



Dahi

1. Dahi (Sanskrit: Dadhi) is considered the oldest Indian fermented milk product and is equivalent to Western Yoghurt.
2. It has valuable therapeutic properties and helps curing gastrointestinal disorders with dyspepsia, dysentery, and other intestinal disorders.
3. Dahi is prepared and consumed in the household on a day to day basis and a huge portion of dahi production in the country is still confined to the unorganized sector.
4. PFA rules (2006) defines dahi or curd as the product obtained from pasteurized or boiled milk by souring, natural or otherwise, by a harmless lactic acid or other bacterial culture. Dahi may contain added cane sugar.
5. Dahi shall have the same minimum per cent of milk fat and milk solids-not-fat as the milk from which it is prepared.
6. According to BIS (1978) specifications, dahi should have a pleasing flavour and a clean acid taste, devoid of undesirable flavour, should have firm, solid body and texture and be uniform with negligible whey separation.

Characteristics	Sweet <u>dahi</u>	Sour <u>dahi</u>
Acidity (% lactic acid)	0.7	1.0
Yeast and molds (per gram) Max.	100	100
<u>Coliforms</u> (per gram) Max.	10	10
<u>Phosphatase</u> test	Negative	Negative

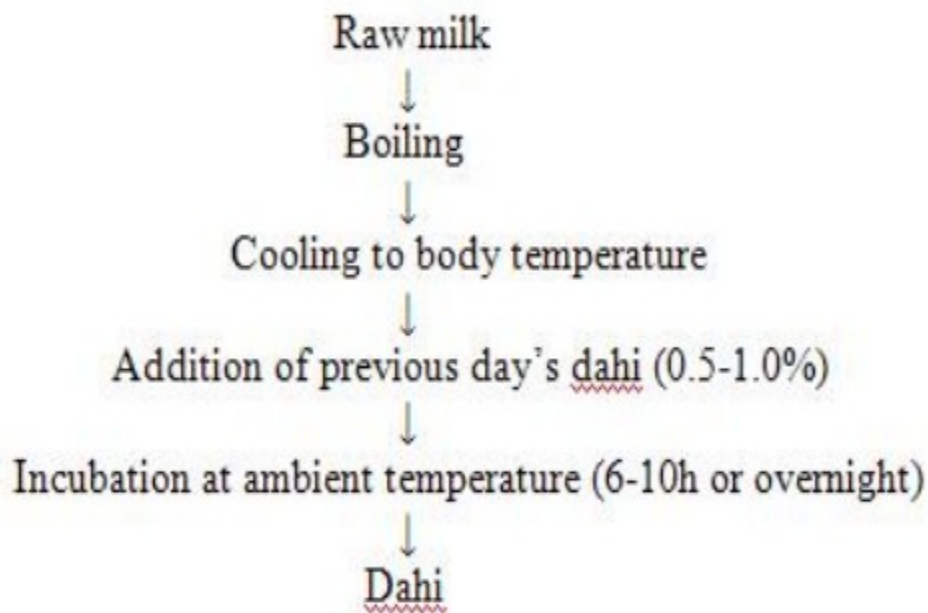
Specifications for dahi (BIS, 1978)

Requirements	<u>Dahi</u>
Total Plate Count	Not more than 1,00,000/g
Coliform Count	Not more than 10/g
<u>E. coli</u>	Absent in 1g
Salmonella	Absent in 25g
<u>Shigella</u>	Absent in 25g
<u>S. aureus</u>	Not more than 100/g
Yeast and Mold Count	Not more than 100/g
Anaerobic spore count	Absent in 1g
<u>Listeria monocytogenes</u>	Absent in 1g

Microbiological specifications for dahi (FSSA, 2006)

