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Significance of Feed Supplementation on Milk Yield and Milk Composition of Dairy Cow

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Abstract

Milk composition and production are the interaction of many elements within the cow and her external environment. Composition of milk influenced by many factors such as genetic and breeds differences, stage of location, milking interval, seasonal variation, disease and nutrition. Nutrition is the major factor on both milk yield and composition. The three factors: Genetic makeup, nutrition and management decide the productivity of dairy cows. Improvement of genetic make up only contributes up to 30% to production, while the 70% is dependent on nutrition and management. Unfortunately, indigenous of tropical dairies are low milk producers because of the shortage of nutrition. Poor nutritive values of feeds lower the production capacity and fertility potential of dairies. If fed well, with supplementary feeds and under good management, more milk could be produced from them. So, supplementary feed with optimum dietary ration providing for dairy cows in good management improves the production level and good proportional composition of product with high nutritive value.

Keywords: Milk fat; Globule membrane; Volatile; Fatty acids; Nutrition; Dairy production

Abbreviations: Igs: Immune Globulins; MFGM: Milk Fat Globule Membrane; NFC: Non-Fiber Carbohydrate; NRC: Nutritional Requirement of Cattle; SNF: Solid Not Fat; TMR: Total Mixed Ratio; VFAs: Volatile Fatty Acids

Introduction

From agricultural activities, dairy production and its management is the one which is the interest of every country because of high nutritional value of milk and milk products and another purpose gained from them. And the feed they consume is not compete with human food and also, they convert feed which is not directly eaten by human being to products that human being can consume. That means, special ability of dairy cattle to transfer feed stuffs into edible food for humans and as much as 70% of their total feed intake is from non-human food. Food requirements of rapidly expanding human population is the other reason which initiates or give importance the development of dairy production.

Milk composition and production are the interaction of many elements within the cow and her external environments Chemical composition of milk is variable and influenced by intrinsic factors like genetic and breed differences, stage of lactation, milking interval, seasonal variation, disease and nutrition. Protein content of milk is positively correlated within a population of dairy cattle; however, different breeds of cattle vary in average component levels. Holsteins have the lowest fat and protein content, while Jersey and Guernsey breeds have the highest. Because Holsteins produce more milk, they generally have a higher total yield of fat and protein than other breeds. There are many factors that can affect milk fat and protein, and many of them can be manipulated to enable you to achieve higher than average levels of milk components. Keep in mind that herds that are below breed average will have more opportunity to improve component levels. Herds that are already above average may have better success by focusing on increasing milk yield, which will increase the total amount of fat and protein production [1].

Stage of lactation affects milk protein and fat percentages very similarly. The highest amount of protein and fat in milk is found just after freshening, in colostrum. Levels drop to their lowest point between 25 and 50 days after calving and peak at 250 days as milk production begins to decrease. Age tends to cause both milk fat and protein to decline as the animal becomes older. Milk fat falls about 0.2% each year from the first to fifth lactation likely as a result of higher production and more udder infections. Protein decreases 0.02 to 0.05% each lactation as animals age.

Season dramatically affects milk fat and protein. The hot, humid months depress fat and protein content. There is a gradual increase of protein and fat in milk through the fall and peak levels occur in the colder months of winter. As temperatures increase through the spring, component levels are gradually decreased. These changes may be indicative of feed intake patterns, which are lower in summer due to changes in weather and temperature. Mastitis infections reduce fat and casein but increase blood protein content of milk. Of all the factors affecting milk composition, nutrition and feeding practices are most likely to cause problems; however, management changes made here are able to quickly and dramatically alter production of fat and protein other than genetics. Digestion of fiber in the rumen produces the volatile fatty acids (VFAs) acetate and butyrate. Butyrate provides energy for the rumen wall, and much of it is converted to betahydroxy butyrate in the rumen wall tissue. About half of the fat in milk is synthesized in the udder from acetate and betahydroxy butyrate. The other half of milk fat is transported from the pool of fatty acids circulating in the blood. These can originate from body fat mobilization, absorption from the diet, or from fats metabolized in the liver. Rumen microbes convert dietary protein into microbial protein, which is a primary source of essential amino acids for the cow. These amino acids are used by the mammary gland to synthesize milk proteins.

