
UNIT 8 PREPARATION OF DESIGNATED AND SPECIAL MILK

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8.0 OBJECTIVES

After reading this unit we should be able to:

- 221 define various types of special milk
- 221 outline advantages/ of manufacturing special types of milk
- 221 specify the requirements for preparation of special types of milks
- 221 prepare various types of special milks

8.1 INTRODUCTION

When natural constituents of whole milks have been altered by addition, removal, exchange and/or treatment, the resultant milk is designated as special milk. Recent years have witnessed a large increase in the market penetration of special types of milk into the total fluid milk market. In India, there is great seasonal fluctuation in the production of milk on account of which many milk plants have to run below their installed capacity, particularly during the lean season. Besides, the cost of whole milk generally remains very high throughout the year. Production of recombined milk and low fat toned milk have greatly helped in extending the market supply and reducing the cost of milk to the consumers. The machinery and manpower of a market milk plant can be fully utilized all the year round by such diversifications.

8.2 FULL CREAM MILK

i. Definition and Standards

Full cream milk means milk, or a combination of cow or buffalo milk or a product which has been prepared by a combination of both, which has been standardized to fat percentage of 6.0 and solids-not-fat (SNF) percentage of 9.0 by adjustment or addition of milk solids. Full cream milk must be pasteurized. It should show a negative phosphatase test. Upon pasteurization, it should be packaged in clean and sanitary containers and should be properly sealed in order to prevent subsequent contamination.

8.3 TONED AND DOUBLE TONED MILK

i. Definition

Toned milk means the milk obtained by the addition of water and skim milk powder to whole milk. In practice, whole buffalo milk is admixed with reconstituted spray dried skim milk for its production.

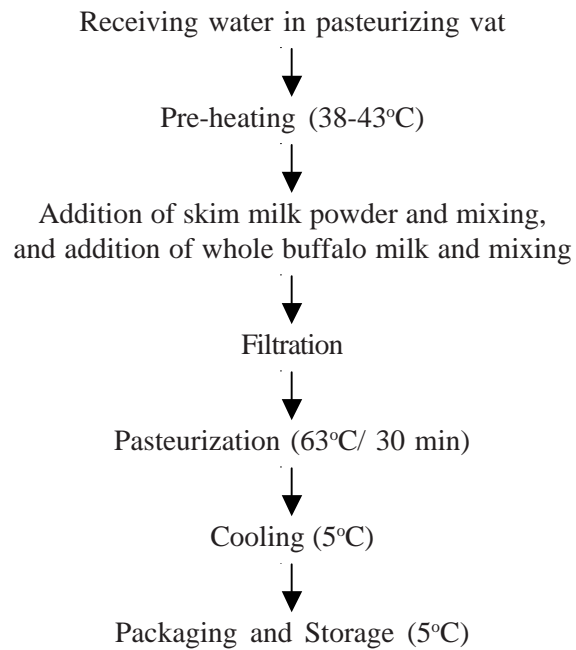
Under the PFA Rules (1976), toned milk should contain a minimum of 3.0 per cent fat and 8.5 per cent solids-not-fat throughout the country, whereas double toned milk should contain a minimum of 1.5 per cent fat and 9.0 per cent solids-not-fat throughout India.

ii. History

Toned milk is the brainchild of D. N. Khurody (an Indian Dairy Pioneer), who is also credited with coining its name. Under his auspices, it was first produced in 1946 in the Central Dairy of the Aarey Milk Colony and marketed in Bombay city. Soon other cities, notably Calcutta, Madras and Delhi started producing and marketing toned milk.

iii. Preparation

The calculated amount of potable water is received in the pasteurizing vat/tank equipped with an agitator. The water is heated while the agitator is kept in motion to 38 – 43°C. Then a proportionate amount of spray dried skim milk is slowly added at the point of agitation and the mixture thoroughly agitated till it dissolves completely. A calculated amount of whole buffalo milk is now added and the mixture again agitated thoroughly till a homogenous mixture is obtained. The mixture is then filtered, pasteurized at 63°C for 30 min, rapidly cooled to 5°C, packaged and kept at 5°C or below until distribution. The detailed flow diagram for manufacture of toned and double toned milk is given below:



Check Your Progress 1

1. Define special milk.

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2. List out quality parameters for full cream milk.

