

**Paper No.: 07**

**Paper Title: TECHNOLOGY OF MILK AND MILK PRODUCTS**

**Module – 14: Traditional Indian dairy products – *Chhana* based sweetmeats**

### **INTRODUCTION**

*Paneer* and *chhana* are two important nutritious and wholesome indigenous, dairy products, which occupy a prominent place among traditional milk products and carry lot of market potential. *Chhana* is an important Indian traditional milk product formed by heat and acid coagulation of milk followed by draining of whey. *Chhana* contains fat and proteins in concentrated form. It occupies a prominent place among traditional milk products and carry lot of market potential. *Chhana* is used as base material for preparation of a variety of sweets viz. rasogolla, sandesh, rasmalai, cham-cham, chhana-murki, etc. Its preparation is mainly confined to the cottage sector, largely in the eastern parts of India, notably West Bengal, Bihar and Orissa.

### **DEFINITION OF CHHANA**

**Food Standards and Safety Act, 2011 (FSSA) Definition:** Food Standards and Safety Act (FSSA) terms *chhana* as a product obtained from cow or buffalo milk or a combination thereof by precipitation with sour milk, lactic acid or citric acid. It should contain not more than 70 per cent moisture and its milk fat content should not be less than 50 per cent on the dry matter basis (Total solids). Milk solids may also be used in preparation of this product.

Skim milk *chhana* is the product obtained from skim milk of cow or buffalo by precipitation with sour milk, lactic acid or citric acid. It should contain not more than 70 per cent moisture, and its milk fat content should not exceed 13 per cent of the dry matter.

**BIS Definition (IS 8162:1980):** Only fresh, sweet, clean milk free from colostrum and in every way fit for human consumption shall be used. Milk shall be free from adulterants, preservatives and any foreign matter to milk. Fat content of milk should be such that the final product confirms to the following requirements:

Table 1: BIS Requirements for *Chhana*

Sr.No.	Requirements	Skim milk <i>chhana</i>	Whole milk <i>chhana</i>
1.	Moisture, % by mass, Max.	60	65
2.	Milk fat, % by mass, on dry matter basis	5 (Max)	50 (Min)

3.	Protein, % by mass, on dry matter basis, Min.	30	25
4.	Ash, % by mass, on dry matter basis, Max.	5	5

## **CHHANA**

*Chhana* is heat and acid-coagulated milk product, also known as India's traditional soft, cottage cheese. Production of *chhana* involves precipitation of casein along with entrapped fat and water soluble components of milk viz. lactose, whey proteins, minerals, vitamins etc. by addition of an acidulant to milk at high temperature. *Chhana* contains a fairly high level of fat and proteins as well as some minerals, especially Calcium and Phosphorus. It is also a good source of fat soluble vitamins A & D. Hence, its food and nutritive value is fairly high. Superior nutritive value of *chhana* is due to presence of whey proteins that are rich sources of essential amino acids. The acids most commonly used for coagulation of milk are lactic acid and citric acid.