Glucose is required to provide energy to support this protein synthesis. Glucose is either formed from the VFA propionate in the liver or absorbed directly from the small intestine. If too little propionate is absorbed from the rumen, the cow will have to breakdown amino acids and convert them to glucose (a process called gluconeogenesis); this can reduce the supply of amino acids available to make milk protein. In addition, some albumin and immunoglobulin protein are transferred directly to milk from the blood. The relative amounts of protein and energy that are available in the rumen at a given time is the major factor affecting rumen fermentation and therefore milk components. Any diet or management factors that affect rumen fermentation can change milk fat and protein levels. Consistently providing adequate energy and protein and balanced amounts of rapidly fermentable carbohydrate and effective fiber are keys to maintaining optimum levels of milk components.

The challenge in feeding for milk components is that high energy, low fiber diets that increase milk protein are likely to reduce fat levels. This may also be the case in some diets with rumen modifiers, such as Rumensin®; however, this product has other ways to affect the rumen that do not necessarily alter milk components. Any situation that causes cows to eat abnormally or limits feed intake may affect milk components. Examples include: overcrowding at feed bunks, housing heifers with older cows in facilities at or near full capacity, feeding rations that encourage sorting, feeding infrequently in a conventional system (non- TMR), failing to push feed up or feed TMR often enough, feeding protein feeds before energy feeds and feeding grain before forage in non-TMR systems. These conditions can create slug feeding (one or two meals per day versus 10 to 15) or allow cows to eat high grain meals part of the time and high forage meals the remainder of the day. Ensure that fresh feed is available 20 hours each day, spoiled feed is removed from bunks, and shade or cooling is provided during hot weather to help maintain normal intake and normal meal patterns. Poor ventilation or cow comfort also can depress milk fat and protein production by reducing intake. Finally, make ration changes gradually to allow rumen microorganisms time to adapt.

Any reduction in rumen microbial protein production from nutrition or feeding management imbalances will reduce milk protein by way of less microbial protein for the cow to digest and depress fat by limiting VFA production in the rumen. Proper body condition is essential so that high producing cows can draw on body stores of nutrients to support milk production. If body stores are minimal, yields of milk and milk components will suffer. On the other hand, excessive body condition increases the risk of metabolic problems and calving difficulty. Weight loss in early lactation can increase milk fat content for a short period of time. Both thin and fat cows tend to have low milk fat in later lactation. Protein can be depressed at calving if animals are overly obese or underweight. In addition, some research shows that underfeeding protein during the last three weeks before calving can depress milk protein [1]. In general, as energy intake or ration energy density increase and/or fiber decreases, milk fat content will be reduced, while protein is increased. In contrast, as ration fiber levels increase and/or energy is reduced, milk protein is depressed, and milk fat is increased. Lack of energy intake or lower ration digestibility may reduce milk protein by 0.1 to 0.4%. This reduction may result from underfeeding concentrates, low forage intake, poor quality forage, and failure to balance the ration for protein and minerals, or inadequately ground or prepared grains. Shifting rumen fermentation so that more propionic acid is produced is apt to increase milk protein and decrease fat content. However, excessive energy intake, such as overfeeding concentrate, may reduce milk fat content and increase milk protein. Normal protein levels can be expected when energy needs are being met for most of the cows. Often this is impossible to achieve with high producing animals.

