



# Managing milk composition – a nutritional approach

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## Introduction

**D**airy farming in India varies in different regions with various traditional practices. The milk supply in places like Mumbai, Delhi, Ludhiana, Hyderabad and other major cities are taken care by buffalo milk. Due to high price of the raw materials and lack of knowledge on scientific farming, the cost of production of milk is increasing day by day in village as well as cities. Increasing milk fat and Solids Not Fat (SNF) level in milk may increase the selling price of the milk and need to focus on this area is important to maximize the profit in dairy farming.

The price of the milk in India is fixed based on its Fat and SNF% by the cooperatives and private milk procuring agencies. Apart from nutrition, several factors like breed, heredity, stage of lactation, environment also influence milk composition.

Pricing based on composition has created lot of interest among farmers to keep their animal to produce high fat and SNF to increase their income. Feeding programs with balanced protein, energy and supplementation of deficient minerals and vitamins increase milk yield and its composition.

## Milk secretion process

Milk fat, lactose and protein are synthesized in the cells from the precursors absorbed from the blood. Other components like water, minerals and vitamins component of milk enter the lumen of the alveolus through diffusion process. Approximately 500 litres of blood has to be circulated through the udder to produce 1lit of milk.

## Factors affecting milk composition

Fifty five percent of the variation in milk components is due to heredity and 45 percent is due to nutrition.

### Heredity

Differences in the milk composition within species and breeds exist. Indian cows produce more fat when compared with the cows like HF and Jersey. The fat percentage of buffalo milk varies from 5.5 to 10. There is a negative correlation between lactation milk yield and the fat and protein percentages. This indicates that selection for milk production results in reduction of milk composition. However genetic selection has little effect on the lactose and mineral composition of milk (Legates, 1960).

### Stage of lactation

The peak yield may be held for 4-8 weeks and starts declining afterwards. This drop is due to pregnancy and the reduction of secretory cells after peak lactation. During this period fat and SNF percentages comes to minimum due to increase in milk yield. These components are increased towards end of lactation.

### Age

The amount of milk produced is increased with age up to 5<sup>th</sup> lactation. This may be due to increase in the size of the digestive system and larger mammary gland. More feed intake increases milk yield. Advancing age or increased no of lactations results in a gradual decrease in the percentage composition of milk fat and SNF. The drop in fat content is about 0.2% from the first to fifth lactations and that for SNF is about 0.4%. Much of the drop in SNF is due to a drop in lactose content with small change in protein content.

### Seasonal effects

The effect of season on milk yield and composition is related with its breeding and availability of green

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fodder. In India milk yield is increased from October to March and decreased from April to June. It is due to the maximum no. of animals calving during this period. Also most of the green fodder available during this period increases feed intake and nutrient intake thus increases milk yield. Availability of milk is more during this period and the procurement price is reduced. Dairy farmers have to plan for breeding their animals to have parturition in the months of March and April so that they could be able to sell milk for higher price during summer.

#### Disease

Mastitis affects the yield and composition of milk. It alters the permeability of the udder tissue and impairs the ability of the secretory tissue to synthesize milk components. Destruction of secretory cells causes reduction in milk yield of infected udder. No change in fat percentage is observed but SNF is reduced due to reduction of lactose content.

#### Nutrition

Maximize feed intake is the first objective in dairy farming. Once an animal takes more feed the production goes up based on the genetic potential. Knowledge on nutrient requirement and balanced nutrition may improve the productivity of the animals. Focus on the palatability of the feed will increase feed intake. Some animals are very much sensitive to the change in the ingredients of the concentrate mix and change in concentrates. This also causes rumen disorders and reduces milk yield. Care should be taken to avoid abrupt change in feed composition.

Major factors, which affect feed intake, are:

❖ Quality of the feed ingredients ❖ Availability of green fodder ❖ Feeding pattern ❖ Environmental temperature ❖ Frequency of feeding ❖ Sudden change in the ration

#### Roughage: Concentrate ratio

The fermentation process in rumen results in the production of volatile fatty acids like Acetic acid (65-70%), Propionic acid (18-20%), Butyric acid (8-10%) and other fatty acids. Acetate is the precursor for the fat production and it results with more of roughage digestion. More propionic acid production results with more concentrate digestion. Roughage: concentrate ratio should be around 60:40 or 70:30 for the normal fat production. With the increase in milk yield the quantity of the concentrate fed also increases and more propionic acid produced resulting in low fat yield. Animals should be encouraged for taking more of roughages for maximum fat production.

#### Carbohydrates in feed

Readily fermentable non-fiber carbohydrates (NFE) like starch and sugar in the concentrate mix affects the fat and protein level in milk. Increase in NFE results in increase in protein yield but fat percentage reduces. This reduction of fat is also due to acidic condition in rumen and reduction of fiber digestion.

#### Protein in feed

Decrease in crude protein level reduces the milk protein level and increased true protein content in the diet not always increases milk protein. Thus it is important to maintain rumen degradable protein (RDP) and Rumen un-degradable protein (UDP) in the diet. Bypass protein in natural protein supplements and rumen protected lysine and methionine increases protein. Addition of urea @ 1 – 2% of the concentrate is good for the cows since it is the cheapest source of nitrogen for the microbes in rumen. However the urea intake should be restricted and should not be fed more than 150g per day to avoid urea toxicity.

#### Fat in feed

Adding fat as vegetable oils and ghee is practised in Haryana & Punjab. When animals are with energy deficient this fat supplementation increases energy intake and resulting into more milk production. Mustard oil @ 50 – 100ml per day per buffalo is given in places like Mumbai to keep the total solids percentage in optimum level. Rumen inert fat (bypass fat) also increases milk fat percentage.

#### Role of supplements in managing milk yield and its composition

Trace minerals are given to animals to make the enzyme system to function in a proper way. Minerals are acting as co-factors for important enzymes, increase the function of different enzyme systems and improve the efficiency of the animal productivity. Supplementation is important to maximize the performance of the animals when minerals and vitamin requirement of the animals are not fulfilled. Supplementation of trace minerals in highly bioavailable form (organic minerals) increases metabolism of the nutrients absorbed from the digestive system. Yeast supplementation increases fiber digestion and increases lactic acid utilizing bacteria in rumen thus resulting in to more milk and milk fat production.

#### References

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