### **PRINCIPLE OF CHHANA MAKING**

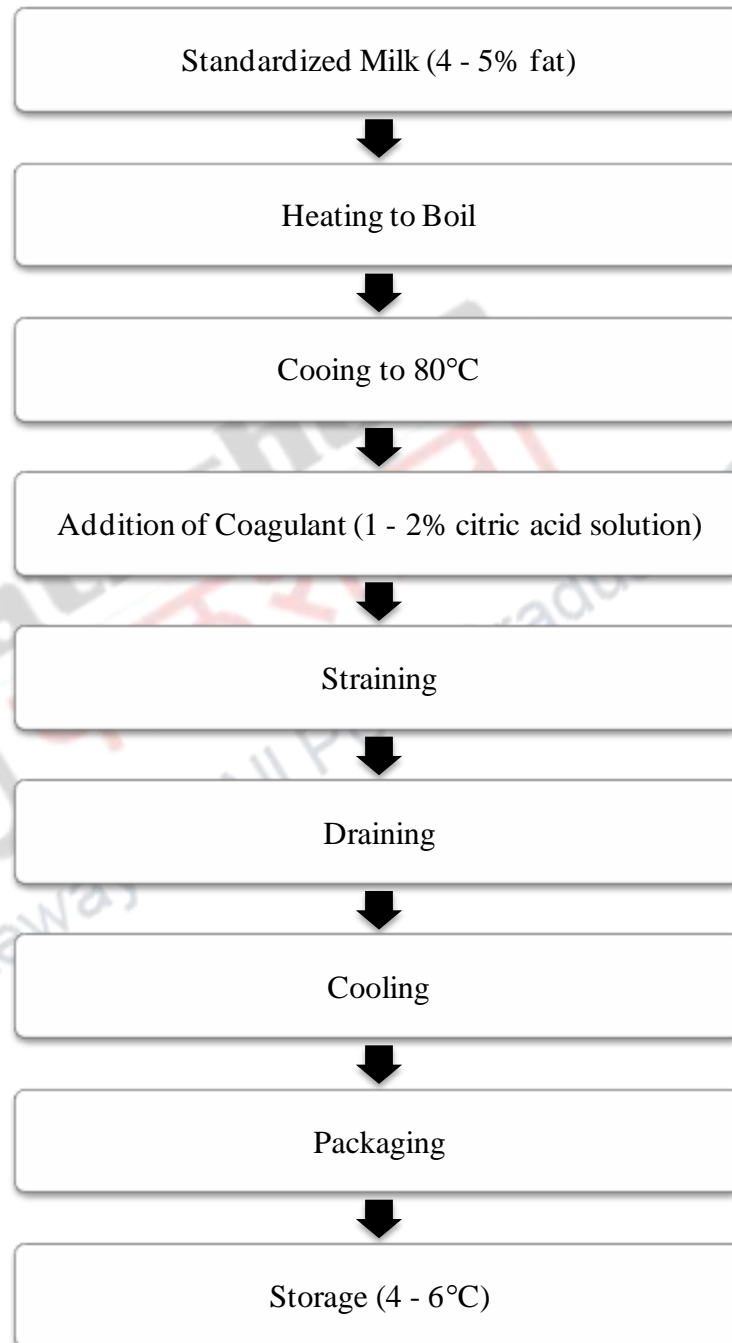
*Chhana* making is essentially a process involving destabilization of casein particle by acidification of milk with dilute acid at relatively higher temperature. Acidification affects the stability of casein directly by disturbing the charges carried by the particles and indirectly by releasing the calcium ion from colloidal calcium phospho caseinate. The destabilization results in formation of large aggregates from the normal colloidal dispersion of casein micelles in which milk fat, serum proteins and other constituents get entrained together. Thus, the large structural aggregates formed is known as coagulum.

### **METHOD OF MANUFACTURE OF CHHANA**

Cow milk is preferred for manufacture of *chhana* as it yields softer and spongier product. Milk is first heated to boil in an iron / Stainless Steel *karahi* with continuous stirring. The milk is then cooled to 80°C and coagulated with 0.5 - 2% citric acid or lactic acid solution within 60 sec while mixing it with stirrer. When the whey becomes clear, the *chhana* is strained through a muslin cloth. The coagulated mass is then hung in muslin cloth to allow dripping till the dripping is stopped.

Milk standardized to 4 – 5% fat is heated to near boiling without holding. Thereafter, the temperature of milk is brought down to 80°C and coagulated at this temperature using coagulating acid solution of 1 – 2% concentration. Acid solution is added to milk with constant stirring till clear whey separated out. The coagulated mass collected in a muslin cloth and hung

up for complete drainage of whey. Finally chhana is packaged in suitable packaging material and stored under refrigeration/ cold store. The flow chart for manufacture of cow milk chhana is presented in Fig. 1.



**Fig. 1** Flow chart for manufacture of *chhana*

## CHEMICAL COMPOSITION OF *CHHANA*

The chemical composition of *chhana* is influenced by the type and composition of milk and processing conditions employed. Proximate chemical composition of *chhana* made from cow and buffalo milk is presented in Table 2.

