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Studies on Preparation of Sterilized Flavour Milk Using Basundi Sweet

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Abstract:*Basundi (a common Indian sweet dish) prepared from cow and buffalo milk. It was found that the values of chemical properties of Basundi such as total solids, fat, solids-not-fat were increased with increase in the level of fat and concentration in milk. The interaction between different fat and concentration levels of cow and buffalo milk had definite effect on increase in total solids and solids-not-fat of Basundi. Perceiving the potential of drinking flavoured milk for having nutritional as well as therapeutic benefits. As children's are not friendly to consume plain milk as such, there is a necessity to modify milk in such a way that it would be more acceptable by the peoples of all age groups. Flavoured milk for having high nutritional value can be an excellent nutrient-rich substitute for this type of beverages like soft drinks and fruit juices etc. There are various types of flavoured milks has been produced with different tastes, flavours and extended shelf life flavoured milk (sterilised and UHT flavoured milk) including chocolate flavoured milk, fruit based flavoured milk, herbal flavoured milk, neutraceutical flavoued milk etc. this article summarized the studies on preparation of sterilized flavour milk Using Basundi Sweet.*

Keywords*:Basundi Sweet, flavoured milk, UHT, soft drinks, cow's milk and buffalo's milk.*

I. Introduction

Indian dairy industry is emerging at an important growth level of the Indian economy. It is the single largest contributor to Agriculture sector (17%) in India, contributing about 8% to Gross Domestic Product. Milk production in India has increased fivefold in the last fifty years and it continues to be number one in the world **(Gakkhar *et al.*, 2015)**. Since India's population is predominantly vegetarian; milk serves as an important part of daily diet. For most households, milk is a popular beverage due to its nutritional value **(Bindu *et al.*, 2014).**

India ranks first in milk production, accounting for 18.5 percent of the world production, with an average production of 160.4 million tons per annum in 2015-16 as compared to 143.3 million tons during 2014-15.**(Anon, 2015)**. Dairy production is one of the major sustenance factors for the rural economy of India. At the national level, about 17% of the total value of output from agriculture derives from this sector, placing Indian milk sector in first place **(Samal and Pattanaik, 2014)**. With the rapid growth of dairy industry in our country, the technology and design of process equipment has also undergone needed changes and equipment for making indigenous products are no exception **(Patel *et al.*, 2005)**.

Sterilized concentrated milk is a rather recent development in the processing of milk. It is one of a series of products developed by man in attempting to extend the storage life of milk, a highly nutritious but readily perishable food. Sterilized concentrated milk offers several advantages over other methods of preserving milk.

Among these advantages are the following:

(1) Since it is a sterile product, sterilized concentrated milk is not subject to bacterial decomposition. It can thus be stored and transported without refrigeration.

(2) Being a concentrate, sterilized concentrated milk represents a more efficient media for the distribution of milk nutrients than fluid whole milk. This applies not only to distribution in this country, but also in impoverished areas of the world where milk nutrients are badly needed and where refrigeration is often unavailable.
(3) Since the finished product exists in a liquid state, it is more readily reconstituted than are dry milk powders.
(4) Sterilized concentrated milk does not possess the strong caramel flavour that is associated with evaporated milk

1.1 Physical Properties Of Milk

1.1.1 Physical State

Milk is an oil-in-water emulsion whose various constituents differ widely in molecular size and solubility. The smallest molecules, those of salts, lactose, and water-soluble vitamins are in true solution. The proteins including enzymes are in colloidal state because of the large size of their molecules (0.05-0.5 µm). The fat in non-homogenized milk is present as globules of larger than colloidal size. Homogenization causes changes 19 in the membrane which prevent coalescence of the fat globules. The membrane exhibits a typical bi-layer membrane structure (**Keenan *et al.*, 1988)**.

1.1.2 Acidity

The hydrogen ion concentration of fresh milk is 6.6 at 25˚C. The concentration lies on the acid side of the pH scale. It is well buffered by protein and salts, especially the phosphates. The pH of milk is temperature dependent. When milk is heated, its pH decreases because hydrogen ions are liberated when calcium phosphate precipitates **(Sherbon, 1988).**

1.1.3 Viscosity

Whole and skimmed milk are Newtonian fluids (their consistency changes with rate of shear). Their viscosities depend only on temperature, whereas the viscosities of the non Newtonian creams, concentrated milks, and butter depend also on shear rate. The quantity of dispersed solids influences the viscosity. Thus, whole milk is more viscous than skimmed milk, which is more viscous than whey **(Sherbon, 1988).** At 20˚C skimmed milk and whole milk have viscosities of 1.5 cP and 2.0 cP respectively **(Cross and Overby, 1988)**.