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3. Who invented toned milk? Give PFA requirements for toned and double toned milk.

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4. How do we prepare toned milk.

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8.4 STANDARDIZED MILK

i. Definition

Standardized milk is a product, whose fat and/or solids-not-fat (SNF) content have been adjusted to a certain pre-determined level. Under the PFA Rules (1976), the standardized milk for liquid consumption should contain a minimum of 4.5% fat and 8.5% SNF throughout the country. The standardization can be done either by

partially skimming the fat in the milk with a cream separator, or by admixture with fresh or reconstituted skim milk in proper proportions.

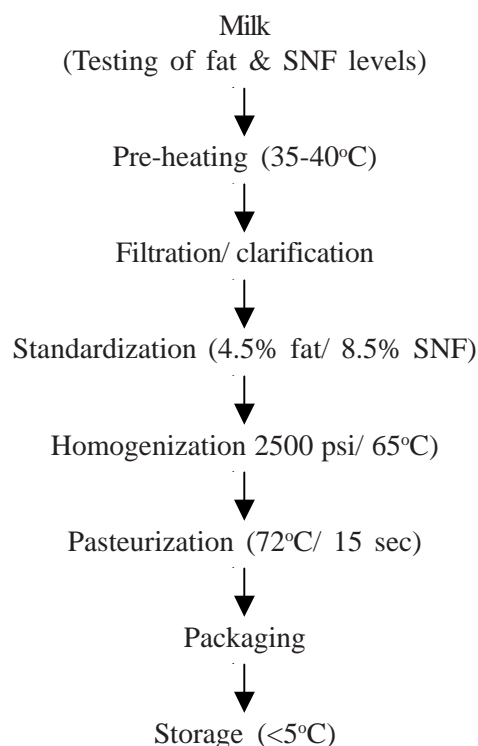
ii. Advantages

Standardized milk offers several advantages such as:

- ^{2/21} It ensures a milk of practically uniform and constant composition and nutritive value to the consumers.
- ^{2/21} The surplus fat can be converted into butter and ghee.
- ^{2/21} It becomes possible to supply cheaper milk as compared to the full cream milk.
- ^{2/21} It is more easily digestible because of less fat content as compared to full cream milk.

iii. Preparation

The detailed step-wise method of manufacture of standardized milk is given below: First of all milk should be received, and tested for fat and SNF levels. It is to be pre-heated to 35-40°C, followed by filtration/clarification. Milk should be standardized to 4.5% fat and 8.5% SNF levels after calculation of required quantity of skim milk or cream to be added. Upon standardization, milk should be homogenized (2500 psi/ 65°C) and then it must be pasteurized (72°C/15 sec). After pasteurization, milk must be packaged either in glass bottles or polypacks and then stored below 5°C till distribution. The detailed flow diagram for preparation of standardized milk is given below:



8.5 SKIM MILK

i. Composition

The average percentage composition of skim milk is given in the following table:

Constituent	% (Average)
Water	90.6
Fat	0.1
Protein	3.6
Lactose	5.0
Ash	0.7

ii. Utilization of Skim Milk for Making Different Dairy Products

Skim milk is a by-product of cream separation process. It is mainly used for standardization of milk and cream. The broad principles for utilization of skim milk, together with the names of commonly made dairy products is given in following table:

Principle of Utilization	Dairy Products Made
1. Pasteurization	Flavoured milks
2. Sterilization	Sterilized flavoured milk
3. Fermentation	Cultured butter milk (Lassi) Acidophilus milk Bulgarian butter milk
4. Fermentation and concentration	Concentrated sour skim milk
5. Concentration	Plain condensed skim milk Sweetened condensed skim milk Low-lactose condensed skim milk Frozen condensed skim milk
6. Drying	Dried skim milk
7. Coagulation	Cottage cheese Bakers' cheese Quarg cheese Casein (edible)

8.6 RECOMBINED MILK

i. Definition

Recombined milk refers to the product obtained when butter oil (also called dry/anhydrous milk fat), skim milk powder and water are combined in the correct proportion to yield fluid milk. The milk fat may also be obtained from other sources, such as unsalted butter or plastic cream. However, production of recombined milk is currently not in practice.