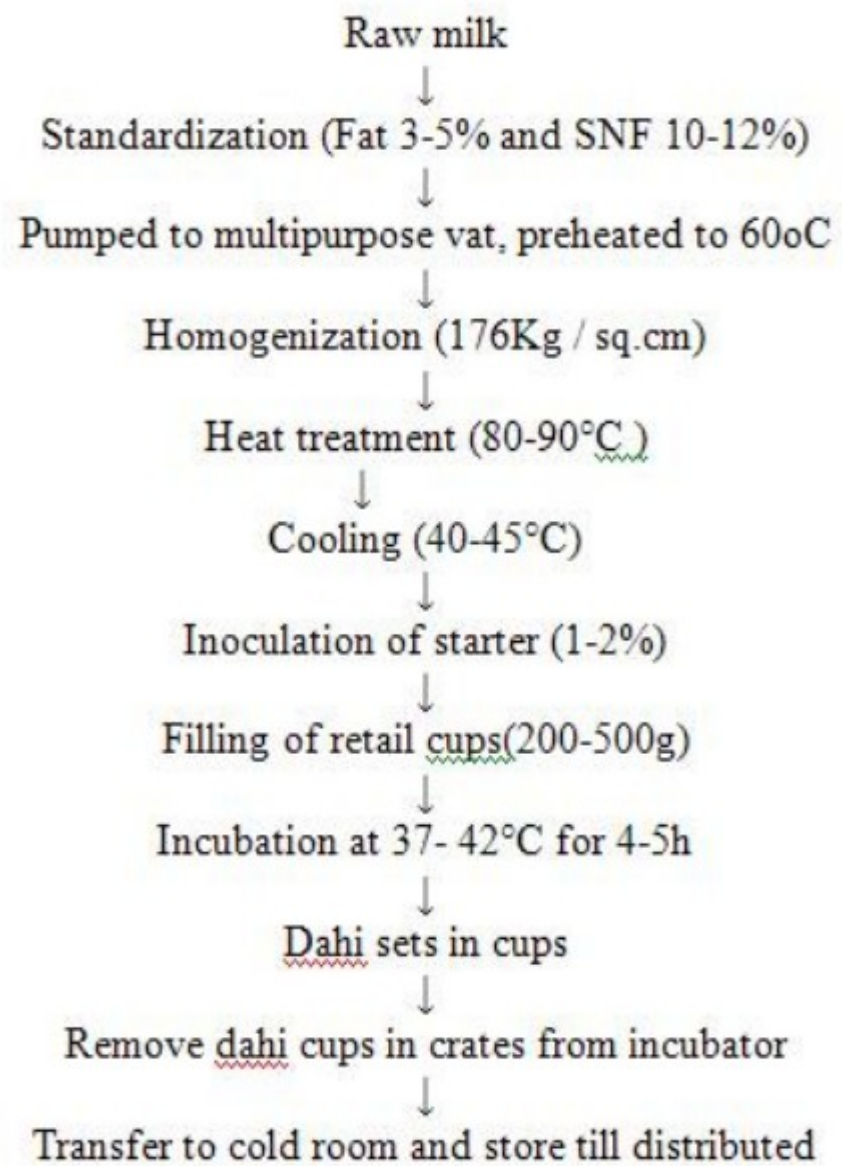
Methods of Production of Dahi

1. The traditional method for preparation of dahi invariably involves a small scale, either in consumers' household or in the sweet makers shop in urban areas.
2. In the household, milk is boiled, cooled to ambient temperature and inoculated with 0.5-1% of starter and allowed to set overnight. It is then stored under refrigeration and consumed.
3. In cooler weather, the dahi setting vessel is usually wrapped in a woollen cloth to maintain warmth.
4. In shops, the method is more or less the same except that milk is concentrated before inoculation and the dahi is usually set in a shallow circular earthen pot, which helps in the absorption of any whey that may ooze out.



Household method of preparation of dahi

Restaurants make dahi by the short set method (curd within 4-6 h). They use inoculum at the rate of 2-4% followed by incubation at 42-45°C till setting of the curd.



Commercial production of dahi (short set method)

Starters of Dahi

1. Traditionally, the previous day dahi or chhach, containing an unknown mixture of lactic acid bacteria was used as starter culture.
2. To manufacture dahi on large scale with predictable uniform quality, the starter bacteria consist of *L. lactis* subsp. *lactis*, *cremoris*, *L. bulgaricus*, *L. plantarum* sp. and *Streptococcus thermophilus*.
3. Lactobacilli dominate in sour dahi due to their higher acid resistance, while streptococci dominate in sweet dahi. In summer dahi, Lactobacilli dominate, while in winter, Streptococci dominate. Similarly in southern parts of India, people habituated to take sour dahi, lactobacilli and yeast dominate, while in northern parts where mildly sour dahi is preferred, Streptococci predominate.
4. The starter cultures for dahi making are available in the form of liquid, concentrated, freeze dried cultures from culture suppliers and Culture collection centres. Alternatively, DVI concentrated culture can be used directly in fermentation vat for the preparation of dahi.