Table 2: Proximate Chemical Composition of *Chhana*

Composition (%)	Cow milk <i>chhana</i>	Buffalo milk <i>chhana</i>
Moisture	53.4	51.7
Protein	17.4	14.4
Fat	24.8	29.7
Lactose	2.2	2.3
Ash	2.1	1.9

## FACTORS AFFECTING QUALITY OF *CHHANA*

Cow milk yields superior quality of *chhana* making because it has soft and spongy body and smooth texture, which is suitable for making *chhana* based sweets such as *rasogolla*. Buffalo milk, due to differences in physico-chemical make-up than that of cow milk, leads to many technological problems in preparation of *chhana* and *chhana* based sweets. The final quality of *chhana* depends mainly on the type of milk, the conditions of coagulation and the technique of straining/pressing.

### Type and quality of Milk

Cow milk *chhana* has moist surface, light yellow colour, soft body, smooth texture and mildly acidic flavour, whereas buffalo milk *chhana* has hard body and coarse in texture, besides whitish in colour and a greasy surface. Hence, cow milk produced *chhana* is preferred over buffalo milk *chhana* in manufacture of Bengali sweets. Sweets particularly *rasogolla* prepared from buffalo milk *chhana* are comparatively hard, coarse and less spongy.

Fresh milk with minimum fat level of 4 – 5% in milk is considered optimum for producing good quality *chhana*. The low fat milk results in a hard body and coarse texture in *chhana*, whereas higher fat level is also not desirable as it produces free fat, greasiness and stickiness in the *chhana* sweets.

### Type and strength of coagulants

As body and texture of *chhana* is influenced by type and strength of coagulant used, various coagulants are used to achieve coagulation from milk viz. lime or lemon juice, vinegar, citric acid, lactic acid, fermented milk or whey. The optimum pH of coagulation of milk is around 5.4 and the temperature of coagulation is about 80°C. The quantity of coagulant to be added varies depending on type of coagulant used such as: citric acid (0.5 – 1.5%), lactic acid (1 – 2%), calcium lactate (4%). Type of coagulant also affects percent moisture retention and yield of *chhana*. E.g. *Chhana* made with citric acid has 55 – 58% moisture and 17 – 18% yield. *Chhana* made using lactic acid yields granular textured *chhana* which in turn yields excellent quality *rasogolla* whereas citric acid *chhana* has pasty consistency and hence it is preferred for the manufacture of *sandesh*.

Sour whey with about 0.9 percent lactic acid acidity is most widely used for *chhana* making by small scale manufacturers. Calcium lactate is also commonly used coagulant. Concentration of coagulant solution has profound effect on quality of *chhana*. Low acid strength (0.5 percent) results in very soft body and smooth texture suitable for *rasogolla* but unsuitable for *sandesh* making, while high acid strength (>5 per cent) results in hard body and less smooth texture, suitable for *sandesh* making. The optimum strength of coagulant solution should be between 1 – 2 % citric acid or lactic acid to produce good quality *chhana* suitable for making both kinds of sweets. The amount of coagulant required to achieve complete coagulation depends upon the type of milk and its acidity and buffering capacity. Usually, 2.5 to 3.5 g of citric acid or 3.0 to 4.0 g of lactic acid per litre of milk is necessary for complete coagulation. Approximately 600 ml of sour whey is necessary to produce suitable quality *chhana* from 1 litre of milk. About 6 to 12 g of calcium lactate is required per kg of milk for coagulation.

### **Temperature and pH of coagulation**

Both temperature and pH during coagulation has significant effect on the final quality and yield of *chhana*. Optimum temperature and pH suggested by various researchers for cow milk *chhana* are 80 – 85°C and 5.4, respectively; while for buffalo milk they are 70 – 80°C at pH 5.7. Higher coagulation temperature leads to grainy textured *chhana* while lower coagulation temperature is responsible for sticky *chhana*. An optimum pH of 5.35 has been reported when making *chhana* from cow milk using calcium lactate as coagulant.

