

Paper No.: 07

Paper Title: TECHNOLOGY OF MILK AND MILK PRODUCTS

Module – 15: Traditional Indian dairy products – *Khoa* based sweetmeats

INTRODUCTION

Khoa is an important indigenous milk product. It is conventionally prepared by heating, evaporating and desiccation of milk in an open kettle at atmospheric pressure accompanied by continuous stirring until dough like consistency is achieved. Approximately 5.5% of total milk produced in India is converted into *khoa*. *Khoa* serves as an intermediate or base material in preparation of variety of popular milk sweets. Among the traditional Indian dairy products *khoa* and *khoa* based sweets namely *peda*, *burfi*, *milk cake*, *kalakand*, *gulabjamun*, etc. have high commercial significance because of their popularity throughout the country. It is also known as *khoya*, *khava*, *khawa*, *kava*, *palghoa* or *mava*. *Khoa* occupies prominent place in the traditional dairy products sector. Nutritional point of view *khoa* is very good source of muscle building proteins. It contains fairly good amount of fat and lactose which provide energy to the body. It is also good source of minerals especially calcium which is helpful for bone-health.

DEFINITION OF KHOA

According to Food Safety and Standard Regulations 2011, *Khoya*, by whatever variety of names it is sold such as *Pindi*, *Danedar*, *Dhap*, *Mawa* or *Kava*, means the product obtained from cow or buffalo or goat or sheep milk or milk solids or a combination thereof by rapid drying. The milk fat content shall not be less than 30 percent on dry weight basis of finished product. It may contain citric acid not more than 0.1 percent by weight.

It shall be free from added starch, added sugar and added colouring matter.

METHOD OF MANUFACTURE

Khoa is obtained by boiling milk (preferable buffalo milk) in a shallow, large, open mild steel or stainless steel pan with two handles known as '*karahi*'. Milk is continuously stirred during initial heat desiccation process, and towards end of the production when milk reaches semi-solid consistency, it is scrapped to prevent caramelization and browning. This stirring cum scrapping is carried out using flat-edged, long handled metal ladle/scrapper called '*khunti*'.

Traditionally *khoa* is prepared by taking 4-5 lit of milk in a shallow iron or mild steel pan and heating it on smoke free fire with continuous agitation and scrapping. Milk thickens with progressive heating and coagulated solid mass is seen on the surface. These mass is

continuously scrapped and brought back in to the thickened milk. When concentration of about 2.5 to 3 times has been attained with continuous rapid evaporation, coagulated particles are brought together to form a pat. In the final stage of process pan is removed from the fire and *khoa* is worked with ladle.

In organized dairies, double jacketed stainless steel kettles with or without inbuilt scrapper have replaces *karahi*. Steam is circulated in the jacket. Continuous methods of *khoa* making involves use of scraped surface heat exchangers, which are steam jacketed heating units with reciprocating spring loaded scrapers.

VARIETIES OF KHOA

There are three distinct varieties of *khoa*. They differ in their composition, body and textural characteristics and preferred end use.

Pindi

This variety is characterized as a circular ball of hemispherical pat with compact mass, homogenous and smooth texture. It shall not show any sign of fat leakage or presence of free water. The grains are very small and of uniform size throughout the mass. *Pindi* type *khoa* possesses pleasant heated/cooked flavour and devoid of objectionable tastes like burnt, acidic, etc. This variety of *khoa* is best suited for manufacture of *burfi*, *peda* and other varieties of sweets.

Dhap

It is a raw (*katcha*) *khoa* characterized by loose but smooth texture and soft grains and sticky body. *Dhap* variety carries highest percentage of moisture over other varieties of *khoa*. This high moisture is necessary to provide adequate free water for soaking of *maida* (refined wheat flour) and semolina (*suji*) and for homogenous distribution of other ingredients in the preparation of smooth *gulabjamun* balls. This variety of *khoa* is used in the manufacture of *gulabjamun*, *kalajamun*, *pantooa*, *carrot halwa*, etc.

Danedar

This is characterized by the uneven body, granular texture with hard grains of different sizes and shapes embedded in viscous serum. Slightly sour milk is preferred in the manufacture of this variety as it yields granular texture. The size of grains depends upon the amount of acidulant added and the acidity of milk used. This variety of *khoa* is used in the manufacture of *kalakand*, milk cake, etc.

