

**“Studies on Process Standardization and Development of
Thikpurli Burfi”**

A Synopsis for the Degree of

DOCTOR OF PHILOSOPHY IN DAIRY SCIENCE

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BY

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RESEARCH GUIDE

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Introduction

Livestock production plays a dynamic and multipurpose role in the nation's agriculture system and Indian rural economy. The livestock sector contributes nearly 28.63% of the value of the total value of output in the Agriculture, Fishery, and Forestry sectors. The overall contribution of the sector in total Gross Domestic Production, the livestock sector contributes nearly 4.2% at current prices during 2018-19 (Economic survey, 2020-21).

India ranks first in the total bovine population in the world, with 195.5 million Cattle, 109.9 million Buffalo, 74.3 million Sheep, and 148.9 million Goat (Livestock census, 2019).

In the world, India has emerged as the largest milk-producing country with an annual growth rate of 5.7percentcompared to the previous year as well as annual milk production is 198.4 MT and with per capita availability of milk has increased up to 407 grams per day during the year 2019-20. Maharashtra ranked 7th place in India for milk production (116.55 Lakh MT) next to Uttar Pradesh (1st), Rajasthan (2nd), Madhya Pradesh (3st), Andhra Pradesh (4th), Gujarat (5th) and Punjab (6th) in 2018-19 (Economic survey, 2020-21).

Kolhapur is one of the most important districts in Maharashtra for milk production around 5620.27 lakhs kg and share of the district in the state's total milk production is around 8.55%, which rank 5th place next to Ahmednagar (1st) and Pune (2nd)(NDDDB, 2015).

Milk is regarded as a complete food in the human diet. Milk has a combined source of physical, mental and intellectual energy. It is the only complete nourishing drink for infants, young ones, adults and old age human life. Milk and milk products occupy a very important place in the food sector and Indian economy. Milk is the traditional diet that has provided all the nutrient elements viz fat, protein, lactose, minerals and vitamins, essential for the nourishment of the human body. Milk and milk products serve as the source of first-class proteins, calcium and phosphorus

along with numerous other essential major and minor substances, especially for children and vegetarians.

Out of the total milk produced in India, 46.00% liquid milk is consumed as whole milk and 54.00% is converted into traditional value-added milk products like *khoa* and *khoa* based sweet, chhana, and chhana based sweet, fermented milk products and frozen milk products which played a significant role in the farmer and Indian economy. Milk is consumed as a whole or by converting it into various milk products such as coagulated, fermented, heat desiccated, and frozen milk products (Venketesh, 2003).

Khoa is an important heat desiccated Indian milk product and used as the base material for a large variety of sweets. *Khoa* is prepared by continuous boiling of milk until desired concentration (65-72 percent T.S.). It contains muscle-building protein, bone-forming minerals, and energy-giving fat and lactose. *Khoa* prepared from whole buffalo milk contains total solid as 78.4 %, fat as 30.5 %, protein as 17.70 %, lactose as 30.90 %, ash as 5.90 %, and more vitamins (Aneja *et al.*, 2002).

Burfi is prepared by heating a mixture of concentrated milk solids (*khoa*) and sugar to a near homogenous consistency followed by cooling, cutting into small cuboids, beating and whipping operations prior to cooling are sometimes practiced to obtain a product with a smooth texture and closely knit body. The most popular varieties of *burfi* are fruit, nut, chocolate, saffron, and *Rawa burfi*. These ingredients can be used single or in combination (Aneja *et al.*, 2002). The shelf life of *burfi* is about 7–10 days under ambient conditions (Khan *et al.*, 2008).

Typically, *burfi* has a mildly caramelized and pleasant flavor which is further enhanced by the addition of some cardamom, chocolate, coconut, fruit, etc. The color of *burfi* may range from off-white to creamy or light caramel, depending mainly upon the type of milk solids used as base material and also the extent of heat desiccation during the preparation of *burfi*. The body and its flavors of *burfi* vary considerably among product varieties. It may range from very loosely compacted to a closely-knit body. The texture could also vary from smooth to granular and crisp to chewy. A microscopic thin layer of free separates granules in the closely-knit mass.