### **Speed of stirring**

Stirring at higher speed during coagulation reduces the moisture content in *chhana* and increases its hardness, whereas lower stirring speed during coagulation yields *chhana* with optimum body and texture. Slow stirring speed of 40 – 50 rpm is preferred to avoid foam formation.

### **Method of Straining**

The method of straining of coagulated milk mass play pivotal role in deciding body and texture of *chhana*, moisture retention and solids recovery in *chhana*. The coagulated mass should be collected in fine cloth and hung to remove moisture. No external pressure is applied for removal of moisture from the coagulated mass. In general two types of straining is employed viz. immediate or delayed straining. Immediate straining is carried out just after coagulation by collecting the coagulated mass in a piece of fine muslin cloth and then hung up for draining out the whey and simultaneous cooling of the *chhana*. In case of delayed straining process, the coagulated mass is left in the whey to cool it to ambient temperature and thereafter it is hung for removal of whey. The delayed straining results in more retention of moisture in *chhana* as compared to immediate straining method. Higher moisture, increased yield, improved recovery of milk solids and lower hardness in *chhana* is obtained when delayed straining is employed.

### **SENSORY QUALITY OF CHHANA**

#### **Flavour**

Mildly acidic smell and pleasant sweetish taste are considered desirable.

#### **Body and Texture**

Moderately soft body and uniform texture and shall show slight springiness. It should yield round ball of even surface and no cracks. It should not release fat on kneading / working.

#### **Colour and Appearance**

Uniform yellow (from cow milk) to whitish colour (from buffalo milk). Slightly moist surface. Absence of burnt particles.

### **CHHANA BASED SWEETMEATS**

*Chhana* is used as a base material for the preparation of a large number of Bengali sweets such as *rasogolla*, *sandesh*, *rasmalai*, *rajbhog*, *chhana murki*, *chamcham*, etc. In *chhana*-based sweets, milk protein constitutes the basis of structure and texture of the product.

*Rasogolla* is a soft, sweet ball of *chhana* soaked in sugar syrup. There are various types of *rasogolla* sold in the market. They include ordinary type, spongy variety, covered with syrup and diabetic *rasogolla*. *Sandesh* is the most popular *chhana* based sweet delicacy of the eastern parts



of India, especially West Bengal. It has firm body and smooth texture. Several varieties of *sandesh* are sold in the market. Three distinct varieties of *sandesh* are popular: soft grade (*narampak*), hard grade (*kara-pak*) and raw grade (*Kachagola*). *Rasmalai* is a *chhana* based sweet prepared essentially by suspending flat circular shaped *rasogolla* in sweetened condensed milk. *Chhana-murki* is a sugar-coated *chhana* based sweet. *Chhana-murki* has the shape of small cubes coated with sugar and has a firm body and close-knit texture.

### **RASOGOLLA**

*Rasogolla* is characterized by soft and succulent balls of *chhana* cooked and soaked in sugar syrup. It is difficult to trace the origin and history of this sweet, however, according to a report; it was made for the first time in 1868 in Kolkata by Mr. Nobin Chandra Das. *Rasogolla* is a popular sweet prepared generally from cow milk and is a good source of milk proteins. The sweet curd called *chhana* is kneaded to a creamy consistency and made into balls which are immediately boiled in previously clarified sugar syrup for at least 10 min. *Rasogolla* along with the hot syrup are filled in sterilized cans. The filled cans are immediately sealed and cooled.

**BIS definition (Canned *Rasogolla* (IS 4079:1967)):** Canned *rasogolla* shall be prepared from *chhana* obtained from clean, fresh and sweet milk. It shall be white or light creamy in colour. It shall be free from dirt and other foreign matter as well as insects and mold growth. It shall be manufactured and packed under hygienic conditions.