As per BIS (IS No. 4883-1980), standards for three varieties of *khoa* are given in Table 1

Table 1 BIS standard for three varieties of khoa

Type of <i>khoa</i>	Total Solids (%, min)	Fat (% DMB, min)	Ash (% DMB, max)	Titratable acidity (% lactic acid, max)
<i>Pindi</i>	65	37	6	0.8
<i>Dhap</i>	55	37	6	0.6
<i>Danedar</i>	60	37	6	0.9

CHEMICAL COMPOSITION AND SENSORY CHARACTERISTICS OF KHOA

Chemical composition of *khoa* varies widely due to its manufacturing by un-organized dairy sector. The average percentage total solids, fat, protein, lactose and ash content in laboratory samples of *khoa* were 80%, 29%, 17%, 29% and 5%, respectively.

Ideal characteristics of *khoa* refer to mild cooked flavour similar to boiled milk, free from any objectionable and foreign flavour, having uniform and slightly granular texture. Cow milk *khoa* has pale yellow colour whereas buffalo milk *khoa* is white in colour with greenish tinge. Slight free fat on the surface of *khoa* is desirable characteristic. Comparison of sensory characteristics between buffalo milk *khoa* and cow milk *khoa* is presented in Table 2

Table 2 Sensory characteristics of buffalo milk khoa and cow milk khoa

Sensory Characteristic	Buffalo milk <i>khoa</i>	Cow milk <i>khoa</i>
Colour	Whitish (dull/light greenish white) with a tinge of brown	Straw/pale yellow with a tinge brown
Appearance	Slightly oily/greasy surface	Moist surface
Smell	Rich, nutty	Rich, nutty
Taste	Slightly sweet	Slightly salty
Body	Soft	Slightly hard
Texture	Smooth granular	Slightly sandy

KHOA BASED SWEETMEATS**BURFI**

Burfi is the *khoa* based popular confection with added sugar, and it occupies the prominence in consumption. Several variants of *burfi* are sold in the market, viz. *mawa burfi*, chocolate *burfi*, nut *burfi*, fruit *burfi*, rava *burfi*, etc. Cane sugar is added as sweetening agent to *khoa*.

Apart from sugar, other flavouring ingredients are also blended to cater to special taste of consumers. Good quality *burfi* is characterized by moderately sweet taste, soft and slightly greasy body and smooth texture with very fine grains. Colour of *burfi* should be white or slightly yellowish or compatible to flavour of *burfi* viz. brown colour for chocolate *burfi*.

Method of manufacture

Preparation of *burfi* is mainly restricted to non-organized dairy sector. The important steps in the preparation of *burfi* involve: desiccation of milk into *khoa*, incorporation of sugar (30% of *khoa*) either in crystalline form or as sugar syrup, admixture of other ingredients, and subsequent desiccation to get desired body and texture characteristics of the variety. The colouring and flavouring materials, if any, are added at the initial or final stages of the preparation, respectively. The hot, semi-solid mass is poured on the previously prepared moulds and cooled till desired consistency is achieved. After cooling, the mass is cut into pieces of required size and shape and packed.

On the cottage scale, *burfi* is prepared in small batches, employing mild steel shallow pans. When prepared directly from milk, buffalo milk with fat:SNF ratio of 1:1.5 is preferred.

Wide variation in the composition of the *burfi* has been reported by various researchers. But, laboratory samples of *burfi* had 15.0% moisture, 20% fat, 30% sucrose, 16.5% protein, 16% lactose, and 2.5% ash.

PEDA

Peda is very popular *khoa* based sweet all over India. It is similar to *burfi* except it has harder texture and has better keeping quality. Due to localized preferences of consumers, method of *peda* manufacturing varies from region to region. The manufacture of *peda* is mostly restricted to halwais.

Method of manufacture

Peda is prepared by breaking freshly made *khoa* into bits and mixed with ground sugar (30 – 35% on the weight basis) into it. The contents are put into *karahi* and cooked very slowly, over non-smoky fire, stirring all the content with *khunti*, crushed cardamom is added to give desirable flavour. The mixture is then poured into tray and allowed to cool. If desired, nuts and flavouring substances are added. The contents are mixed thoroughly and made into balls of 15-20 g size by rolling between the palms and round or flat pieces of *peda* are formed.

Peda is whitish yellow in colour and has a coarse grainy texture. Average chemical composition of *peda* is shown in Table 3.