A deficiency of crude protein in the ration may depress protein in milk; marginal deficiency could result in a reduction of 0.0 to 0.2%, while more severe restriction of diet crude protein would have greater impact. However, feeding excessive dietary protein does not increase milk protein, as most of the excess is excreted. Dietary protein has little effect on milk fat levels within normal ranges. Diet protein type also could affect milk protein levels. Use of non-protein nitrogen (NPN) compounds, like urea, as protein substitutes will reduce protein in milk by 0.1 to 0.3% if the NPN is a main provider of crude protein equivalent. Rations higher than recommended in soluble protein may lower milk protein by 0.1 to 0.2 points. NPN levels in milk will be increased by excessive protein or NPN intake, heavy feeding of ensiled forages, ensiled grains, immature pasture and lack of rumen undegradable protein in the diet. Balance rations for crude protein, rumen undegradable protein, rumen degradable protein, and soluble protein. For high producing cows, balancing for amino acids also may be required.

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An increase in the intake of concentrates causes a decrease in fiber digestion and acetic acid production. This creates an increase of propionic acid production. Propionic acid production encourages a fattening metabolism that is in opposition to milk fat. Addition of buffers to some rations may help to prevent acidosis; this will not change milk protein but will increase milk fat content [2]. Animals that eat a substantial amount of concentrates or a low ratio of dietary forage to concentrate may develop acidosis even when buffers are added to the ration. The non-fiber carbohydrate (NFC) portion of the diet is highly digestible and can influence both fat and protein in milk. Excessive amounts of NFC can depress fiber digestibility, which reduces the production of acetate and leads to low milk fat (1% or more reduction). At the same time, greater propionate production allows higher milk protein levels of 0.2 to 0.3%. Generally, an NFC of 32 to 38% of ration dry matter is recommended to optimize production of milk fat and protein.

Balance rations for lactating cows to contain at least 40 to 45% of ration dry matter from forage. This may be altered by the level of corn silage in the ration and the level of high-fiber by-product feeds in the ration. Low forage intake can cause a major reduction in the fat content of milk due to low fiber levels. Several potential reasons for low forage intake are inadequate forage feeding, poor quality forage, and low neutral detergent fiber (NDF) content in forage that was cut too young or late in the fall. Although low forage (high energy) diets increase milk protein production, this strategy is not recommended. The low forage levels contribute to acidosis and laminitis; they do not promote good health for the rumen or the cow in the long run. Protein and fat content also can be changed due to the physical form of forage being fed. Much of this is related to ration sorting and failure to provide a consistent diet throughout the day. Coarsely chopped silage and dry hay are the most common causes of sorting. At the other extreme, very finely ground diets negatively affect rumen metabolism and depress fat and protein production. Monitor ration particle size to ensure that adequate effective fiber is provided, TMRs are mixed properly, rations are distributed evenly to all cows, and sorting is minimal [3].

Adding fat to the ration can affect milk component levels depending on the amount and source of fat. Fat is generally toxic to rumen microbes and may reduce fiber digestibility when fat from natural sources exceeds 5% of ration dry matter. If rumen inert or bypass fat is used, total fat content may safely reach 6 to 7%. At low levels of dietary fat, milk fat content could increase slightly or show no change at all. Milk fat is reduced at higher levels, especially with polyunsaturated oils. If fat or oil is rancid, milk fat content decreases even at low levels of consumption. Milk protein content may be decreased by 0.1 to 0.3% in high-fat diets. Generally, the objective is reviewing the significance of feed supplementation on milk yield and milk composition of dairy cow

Rate of Milk Secretion

The period following milk removal is characterized by low intra-alveolar pressure, which facilitate the transport of newly synthesized milk into the alveolar lumen. As secretion continues between milking's, pressure is exerted on the secretory process by the alveolar luminal contents. When the luminal pressure exceeds the force of secretion as the alveolar enlargement reaches its limit. It is presumed that the distention pressure of the lumen exceeds the strength of the secretory mechanism needed to push the newly forced milk precursors by chemical feedback mechanism and or physical factors (e.g.,intra-mammary pressure [4].