*Rasogolla* to syrup ratio of concentration shall be about 1:3. The product shall have following composition:

Table 3: BIS Requirements for *Rasogolla*

Sr. No.	Constituents	Content, %
1.	Moisture, % by wt., max.	55
2.	Fat, % by wt., min.	5
3.	Sucrose, % by wt., max.	45
4.	Proteins, % by wt., min	5

The syrup has following requirements:

Table 4: BIS Requirements for Sugar Syrup for *Rasogolla*

Sr. No.	Parameter	Requirement
1.	Acidity of syrup (ml of 0.1 N NaOH required to neutralize 100 ml syrup), max	6
2.	Concentration of syrup, °Brix, max	55
3.	Bacterial count, cfu/g, max	500
4.	Coliform count, cfu/g, max	Nil

### Method of Manufacture of *Rasogolla*

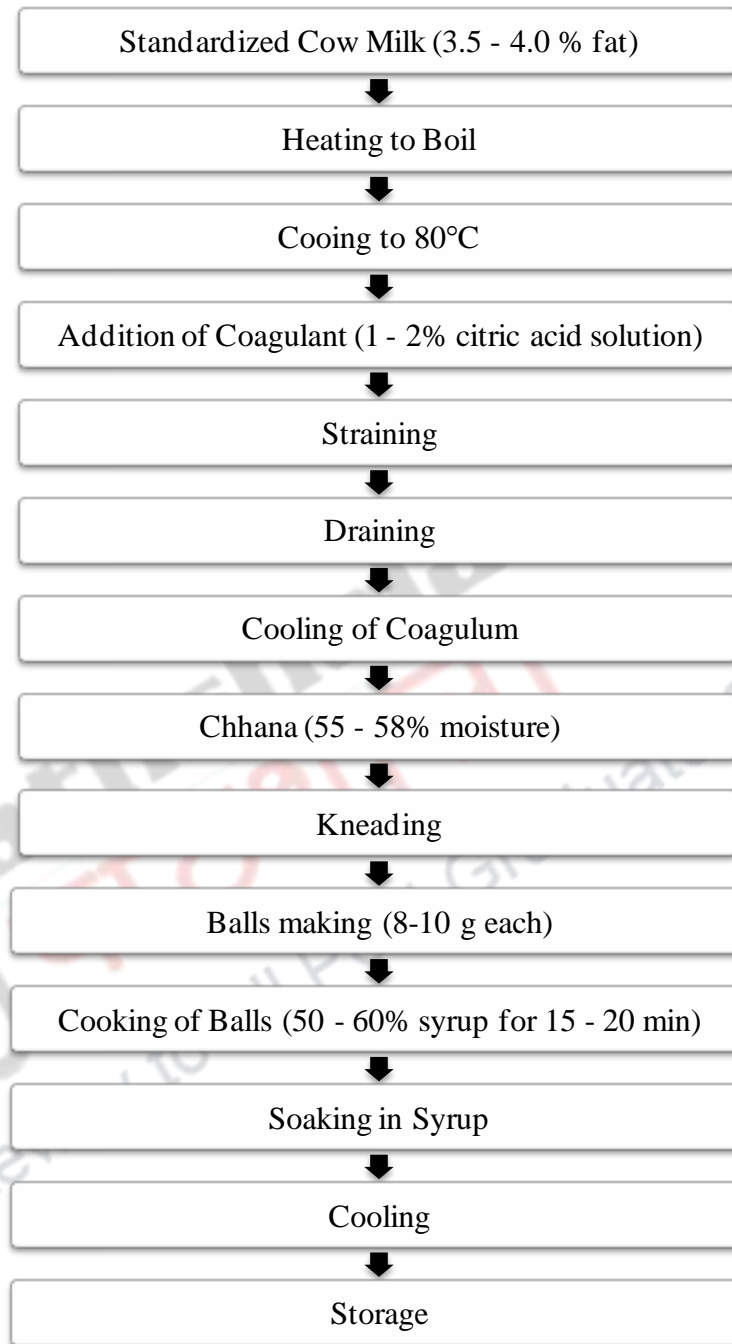
*Rasogolla* is prepared from soft and freshly made *chhana*. For *rasogolla* production, *chhana* is kneaded to a smooth paste and then small balls of about 15-20 mm diameter and 10-12 grams in weight are made. The surface of balls should be smooth and free from of any cracks. In case of buffalo milk *chhana*, arrowroot, semolina, and baking powder are mixed and kneaded manually to a smooth paste. *Rasogolla* balls are cooked in sugar syrup having 50-60 per cent sugar concentration for about 15-20 minutes. During cooking, a small amount of water is continuously added to maintain sugar concentration. This makes up for the loss of water due to evaporation. After cooking *rasogolla*, balls are soaked in 40-45 per cent sugar syrup for about 1-2 hours. The *rasogolla* balls are cooled to room temperature and finally stored at refrigeration temperature. The yield of *rasogolla* is about 240-260 grams per 100 grams of *chhana*.