Groups	Criteria
Rod <u>cocci</u>	Shape
Lactic Non lactic	Ability to ferment lactose
<u>Homofermentative</u> <u>Heterofermentative</u>	Fermentative nature
<u>Mesophilic</u> <u>Thermophilic</u>	Growth temperature
Single strain Paired strain Multiple strain	Composition of microflora
Liquid Frozen Frozen concentrated Freeze dried Concentrated freeze dried	Forms in which cultures are available

Composition of Dahi

Characteristics	Cow milk	Buffalo milk
Moisture	85-88	82-85
Fat	3.5-4.5	6.0-8.0
Protein	3.0-3.5	3.5-4.0
Lactose	3.8-4.5	4.6-5.2
Ash	0.64-0.66	0.7-0.72
Lactic acid	0.5-1.0	0.5-1.1

Desirable properties of dahi and factors influencing:

A good quality dahi made from whole milk has a creamy layer on the top, the rest being made up of a homogenous body of curd and the surface being smooth and glossy, while the cut surface should be firm and free from cracks of gas bubbles and it should have a pleasant acid taste with sweetish aroma.

Quality of milk as a raw material:

- 1. The type and quality of milk used for dahi making has great influence on the quality of dahi as it affects the starter activity as well as sensory characteristics of the dahi.**
- 2. Milk should be fresh, clean and free from developed acidity and any off flavours.**
- 3. It should be free from antibiotic residues and inhibitory substances which can adversely affect the starter activity.**
- 4. The chemical composition, status of fat, protein, minerals, enzymes and vitamins, etc. of dahi can vary with the type of milk used in its manufacture.**
- 5. Treatments like filtration, clarification, bactofugation, etc. can be applied to make the milk clean and bacteriologically better.**
- 6. Milk with abnormal composition like colostrum, late lactation milk and mastitic milk should not be used as it adversely affects the growth of starter culture which subsequently results into poor quality product.**

Additives:

1. Except sugar, no other additives are legally permitted in dahi. However, various additives such as starch, alginate, gelatin, CaCl_2 and MgCl_2 are frequently used to control the texture and also to reduce whey separation in dahi.

Homogenization:

2. Homogenization increases the viscosity and coagulum stability.
3. It also improves the mouth feel of the product, and thus increases the organoleptic quality of dahi.
4. This step processed unhygienically can serve as a source of contamination in dahi.

Heat treatment of milk:

1. Generally milk is heated to higher temperatures than the normal pasteurization. Higher temperature is necessary to produce relatively sterile and conducive environment for the growth of starter culture, to denature and coagulate whey proteins to enhance the viscosity and texture of the final product, affects the activity of the culture by causing stimulation and inhibition of lactic cultures during fermentation of milk depending on changes in O-R potential, denaturation of whey proteins and destruction of inhibitors.

Starter cultures:

1. The type and characteristics of starter organisms used in the production of dahi and their associative growth during the fermentation process plays an important role in determining the overall quality of the final product.
2. Dahi quality is based on activity and purity of the culture, composition of starter microflora, type of fermentation, growth temperature.
3. Starter cultures should be periodically examined for contamination by extraneous organisms.

1	Production of lactic acid
2	Coagulation of milk and bring about changes in the body and texture of the product
3	Production of volatile Flavour compounds like <u>diacetyl</u> , acetaldehyde, etc.
4	Controlled <u>proteolytic</u> and <u>lipolytic</u> activity
5	Production of other compounds like vitamins, other acids, CO ₂
6	Production of antibacterial substances
7	May add functional properties to the product

Inoculation and incubation:

- 1. The amount of inoculum should be optimum for the production of cultured milk products.**
- 2. The use of minimum amount of culture causes greater fluctuations in acid production and high amount will result in defect in the texture and aroma of the final product.**
- 3. The amount of inoculum can vary depending on the method of production. A short set production method requires more amount of inoculum where as a long set requires less amount of inoculum.**
- 4. The rate of inoculum vary from 1 to 10% for making dahi.**
- 5. Incubation temperature and period depends on the optimum growth of starter culture, manufacturing schedule etc.**
- 6. Mesophilic starters incubated between 20-30 C and thermophiles is 37-45 C.**
- 7. The inoculated milk is either retail packed or set in bulk. The packaging before or after setting depends upon whether the product is stirred type or set type.**

Cooling and packaging:

- 1. The product is immediately cooled to $<5\text{ C}$ to arrest excessive acid development and whey-off'.**
- 2. Cooling should give minimum mechanical damage to the curd.**
- 3. In India, earthen pots are used for setting as well as selling large quantities of dahi. Dahi packaged in earthen pots has a firm body and these packages are eco-friendly and easily degradable after disposal, but limitations are heavy, breakable and can cause excessive shrinkage of the product during storage due to moisture seepage through pores.**
- 4. Polystyrene cups are the most convenient packaging material for set dahi in case of commercialization.**
- 5. The other commonly used plastics for packaging of dahi are polypropylene, polyvinylchloride and polyvinylidene chloride. The polystyrene containers are clean in appearance, give a good shining look, light in weight and unbreakable, but causes wheying off during storage and are non-biodegradable.**

Defects of Dahi

Sl No.	Defect	Probable Cause	Remedy
Flavor defects			
1	Insufficient Flavor	Low citrate level in milk, Low diacetyl content	Add 0.02 – 0.05% Sodium citrate prior to mixing the starter culture. Cool rapidly after culturing
2	Oxidized flavor	Copper contamination Exposure to fluorescent light Exposure to sunlight	Avoid usage of copper utensils Protect product from direct exposure to Sunlight/ UV light
3	Yeast/cheesy	Contaminating yeast growth	Sanitation check
4	Rancid flavor	Lipolytic activity	Do not mix pasteurized and raw dairy ingredients prior to homogenization
5	High acid	Addition of more culture, Increased incubation time Use of sour milk	Optimum culture addition Blast cool the product immediately after optimum pH is reached Use good quality fresh milk
Body and textural defects			
1	Weak body	Insufficient heat treatment to the mix Too low milk SNF Severe agitation after fermentation	Heat treatment should not be less than 85°C/30min Homogenize the dahi mix prior to homogenization Increase the MSNF content to 11% by adding Skim milk powder
2	Grainy texture	High acidity Improper dispersion of Skim milk powder	Rapidly cool the product to <5°C after attaining optimum acidity Use in line screen/filter
3	Syneresis	Insufficient heat treatment to the mix Improper standardization and too low milk SNF Agitation/disturbances during fermentation	Heat treatment should not be less than 85°C/30min Increase the MSNF content to min. of 11% by adding Skim milk powder Do not disturb the cups during fermentation
4	Ropiness	Contamination of milk with psychotropic microorganisms Culture contamination/impure culture	Proper heat treatment of milk, Avoid cold storage of milk before pasteurization/thermization Use of pure culture

Nutritive and therapeutic value of Dahi:

- 1. Dahi contain all the valuable constituents of milk except for the changes caused as a result of heat treatment of milk, microbial growth and fermentation processes.**
- 2. The milk constituents are predigested by microorganisms, hence become easily digestible.**
- 3. The digestibility of proteins in dahi is higher due to formation of softer curd, high acidity, release of peptides and amino acids. The hydrolyzed lactose becomes more easily digested.**
- 4. The bioavailability of essential minerals increases. As compared to milk, dahi will have higher lactic acid, amino acids, fatty acids, bacterial cell mass, carbohydrates and certain vitamins. The status of vitamins will depend upon the starter strains employed.**

6. The value of dahi as therapeutic agent in the treatment of gastrointestinal disorders and other ailments of man has been recognized in the Ayurvedic system of medicine in India.
7. Dahi can be safely consumed by lactose intolerant people. Dahi can significantly reduce the duration of diarrhoea in children, improve appetite and vitality.
8. Dahi containing probiotic bacteria is antidiabetic, anticarcinogenic, antiatherogenic effect. Dahi has found its applications in the cosmetics. It is used as a beautifying, soothing, cleansing and moisturizing agent.