Table 3 Average chemical composition of *peda*

Constituent	Moisture	Fat	Protein	Lactose	Ash	Sucrose
Value (%)	14.36	19.31	15.34	15.25	2.47	33.27

GULABJAMUN

Gulabjamun is very popular *khoa* based sweetmeat in India. *Gulabjamun* name has been derived from two words: *Gulab* and *Jamun*, as it was usually flavoured with rose water (*gulab jal*) and its shape is like *jamun*, a monsoon fruit. *Gulabjamun* are available in round and cylindrical shapes. It is golden to dark brown in colour and has soft to firm body and smooth texture.

Method of manufacture

Gulabjamun is prepared from *dhap* type of *khoa* (300 g) with 100 g of maida and 3 g of baking powder. The mixture of *khoa*, maida and baking powder is kneaded into uniform dough with sufficient quantity of water. The dough is then divided and rolled into small balls (8-10 g each). The balls are then uniformly deep fried (130-140°C) in vegetable oil/ghee until they are golden brown in colour. The fried *gulabjamun* balls after cooling are dipped into sugar syrup of 62.5% strength for few hours.

Chemical Composition of *Gulabjamun*

Composition of *gulabjamun* is expressed on the drained weight basis. Average chemical composition of *gulabjamun* on drained weight basis is fat (10%), protein (6%), sugar (42%) and other solids (14%). Acidity of the sugar syrup for *gulabjamun* should not exceed 6 ml of 0.1 N NaOH, needed to neutralize 100 ml of the syrup.

KALAKAND

Kalakand is known for its unique granular texture. A deliberate attempt is made during manufacture of *kalakand* to achieve granular texture of the concentrated mass of milk solids. *Kalakand* is very well manufactured by blending sugar with *damedar khoa*. *Kalakand* has typical caramel flavor and granular texture. Colour of *kalakand* varies from off-white to light brown or caramel.

Method of manufacture

Buffalo milk having 6.0% fat and 9.0-9.5% SNF is best suited for preparation of *kalakand*. Milk is taken in shallow iron *karahi* and heated over a non-smoky fire. Continuous stirring in circular motion with scrapping of heating surface is carried out to prevent burning. 0.02% citric acid of the volume of milk, in the form of 1-2% solution is added to milk after 10-15

min of boiling. Addition of citric acid helps in formation of fused granular mass at the end of production. When a semi-solid state is reached, sugar at the rate of 6-7% by weight of milk is added and stirred well. Other flavourings and nuts may also be added at this stage. Heating is further continued for 5 min. The finished mass is then transferred to previously greased tray and allowed to cool to ambient temperature. Once the product sets firmly, it is cut into desired shape and size, packaged and stored.

Proximate chemical composition of laboratory made *kalakand* is given in Table 4.

Table 4 Proximate chemical composition of *kalakand*

Constituent	Total solids	Fat	Protein	Lactose	Sugar	Ash	Acidity (% Lactic acid)
Value (%)	64 – 85	5 – 26	9 – 18	12 – 22	15 – 42	1.5 – 3.5	0.25 – 0.7

MILK CAKE

Milk cake is almost similar to *kalakand* except its colour and flavour. Milk cake has unique grainy texture, distinct caramelized flavour and layers of white to light brown colour from top to bottom.

Method of manufacture

Buffalo milk having 6.0% fat and 9.0% SNF is preferred for manufacture of milk cake. After three minutes of boiling of milk in iron *karahi* over a non-smoky fire, citric acid at the rate of 0.02% (weight/volume of milk) in the form of 1 – 2 % solution is added. Heat desiccation is continued till the volume of milk is reduced to 50 percent of the original. At this stage sugar is added at the rate of 6% on the basis of volume of milk taken. Further heat desiccation is continued to obtain dough like consistency. The hot dough is transferred to a previously greased tray and it is slowly cooled down in an insulated box for 5 – 6 hrs. Alternatively, the bottom of the tray is cooled down in chilled water to enhance colour differential in top and bottom layers. After cooling product is cut into desire shape and size and packaged into parchment paper.

FURTHER READING

De Sukumar (1980), *Outlines of Dairy Technology*, Oxford University Press, Delhi.

Aneja R.P., Mathur B.N., Chandan R.C., Banerjee A.K. (2002) *Technology of Indian Milk Products*, Dairy India Pub., Delhi.