EXPERIMENT 13 PREPARATION OF FLAVOURED MILK, RECONSTITUTED MILK, AND TONED AND DOUBLE-TONED MILKS

Structure

13.1 INTRODUCTION

Liquid milk is sold in various forms with respect to its composition, added flavouring, and whether it is obtained from fresh, raw milk or from dried or concentrated milk (i.e. milk from which water has been partly or nearly completely removed for preservation purposes). Most of it is sold as plain milk, also known as 'market milk', whereas a small portion is sold in sweetened and flavoured form i.e. as a value-added commodity.

Milk may be standardized to various types with respect to its fat and solids-not-fat (SNF) contents. These include toned milk (min. 3.0% fat and 8.5% SNF) and double-toned milk (min. 1.5 fat and 9.0% SNF). Toned milk (TM) and double-toned milk (DTM) and also standardized milk containing not less than 4.5% fat and 8.5% SNF can be obtained from fresh raw milk or from preserved milk products. When prepared from dried milk, the resulting commodity is called 'reconstituted' milk (from whole milk powder) or 'recombined' milk (from skim milk powder, and butter oil / anhydrous milk fat or unsalted butter).

Further, when sweetened and suitably flavoured, fresh or reconstituted (or recombined) milk would yield the corresponding 'flavoured' milk viz., flavoured TM or flavoured DTM. The type of flavouring used would further designate the milk. Also, depending on the thermal treatment employed during the process, such milks may be 'pasteurized' (to be stored under refrigeration) or 'sterilized' (stable under ambient conditions). Plain, pasteurized TM and DTM are normally meant for augmenting the market milk supply in the so-called 'lean' season.

13.2 OBJECTIVES

- learn how to manufacture reconstituted/ recombined milk or toned/ double toned milk.
- know how to prepare flavoured milk.

13.3 EXPERIMENT

i. Principle

The milk solids which are obtained in the form of milk powder and butter oil/ anhydrous milk fat or unsalted butter by removal of water from milk can be re-dispersed into potable water in correct proportions so as to obtain a fluid milk appropriately called reconstituted (or recombined) milk. The composition of such a milk can be so adjusted that it would meet the standards of TM or DTM. A high-fat milk such as buffalo milk containing approx. 7% fat and 9% SNF can also be 'toned' down to the TM or DTM composition by suitably blending it with reconstituted skim milk.

Flavouring and sweetening of milk of any designation can be done during processing, and depending on the subsequent heat treatment, the milk can be marketed through a refrigerated line (pasteurized milk) or, if sterilized it can be handled under ambient conditions.

ii. Requirements

i) A multi-purpose milk processing vat (capacity, 200-500 litres) with a matching-capacity milk pump, powder feeding hopper (or funnel) and a recycling provision.

ii) Weighing balance.

iii) For larger capacities, an HTST pasteurizer in the recycling loop with the vat would be desirable.

iv) Homogenizer of matching capacity.

v) Skim milk powder, whole milk powder, butter oil or unsalted butter and sugar and flavouring (cocoa powder for chocolate milk).

iii. Procedure

i) Ensure the composition desired in the finished milk and that of the materials to be held.

ii) Calculate the required quantities of the materials and weigh them out into suitable containers.

iii) Sanitize the multi-purpose vat and other associated equipment using hot water (85^{o}C) for a contact time of 20-30 min.

iv) Take the required quantity of potable water in the multipurpose vat and switch on the pump in a recycling mode.

v) Dose the weighed quantity of skim milk powder (for reconstituted skim milk) through the hopper/funnel and continue recycling (for 10-15 min) until all the powder is thoroughly dispersed in water. (Alternatively, the required quantity of water can be pumped into the vat while simultaneously dosing the powder through the funnel).

vi) Filter the reconstituted skim milk to remove un-dispersed lumps of powder before being heated to pasteurize at 63^{o}C for 30 min and finally cooled to below 5^{o}C prior to packaging and storage. When using an HTST pasteurizer, the heat treatment would be for at least 72^{o}C for not less than 15 sec.

vii) In case 'recombined' milk conforming to TM, DTM or standardized milk standards is to be prepared, add the predetermined quantity of melted butter oil or unsalted butter to the reconstituted skim milk (warmed to 40^{o}C) being recycled through the processing vat.

viii) Heat the milk to about 60°C and homogenize it at 175-200 kg/cm^2 (or 2500-3000 psig) before subjecting it to pasteurization, cooling, packaging and storage.

ix) For flavoured (fruit-flavoured) milk (usually, TM or DTM), add the calculated quantities of sugar (5-7%), food colour and flavouring to the recombined milk (or, appropriately standardized fresh milk) after homogenization and before pasteurization.

x) To prepare chocolate milk, add cocoa powder (1.0 – 1.5%) mixed with sugar and stabilizer (0.1 – 0.2%) to the homogenized milk and pasteurize it at 63°C for 30 min or 74°C for 15 sec.

xi) Often, flavoured milk is sold as sterilized milk, for which it is necessary to bottle the un-pasteurized milk and subject it to in-bottle sterilization (vide Chapter 6 of this manual), or it may be subjected to UHT sterilization prior to aseptic packaging.

iv. Observations/ Production Chart

i) Quantity of reconstituted/recombined/flavoured milk to be prepared : .....

ii) Quantity of skim milk powder required: .....

iii) Type & quality of the milk powder: .....

iv) Moisture content of the milk powder: .....

v) Quantity of butteroil/ butter required: .....

vi) Moisture content of butter: .....

vii) Quality of butteroil/butter: .....

viii) Quantity of sugar required: .....

ix) Quantity of water required: .....

x) Amount of colour: .....

xi) Amount of flavouring: .....

xii) Amount of stabilizer, if required: .....

xiii) Composition of the desired milk: ..... % fat; ..... % SNF

xiv) Homogenization temperature: .....

xv) Homogenizing pressure: .....

xvi) Time-temperature of pasteurization/ sterilization: .....

xvii) Temperature of the final product: .....

xviii) Temperature of storage: .....

xix) Remarks: .....

.....

13.4 PRECAUTIONS

i) Do not use starting materials with an off-flavour or any other defect. Only good quality materials will yield a good product.

ii) In order to prevent excessive lump formation during reconstitution, allow the powder to mix slowly into the stream of water at the base of the feeding hopper. A specialized mixing device would minimize lumping of powder.

iii) During reconstitution of skim milk, excessive foaming can be avoided by

allowing the milk fall along the wall of the vat when re-circulating. Desecration of the reconstituted milk is necessary before pasteurization.

iv) When homogenizing raw milk, the latter must be preheated to about 60°C to avoid development of lipolyzed flavour (rancidity).

v) Do not add chocolate powder before homogenization, as it would otherwise cause excessive sedimentation.

vi) When sugar is used, mix sugar and powder before adding the two to the milk. Also, cocoa should be mixed with sugar before being added to the homogenized reconstituted milk.

vii) Permitted food colour or flavouring, or both, when required, should be first mixed with a small quantity of milk and then the mixture added to the main product lot. This will ensures thorough mixing.