The physical factors are a result of the distended alveoli partially displacing all other intra-mammary compartments, including the blood vessels. With restricted blood flow, less nutrients are available for milk production, less hormones are available to drive the mammary synthetic systems, removal of waste products of synthesis is reduced and less ox toxin is available to stimulate the myoepithelial cells. In dairy cows, average secretion rate begins to decline after ten hrs since the last milking and secretion stops after thirty five hrs .The pressure measured in the teat cistern increases in three phases. An initial rapid increase in the pressure caused by the movement of residual milk into the cistern from the alveoli and small ducts. The second, lower phase can be an accumulation of newly synthesized milk that is released into the duct system from the alveolar lumens as they begin to accumulate milk. The third phase is marked by the accelerated pressure increase and probably represent over filling of alveoli, ducts and gland cisterns [4].

Factors affecting Milk Yield and Milk Composition

Milk composition and production are the interaction of many elements within the cow and her external environments [5]. High milk yield of satisfactory composition is the most important factor ensuring high economic returns. If the composition of milk varies widely, its implication is that nutritive value and its availability as a raw material will also vary. Chemical composition of milk is variable and influenced by intrinsic factors like genetic and breed differences, stage of lactation, milking interval, seasonal variation, disease and nutrition [1].

Genetic and breed differences: Heritability is defined as the ratio of genetic variance to total phenotypic ratio. The concentrations % of the three major milk constituents are genetically controlled to a considerable extent. Heritability's of fat, protein, and lactose contents average: 0.58, 0.49 and 0.5 respectively, while that of milk yield average is 0.27 [1]. The above Table1 indicate that there is a room to increase milk protein % by genetic selection without increasing fat % and that selection for high milk yield alone may reduce milk fat and protein %. Milk from Holstein cows has a lower milk fat % than milk from Jersey and Guernsey. droplets also differ among breeds. Holstein has smallest fat droplet while Guernsey and Jersey Brown swiss has the largest. Milk of Jersey cows also has a higher total solid than milk from other dairy cattle breeds. Differences in milk composition among individual with a breed are often larger than differences among breeds. Milk color also affected by breed type. For example, milk from Guernsey and Jersey is yellowish in color because if these

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breeds convert much less carotene (yellow pigment) to vitamin A than other breeds of dairy cow (Table 2).

Table 1: strongly correlated of milk components [1].

Strongly Correlated of Milk Components	
Fat and protein %	ratio= 0 .45 to 0.55
Fat and SNF%	ratio= 0.4
SNF and protein%	ratio= 0.81
Milk yield and fat%	ratio= -0.15 to -0.3
Milk yield and SNF%	ratio= -0.1
Milk yield and protein%	ratio= -0.1 to -0.3

Dairy production textbook 5:28-29.

Table 2: Milk composition of five breeds of dairy cow in % [24].

Breeds	Total solids	Fat	protein	lactose	ash
Ayrshire	12.69	3.97	3.26	4.63	0.72
Brown swiss	12.69	3.80	3.18	4.80	0.72
Guernsey	13.69	4.58	3.49	3.78	0.75
Holstein	11.91	3.56	3.02	4.61	1.3
Jersey	14.15	4.97	3.03	4.70	0.77

Stage of lactation: Colostrum, the first mammary secretion after parturition differs greatly from normal milk. Cows colostrum contains more minerals, protein and less lactose than milk. Fat is usually higher in colostrum than in milk.Ca,Mg,P,and Cl are high in colostrum's, whereas K is low. Fe is 10-17 times higher in colostrums than in milk. The high levels Fe are needed for the rapid increase in hemoglobin in the red blood cells of newborn calf. Colostrum contains ten times as much vitamin A and three times as much vitamin D as milk [6]. The most remarkable differences between colostrum and milk is the extremely high levels of Ig content of colostrum. Mammary secretion gradually changes from colostrum to normal milk within 3-5 postpartum [7]. From normal milk changes in composition occur during the first few days continue but at reduced rate for about five weeks of lactation. Fat and protein then rise gradually and may increase mare sharply near the end of lactation. Lactose decreases while mineral concentration increases slightly during that period.