Kolhapur District is situated in the Maharashtra state of India, in which Kolhapur city is the district headquarters and 12 Tahasil place. The Kolhapur District is in the southwestern part of the Maharashtra state. Radhangari is one of the talukas of

Kolhapur districts having Thikpurli, Rashivade, Walava, and Radhanaari major big villages.

Thikpurli village is located at longitude 74.1166552 and latitude 16.5029492 and 20, 5, 10, 8, 15 km away from Kolhapur, Bhogawati, Bidri, Rashivade, Kagal big villages respectively in between Kolhapur Gargoti Road and Kolhapur Radhanagari Road. It is situated 30 km away from Radhanagari (tehsildar office) and 20 km away from district headquarter Kolhapur. Thikpurli is surrounded by Gagan Bavada Taluka towards North, Bhudargad Taluka towards South, Kagal Taluka towards East, Karveer Taluka towards North. Thikpurli's Local Language is Marathi. According to Census 2011, Thikpurli Village's total population is 5055 and the number of houses are 1028, in which Female Population is 47.7%. The village literacy rate is 71.3%.

Thikpurli burfi is the heat desiccated indigenous dairy product of Thikpurli village and it is become popular with sticking the name of this village to this product. Two families i.e., Malage and Chougale are preparing this product since the beginning of the 20th century. Today there are 15 manufacturers involved in this business of *Thikpurli burfi*. The special thing regarding these families and other manufacturing agents is that they do not prepare any dairy product except *Thikpurli burfi*.

The production of *Thikpurli burfi* is confined to hotel owners, which results in variation in its quality attributes but yet because of its characteristic taste, appearance, and popularity *Thikpurli burfi* becomes the only important and popular dairy product throughout the district. Day to day with the increasing popularity of this product demand is also increasing. So to fulfill this huge demand manufacturers purchase milk from milk producer's cooperative dairy societies, local milk producers, or in case of emergency packaged milk of various brands whichever available, in which not maintaining proper hygienic condition is used for the production of this product, which has variation in their chemical composition, obviously resulted in variation and deteriorate the quality of the final product. But having special flavor, body, texture, and appearance gaining popularity throughout and out of the district but due to lack of marketing, proper hygienic condition, and standardization it is not spreading out of the district. In our country, the hygienic quality and shelf life of traditional dairy products is very poor due to their manufacture in the unorganized sector mostly by the *halwais* (Sindhu, *et. al*, 2000 and 2008). The manufacture of this product is confined to the district and has not been tried to expand its horizon out of the region due to lack of proper studies regarding standardization and marketing aspects. The *Charoli* seed

(*Buchananiacochinchinensis*) is a lentil-sized almond-like flavour seed. They are commonly used as ingredients in different sweets in India. Charoli seeds are used in the Ayurveda and Unani systems of medicine Hence attempt will be made to study the quality assessment, production process standardization and development of *Thikpurli burfi*.

Review of Literature

1. Definition:

According to FSSAI (2011), *Burfi* is prepared using *Khoa* a heat coagulated milk product obtained by rapidly evaporating buffalo/cow milk in shallow pans to a total solid of about 70 per cent. The important steps involved in the preparation of the *burfi* are desiccation of milk in *Khoa* of different consistencies, incorporation of sugar, and further desiccation to get the desired consistency and texture. The coloring and flavoring materials, if any, are added at the initial and final stages of preparation. The product while still hot and processing a semi-solid consistency is poured into the previously prepared molds and then cooled. After cooling the mass is cut into pieces of the required size and shape.

According to Patangeet *al.* (2018), *Burfi* is a product obtained from continuous boiling and stirring cum scraping of cow or buffalo milk or a mix of them in a wide mouth open pan to get Pindi type *khoa*, in which sugar is added @ 30 per cent of *khoa* or 6 percent to the original quantity of milk.

2. Technology of *Burfi* Preparation

Anejaet. *al.* (2002) described the process for the preparation of *burfi* on a cottage scale. They recommended that buffalo milk with a fat: SNF ratio of 1:1.5 for preparation of *burfi*, depending upon the type of *burfi* desired, specially prepared quality of *Khoa* may be selected. *Khoa* is thoroughly worked by hand to produce a smooth texture as possible. The heat from the direct fire is applied for blending *khoa* with sugar @ 30 per cent of *Khoa* in a steel shallow pan. Contents of the pan are skillfully handled to produce desired attributes of flavor, body, and texture. When desirable organoleptic attributes have been developed, the product is poured in trays or moulds in a uniform layer, the thickness of which is consistent with the final form of *burfi*. The product is allowed to be set, *burfi* is cut into the required shape and size and finally packed in paper or corrugated cardboard boxes.

