

# CHHANA

Product description, standards,  
method of manufacture, packaging,  
preservation and associated  
defects

# Chhana: Acid coagulated product obtained from milk

- Curd mass obtained when milk is coagulated with organic acids (citric acid, lactic acid) at higher temperature and after subsequent drainage of whey, mass of curd is called chhana.
- **Off-white, tastes mildly acidic, characteristic spongy texture.**
- According to FSSR-1511, product obtained from the cow or buffalo milk or a combination thereof by precipitation with sour milk, lactic acid or citric acid.



**Low fat chhana shall conform to the following requirements.....**

**Moisture not more than 70.0 percent**

**Milk fat not less than 50.0 percent of dry matter**

- Prepared from cow milk, used for preparation of varieties of Bengali sweets.
- About 4-4.5% of total milk produced in India is used for making chhana.
- As a base for preparation of.....



# Chemical composition

Parameter	Cow milk chhana	Buffalo milk chhana
Moisture %	53.4	51.7
Fat %	24.8	29.7
Lactose %	2.2	2.3
Protein %	17.4	14.4
Ash%	2.1	1.9
pH	5.7	5.4

**Chhana retains about 90% fat and protein, 50% mineral and 10% lactose of the milk from which it has been made and it is possible to recover 52-61% of milk solids originally present in milk.**

Partitioning of milk solids in chhana and its whey prepared from cow milk

Constituent	Milk	Chhana	Chhana Whey
Moisture %	87.34	53.20	93.42
Fat %	3.50	24.70	0.42
Protein%	3.62	17.82	0.44
Lactose %	4.86	2.20	5.12
Ash %	0.68	2.08	0.60
T.S %	12.66	46.80	6.58
SNF %	9.16	22.10	6.16