1.1.4 Freezing Point

The freezing point of milk is slightly lower than that of water because of the presence of lactose and soluble salts. Reported values range from -2.531˚C to 0.570˚C **(Sherbon, 1988)**. Determination of the freezing point can be used for detection of milk to which water has been added.

1.1.5 Surface Tension

Compared with water, the surface tension of milk is low. At 20^0 C the surface tension of milk is 50 dyn cm^{-1}. Milk fat, proteins, free fatty acids, and phospholipids lower the surface tension of the milk **(Sherbon, 1988)**.

1.1.6 Fat Stability

The milk fat globules are liquid when in the udder. The fat globules are described in section 2.1.5.3. According to **Klostermeyer and Reimerdes, (1976)** the milk fat will crystallize by cooling, starting from the outer part of the globule and continuing inwards when it leaves the udder. Depending on the fat composition and cooling rate, this crystallization may lead to disruption of membranes of the fat globules which causes an impairment of the fat emulsion stability. **Badings and van der vol, (1973)** found that cooling below 5 ^{0}C caused an adsorption of material from the membranes to the serum phase. (Patton *et al.*, 1980) has shown that cooling raw milk at 2-4˚C for 24 hr will results in an increase of phospholipids in serum. **Christiansen, (1982)** showed that cold-separation of cold-stored raw milk gives whipping cream with improved whip ability, but reduce fat emulsion stability.

1.2 Nutritional Functions of Milk

(O'Conner, 1993) indicated that milk is a main source of nutrients for most young mammals for lengths of time, which vary with the species. Milk serves the following broad functions: growth, supply of energy, maintenance and repair of body tissue, and appetite satisfaction. Milk contains various nutritionally important components, namely proteins, carbohydrates, lipids, minerals, vitamins and water. The metabolically available energy is approximately 4.0, 4.1 and 8.9 kcal/g (16.8, 17.0 and 37.0 kJ/g) for lactose, protein and fat, respectively. The chief function of lactose in milk is to supply energy for muscular activity and maintenance of body temperature. Cow milk forms a firm curd in the stomach and digestion is slower than with human milk **(De Wit, 1989).**

Milk lipids supply the body with a concentrated source of energy and are important contributors to both desirable and undesirable flavours in milk and milk products. Certain fatty acids are not synthesized by the animal in enough quantities as indicated in Table 7, **(Kaufmann and Hagemeister, 1987).** They include polyunsaturated acids, linoleic (C18:2) and linolenic acid (C18:3). It is considered that 2-4% of the energy of the diet should be supplied by polyunsaturated acids. The linoleic acid content in human milk fat accounts 21 for 5% of the energy in milk. This is much higher than for cow milk, which accounts for only about 1% of the total energy. Milk is an

excellent source of Vitamins A, D, E and K. Milk is a major source of some of the vitamins needed by infants and adults. It is relatively rich in Vitamins A and E, thiamine, riboflavin, folic acid and Vitamin B12. However, large variations occur between human and cow milk **(Adams *et al.*, 1975)**. Human milk contains only 35% as much thiamine, 25% as much riboflavin and 5% as much B12 as cow milk. On the other hand human milk contains 10 times as much Vitamin E and 2.5 times as much ascorbic acid as cow milk. Vitamin A is central to the visual processes as a constituent of the visual pigment rhodopsin **(Eckles, 1943).** Vitamin D is essential for the calcification process in the body, including bone and teeth formation. The high levels of calcium and phosphorous in milk are important in bone and tooth formation in young children; both these elements play a significant role in preventing osteoporosis in elderly people **(Penfield and Campbell, 1990).** The mineral content is shown in Table 8 (section 2.1.5.5). Milk also contains high levels of magnesium, zinc and iodine. However, milk is a poor source of iron and neither human nor cow milk supply enough for human infants. Infants have a store of iron in the liver, which is sufficient to meet the needs of the body during the first six months **(Dowd and Dent, 1937)**.

1.3 Alteration of Milk Through Processing and The Effect on Nutritive Value

Prior to the consumption of milk as fluid milk or as a product from fluid milk, milk is subjected to one or more treatments that may influence the characteristics of the product. Milk is treated to preserve it. Treatment may include one or more heat treatments, coagulation and/or dehydration and may influence flavour, colour, texture, functional properties, and nutritional value **(Egounlety, 1985).**

1.3.1 Heat Treatments and their Effects

1.3.1.1 Pasteurization

Pasteurization is the mild heat treatment of products. It is used to destroy selected vegetative and/or pathogenic micro-organisms and inactivation of enzymes which may cause the development of off-flavours. It results in the increase in keeping quality. It may be accomplished by one of several treatments that meet FDA requirements (FDA, 1998). Pasteurization conditions include heating at 62˚C for 30 minutes, 72˚C for 15 seconds or 138˚C for 3 seconds **(Hill, 1998).**