Milking Interval: When milking is done at longer intervals the yield is also more with a corresponding smaller percentage of fat, whereas milk drawn at short intervals yield smaller quantities with higher amount of fat. The effect milking interval is mainly on fat percentage rather than the SNF [8]. The fat content of milk is usually lower in the morning than in the evening milking, because there is usually a much shortage interval between the morning and evening milking than between evening and morning. SNF content varies little even if the intervals between milking vary. Cows are usually milked at equal intervals (12-hrs interval for two times milking). Cows milked at unequal intervals produce less milk than those milked at equal intervals. The reduction in milk yield is more i8n high producing cows than in low producing ones. In complete milking for several consecutive days can permanently reduce milk yield for the entire lactation. Milking time for most cows is 5-6 minutes per cow [7].

Season of calving and seasonal variation: The effect of season of calving on milk yield is confounded by breed, the stage of lactation and climatic condition. Cows calving in the late fall to soring produce more milk (up to 8% more) than cows calving in the summery. This is likely due to an interaction between day light and ambient temperature in case of tropical areas. Seasonal differences have become less significant because of better feeding and management of dairy cow can overcome this effect. The seasonal variations in milk composition are commonly observed with dairy cattle in temperate regions. Milk fat and SNF percentages are highest in Winter and lowest in Summer. Milk fat and protein percentages are lower by 0.2-0.4 in summer than in winter. The effect of ambient temperature on milk yield is dependent up on the breed, for example, Holstein and the other larger breeds are more tolerant to lower temperature whereas the smaller breeds particularly the Jersey and Zebu are more tolerant to high temperature. Milk production declines when environment temperature exceeds 27 degree Celsius. The reduction in milk yield is largely due to drop in feed intake. High temperature affect high producing cows more than low producers and it is particularly harmful during the peak of lactation.

Disease: The main disease affect milk yield and milk composition of dairy cows is mastitis. It impairs the ability of secretory tissue synthesize milk composition and destroys the secretory tissues and consequently lowering milk yield. A decrease in milk production persists after the disappearance of the clinical signs of mastitis due to a destruction in the secretory tissues [9]. Infection of udder (mastitis) greatly influences milk composition. Concentration of fat, SNF, lactose, casein, beta-lacto globulin and alfa-lactalbumin are lowered and concentrations of blood of blood serum albumin, Igs, sodium, chloride are increased [10]. In severe mastitis, the casein content may be below the normal limit of 78 % of total protein and chloride content may be rise above the normal maximum level of 0.12 %. Mastitis is also responsible for differences observed in milk composition from different quarters of the udder.

Nutrition: Nutrition has also a major effect on both milk yield milk composition. According to O'Connor [10], under feeding reduces the amount milk production, the fat, protein and SNF, contents of milk. As a general rule it is believed in that any ration of diet that increases milk production, usually reduces the fat percentage of milk and fat content is influenced more by roughages (fiber) intake and SNF content can fall if the cow fed a low energy diet, but it is not greatly influenced by protein deficiency, unless the deficiency is acute. Of all milk components, milk fat is the most influenced by dietary manipulations. Most of changes in milk composition due to dietary manipulation are related to changes in ruminal acetate: propionate ratio. Several nutrition factors can influence milk composition. These includes plan of nutrition,

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forage concentrate ratio, forage quality (e.g., particle size), level and type of dietary fat. In plan of nutrition, under feeding dairy cows reduces lactose percentage and increases fat percentage. Feeding imbalance rations (e.g., low energy: protein ratio) may reduce milk fat and protein percentages. In case of forage concentrate, as the proportion of the concentrate in the ratio increases (above 50-60 % of ration), milk fat % tends decline. This is mainly because of the lower ruminal production of acetate and butyrate (precursors of milk fatty acid synthesis in the mammary gland) associated with feeding high concentrate diets. The extent of milk fat depression is influenced by other feeding practices such as frequency of feeding and feeding system. Feeding cows less frequently especially if the concentrates are fed separately from the forage results in a reduced ruminal acetate: propionate ratio which in turn can result in reduced milk fat % will be less where total mix rations are fed and or if feed is offered three or more times daily.