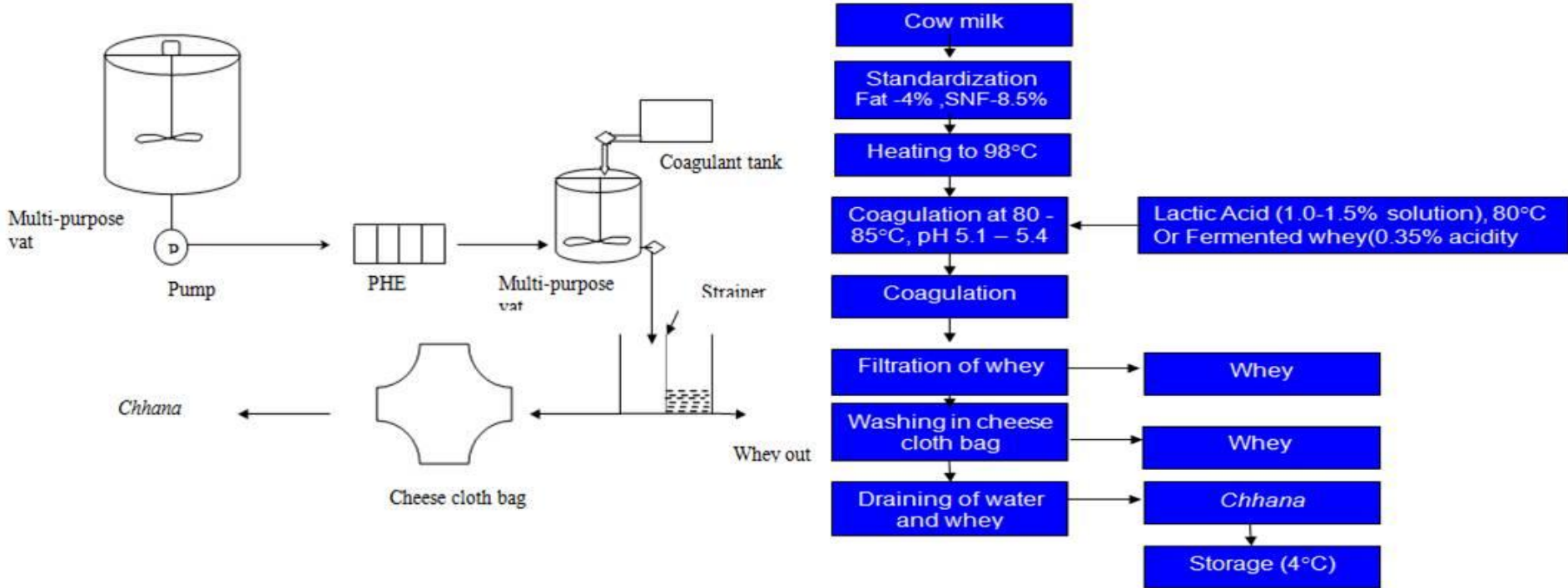


# Traditional Method of Manufacture

- Chhana has been prepared by boiling about 15-40 litre of cow milk in a steel pan.
- Acidic whey (previous day whey) added to boiling hot milk serve as coagulant with continuous stirring till completion of coagulation.
- Contents poured over muslin cloth held over another vessel and whey is collected in vessel.
- Muslin cloth containing curd mass washed with potable water by immersion process and allowed to drain for 30 min to expel free whey.

# Industrial Production of Chhana from Cow Milk:

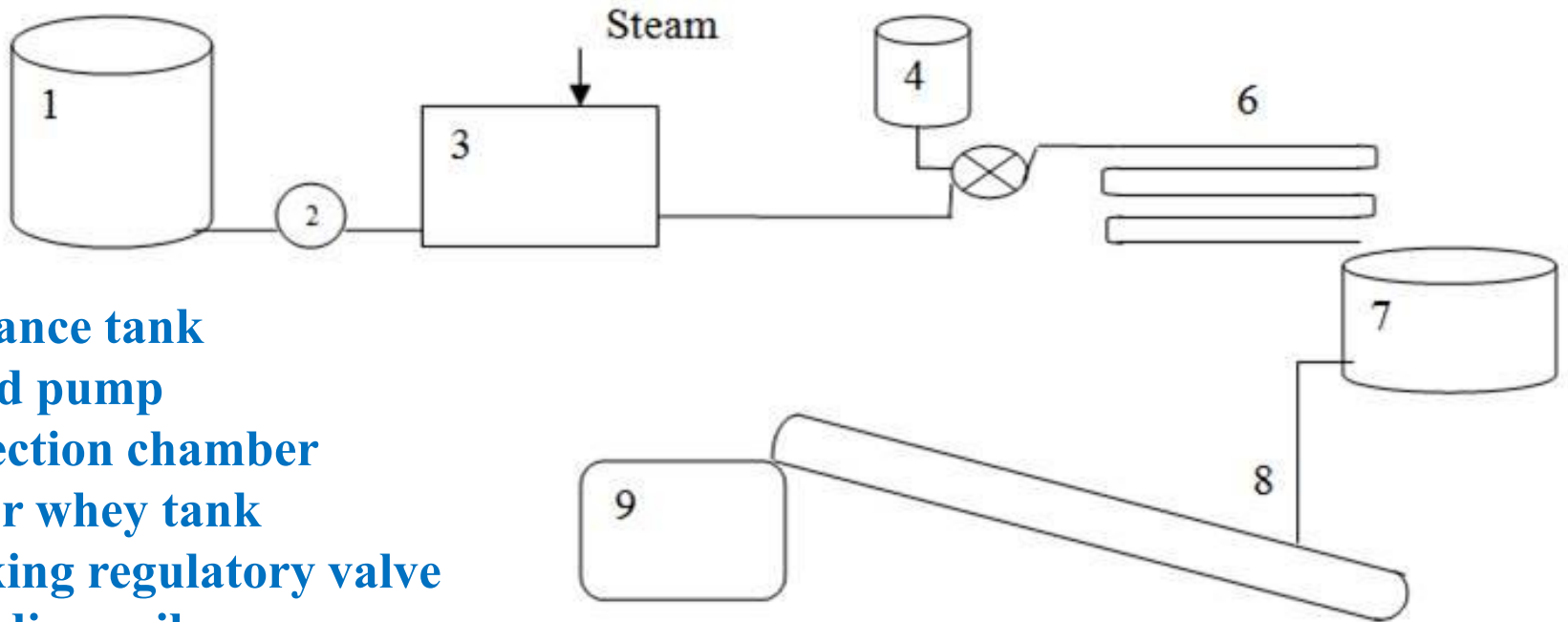
- In industrial production, multi-purpose stainless steel vats or storage tanks are used for storage of milk, plate heat exchanger or steam jacketed kettle are used for heating of milk.
- Other process controls like temperatures of heating of milk, coagulation and coagulant are very precisely maintained.
- SS strainers with cloth lining used to filter whey out of coagulum.



