

Quadrant II – Transcript and Related Materials

Programme : Bachelor of Science (Third Year)

Subject : Zoology

Paper Code : ZOD 102

Paper Title : Applied Zoology

Unit : 7

Module Name : Milk- Composition and its Types – Toned , Standardized and Homogenized.

Module No : 37

Name of the Presenter : Ms Rita Sharma

Notes

Introduction:

Living beings require food for various purposes like growth, reproduction, supply of energy, maintenance and recovery from diseases at different stages of their life. These functions are met from foods of different sources. Amongst different foods milk is a mixture par excellence which contribute towards nutrition of human beings. Milk is taken by the infant from birth to weaning, by the adults as well as old and sick. Milk is the liquid secreted by the mammary gland with broad components consisting of a mixture of water, fat, proteins, lactose, minerals and vitamins as the nutrient.

Milk and milk products have an unique position as a source of nutrients.

Milk contains water, fat, protein, lactose, vitamins and minerals. Each of the milk constituent plays an important role in the life span of an individual. Milk is an important food for mankind and young ones of all mammals as a liquid food. Milk is required by young ones for energy and growth. India is the world's largest producer of milk, and is the leading exporter of skimmed milk powder.

Composition of milk:

The main constituents of milk are as following: Water – principal constituent, protein in colloidal suspension (casein, lacto-albumin and lacto-globulin),

lactose and fats in emulsion, inorganic salts in solution (good source of Calcium and Phosphorus, Poor – Iron) Vitamins, enzymes, gases and other substances.

Composition of milk from different species (amount per 100 g)

Species	Water	Proteins	Fat	Lactose	Ash
Cow	87.7	3.4	4.6	4.9	0.7
Goat	86.5	3.5	4.5	4.7	0.8
Sheep	79.4	6.7	8.6	4.3	1.0
Buffalo	84.2	3.9	6.6	5.2	0.8

Water

The nutritional value of milk as a whole is greater than the value of its individual nutrients because of its unique nutritional balance. The amount of water in milk reflects that balance. In all animals, water is the nutrient required in the greatest amount and milk does supply a great amount of water as it contains approximately 90%.

Carbohydrates

The principal carbohydrate in milk is lactose although it is a sugar and is not noticeably sweet to taste. The concentration of lactose in the milk is relatively constant and averages about 5% (4.8-5.2%). On the contrary to the concentration of fat in milk, lactose concentration is similar in all dairy breeds and cannot be altered easily by feeding practices. The molecules from which lactose is made are found in much lower concentrations in milk: glucose (14 mg / 100g) and galactose (12 mg / 100g).

Proteins

The concentration of protein in milk varies from 3.0 to 4.0% (30-40 grams per litre). The percentage varies with the breed of the cow, various environmental factors like feed and in proportion to the amount of fat in the milk.

Furthermore, milk contains two specific proteins; Casein: accounts for approximately 80% of the protein in milk. Whey: around 20% of milk's protein is in the form of whey.

Fat

Normally, fat (or lipid) makes up from 3.5 to 6.0% of milk, varying between breeds of cattle and with feeding practices. Fat is present in milk in small

globules suspended in water. Each globule is surrounded by a layer of phospholipids, which prevents the globules from clumping together by repelling other fat globules and attracting water. As long as this structure is intact, the milk fat remains as an emulsion. The majority of milk fat is in the form of triglycerides formed by the linking of glycerol and fatty acids. The proportions of fatty acids of different lengths determine the melting point of fat and thus affect the consistency of the butter which we derived from it. Milk fat contains predominantly short-chain fatty acids (chains of less than eight carbon atoms) built from acetic acid units derived from fermentation in the rumen.

Minerals

Milk is an excellent source of most minerals required for the growth of the young. Milk is the best source of calcium for skeletal growth in the young and maintenance of bone integrity in adults. Another mineral of interest in the milk is iron. The low iron concentration in milk cannot meet the needs of the young, but these low levels in turn have a positive aspect because it limits bacterial growth in milk as iron is essential for the growth of many bacteria.

Milk Vitamins

Milk is a very rich source of most of the vitamins except vitamin C. Almost all the vitamins are present in milk. Milk contains both fat soluble and water soluble vitamins. Fat soluble vitamins i) Vitamin A ii) Vitamin D iii) Vitamin E iv) Vitamin K. Water soluble vitamins i) B1 (Thiamine) ii) B2 group- This group consists of Riboflavin, Nicotinic acid, Pyridoxine, Pantothenic acid, Biotin, Vitamin B12 and Folic acid iii) Vitamin C or Ascorbic acid.

Milk has 9 essential nutrients

1. Calcium = strong bones
2. Vitamin D = calcium absorption
3. Riboflavin = energy
4. Phosphorus = strong bones
5. Protein = lean muscle
6. Potassium = fluid balance & blood pressure
7. Vitamin A = good vision & skin health
8. Vitamin B12 = red blood cell formation
9. Niacin = energy

Types of milk-Toned, standardized, and Homogenized.

Toned milk

It is a method, developed in India, of treating buffalo milk by adding skim milk, powdered skim milk and water to buffalo milk. This process decreases the fat content, increases the quantity of available milk, and 'tones up' the non-fat solids level to the original amount. The cost of the milk is reduced, making it more widely available and not a luxury purchase. Toned milk is often used in areas where milk production is extremely low or demand is very high compared to the available capacity. Buffalo milk has a fat content of about 7-8%, and contains calcium and a non-fat solids content of 9-10%. By reducing the fat content to 3% through the toning process, the available milk quantity is nearly tripled.

Standardized Milk

Standardized Milk means cow milk or buffalo milk or sheep milk or goat milk or a combination of any of these milk that has been standardized to fat and solids-not-fat percentage by the adjustment of milk solids. Milk composition is standardized so elements like fat content are made consistent no matter the season or breed of cow the milk comes from. This removes some or all of the cream to make reduced-fat, low-fat or skim milk.

Homogenized milk:

Milk homogenization is a simple process that mixes and disperses the milkfat by using a high-pressure procedure to break it down into smaller particles.

When people buy non-homogenized milk, they either skim the layer of cream off the top, or mix the milk to evenly distribute the cream back into the milk.

Milk is homogenized for four reasons:

Since the fat is dispersed evenly, cream doesn't gather on top. Homogenized milk looks more appealing. Its shelf life increases (upto11days).

Homogenization allows producers to mix milk from different cows into one batch.