Under PFA rules, recombined milk should contain a minimum of 3.0 per cent fat and 8.5 per cent solids-not-fat throughout the country.

ii. Advantages

^{2/21} It helps in making up the shortage of fresh milk supplies in developing countries.

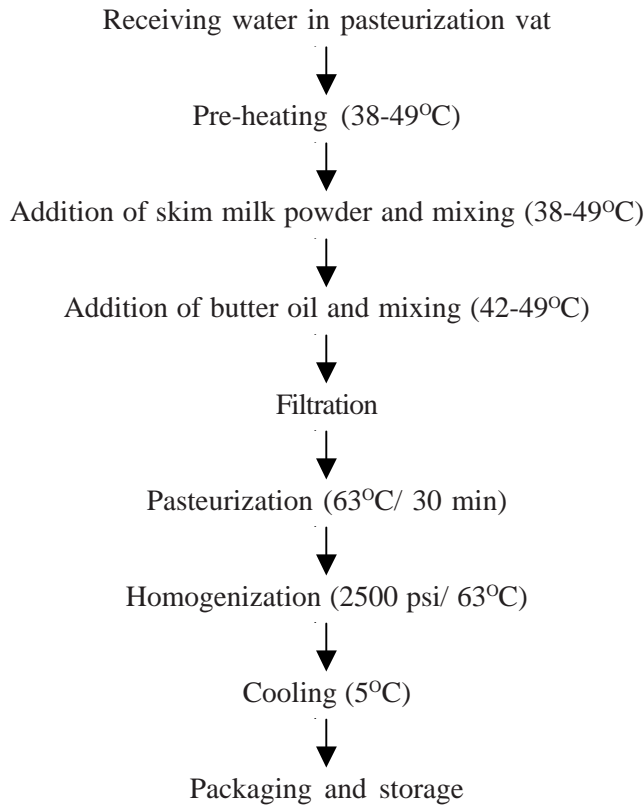
^{2/21} Helps prevent price rise of liquid milk in cities.

iii. Preparation

A stepwise process for preparation of recombined milk is given below:

A calculated amount of potable water is received in pasteurization tank and it is heated to a temperature of 38^o-43^oC, while the agitator is kept in motion. A proportionate amount of dried skim milk is slowly added at the point of agitation. When the water reaches a temperature of 43-49^oC, proportionate amount of butter oil is added. The mixture is thoroughly mixed, filtered and pasteurized at 63^oC for 30 min. It is then homogenized at 2500 psi pressure and cooled to 5^oC.

The detailed flow diagram for manufacture of recombined milk is given below:



Check Your Progress 2

1. What are the advantages of manufacturing standardized milk? Define standardized milks according to PFA.

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2. What is skim milk? Give its average chemical composition.

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3. Define recombined milk and briefly describe the method of manufacturing the same.