# Mechanized system for Chhana Making:

- A prototype machine with a capacity to produce 40 kg of chhana/hour has been developed at NDRI, Karnal.
- Equipment consists of 1) Balance tank 2) Injection chamber 3) holding coil 4) Cooling chamber and 5) a strainer.
- The standardized cow milk is pumped from balance tank at the rate of 250 lit of milk/ hr to an injection chamber where culinary live steam (at 1 kg/cm<sup>2</sup> pressure and at the rate of 65 kg/hr) is directly injected into the milk.
- Steam gets completely condensed in milk and temperature is raised to 90-95°C.
- Thereafter, the milk is brought in contact with sour whey, the quantity of which is regulated in proportion to the rate of milk flow.
- The mixture of whey and milk is circulated through a holding coil (8m length X 10mm diameter) to facilitate complete coagulation of milk.
- Coagulated product along with whey is then pumped into a double jacketed cooling tank, where it is cooled down to room temperature.
- Product is taken to mechanical strainer wherein inclined sieve situated to drain the whey thoroughly. Chhana with 55-65% moisture is discharged through outlet and collected in container.
- Drained whey is transferred to a holding tank for souring for subsequent use.





1. Balance tank
2. Feed pump
3. Injection chamber
4. Sour whey tank
5. Mixing regulatory valve
6. Holding coil
7. Double jacketed cooling tank
8. Inclined sieve
9. Chhana collecting tray

*Indian Institute of Technology, Kharagpur developed a continuous chhana-making unit of 60 L/h of milk capacity. The unit has a duplex plunger pump for dosing of milk and acid. Helical coil heat exchanger was used to heat milk prior to acid coagulation. Also consists of a vertical column that gives residence time for separation of milk solids to chhana.*

# **PREPARATION OF CHHANA FROM BUFFALO MILK.....**

- **In India: 53% of the total milk produced is from buffaloes.**
- **Dairy plants prefer to buy buffalo milk as it contains higher proportion of fat and total solids, approx. 1.5 to 2.0 times more fat than cow milk.**
- **High calcium and casein (cow milk contains 110 mg calcium and 2.42 - 2.7% casein and buffalo milk contains 170 mg calcium and 2.6 - 3.38% casein per 100 g milk) contents in buffalo milk render it unfit for preparation of most chhana based sweets.**
- **Mixture of buffalo milk and cow milk in 1:3 yields chhana with soft body and smooth texture (for rasogolla and Sandesh).**
- **Addition of mixture of sodium diphosphate (75 g per 100 lit.) and disodium phosphate (58 g per 100 lit.) followed by storing hot milk for some time before precipitation produces a soft chhana.**
- **Sodium citrate converts some of insoluble calcium into soluble salts in buffalo milk and this helps in production of softer chhana.**
- **Dilution of buffalo milk (standardized to 4% fat) with potable water @ 30% of milk after boiling and coagulating at 70°C using 0.5% citric solution produces chhana good for sandesh making.**

# Factors influencing quality of chhana

## Type of milk:

- Cow milk produces chhana with moist surface, light yellow colour, soft body, smooth texture and mildly acidic flavour which is more suitable for sweet preparation.
- Buffalo milk produces chhana with hard body and coarse texture, with white colour and greasy surface. Sweets prepared are hard, coarse and less spongy.
- Colostrum milk produces pasty Chhana with deeper yellow colour and unsuitable for rasogolla production.



