natural emulsifying substances. Noticeable improvement in flavour also observed.	Should normally replace up to 25-33% of the SMP in the ice cream mix.

6.6 Special Commercial Products

- Sodium caseinates: Dehydrated product may be used at 0.5-1.0% by weight of mix. It is advantageous in improving the whipping properties of mix and improves the texture of ice cream. However, it may produce slight undesirable flavour in ice cream.
- Low-lactose milk powder: It may be used in high solids ice cream either to replace a portion of the regular milk solids or to supplement the MSNF without the occurrence of sandiness during storage. Dehydrated low-lactose product may be used at the rate of 10-12% of MSNF in ice cream.
- Whey powder: In most mixes, whey powder maybe used at 25.0% of the MSNF or 3.0% of the total mix weight. It can lead to improved body and whipping quality at a reduced cost.

Table 6.3 Composition (%) of few milk based products

Milk product	Moisture	Fat	Protein	Lactose	Ash
Condensed buttermilk	72.0	1.95	10.61	13.01	2.43
Dried buttermilk	3.90	4.68	35.88	47.84	7.70
Condensed whey	48.1	2.4	7.0	38.5	4.00
Dried whey	6.1	0.9	12.5	72.25	10.50
Na-caseinate	4.00	1.50	94.00	0	0.50

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