Forage particle size (forage processing), feeding finely chopped forages has a negative impact on milk fat % and may cause milk fat depression syndrome (drop of milk fat % below 3 %). Cows fed finely chopped forages spend less time to chewing and therefore, will produce less saliva. Ruminal PH will drop as less saliva is produced to buffer the acid production in the rumen. As the ruminal PH drops below 6, the activity of cellulolytic bacteria is reduced and so it is the production of acetic acid and butyric acid (precursors of short chain fatty acid synthesis in mammary gland). In case of level of starch in the ration, as the level of starch in the ration increases, the level of acetate produced in the rumen is decreased while that of propionate is increased. This may cause a reduction in milk fat %. Dietary Fat Corporation or oil in dairy cow ration can substantially alter the profile of milk fatty acids. The effect of supplemented fat in milk fat % depends on the type of supplement of fat. Feeding poly unsaturated fat (susceptible bio hydrogenation in the rumen) such as vegetable oils may reduce milk fat % whereas feeding protected fat tend to increase milk fat %. Changes in dietary protein levels have minimum effects on milk fat content. When the protein content of the diet is limiting, increased dietary protein may increase milk fat content through increases in roughage intake (Table 3).

Table 3: Composition of colostrum's, transitional milk and milk [7].

Time after calving	Casein %	Globulin %	Fat %	Lactose %	Ash %	Total solids%
At once	5	11.07	6.55	2.90	1.22	26.74
6 hrs	3.5	6.6	7.82	3.29	0.97	22.18
12 hrs	3.12	2.86	4.1	3.85	0.88	14.84
18 hrs	3	2.14	4	3.75	0.85	13.74
24 hrs	2.61	1.91	3.64	3.82	0.85	12.83
36 hrs	2.86	1.32	3.58	3.68	0.84	12.1
72 hrs	2.77	1.1	3.52	3.41	0.84	12.64
3 days	2.74	1	3.55	4.79	0.83	12.91
10 days	2.62	0.68	3.57	4.92	0.82	12.61

Milk production and processing textbook fourth edition.

Nutritional Requirement of Dairy Cow

Feed serves many different purposes, including the following

Maintenance: The normal activities of staying alive breathing, blood circulation, digestive process, etc. all requires nutrient. This maintenance is not for extra function like production unless extra feed is provided for cell function [11].

Reproduction: Pregnancy and delivery make demands on the dam which have to be met from her feed, if it is not to lose weight. The fetus increases in size quickly during the last two to three months of gestation, drawing on the body reserves of the dam.

Lactation: Producing milk either for one or two offspring or for human consumption requires high levels of energy and protein and good access to protein and good access to water.

Factors Influencing Nutritional Requirement of Dairy Cow

Nutritional requirement of dairy cow influenced by many factors like stage of production, condition of the environment, size of the cow and the like.

Stage of production: One of the most challenging aspects of dairy cow nutrition is that their requirements change during the course of a year based on stage of pregnancy and lactation NRC [12].

Weather: Cold weather greatly increases the nutritional requirement. Therefore, during cold weather, the cow's diet may need to be supplemented to allow for the additional requirement dairy perform optimally in their "their monaural zone" where temperatures are either too hot or too cold. When the ambient temperature, which includes wind, humidity, solar radiation and air temperature, is outside of that zone, dairy performance is depressed [13]. The most common situation dairy man face is an ambient temperature below the lower critical temperature or the lower range of the thermo neutral zone. Tit should be pointed out that in cases simply feeding more of a low-quality feed stuff will not meet these additional requirements, in which case the energy density of the diet must be increased by either feeding a high-quality forage or by adding a high energy supplement.

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Size: As cows size increases, the nutritional requirement for energy and protein increases. This should be expected because the larger cow is the more energy and protein it takes to maintain normal body functions.