Mild heat treatment such as pasteurization causes very little change in nutritive value. Severe heat treatment results in some loss of available lysine, but this has little effect on traditional quality because milk proteins are rich in lysine **(Hansen, 1997).** The use of a High-Temperature-Short-Time (HTST) such as 720C or higher for 15 seconds, changes the flavour more than the holding method of at least 620 C for 30 minutes. Some of the most common off-flavours in milk are rancid and oxidized flavours. Boiling changes the flavour of milk more than pasteurization does. Off-flavours may be attributed to free sulfhydryl, aldehydes and ketones **(Hansen, 1997). Hutton and Patton (1992)** reported that sulfhydryl groups of β-lacto globulin, which give rise to hydrogen sulphide with denaturation are responsible for the cooked flavour of milk. The interaction between lysine and lactose during heating results in formation of a brown pigment (Millard browning) that causes off-flavours to develop during storage of milk products. Oxidized flavour, is accelerated by traces of copper; this finding has caused a virtual elimination of copper containing equipment from dairies **(Hutton and Patton, 1992).**

1.3.1.2 Evaporation and Canning

The functions of evaporation are to:

i) Pre-concentrate food for drying, freezing or sterilization.
ii) Increase solid content of product.
iii) Reduce water activity.
iv) Convenience for consumer or manufacturer
v) Change flavour and/or colour of food.

To produce evaporated milk, milk is warmed and concentrated to slightly more than double the solids content of the fluid whole milk (25% total milk solids including 7.5% milk fat) **(FDA, 1998).** Then it is homogenized, sealed in cans, and sterilized. The characteristic "cooked" flavour of evaporated milk is caused by the high temperature required in canning. The milk is sterilized at 115 to 118^{0}C for 15 to 20 minute **(Morr and Richter, 1988).** Methyl sulphide, a component that is responsible for a "cow" flavour in fresh milk (Patton et al., 1956), has been found at elevated levels in evaporated milk, suggesting that it plays a role in the cooked flavour. Off-colours may develop in evaporated milk stored at high temperatures for long periods of time as a result of carbonyl amine browning. Flavour deterioration in concentrated milk in the form of cooked, scorched and staled notes was greater at 20 and 37˚C than at 40C when concentrated milk was stored for 8 months **(Loney *et al.*, 1968).**

The present investigation on preparation of sterilized basundi flavoured milk with following distinct objectives:

Objective

1. To manufacture flavoured milk using basundi as a source material.
2. Optimization of different flavour concentrations and sensory evaluation.
3. Shelf-life study of the formulated products at room temperature.

II. Materials and Methods

The present investigation "**Studies on preparation of sterilized flavour milk**" was carried out in jain dairy bhandara. Materials used and methods adopted for the present investigation is presented under suitable headings.

2.1 Materials

2.1.1 Raw Material

Milk, sugar, basundi flavour, colour, etc.

2.1.2 Packaging material

Packaging material i.e. glass bottles were taken from Jain Dairy Bhandara.

2.1.3 Chemicals and glassware's

Chemicals (analytical grade) and glassware's required during experiments were taken from jain dairy.

2.1.4 Equipments

The equipments and machineries like Brookfield viscometer, hot air oven, muffle furnance, and weighing balance equipment was used for the present investigation were used from the Jain dairy.

2.1.5 Digital Milkometer (milky lab)

The parameter of milk like lactose, protein, fat, freezing point, pH and SNF of cow milk was done by using Milky lab (Digital Milkometer).

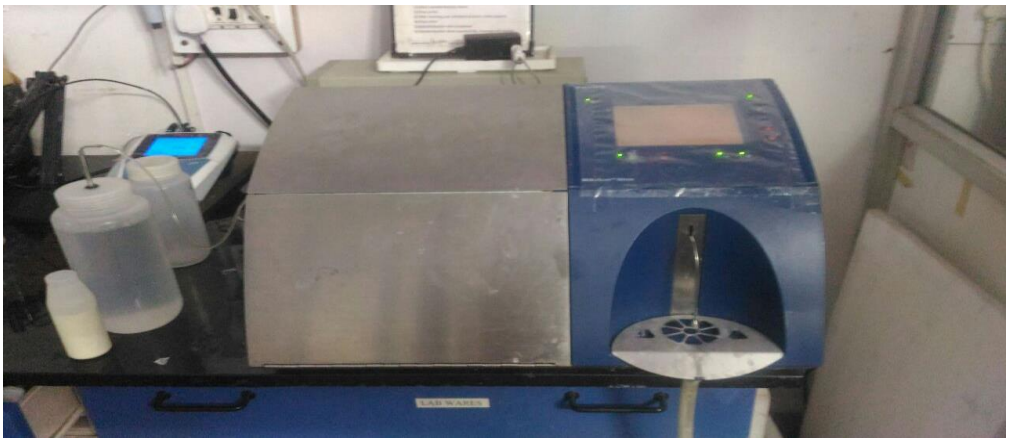


Fig: Digital milkometer

2.2. ***Methods***

3.2.1 Standardization Of Milk

The cow milk was standardized for fat and SNF by using Pearson`s square method.