3. Chemical Composition of *Burfi*

There is a wide variation between the samples of plain as fruits, nuts, cereal and pulse added burfi as reported by various workers as shown below.

Type of <i>burfi</i>	Chemical constituents (%)						Reference
	Moisture	Fat	Protein	Lactose	Sucrose	Ash	
Cow milk <i>burfi</i>	20.73	19.04	10.37	16.56	30.83	2.44	Sarkar <i>et al.</i> (2002)
Plain <i>burfi</i>	15.64	20.37	15.05	15.81	30.41	2.72	Palit and Pal (2005)
Mango <i>burfi</i>	23.39	22.86	10.41	19.02	-	-	Kadam (2008)

4. Storage Related Changes in *Burfi*

Khan *et al.* (2008) evaluated the sensory quality of groundnut *burfi* by a panel of 15 trained judges on a 9-point hedonic scale. Initially, the groundnut *burfi* had an overall acceptability score of 8.2. The groundnut *burfi* remained acceptable for 6 to 8 months under ambient temperature conditions when packed in PP and MP, respectively.

Shrivaset *al.* (2018) observed that the decrease in moisture content with increase in storage period which effects of the simultaneous increase in protein, fat, lactose sucrose, and ash contents during the storage period of Ravaburfi. During the storage period on the first day, the moisture was 19.29 per cent which decreases up to 17.53 on 9 th day of storage at room temperature.

Kuchiet *al.* (2017) reported that *Burfi* samples stored at ambient conditions irrespective of packaging material deteriorated faster due to high microbial count and not available after 5 days of storage. *Burfi* samples packed in aluminum foil retained moisture and could be stored for 15 days at low temperatures with low microbial load and high consumer acceptability.

Limitation of study

This study is only restricted to the Thikpurli village and related allied local areas of the district. The study is focused on only the manufacturing process of Thikpurli burfi and its quality assessment.

Objectives

- 1) To study the existing manufacturing practices for the production of *Thikpurli burfi*.
- 2) To analyze the sensory, Physico-chemical and microbial qualities of *Thikpurli burfi*.
- 3) To assess the cost analysis of traditionally manufactured *Thikpurli burfi*.
- 4) To optimize the processing parameter for the production of *Thikpurli burfi*.
- 5) To standardize the quantity of sugar, fat, and SNF for the manufacture of *Thikpurli burfi*.
- 6) To study the value addition of *Charoli* in *Thikpurli burfi*.
- 7) To study the shelf life of the standardized product of *Thikpurli burfi*.

Materials and Methods

1. Materials

a. Ingredients

1 Milk - Fresh buffalo milk will be standardized to various fat percentages.

2 Sugar - Good quality cane sugar will be procured in a single lot from the local market.

b. Utensils / Equipments

1 Karahi - An iron *karahi* will be used for the preparation of *burfi*.

2 Stirrer - Long-handled stirrer with the flattened end made up of mild steel will be used for stirring-cum scraping the milk during the preparation of *burfi*.

3 Tray - Stainless steel trays (30x30x1.5 cm) will be used to cool, flatten and shape *burfi* pieces.

4 Cutting knife - Stainless steel cutting knife will be used to cut the *burfi*.

5 B.O.D. incubator - B.O.D. An incubator will be used for the storage of the sample at $30\pm 1^{\circ}\text{C}$.

6 pH meter - pH meter will be used to measure the pH of the stored *burfi* sample.

7 Autoclave – To sterilize the microbial media, solutions.

8 Penetrometer – It is used to measure the hardness of burfi.

c. Chemicals

All the chemicals required for the analytical work will be used of Analytical Reagent (AR) or Guaranteed reagent (GR) grade manufactured by Merk India Ltd/Glaxo India Ltd.

d. Microbiological Media

Microbiological media made by M/S Himedia laboratories will be used for the preparation of media and microbial examination of *burfi*.

e. Packaging Material

Laminate Paper board boxes will be used as a packaging material for packing *burfi*.

f. Glasswares

All the glassware viz., Petri plates, dairy microbiological pipette, test tubes, glass beakers, conical flasks, etc. of Borosil make will be used to analyze *burfi* for different parameters throughout the study.