Misti Dahi:

1. Misti dahi is an indigenous sweetened fermented milk product popular in the eastern parts of the India.
2. Misti dahi has creamish to light brown color, firm consistency, smooth texture, and pleasant aroma. Because of its brown colour as a result of caramelization of sugar during heating, it is also called Lal Doi.
3. Misti dahi production is mainly confined to household or cottage industries.
4. Traditionally, it is prepared by boiling cow, buffalo or mixed milk with a required quantity of sugar and partially concentrated by simmering over a low fire during which milk develops a distinctive light cream to light brown caramel color and flavor. This is followed by cooling and culturing at ambient temperature using lactic culture and pouring into retail earthen cups and left undisturbed overnight for fermentation. When a firm body curd has set, it is stored at a low temperature (4°C) and served chilled.

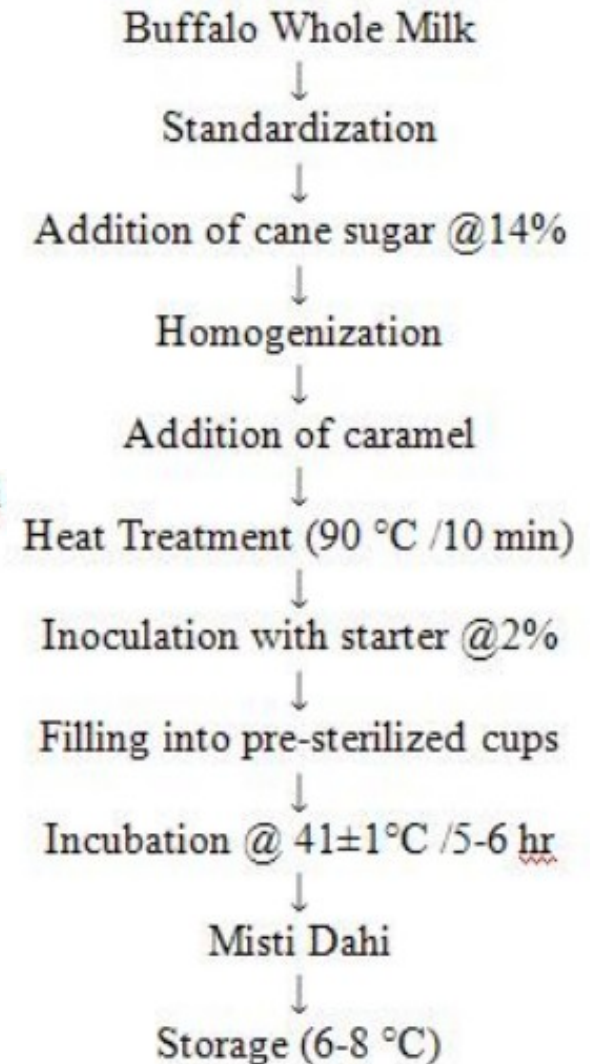
Constituent	Low fat	Medium fat	High fat
Milk fat	2-3	4-5	8-9
Milk SNF	13-14	11-13	10-11
Sugar	17-19	17-18	17-18
Total solids	32-35	32-36	35-38

Composition of different grades of mishtidahi (%)



Flow diagram for the manufacture of misti dahi

The starter cultures for mistidoi mainly comprises of combinations of *Streptococcus salivarius* ssp. *thermophilus*, *L. acidophilus*, *L. delbrueckii* ssp. *bulgaricus* and *L. acidophilus*, *L. lactis* ssp. *lactis* and *Saccharomyces cerevisiae*. The packaging of misti doi performed in earthen ware or plastic cups with aluminium foil lids of various sizes.



Bhapa Doi:

1. Bhapa Doi is a steamed, unsweetened yoghurt popular in Bengal.
2. It resembles a soft cheesecake in its texture and consistency and has a mild sweet taste.

Dahi based products in India:

3. Dahi is consumed by large segments of population either as a part of daily diet or as a refreshing beverage. The surplus dahi is used as the intermediate product and churned into makkhan (butter), while the liquid whey (chhach or mattha) is consumed as refreshing beverage or converted into kadhi, a spicy dish served hot with rice. Dahi is used as a base for producing shrikhand and lassi.