Fig: starting stage of milk for making flavoured milk.

2.2.2 Standardization of recipe for preparation of flavoured cow milk

The formulation of flavoured cow milk was done in Jain Dairy by using cow milk, sugar, flavour, colour. For preparation of flavoured cow milk the quantity of ingredients were standardized. Further the selected sample was assessed for the flavour variation at different levels is presented in table 1.

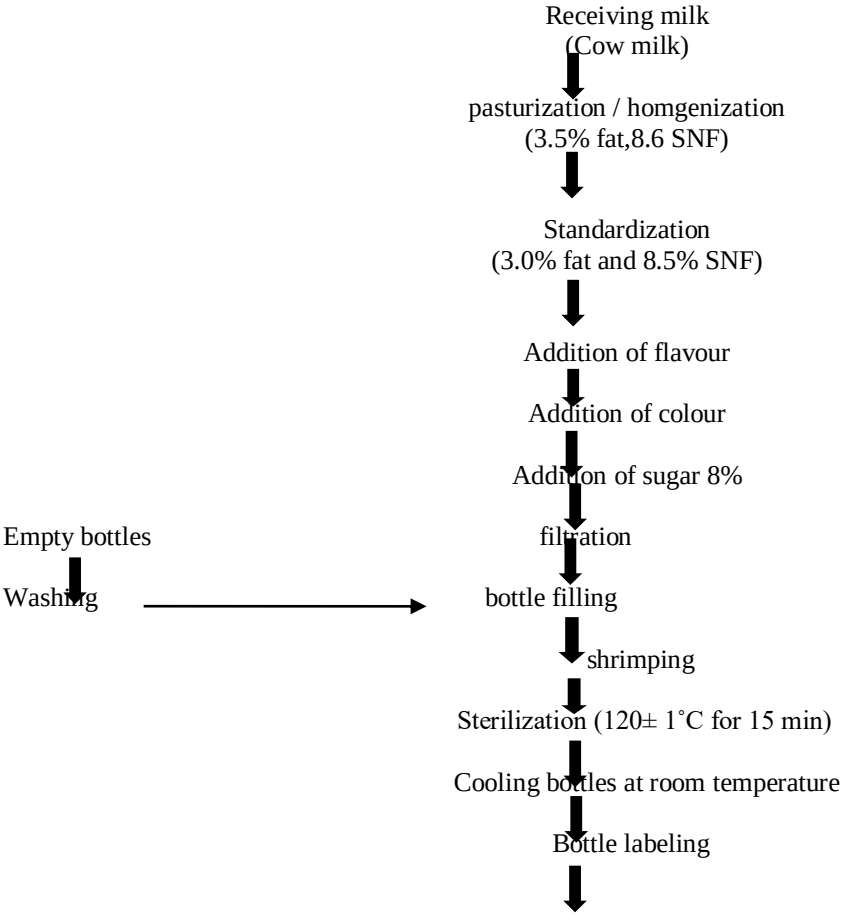
Table 2: Formulation of flavoured milk

Ingredients	**Control**	**C1**	**C2**	**C3**
Milk	1000ml	1000ml	1000ml	1000ml
Sugar	80g	80g	80g	80g
Colour	2gm	2gm	2gm	2gm
Flavour	0.0	0.10	0.15	0.20

2.2.3 Preparation of flavoured cow milk

2.2.3.1 Methodology for preparation of flavoured cow milk

Cow milk was taken for the preparation of flavoured milk. The required quantity of cow milk having 3 percent fat was taken in a pan and sugar was added at 9% and mixed well with addition of flavour.



Shrinking (150˚C)

↓

Tray packing (24 bottles per tray)

↓

Shrink wrapping trays (150-160˚C)

↓

Storage

Flow sheet: Preparation of sterilized flavoured cow milk

Fig: final product

III. Conclusion

Perceiving the potential of drinking flavoured milk for having nutritional as well as therapeutic benefits. As children's are not friendly to consume plain milk as such, there is a necessity to modify milk in such a way that it would be more acceptable by the peoples of all age groups. Flavoured milk for having high nutritional value can be an excellent nutrient-rich substitute for this type of beverages like soft drinks and fruit juices etc. There are various types of flavoured milks has been produced with different tastes, flavours and extended shelf life flavoured milk (sterilised and UHT flavoured milk) including chocolate flavoured milk, fruit based flavoured milk, herbal flavoured milk, neutraceutical flavoued milk etc.

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