VI Semester B.Sc. Zoology – Elective Course XV

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Dairy Farming



DAIRY FARMING MILK

• Dairy industry depends heavily on the ability of the mammary glands of domestic cattle to produce milk in excess of what required to nourish young ones.



- Colostrum is the first milk of a mammal after parturition.
- Composition-markedly different from that of normal milk.
- Supplies essential immune bodies to young ones, helps in establishment of digestion.
- Production may continue up to 3 to 10 milking.

COLOSTRUM

- Rich in antibodies, vitamins essential for newborn.
- Composition fat and vitamin A content higher than normal milk.
- Reddish yellow, abnormal odour and bitter taste.
- Colostral cells and fat globules present in plenty.

COLOSTRUM

- Milk produced by mammary glands specialized skin glands.
- Fresh milk- viscous, heavier than water, mild odour, slightly acidic(pH6.5), boils at 100.5°C, freezes at -0.54°C, tastes slightly sweet.
- Milk is an emulsion of fat in continuous phase.

CHEMICAL COMPOSITION OF MILK

- **1.** Water dispersion medium for solid constituents, provides fluidity. 80%-90 %.
- 2. Fats in form of globules remains as emulsions -Determines food value. Fat globules surrounded by proteins, phospholipids, carotene and cholesterol to prevent coalescing together . Churned to separate butter from milk. Milk fat is bland – imparts smoothness and palatability to dairy products. Fat content depends on food consumed, stage of lactation and breed of cow.

3. Lactose – largest constituent in cow milk next to water. Disaccharide, formed by galactose and glucose units. Milk contains 2.4 to 6.1% lactose. Helps absorption of Ca, Mg, P and vitamin D in intestine and is ideal for growth of microorganisms, to convert lactose to lactic acid leading to curdling of milk.

4. Casein – most important milk protein, 80% of total proteins. Mixture of alpha, beta and gamma caseins. Liquid after removal of casein from milk is whey. Casein contains whey proteins or milk serum proteins. Lactalbumins and lactoglobulins are major whey proteins. Exists in milk in combination with calcium as calcium caseinate. Viscous nature and white colour of milk due to this.

- Albumins lactalbumin is the albumin in milk.0.5% of total protein content of milk. It has sulphur containing amino acids like cysteine.
- 6. Globulin makes a very small fraction 0.1% of milk protein. Identical to blood globulin and appears to filter from blood into milk.

- 7. Minerals(ash) milk is rich source of minerals. K, Na, Ca, Mg, Cl, P, and S. are present in larger amounts. Traces of Fe, Cu, Zn, Al, Mn, I, B, Co and Si present too to increase the nutritional value.
- 8. Vitamins vitamin A, B2, B1, D, E and K. deficient in C.
- 9. Enzymes native enzymes originating from bacterial contamination. Amylase, catalase peroxidase, lipase, phosphate, galactase lactase and aldehydase present in milk.

- Production of high quality milk should be ensured, besides increasing production per cow.
- Bacteria counts, sediment tests and somatic cell counts are techniques to ensure quality of milk.
- Low bacteria count, low content of foreign material, low somatic cell count, desirable flavour, slightly sweet and odourless is good quality milk.

PRODUCTION OF CLEAN MILK

- Clean, healthy, properly fed cow are required.
- Milk should be well preserved and only pasteurized milk should be consumed.
- Milk from diseased cows is to be discarded.
- Smooth, clean and sterilized utensils required.
- Constant protection from contamination, dust, dirt, extreme cold or heat, strong light.

PRODUCTION OF CLEAN MILK

- Milk in mammary glands is sterile. But when it comes out it get contaminated. Freshly drawn milk remains unchanged for a very short period called germicidal period.
- Ideal medium for growth of microbes due to high nutrient content and neutral pH. Usually contaminated by bacteria which produce metabolic products.
- Under acidic pH, casein coagulates.

MILK SPOILAGE

- *Clostridium butyricum* acts on milk to produce butyric acid that inhibits lactic acid formation which is not desirable.
- Formic, citric and acetic acid also formed in spoiled milk.
- Salts of organic acids in milk are converted to alkaline carbonates and urea which are transformed to ammonia by action of bacteria.
- Changes in environmental factors and antibiotics, pesticides, radionuclides affect cows which in turn affect the milk they produce negatively.

MILK SPOILAGE

- Adulterants in milk mainly include addition of vegetable protein, milk from different species, addition of whey and water which are known as economically motivated adulteration
- Some of the major adulterants in milk having serious adverse health effect are urea, formalin, detergents, ammonium sulphate, boric acid, caustic soda, benzoic acid, salicylic acid, hydrogen peroxide, sugars and melamine

- Cane sugar, starch, sulfate salts, urea and common salts are added to increase solid-not-fat (SNF).
- Commercial urea is added to milk to increase non-protein nitrogen content.
- Melamine is added to increase protein content falsely.
- Ammonium sulphate is added to increase the lactometer reading by maintaining the density of diluted milk.
- Formalin, Salicylic acid, Benzoic acid and Hydrogen peroxide act as preservatives and increase the shelf life of the milk.

- Since milk fat is very expensive, some manufacturers of milk and dairy products remove milk fat for additional financial gain and compensate it by adding non-milk fat such as vegetable oil.
- Detergents are added to emulsify and dissolve the oil in water giving a frothy solution, which are the desired characteristics of milk

- Some of the adulterants have severe health impact, sometimes in the long run.
- The ingestion of melamine at levels above the safety limit can induce renal failure and death in infants.
- Both peroxides and detergents in milk can cause gastrointestinal complications, which can lead to gastritis and inflammation of the intestine.

- Excessive starch in the milk can cause diarrhea due to the effects of undigested starch in colon, however, accumulated starch in the body may prove very fatal for diabetic patients.
- Urea in milk overburdens the kidneys as they have to filter out more urea content from the body.
- In addition, carbonate and bicarbonates might cause disruption in hormone signaling that regulate development and reproduction.

- Common parameters that are checked to evaluate milk quality are- fat percentage, SNF (Solid-not-Fat) percentage, protein content and freezing point.
- Adulterants are added in milk to increase these parameters, thereby increasing the milk quality in dishonest way.
- Qualitative detection of adulterants in milk are simple color based chemical reactions

TESTING OF MILK

- Qualitative detections are advantageous because these are simple, rapid and very easy to perform.
- Some of the edible compounds are often used as adulterants to improve the taste of the milk.
- There are some hazardous chemicals added in milk to improve the physical appearances and shelf life.
- Some of those are very hazardous and can lead to fatal diseases.

TESTING OF MILK

- In addition, some other mixed chemicals such as soap, detergents and coloring compounds are sometimes added to the milk to improve appearance.
- Hansa Test developed by NDRI, Karnal to detect the presence of buffalo milk in cows milk upto 3 %
- Freezing point of test water adulteration in fresh milk

TESTING OF MILK