The flow diagram for manufacture of *rasogolla* from cow milk is presented in Fig. 2.

### SANDESH

*Sandesh* is the most popular *chhana* based sweet delicacy of the eastern parts of India, especially West Bengal. Several varieties of sandesh are sold in the market and each variety differs in composition and sensory properties. Three distinct varieties of sandesh are popular: soft grade (*naram-pak*), hard grade (*kara-pak*) and raw grade (*Kachagola*). One more variety, known as Nolan *gur sandesh* is prepared from *Khajur gur* (date jaggery).





**Fig. 2 Flow chart for manufacture of *rasogolla***

### **Method of Manufacture *Sandesh***

*Chhana* is kneaded or ground into smooth paste and divided into two equal lots. Ground sugar, at the rate of 30 per cent of total weight of *chhana* is mixed with one lot of *chhana*. The mixture is

then slowly cooked with continuous stirring and scrapping in a shallow vessel and the temperature is raised up to 75°C. When patting stage has reached the second lot of *chhana* is also mixed to it. Heating and scrapping of this mixture is continued till a final temperature of 60°C is attained. Thereafter, the mix is cooled to room temperature and moulded in desired shape and size. The average yield of *sandesh* varies from 16.50 - 20.50 per cent. The production process of soft grade *sandesh* is presented in Fig. 3.

### **RASMALAI**

*Rasmalai* is a *chhana* based sweet prepared essentially by suspending flat circular shaped *rasogolla* in sweetened condensed milk. It is a very delicate, spongy and chewy sweet that has a delectable taste. It is also flavoured with saffron and *pista*. The product is refrigerated and served chilled.

#### **Method of Manufacture of *rasmalai***

Milk is heated with continuous stirring in open pan to evaporate to about one-half of its original volume. At this stage sugar is added at the rate of 4.0 per of original milk. The heating and stirring is continued at slow fire till the content is reduced to about one-third of its original volume. The addition of sugar during heating imparts pleasant flavour and palatable taste to the end product. Subsequently, flat circular shape *rasogolla* is added to this concentrated milk and content is further heated for few minutes (2-5 min). Thereafter, the container is removed from the fire and content is allowed to cool to room temperature, chilled and stored under refrigeration. The product is served chilled. *Rasmalai* has limited shelf life of 3-5 days.