# Quality of milk:

## Fat level

- Minimum 3.5 to 4% fat in cow milk and 5% fat in buffalo milk gives a satisfactory body and texture in chhana.
- Lower than 3.5% fat leads to hard body and coarse texture while higher fat level results in greasy surface.

## Acidity

- Acidic milk produces chhana with sour smell and bitter taste hence unfit for sweet making.
- Addition of neutralizer to slightly acidic milk helps in getting chhana suitable for sandesh and not for rasogolla.
- Milk with 0.25-0.28% LA can be used by adding 0.2% sodium citrate followed by thorough washing of coagulum.

## Type, strength and quantity of coagulant:

### Type

- Lactic acid produces granular chhana suitable for rasogolla.
- Citric acid gives pasty texture suitable for sandesh.
- Dilute solution of citric acid can be used for making chhana suitable for rasogolla.
- Sour whey with (0.9% LA) can also be used for producing good quality chhana.
- Calcium lactate produces chhana with bright white colour, soft body and smooth texture and pleasant flavour (sandesh making).

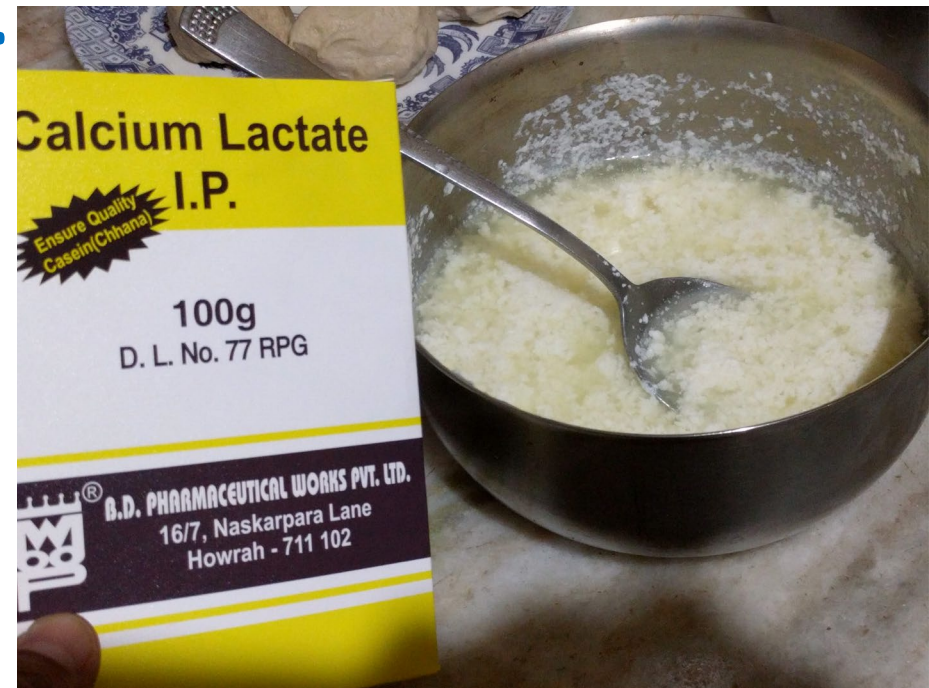
### Strength:

- Low acid strength (0.5%) results in very soft body and smooth texture suitable for rasogolla but unsuitable for sandesh making.
- Optimum strength of coagulant should be between 0.5 to 0.8% citric or lactic acid to produce good quality chhana suitable for making both rasogolla and sandesh.
- Calcium lactate of 4% solution produces most satisfactory quality chhana.



## Quantity:

- Quantity of coagulant required is dependent on the type of milk.
- Generally, 2 to 2.5 g of citric acid per kg of fresh milk and 2.5 to 3.9 gm of lactic acid and 6 to 12 gm of calcium lactate per kg are required individually for complete coagulation.



## Temperature and pH of coagulation:

- As coagulation temperature decreases, moisture content of chhana increases resulting in softer body and smooth texture.
- Higher coagulation temperature imparts graininess and hardness.
- Optimum coagulation temperature of cow milk is 80 to 85 C and pH is 5.4 and that of buffalo milk is 70 to 75 C and pH is 5.7.

