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 scraper 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

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

### CHEMICAL COMPOSITION AND SENSORY CHARACTERISTIC 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 where as 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

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

### 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

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>14.36</td>
</tr>
<tr>
<td>Fat</td>
<td>19.31</td>
</tr>
<tr>
<td>Protein</td>
<td>15.34</td>
</tr>
<tr>
<td>Lactose</td>
<td>15.25</td>
</tr>
<tr>
<td>Ash</td>
<td>2.47</td>
</tr>
<tr>
<td>Sucrose</td>
<td>33.27</td>
</tr>
</tbody>
</table>

**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 danedar 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**

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Total solids (%)</th>
<th>Fat (%)</th>
<th>Protein (%)</th>
<th>Lactose (%)</th>
<th>Sugar (%)</th>
<th>Ash (%)</th>
<th>Acidity (% Lactic acid)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value (%)</td>
<td>64 – 85</td>
<td>5 – 26</td>
<td>9 – 18</td>
<td>12 – 22</td>
<td>15 – 42</td>
<td>1.5 – 3.5</td>
<td>0.25 – 0.7</td>
</tr>
</tbody>
</table>

**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**
