



CHEMISTRY OF CHHANA AND CHHANA BASED SWEETS

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Definition of chhana

According to FSSAI (2006), chhana is the product obtained from cow or buffalo milk or combination thereof by precipitation with sour milk, lactic acid or citric acid. Milk solids may be used in preparation of this product. It shall not contain more than 70% moisture and the milk fat content shall not be less than 50% of the dry matter. Chhana when sold as low fat chhana, it shall not contain more than 70% moisture and the milk fat content shall not more than 15% of dry matter.

Chemical Composition of Chhana (FSSAI, 2011):

Parameter	Chhana	Low fat Chhana
Moisture, maximum, %, (m/m)	65.0 (for Chhana)	65.0 (for Chhana)
Milk fat, %, (m/m), dry matter basis	50.0 (minimum)	15.0 (maximum)



Chemistry of chhana processing

- The process of coagulation of milk in the preparation of chhana due to combined chemical and physical changes in casein brought about by the action of acid and high temperature of coagulation.
- This involves the formation of large structural aggregates of casein or curd from the normal colloidal dispersion of discrete casein micelles in which fat and coagulated serum protein are entrained together with whey.
- Then the curd separates from the milk serum as a flocculent. A part of calcium and phosphate losses from the casein micelles during boiling and subsequent coagulation.



Various factors influencing the quality of chhana

1. Type of milk
2. Fat content in milk
3. Homogenization
4. Calcium level
5. Additives
6. Type and amount of coagulant
7. Temperature of coagulation
8. pH of milk
9. Speed of stirring



1. Type of milk:

Cow milk is preferred for chhana preparation since it yields a **soft body, smooth texture and small grain** that are suited for making sweet. The chhana from buffalo milk has a slight hard body, a greasy and coarse texture. Buffalo milk contain higher concentration of casein, mainly in the miceller form with bigger size of the micelles, higher proportion of high melting triglycerides and higher content of calcium may be responsible of hard body and coarse texture in buffalo milk chhana.

2. Fat content in milk:

Fat level in milk affect the final quality of chhana. A minimum fat level of 4% in cow milk and 5% in buffalo milk is essential for satisfactory quality of chhana. Higher fat level would give rise to a softer chhana with higher fat loss in the whey.

3. Presence of colostrum:

The presence of colostrum in milk tends to produce a pasty texture in the coagulation mass. The adulteration of milk with starch results in a gelatinous mass on coagulation.

4. Mineral level of milk:

Addition of calcium or magnesium chloride produces a hard chhana whereas sodium chloride, sodium citrate and sodium acetate have negligible effect on the body and texture of chhana

5. Type of coagulants:

Coagulants generally added are organic acids like citric acid, lactic acid or their salts, lemon juice or sour whey. Lactic acid (0.5-0.75%) tends to produce a granular texture chhana suitable for rosogolla making, while citric acid (1-2%) produces doughy product suitable for sandesh making. Calcium lactate (4%) produces soft body, smooth texture, and pleasant flavour chhana that is suitable for the preparation of sandesh. Generally low acid strength coagulant results a soft body and smooth texture required for rosogolla preparation and high acid strength results a comparatively hard body and less smooth texture required for sandesh preparation.

6. Coagulation temperature:

Temperature of coagulation exerts a significant influence on physico-chemical attributes. A temperature range of 80-85⁰C and pH 5.4 for cow milk and 70-80⁰C and pH 5.7 for buffalo milk will give better yield and quality. Higher coagulation temperature results hard, granular and graininess texture chhana and lead to lower moisture content but higher percentage of milk solids comprising fat, protein, lactose and ash. The lower temperature imparts in a sticky chhana with slow drainage problem.

7. Stirring/agitation:

Generally slow stirring is preferred for avoiding foam formation and reduce the shattering of the coagulation mass, whereas fast stirring reduce the moisture content and increased hardness in chhana. Again, delayed straining produced comparatively a soft body and smooth texture with higher yield chhana than immediate straining. Delayed drainage of whey following coagulation results in a softer body and smoother and sticky and less chewy texture and is more acceptable from overall quality.

8. Proteolysis:

Proteolysis of buffalo milk with enzyme trypsin coagulation produced a chhana with very soft and smooth body having minutes sized micelles and suitable for rosogolla preparation. Addition of 0.3% sodium citrate to buffalo milk produces a chhana similar to cow milk chhana. A mixture of 75% buffalo milk and 25% cow milk produces suitable chhana, which offers good rosogolla.

Chhana based sweets

Sandesh

Sandesh is a very popular chhana based sweets of eastern India. It is usually prepared by heating a mix of grind chhana with cane sugar with continuous stirring and scrapping in a shallow pan until the characteristics consistency and flavour develops. The mix is cooled and mounded in different shape. Sandesh is broadly classified into three main sources, namely, soft sandesh (naram pak), hard sandesh (karapak) and kachhagolla.

