



**CHEMISTRY OF FERMENTED MILK PRODUCTS
(DAHI AND LASSI)**

Soma Maji

Fermented milk product:

Dahi (Curd)	Lactic acid bacteria
Yoghurt	Symbiotic cultures of <i>Streptococcus thermophilus</i> and <i>Lactobacillus delbrueckii sub sp. bulgaricus</i>
Alternate Culture Yoghurt	Cultures of <i>Streptococcus thermophilus</i> and <i>Lactobacillus species</i>
Acidophilus milk	<i>Lactobacillus acidophilus</i>



Dahi

Definition:

According to FSSAI (2006), dahi or curd is 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 additional cane sugar. Milk solids may also be used in preparation of this product. It should have the same percentage of fat and SNF as the milk from which it is prepared. When dahi or curd other than skimmed milk dahi, is sold or offered for sale without any indication of the class of milk, the standard prescribed for dahi prepared from buffalo milk shall apply.

The dahi may be classified into various types depending upon the type of milk used such as whole milk dahi, skim milk dahi and on basis of acidity and addition of sugar it can be classified as: sweet dahi (acidity < 0.7%), sour dahi (acidity > 0.7%) and sweetened dahi. The composition of dahi depends upon the type of milk and the manufacturing condition.

Type of dahi preparation

Household preparation

During preparation of dahi at home, cow or buffalo or mixed milk is boiled or simmered for a long time to concentrate it, allow cooling to room temperature and then transferred to earthenware pots or pan. A small amount of the previous day's curd is added as a starter culture and then allowed to set undisturbed overnight. The dahi is usually ready within 16 to 20 hours.

Commercial preparation

Fresh, sweet, good quality milk (cow or buffalo or mixed) is received. It is then standardized to have 4-5 percent fat and 10-12 percent solids not fat, preheated to 60⁰C and homogenized at a pressure of around 176 kg/sq. cm. The milk is preheated to 80⁰C to 90⁰C for 15 to 30 minutes, cooled to 40 – 45⁰C and inoculated with 1 to 2 percent of specific starter culture. It is then filled in a suitable containers using automatic filling and sealing machine and incubated at 40 -42⁰C till curdling (3-4 hour). When a firm curd is formed, dahi cups are stored in a cold room temperature.

Biochemical Changes during dahi preparation

1. Break down of lactose:

- Hydrolysis of lactose to glucose and galactose by starter organism is the first step in the process of fermentation during the preparation of dahi.
- The liberated glucose is then enters the classical Embden Meyer Hoff pathway (EMP). But the galactose produced cannot enter the EMP pathway directly but follows a longer route and ultimately enter the EMP pathway via glucose – 1 – phosphate.
- Each of the simpler sugar is further acted upon by several enzymes successively before arriving at the lactic acid stage. There may be several form of acid end product.
- The amount of lactic acid produced may range from 75 – 95 % of the total acidity, the rest being volatile acid.

2. Role of lactic acid:

- The lactic acid cause at first an acid flavour combine with calcium of casein to form calcium lactate, then setting free the casein and coagulated it when isoelectric point (4.6) is reached .
- The fermentation is accompanied by gelling of the solids, principally the proteins and syneresis manifested by appearance of thin exudates of clear whey on the surface of dahi.

3. Nitrogen content:

- Total nitrogen content of milk remains more or less unchanged during fermentation.
- Appreciable changes occur in non-protein nitrogen, albumin nitrogen, ammonia and dialyzable nitrogen during fermentation.
- The increase in the non- protein nitrogen during fermentation is attributed to the breakdown of protein.

4. Salt content:

- The total mineral content is not affected.
- The soluble calcium and phosphorus are increased during souring. Citric acid is completely disappears during fermentation.

5. Vitamin content:

- Vitamin content of dahi depends on the type of organisms used for fermentation.
- Fermentation of milk with *streptococcus lactic* and *streptococcus cremoris* results in increase in thiamine, riboflavin and folic acid and decrease in vitamin A.
- The incorporation of *propionibacterium shermani* in lactic culture would enrich in with riboflavin and folic acid and cynocobalamine (vitamin12).
- Fermentation of milk with *streptococcus cremoris*, *streptococcus diacetylactis*, *streptococcus thermopilus* and *lactobacillus thermophilus* results in increase in riboflavin and folic acid and decrease in nicotinic acid.

During fermentation, the electrical charge on the fat particles is neutralized, causing the globule to coalesce and rise to top. The iso-electric point (pH 4.5 – 4.6) of the fat globule in milk is slightly higher than that of washed globule (pH 4.3) from cream. With respect to acidity, a pure culture is able to neutralize the charge on the fat globule at a lower level (1%) of acidity than a mixed starter (1.3 – 1.5 %).

Misti Doi

In the eastern region of India, sweet variety of dahi known Misti dahi, lal dahi or payondhi is popular. It is creamish to light brown colour, firm consistency, smooth texture and pleasing aroma. It is produced with the addition of 6 -6.5% sugar to milk either during boiling or at the setting stage. Prolong heating of sweetened milk at low temperature leads to milk solid concentration and development of brown colour. It is then cooled , add dahi culture and poured into earthen cups and left undisturbed overnight for fermentation. When a firm body curd has set, it is stored at low temperature of about 4⁰C and served chilled.



Lassi

Lassi is a popular refreshing beverage in the northern and western state of India. Lassi is the by-product in the preparation of dahi by indigenous method. Dahi is churned, with frequent addition of water, until the butter granules are formed. The diluted beaten curd is lassi. It is desirable to homogenize the product for improving body and texture. The composition of lassi, however, varies from place to place and depends upon the fat content of dahi, extent of dilution during churning and efficiency of churning.



Chemical composition (%) of lassi:

Water	Fat	Protein	Lactose	Lactic acid
90 - 91	0.1 – 1.0	3.3 – 3.5	4.7 – 5.3	0.5 – 1.1

The product is used to quench the thirst after addition of sugar, salt and spices. It has a low keeping quality and it very quickly separates into a watery layer on the top and a thick proteinous layer at the bottom. A process has been developed for the large scale manufacture of long life UHT lassi for a period of 3 months.