## Speed of stirring during coagulation:

- Higher speed of stirring during coagulation reduces moisture content of chhana, increases hardness, optimum speed: 40-50 rpm.

## Method of Straining:

- Delayed straining produces soft and smooth texture chhana than immediate straining.
- Delayed straining gives higher proportion of moisture, yield, recovery of milk solids and lower hardness.
- Delayed straining is recommended for buffalo milk.



## Effect of heat treatment given to milk:

- Recovery of milk solids and yield of chhana is influenced by the heat treatment given to milk prior to acidification.
- Heat treatment prior to acidification involves temperature to which milk is heated, the rate of heating, temperature to which milk is cooled and the rate of cooling.
- Several heat induced changes occur during heating; denaturation of whey proteins and their subsequent association with casein micelles, precipitation of calcium phosphate onto the casein micelles and dissociation of  $\kappa$ -casein from the micelle.
- Degree of denaturation of whey proteins depends on time temperature combination during heating and is mainly determined by maximum temperature to which milk is heated.
- Whey protein denaturation at above 70 C is two step process, first an infolding of whey proteins takes place followed aggregation.
- $\alpha$ -lactalbumin shown the higher resistance to denudation and it reported that 95 C temperature denaturates all whey proteins.

## **Yield of Chhana**

- **Yield and quality of chhana depends on the type of milk, heat treatment given to milk prior to acidification, acidity of milk, coagulation temperature, strength of coagulant and residence time of coagulated chhana- whey mixture before separation of coagulated milk solids from whey.**
- **Total solids present in milk especially fat and casein influence yield of chhana, which from cow milk is 15-17% and from buffalo milk is 18-20 %.**

## **Shelf-life of Chhana**

- **Chhana is an extremely perishable due to its high moisture content.**
- **At room temperature, it does not keep longer than a day.**
- **Under refrigeration, shelf life can be extended up to 6 days.**
- **Packaging materials have a role in extending the shelf life.**
- **Cow milk and buffalo milk chhana stored in tin cans and cellulose film/LDPE was found acceptable upto 3 days at 37 C, and 20 days at 4-5 C.**

# Packaging of Chhana

- Due to high heat treatment during production of chhana, microbial load is very low in fresh products.
- Post processing contamination that takes place during handling and storage, which leads to sharp increase in spoilage and pathogenic microorganisms.
- Packaging plays an important role to protect and preserve quality of products for long time.
- Chhana is manufactured in rural households and packaged in bamboo baskets lined with leaves/parchment paper/polyethylene film and it is locally sold to retailers.
- Chhana should be protected from microbial contamination, light and oxygen using appropriate packaging system.
- Vegetable parchment paper can be used for packaging of chhana but not so effective in extending the shelf life.
- Chhana packed tin cans showed maximum protection against chemical deterioration.
- Cellulose film/ LDPE laminates and aluminium/LDPE laminates also exhibit maximum protection to chhana against chemical deterioration.

## Defects of Chhana

Defects	Prevention
<b>Flavour</b>	
Burnt/smoky	Avoid smoky fire, stir milk continuously during heating
Sour	Use fresh milk, use optimum level of coagulant (acid/ sour whey)
Rancid	Store chhana at low temperature (4-6°C).
Stale/ foreign	Avoid contamination, store chhana at 4-6°C, control microbial growth.
<b>Body and Texture</b>	
Hard body	Use optimum fat level in milk, employ optimum heating, coagulation and pressing during paneer manufacture.
Coarse texture	Use fresh milk, standardize milk for optimum fat-SNF ratio, optimum temperature of coagulation, and proper pH of coagulation.
<b>Colour and appearance</b>	
Dry surface	Optimize fat and moisture content
Surface skin/ hardening	Proper packaging with moisture barrier packaging material.
Viable foreign matter/ inert material	Proper straining of milk, adopt good manufacturing practice and good packaging system.
Mouldy surface	Optimum moisture content, proper packaging and storage, easily disposal.