2. Methodology

- I. **Market survey of existing manufacturing practices for production of *Thikpurli burfi*** - Survey is done by questionnaire for knowing existing traditional method production of *Thikpurli burfi*. A minimum of 20 samples from the selling place and manufacturing place will be collected from a particular area and analyzed for sensory, chemical, and microbial quality
- II. **Cost of production for *Thikpurli burfi*** – It will be worked out using standard procedures suggested by Lal et al., (1980)

III. Process Optimization – Initially the plain burfi samples will be prepared as per the method suggested by De (1980).

a. Stage of addition of sugar – Sugar will be added at four stages of burfi making viz. Milk Boiling, Basundi, Pat formation stage followed by heating and whipping

IV. Optimization of ingredients

a. Optimization of sugar level – After a survey of existing production methods, suitable three levels of sugar will be worked out

b. Optimization of fat level – Different levels of fat percentages containing buffalo milk will be used for the preparation of burfi

V. Shelf-Life study – The standardized burfi will be subject to self-life studies. The potassium sorbet will be used as a preservative at the rate of 0.1 and 0.2 percent of Khoa at last stage of burfi preparation. The packed product was stored at 7 +/- 1 °C and 30 +/- 1 °C and evaluated for sensory, Physico-chemical and microbial changes periodically.

3. Preparation of standardized Thikpurli burfi -The Thikpurli *burfi* will be prepared as per the method suggested by Aneja *et al.* (2002) for the preparation of plain *burfi* with certain modifications.

4. Analytical Method

1. Physico-chemical analysis of milk

a. Fat: Determined by using Standard Gerber method as described in IS: 1224 (PartII), 1977.

b. Total solids: Determined by the gravimetric method as described in IS: 1479 (Part-II), 1961.

c. Titratable acidity: Determined by the IS: 1479 (Part-I), 1960

2. Physico-chemical analysis of Thikpurli burfi

a. Moisture: Moisture content of *burfi* will be determined as per SP:18 (Part XI), 1981.

b. Fat: Fat in *burfi* sample will be determined by Rose Gottlieb method for milk as described in SP: 18 (Part XI), 1981 with some modifications.

c. Total protein: It will be determined by the Micro-Kjeldahl method as described for canned *Rasogollain* SP: 18 (Part XI), 1981.

d. Reducing sugars: The reducing sugars of burfi will be estimated by method with slight modification suggested by Ranganna (1986).

e. Non-reducing sugar: It will be determined by subtracting reducing sugars from total sugars.

f. Total ash: It will be determined as per method IS: 1479 (Part II, 1961).

g. Acidity (% Lactic acid): A.O.A.C. (1975) method for cheese was adopted for *burfi* for determining acidity in terms of per cent lactic acid.

h. pH: The pH was measured by Oroion-3 star pH benchtop pH meter.

i. Free Fatty acid: It will be estimated by Thomas et al., (1954) method.

j. Free Fat: The method described by Hall and Hedric (1971) for milk powder will be adopted

3. Sensory Evaluation of Burfi

Sensory evaluation of fresh and stored *burfi* samples will be carried out by a semi-trained panel of five judges. The flavour, color and appearance, body and texture, and overall acceptability was assessed by using a 9-point Hedonic scale (Amerine *et al.* 1965).

4. Microbiological Analysis of Burfi

a. Preparation of dilution blanks: The method of preparing dilution blanks was used as described in the Manual of Dairy Bacteriology, ICAR (Anon. 1966).

b. Standard plate count (SPC): The standard plate counts in the *burfi* sample will be estimated by SP: 18, Part XI, (1981).

c. Yeast and mold count (YMC): It will be estimated by SP: 18, Part XI, (1981).

d. Coliform count (CC): It will be estimated by SP: 18, Part XI, (1981).

5. Value addition of Thikpurli Burfi

Charoli will be used in burfi for value addition in different proportions.

7. Consumer study

The taste will be carried out with 200 respondents from the local area by using the prescribed proforma.