Chemical Composition of Sandesh (%):

Constituents	Soft Grade	Hard Grade	Kachhagolla
Moisture	23.4	11.6	33.89
Fat	23.1	21.8	15.50
Protein	26.1	20.5	12.75
Sucrose	47.9	53.0	35.75
Ash	1.71	1.69	1.45
Acidity (% lactic acid)	0.88	0.82	0.70

- Cow milk chhana is usually preferred for sandesh making because of its soft body, smooth texture and small grain.
- Buffalo milk chhana results in hard body, coarse texture and bigger grains size due to its compositional differences.
- Generally buffalo milk is skimmed to 4% fat and sodium chloride or sodium phosphate is added at the rate of 0.05% to the milk. The quality of buffalo milk sandesh is same as that of cow milk.
- Normally sandesh has a limited shelf life of 2-3 days due to high moisture, unsanitary condition and unhygienic method of handling.
- Hard sandesh has longer shelf life than soft grade sandesh due to higher sugar and low moisture content are the two main contributing factors for long shelf life.

Rosogolla

- Rosogolla is one of the most popular chhana based sweet of West Bengal.
- Rosogolla is snow-white in colour and possesses a spongy and chewy body and smooth texture. Though rosogolla has been reported to exist since 1868 as a brain child of Mr. Nabin Chandra Das of Kolkata and is being reproduced since then by thousands of others.
- In recent past the popularity of these ancient delicacy has crossed the limit of West Bengal, Eastern India
- As a whole and now being marketed throughout the World. Its actual manufacturing techniques has neither been properly reported not standardized.
- It is best prepared from cow milk chhana as buffalo milk chhana is hard and lacks sponginess, as well as desired body and texture.
- Rosogolla is manufactured by acid coagulation of boiled hot milk and subsequent drainage of whey. The coagulum is then cooked in sugar syrup after kneading them with some additives and making small balls. Finally these cooked balls are soaked in sugar syrup again.

Chemical Composition (%) of Rosogolla:

Constituents	Range	Average
Total Solids	52.98 – 58.35	55.98
Fat	4.65 – 8.67	6.53
Protein	7.23 – 8.53	7.97
Sucrose	33.98 – 37.67	35.45
Ash	0.61 – 1.37	0.93
Additives	2.11 – 6.51	5.10



Rosomalai

It is popular in eastern and western part of India. It is marble white, spongy in texture and served in thickened milk. The process is similar like rosogolla preparation. The balls are subsequently soaked in sweetened thick milk.



Cham-Cham

It is a chhana based sweet product and has firm body, a close knit texture and coated with sugar. Grind chhana and maida or suji are mixed and is kneaded into uniform dough. Ball are prepared and cooked in boiling sugar syrup for 25 – 30 minutes. After cooking the balls are removed from the sugar syrup and allowed to cool.



Pantooa

Pantooa is a chhana sweet similar to gulabjamun prepared in the eastern region of India. Chhana is mixed with maida and suji and is kneaded into uniform dough. Ball are made and are deep fried in ghee till the ball deep brown colour appears .The balls are then transferred to sugar syrup and soaked for few minutes .



Chhana- Murki

It is popular chhana based sweet in the eastern region. It is a small cubical in shape, coated with sugar and has a firm body and close knit texture. Chhana is kneaded and cut into small cube. Cubes are then boiled in sugar syrup and stirring gently till firm. The cubes are then removed from the syrup and are spread in a shallow tray for cooling. Flavour and colour may be added to the top.



Khirmohan

This form of sweet is commonly prepared in eastern India. Chhana is kneaded with wheat flour to form dough. Ball are made and processed like rosogolla .After soaked in concentrated milk, remove and smeared with grated khoa.



Lalmohan

It is also similar to gulabjamun but light in colour than gulabjamun. It is generally made from chhana.



Sitabhog

Sitabhog is a popular chhana based milk sweet of Burdwan district of West Bengal. Chhana is kneaded and mixed with sobeda (dust form of rice) in the ratio 1:1. After proper mixing, dough is prepared. It is placed over a mesh to prepared thread like noodle texture. It is fried in ghee/vanaspati; taking care no discoloration would take place. After frying, it is strained to drain out excess ghee or vanaspati and dipped in sugar syrup for 2 - 3 hours.



Chhana Podo

Chhana Podo is a typical indigenous chhana based sweet of Orissa. The term Chhana Podo is a purely spoken Oriya language meaning burnt chhana or cooked chhana. It is characterized by its light brown in appearance, spongy texture, cooked flavour and a very rich in taste. Generally, it is prepared by mixing sugar, suji/ maida to chhana with small amount of ghee followed by slow cooking on low flame.



Thank you