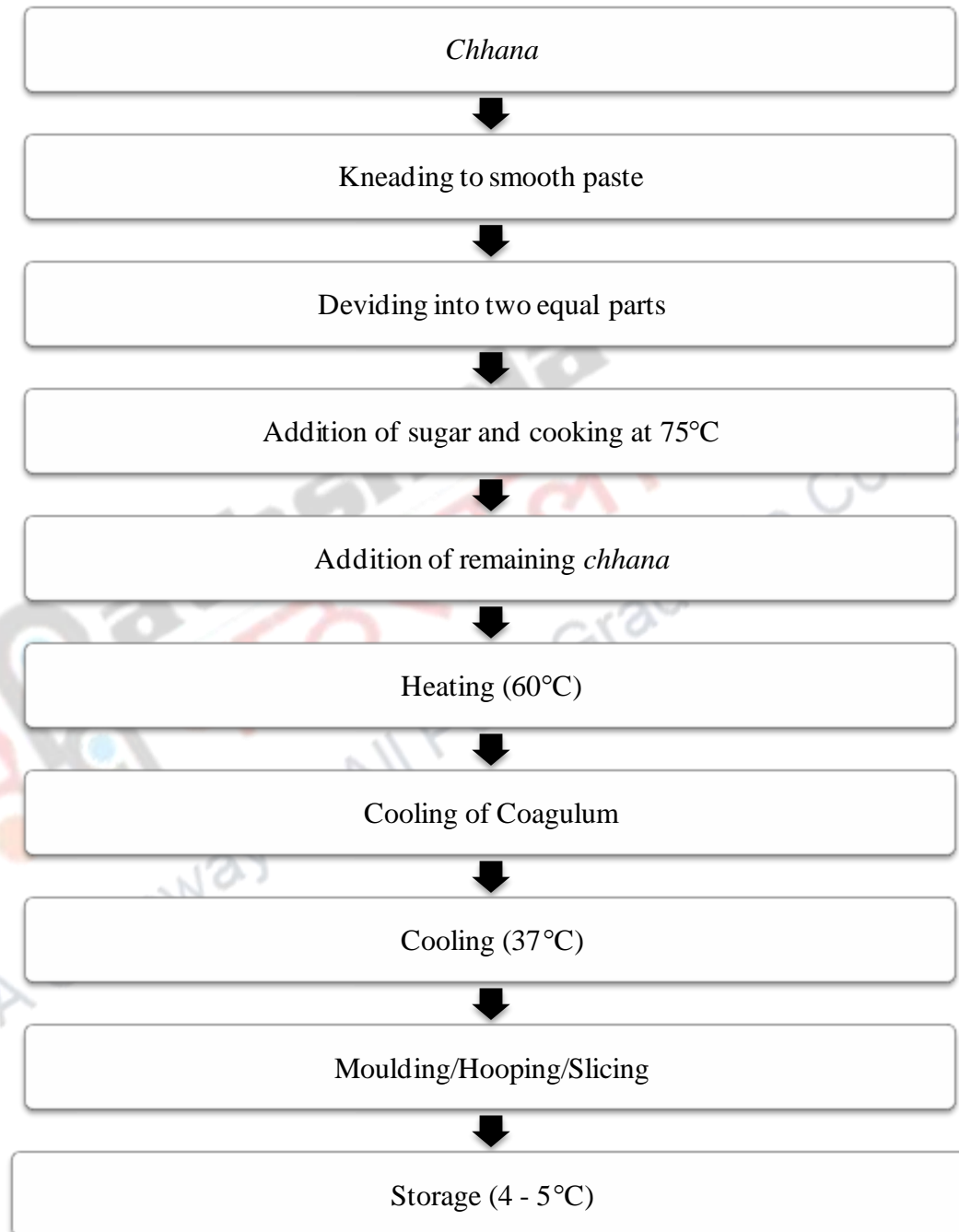
### **CHHANA MURKI**

*Chhana-murki* is a sugar-coated *chhana* based sweet. This product is very popular in the northern parts of the country. It is mainly served during weddings and feasts. *Chhana-murki* has the shape of small cubes coated with sugar and has a firm body and close-knit texture. Buffalo milk is preferred for the preparation of this sweet.

#### **Method of Manufacture of *Chhana Murki***

*Chhana* or paneer is cut into small cubes of about 10 mm. The cubes are cooked in boiling sugar syrup (of 3 strings consistency) in an open vessel (*karahi*) for about five minutes with gentle stirring. The vessel is removed from the fire and stirring is continued till the sugar is coated uniformly around the cubes. The cooked cubes are then removed from syrup. After cooling, a

few drops of *Kewara* flavour are sprinkled. The product may be coloured using food grade colours in sugar syrup.



**Fig. 3** Flow chart for manufacture of *sandesh*

## REFERENCES

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