8. Statistical Analysis

Data of market samples will be analyzed using a randomized block design. Optimization of a single process will be assessed statistically by completely randomized design whereas the combined effect of ingredients and storage study will be analyzed by factorial completely randomized block design as per Snedecor and Cochran (1968).

Importance of study

*International Status

In India about 600,000 metric tons of *khoa* is produced annually, utilizing 7 per cent of total milk production. It has been estimated that 6.5 per cent of total milk produced in India is converted into *khoa* and condensed milk products (Sheteet *al.*, 2012). The value of *khoa* manufactured annually becomes almost double on its conversion into a variety of *khoa-based* sweets particularly *burfi*, *peda*, *gulabjamun*, milk cake, *kalakand*, etc. *khoa* based sweets have become popular in India and neighboring countries.

*National Status

Dairy is a supplementary activity to agriculture. It has the potential for generating additional income & employment opportunities for rural households besides improving nutrition levels. These traditional dairy products have a great influence in the social, economic and cultural prospects of Indian tradition. About 45 - 50 percent of milk produced is converted to indigenous dairy products and only 5-6 percent is used to manufacture the western dairy products (Sindhu, *et al*, 2000).

Table 1.1, Economic strength of indigenous dairy products in the national economy

Product	Volume (Million tones)	Rate (Rs. 000/tones)	Value (Rs. Billion)
Ghee	1.3	100	130
Makkhan	0.4	100	40
Khoa based sweets	2.0	100	200
Chhana based sweets	1.0	70	70
Paneer	0.2	90	18
Curd /curd products	6.0	20	120
Total		578 (US 1 1.5 billion)	

(Adapted from Aneja, *et al*, 2002)

Indigenous dairy products production and marketing value addition to the extent of 200 percent, as compared to only 50 percent obtained by western products (Bandopadhyay, 2006). This fact underlines the significance of traditional dairy products in the national economy. Table 1.1 indicates the scope and opportunity of indigenous dairy products.

***Scope of the study**

There is a large scope to enhance the profitability of the dairy industry through product diversification. Per capita availability of milk in India has increased up to 407 grams per day during the year 2019-20, which is higher than the requirement as per the medical council. Milk is perishable in nature. It cannot be stored for a very long period. In order to preserve it, more than half of milk produced in India is converted into milk products. Therefore, it needed to convert more and more milk into milk products to satisfy the demand of consumers and for a better life. The surplus milk converted into traditional milk products has been practiced since old times for preservation purposes.

Burfi is a *khoa-based* indigenous milk product of considerable economic and nutritional importance sweet in India. *Burfi* is the most popular, nutritious, rich flavour and palatable *khoa-based* sweet. Therefore it has occupied a significant place in the hearts of consumers belonging to all age groups and various classes of society.

Outline of the Research Problem

1. Introduction
2. Review of literature
3. Materials and Methodology
4. Result and Discussion
5. Conclusion and Recommendation

Year-wise plan of work and targets to be achieved

FIRST YEAR		
Completion of course work:	:	At S.R.T.M.U.Nanded/ Yeshwant College, Nanded.
Collection of references and review of literature writing	:	M.A.U. Parbhani, M.P.K.V., Rahuri, N.D.R.I.Karnal, Bangalore, CFTRI, Mysore and other relevant sources by referring books and Dairy Science and Technology Journals/ reputed scientific Journals
Review of existing manufacturing practices	:	By Survey method
Preliminary experimental trials	:	Using various proportions of Sugar and standardization of milk
SECOND YEAR		
Sensory evaluation of preliminary trials	:	By panel of judges
Preparation of finished product	:	By proper proportions of Sugar and standardization of milk
Sensory evaluation of samples	:	By panel of judges
Physico-chemical, microbial analysis, energy value of samples	:	By standard procedure
To study shelf life of finished product	:	By standard method
Determination of cost of the finished product	:	Considering existing prices of ingredients
THIRD YEAR		
Statistical analysis of data	:	By standard method
Writing research paper	:	For National and International reputed Peer-reviewed, Refreed scientific/ UGC CARE /WOS/Journals.
Submission of Final synopsis	:	To S.R.T.M.U.Nanded
Pre-PhD seminar	:	At Yeshwant College Dairy Science Research Centre, Nanded.
Thesis writing and Submission	:	To S.R.T.M.U. Nanded

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