Factor effecting on milk composition and production

Milk is the white liquid produced by the mammary glands of mammals, which people drink and use to make butter, cheese, and yoghurt. It contains proteins,fats, vitamins, minerals(salts), and lactose(milk sugar). The proportion of these components varies with type of milk. Cow, buffalo, goat and sheep milk are often consumed.

Factor effecting on milk composition and production

Some of the factors which affect the composition and production of milk are:

1. Species: The milk from various species of mammals have different composition. This variation in milk composition is due to species effect.

Species	Water%	Fat%	Sugar%	Protein
Cow	87.54	3.71	4.70	3.31
Goat	85.58	4.93	4.78	4.11
Buffalo	82.90	7.50	4.70	4.10
Human	88.50	3.30	6.80	1.30

2. Breed: Composition of milk is also determined by breed. Within the different breed's fat is the major component, which is affected most. This variation in fat content in different breeds is evident.

3. Individuality of animal: Under identical condition of management and feeding, within the same breeds, individual variations in the composition of milk always exist. These may affect milk components like fat or protein, which may be high or low. These variations have been attributed to the individuality of the animal.

4. Milking Intervals: Milking intervals also affect the composition of milk. A longer the milking interval lower is the fat content, which is compensated with a higher milk yield. However, variation in the fat content of both the individual and herd milk between the morning and evening bulk milk samples occur.

5. Stage of Lactation: The composition of milk varies with lactation. The first secretion after parturition, the colostrum is totally different from milk in its composition and general properties. Colostrum is very thick in nature with a high viscosity. It has a high concentration of immunoglobulin, lactoferrin, chloride and low lactose content. Its fat content may be higher or lower than that of milk. Colostrum from different cows and buffaloes varies much more in composition than does milk. The transition from colostrum to a composition within the range of variation of normal milk is complete in about 4 days, the protein content being slowest to complete the transition. The yield of milk increases to a maximum in early lactation and then falls to normal. When yield of milk increases, fat and solids-not-fat decreases and vice versa. This decrease is between 0.2 to 0.4 percent. The only change in lactose percentage attributable to stage of lactation is a slight decrease towards the end

6. Feeds and nutritional level: Excessive feeding of fooder and concentrate is known to slightly increase solids-not-fat content in milk. Excessive protein in the feed does affect the protein content but may increase non-protein nitrogen content and sometimes fat. On feeding on pastures solids-not-fat content increases. The lactose content is not changed. Rations low in roughages lower the fat content by 0.5% with no change in milk yield. Additional feeding with palm oil, butterfat, lard and coconut oil increases the fat percentage while cod liver oil lowers the same. Food fats modify the composition of milk fats to a limited extent. Feeding of minerals such as calcium and phosphorus does improve their level in milk.

7. Season: Seasonal variations are directly related to temperature, humidity, sunshine and drought. In summer months drop in milk yield occur with slight decrease in fat content. However, vitamin D content increases due to exposure to sunlight. During rainy season when green fodders are available in plenty carotene and riboflavin level increases. During the period of drought the solids-not-fat content decreases while there is no change in fat percentage. Fat content is highest in May and minimum in November while solids-not-fat is highest in October and lowest in July and September.

8. Disease: Disease affects the composition. During infection of the udder with mastitis or foot and mouth disease there is lowering of lactose and casein. There is an increase in chloride content, increase in soluble nitrogen and reduction in natural acidity. There is also an increase in ash content.

9. Age of the Animal: With the advancement of age there is a slight decrease in fat content.

10. Hormones: Injections of hormones such as prolactin and oestrogen is known to have a favourable role in enhancing milk production, fat and solids-not-fat content by enhancing the metabolic activity of the body. However, excessive dose has a negative effect with depression of milk.

11. Heat: During the heat period the yield of milk and fat is slightly affected. This is due to nervousness of the animal due to heat or hormonal secretion.

12. Gestation: During the gestation period especially towards the end of lactation changes in milk composition occurs. These variations are reflected in solids- not-fat content, which is increased.

Microorganisms in milk

Milk is sterile at secretion in the udder but is contaminated by bacteria even before it leaves the udder. Further infection of the milk by microorganisms can take place during milking, handling, storage, and other pre-processing activities.

Milk supports the growth of a variety of bacteria including pathogenic one.

1. Acidic forming bacteria

    - Acetic acid bacteria are a group of bacteria which produce acetic acid during fermentation of carbohydrates. Common acetic acid bacteria in milk are species of Acetobacter and Gluconobacter.

    - Lactic acid bacteria are a group of bacteria which produce lactic acid by fermenting glucose. Common lactic acid bacteria in milk are species of Leuconostoc, Lactobacillus, Streptococcus, pediococcus.

    - Butyric acid bacteria are a group of bacteria which produce acetic acid during fermentation of carbohydrates including glucose and xylose. Common butyrics bacteria in milk are species of Clostridium

    - Propionic acid bacteria are a group of bacteria which produce propionic acid during fermentation of lactate. Common Propionic acid bacteria in milk are species of Propionibacterium

2. Proteolytic bacteria which breakdown of milk proteins (casein) by proteases. Common Proteolytic bacteria in milk are species of Bacillus cereus, Pseudomonas fluorescens, Clostridium sporogenes, Proteus vulgaris.

3. Lipolytic bacteria which breakdown of milk fats by lipase. Common lipolytic bacteria in milk are species of Pseudomonas fluorescens, Staphylococcus, Alcaligenes, Micrococcus, Serratia

4. Saccharolytic bacteria which breakdown of milk sugar (lactose) by lactase. Common Saccharolytic bacteria in milk are species of E.coli

5. Psychrotrophic bacteria refers to microorganisms which are able to grow at low temperatures but have optimal and maximal growth temperatures above 15 and 20 °C. Common psychrotrophic bacteria in milk are species of achromobacter, pseudomonas, flavobacterium, alcaligenes, Enterobacter, lactobacillus, and micrococcus

6. Thermophiles bacteria refers to microorganisms which are able to grow at temperatures more than 50. Common Thermophiles bacteria in milk are species of Bacillusstearothermophilus.

7. Thermoduric bacteria in milk are the microorganisms which are able to resist the pasteurization temperature. Common thermoduric bacteria in milk are species of micrococcus, streptococcus, lactobacillus, microbacterium, clostridium, bacillus.

8. Halophilic bacteria are salt loving organisms that grow in saline environments. Halophilic bacteria can be classified based on their requirements for sodium chloride into slight halophiles grow optimally 1-5% sodium chloride (NaCl), moderate halophiles grow optimally (5-20%) NaCl, and extreme halophiles grow optimally (20-30% NaCl.

9. Saccharophillic bacteria are living organisms that grow in sugar environments. Common Saccharophillic bacteria in milk are species of Leuconostoc

10. Pigmented bacteria: Bacteria can produce pigments of different colors. Common Pigmented bacteria in milk are species of Flavobacterium(orange), Serratia(red), Lactobacillus plantarum

11. Slim and rope bacteria cause stringy milk due to excretion of gummy polysaccharides. Common Ropy bacteria in milk are species of Enterobacter, aerogenes, alcaligenesviscolactis,klebsiella,oxytoca, streptococcus,lactobacillus, streptococcus.

12. Gas-Forming bacteriawhich cause cheese openness, floating curd in cottage cheese, and gassy milk. Common Gas-Forming bacteriain milk are species of Leuconostoc, lactobacillus, propionibacterium, clostridium, bacillus, enterobacter, Escherichia