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8.7 RECONSTITUTED MILK

i. Definition

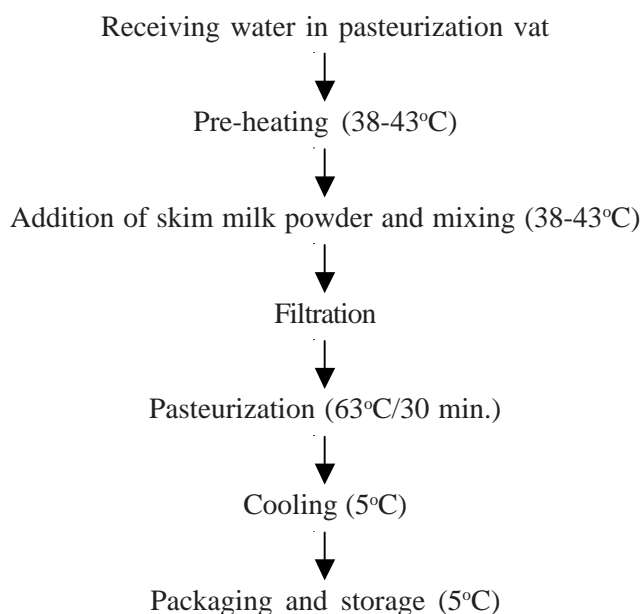
Reconstituted milk refers to milk prepared by dispersing whole milk powder in water (approximately in the proportion of 1 part powder to 7-8 parts water). During the lean season, reconstituted milk is the main source of milk supply in cities.

ii. Advantages

- ^{2/21} It helps in making up the shortage of fresh milk supplies.
- ^{2/21} It is used by the military forces

iii. Preparation

The calculated amount of potable water is received in pasteurization tank equipped with agitator. The water, is heated to 38-43°C and then calculated amount of spray dried whole milk is slowly added at the point of agitation. The mixture is thoroughly mixed, filtered and pasteurized at 63°C/30 min. and promptly cooled to 5°C or below until distribution. Detailed flow diagram of the process is given below:



8.8 FLAVOURED MILK

i. Definition

Flavoured milk is milk to which some flavour has been added. When the 'milk' is used, the product should contain a milk fat percentage at least equal to the minimum legal requirement for market milk. But when the fat level is lower (1-2 per cent), the term 'drink' is used.

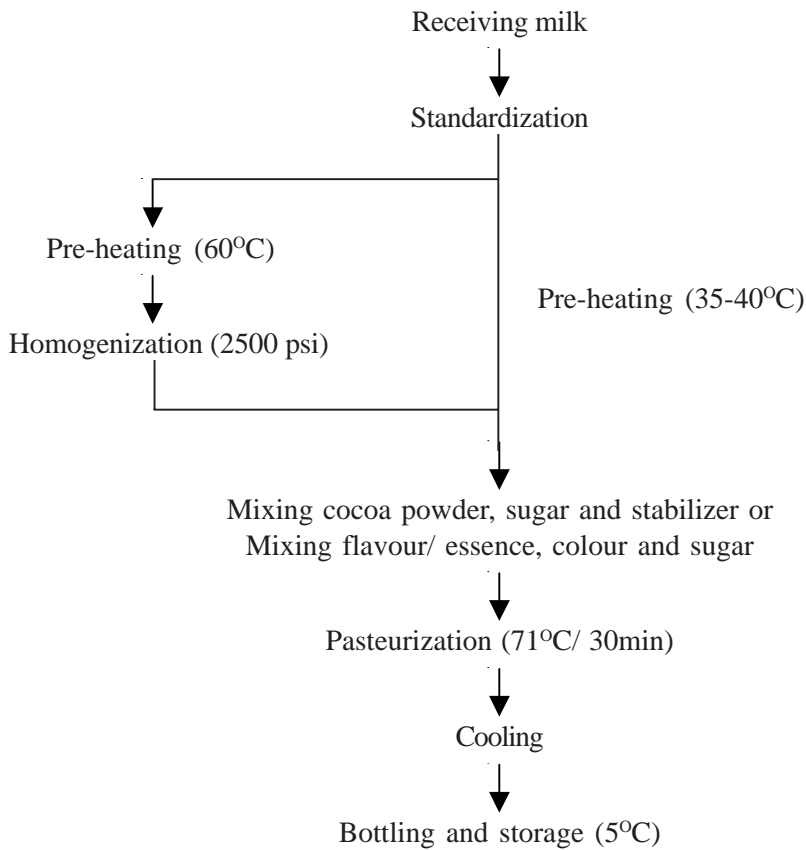
ii. Types of Flavoured Milk

The main types of flavoured milk are as follows:

- ^{2/21} chocolate milk/drink
- ^{2/21} fruit flavoured milk/drink
- ^{2/21} sterilized flavoured milk/drink

iii. Preparation of Chocolate Milk Drink

The milk on receipt is standardized to 2% fat level for preparation of drink. Standardized milk is then pre-heated to 35-40°C and filtered; alternatively, after standardization it is pre-heated to 60°C, homogenized at 2500 psi and then clarified. To the warm milk, cocoa powder (1 to 1.5%), sugar (5 to 7%) and stabilizer (sodium alginate – 0.2%) are slowly added and stirred to dissolve them properly. The mixture is then pasteurized at 71°C/30 min., cooled rapidly to 5°C, bottled and kept under refrigeration (5°C) until used. The detailed flow diagram for the manufacture of chocolate milk/ drink is given below:



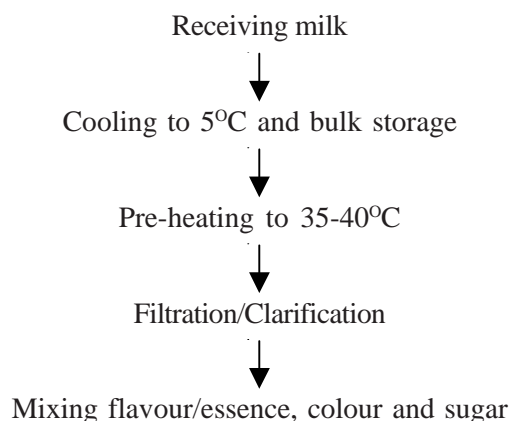
iv. Preparation of Fruit Flavoured Milk

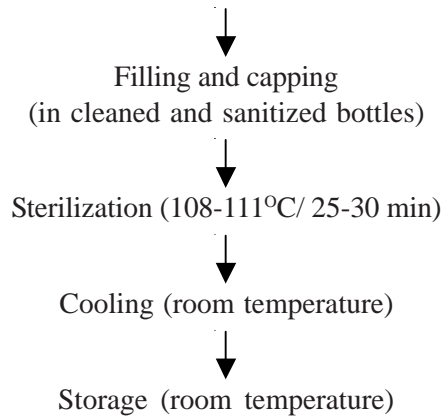
The method of preparation of fruit flavoured milk is similar to that used for chocolate milk/drink. Instead of cocoa powder, permitted fruit flavours/essence, together with permitted (matching) colours and sugar are used. The common flavours used are strawberry, orange, lemon, pineapple, banana, vanilla, etc. In order to obtain good results, the following precautions should be taken:

- ^{2/21} No acid (citric or tartaric) should be added to the fruit syrup, as this may cause curdling of milk.
- ^{2/21} Excessive sweet syrup should be avoided. The best sugar content of the syrup is 45-55 per cent.
- ^{2/21} Add 1 part of fruit syrup to 5 parts of milk.
- ^{2/21} Care should be taken to see that there is a pleasant blend of sweet, fruity and milky flavours (together with an appealing colour)

v. Preparation of Sterilized Flavour Milk

These combine the advantages of both sterilized and flavoured milk/drinks. The method of preparation is given below:





The raw milk, upon receiving, should be strictly examined by the prescribed physico-chemical and bacteriological tests and only high quality milk should be used for production of sterilized milk. The incoming milk should be promptly cooled to 5°C for bulk storage in order to check any bacterial growth. Next, it should be pre-heated to 35-40°C for filtration, so as to remove visible dirt, etc. Flavour/ essence, permitted (matching) colour and sugar (syrup) are added to clarified milk and mixed well. The fruit flavoured milk is now filled in cleaned and sterilized bottles and then capped properly. The filled bottles are then sterilized at 108-111°C for 25-30 min. The sterilized milk bottles should be gradually cooled to room temperature. Finally, the sterilized milk is stored in a cool place.

