



PHYSICAL AND CHEMICAL PROPERTIES OF MILK

Dr. Jena Ram Gehlot
Assistant professor
Department of Livestock Products Technology

PHYSICAL AND CHEMICAL PROPERTIES OF MILK

MILK

- Milk may be defined as the lacteal secretion obtained by the complete milking of one or more healthy milch animals. (colostrum free , minimum percentages of milk fat and milk-solids-non-fat).

COLOSTRUM

- colostrum, or first milk, is the first form of milk produced by the mammals immediately following parturition of the newborn.



Colostrum



Mature milk

PHYSICAL PROPERTIES OF MILK

- Physical state of milk
- Colour and optical properties of milk
- Flavor of milk

CHEMICAL PROPERTIES OF MILK

- Acidity & PH
- Density & Specific gravity
- Freezing point & Boiling point

PHYSICAL PROPERTIES OF MILK

1. Physical state of milk :

- The physical properties of milk are similar to those of water but are modified by the presence of various solutes (proteins, lactose and salts) .
- Milk is a dilute emulsion combined with a colloidal dispersion in which the continues phase is solution.



2. Colour and optical properties of milk :

- The colloidal casein particles and the dispersed fat globules both of which scatter light – **Turbid and opaque.**
- Yellowish creamy colour of cow milk due to **Beta- carotene** content.
- Buffalo milk – **creamy white.**
- Skim milk – **slight blue**
- Greenish tinge in whey – **Riboflavin**

Note: 1.The greater the intake of green feed the deeper yellow the colour of cow milk.

2.The larger the fat globules the higher the fat percentage, the greater the intensity
Of yellow colour.

3. Flavour of milk:

- Flavour is composed of smell and taste.
- The flavour of milk is a blend of the sweet taste of **lactose** and salty taste of minerals, both of which are damped down by proteins.
- The phospholipids, fatty acids and fat of milk also contribute to the flavour.
- Naturally- **sweet flavour**.
- Sulfydryl compounds contribute to the **Cooked flavour of heated milk**.
- Changes in the flavour of milk occur due to type of feed, season, lactation, condition of udder , sanitation during milking and subsequent handling of milk during storage.

CHEMICAL PROPERTIES OF MILK

1. Acidity of milk :

- Freshly drawn milk is amphoteric to litmus.
- However milk shows a certain acidity as determined by Titration with an alkali (NaOH) in presence of an indicator (phenolphthalein) . This acidity is known as **titratable acidity (T.A.)**.
- **Natural or apparent acidity** is caused by the presence of casein , acid-phosphates , citrates etc.
- The higher the solids-non-fat in milk, the higher the natural acidity.

T.A. of cow milk varies from 0.13-0.14 %.

Buffalo milk = 0.14-0.15%.

- The titratable acidity is usually expressed as ‘ **percentage of lactic acid**’.

2. PH of milk :

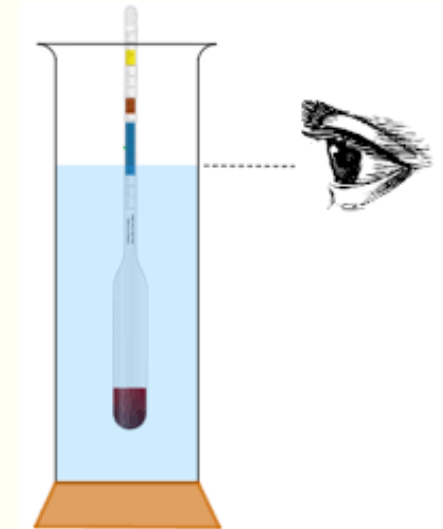
- Normal fresh cow milk- 6.4-6.6 , buffalo milk- 6.7-6.8
- Higher PH values indicate udder infection(mastitis).
- Lower PH values indicate bacterial action.

3. Density & specific gravity :

- The specific gravity of milk is usually expressed at **60 degree F**.
- Milk is **heavier** than water.
- SG ranges at 60 degree F,

In Cow milk: **1.028-1.030** , Buffalo milk: **1.030-1.032** , Skim milk: **1.035-1.037** , Colostrum: **1.070**.

- Specific gravity of milk is lowered by addition of water and cream and increased by addition of skin milk or removal of fat.
- Specific gravity of milk is measured by **Lactometer**.



4. Freezing and boiling point of milk:

- Freezing point is the temperature at which the liquid milk freeze or crystallize.
- The freezing point of cow milk and buffalo milk ranges from **-0.53 to -0.57 degree celcius** making an average of **-0.55 degree celcius**.
- Milk freezes at a temperature slightly lower than that of water due to the soluble constituents in milk such as **lactose , minerals** which lowers the freezing point.
- Boiling point of milk is 101.17 degree Celsius.

Type of milk	Energy	Fat	Carbohydra tes	Protein	calcium
Full Cream	89	6.2	5	3.3	134
Toned Milk	59	3.1	4.7	3.1	127
Double Toned Milk	47	1.5	5	3.3	134
Skimmed Milk	33	0.1	4.9	3.2	134

Product	Product composition	
	Fat [%]	SNF* [%]
Producer milk	4.00	8.95
Homogenized milk	3.60	8.60
Skim milk,	0.02	8.90
Fortified skim milk	0.02	10.15

SOURCES: Outlines of Dairy Technology, Sukumar De.
Photos from Google.

THANK YOU!