Check Your Progress 3

1. How reconstituted milk is different from recombined milk?
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2. Define flavoured milk and list out different types of flavoured milk.
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3. Briefly describe method of manufacturing chocolate milk.
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4. What precaution should be taken during manufacturing of fruit flavoured milk?
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8.9 LET US SUM UP

Special milk physically resembles and behaves like liquid milk. Special types of milk are prepared by altering natural constituents of milk by addition, removal, exchange and/ or treatment. Different types of special milk are full cream milk, toned milk,

double toned milk, standardized milk, skim milk, recombined reconstituted milk and flavoured milk such as chocolate and fruit flavoured milk.

All types of special milk should fulfill certain requirements laid down in the PFA rules. Also there are certain merits of manufacturing such special milk.

Different manufacturing procedures and ingredients are required in the production of special types of milk.

8.10 KEY WORDS

- Pasteurization** : Pasteurization of milk is done by heating milk to at least 63°C for 30 min, or 72°C for 15 sec. After pasteurization milk is cooled to 5°C or below.
- Pre-heating** : Pre-heating of milk refers to heating before the operation which follows immediately. The usual temperature of pre-heating is 35-40°C, and the equipment used may be a plate or tubular heater.
- Filtration** : Filtration removes dirt, dust, suspended and foreign particles by the straining process.
- Cooling** : Milk is generally chilled to 5°C or below and stored cool till it is used, to prevent deterioration in its bacteriological quality.
- Standardization** : Standardization of milk refers to adjustment of fat and solid-not-fat of milk to fulfill the legal requirements before sale.
- Homogenization** : Homogenization refers to the process of breaking fat globules in order to prevent formation of cream layer upon storage and enables easy digestion of milk
- Sterilization** : Sterilization of milk refers to subjecting milk to heat treatment at more than 100°C for sufficient period of time, so as to destroy almost all spoilage causing microorganisms.

8.11 SOME USEFUL BOOKS

- Ahmed, T. (1999). Dairy Plant Engineering and Management, Kitab Mahal, Allahabad.
- Aneja, R.P., Mathur, B.N., Chandan, R.C., Banerjee, A.K. (2002). Technology of Indian milk products, Dairy India Publication, Delhi.
- De, S. (1999). Outlines of Dairy Technology, Oxford University Press, New Delhi.
- Mathur, M.P., Datta, Roy, D., Dinakar, P. (1999). Textbook of Dairy Chemistry, Indian Council of Agricultural Research, New Delhi.
- Rangappa, K.S., Acharya, K.T. (1974). Indian Dairy Products, Asia Publishing House, Bombay.

8.12 ANSWERS TO CHECK YOUR PROGRESS

Your answer should include the following points:

Check Your Progress 1

- 1) i. Definition of special milk.
- 2) i. Types of milk or milk products used for manufacture of full cream milk.
ii. Fat and solid-not-fat per cent
iii. Pasteurization, packaging, storage
- 3) i. Name of person who invented toned milk.
ii. Fat and solid-not-fat requirements for toned and double toned milk according to PFA.

Check Your Progress 2

- 1) i. Merits of manufacturing standardized milk
ii. PFA requirements for standardized milk – fat and solid-not-fat per cent.
- 2) i. Skim milk – a by product of cream separation
ii. Chemical composition of skim milk
- 3) i. Definition
ii. Mixing of potable water and skim milk powder – addition of butter oil – mixing – pasteurization – homogenization

Check Your Progress 3

- 1) i. Differentiate between ingredients used
ii. Homogenization (Recombined milk) vs. non-homogenized (reconstituted milk)
- 2) i. Definition of flavoured milk
ii. Different types of flavoured milk
- 3) i. Milk reception – standardization – pre-heating – homogenization – Addition of ingredients – Pasteurization – Cooling – Packaging – Storage.
- 4) i. Avoid addition of acids.
ii. Optimum levels of sugar, fruit, flavour and colour, etc.