Priorities and strategies for feed Resources Development

The feed value of forage that form the basis for ruminant feeding is a functional of its nutrient content and digestibility, its palatability (which determines its consumption level) and the associative effects of the other feeds [14]. Interplay of these factors determines the effective utilization or feed value of the material. Strategies for ensuring adequate nutrition of animal includes the following like: matching dairy production system to available resources, selection of crops and cropping systems that will maximize biomass production, and developing the simple techniques to optimize the use of different components of crops for different end purpose, making more efficient and wide spread use of agricultural and industrial by products as source of dairy feed, and also conserving feeds when it is available for drought season. From these strategies, increasing feed availability with production system of dairy number is through increasing off take of animals through sale (destocking). The amount of feed available to the remaining animals will increase in the process [14] (Table 4).

Table 4: Summarization of minerals in dairy cows.

Mineral	Function	Deficiency symptoms and associated problems	Feed sources for dairy cattle
Ca	Bone and teeth formation, blood clotting, muscle contraction, 12% in whole milk.	Rickets, slow growth and poor bone dev`t, easily fractured bones, reduced milk yield.	Alfalfa and other legumes, ground limest one, dicalcium phosphates, steamed bone meal.
P	Bone and teeth formation, involved in energy metabolism, part of DNA and RNA, 0,09% in milk.	Fragile bones, poor growth, low blood phosphorus, depraved appetite, poor reproduction performance.	Phosphates, steamed bone meal, cereal grains, grain by products, oil seed meals.
Na	Acid- base balance, muscle contrition, nerve transmission	Craving for salt, reduced appetite, in coordination weakness, shivering.	Common salt and butter products.
Mg	Enzyme activator, found in skeletal tissue and bone,	Irritability, tetany increased excitability.	Magnesium oxide forages and mineral supplements.
S	Rumen microbial protein synthesis, found in cartilage, fendons and acids.	Slaw growth, reduced milk production, reduced feed efficiency.	Elemental sulfur, sodium and potassium sulfates, legume forages.
K	Maintenance of electrolyte balance, enzyme activator muscle /nerve/ function	Decrease in feed intake, loss of hair glossiness, lower blood potassium.	Legume forages, potassium chloride, potassium sulfate.
I	Synthesise of thyroxine.	Big nech in calves, goiterogenic (enlargement of thyroid gland), substances may be caused efficiency.	Ionized salt, trace mineralized salt, and commercial supplements.
Fe	Part of hemoglobin, part of many enzymes.	Nutritional anemia, pale mucus membrane.	Forages, grains, trace mineralized salt, ethylene diamine dehydroiodine.
Cu	Needed for manufacture of hemoglobin, co enzyme.	Severe diarrhea, abnormal appetite, poor growth, coarse, bleached hair coat.	Trace mineralized salt and commercial supplements.
Co	Part of Vit B12, needed for growth of rumen microorganisms.	Failure of appetite, anemia, decreased milk production, rough hair coat.	Trace mineralized salts and commercial supplements.
Zn	Enzyme activator, wound healing.	Decreased weight gains, lowered feed efficiency, skin /wound problems/.	Forages, trace mineralized salts, and zinc methionine.
F	Not known if it is essential for cows although essential for lab animals.	Severe reduction in feed intake, stiffness in legs, enlarged bones.	Rock phosphate mineral
Se	Function with certain enzymes, associated with Vit, E, immune system.	White muscle disease, retained placenta, lessens sub clinical mastitis.	Oil meals, alfalfa, wheat, oats com, commercial supplements.
Mo	Part of enzyme xanthenes oxidize	Loss of weight, emaciation, diarrhea	Widely distributed in feeds, deficiency rarely a problem

Types of Supplementary Feeds

Supplementary feed is any stuff added to the total diet of the animal to increase the nutritive value of the feed and to increase content of single nutrient or compound nutrient. These supplementary feeds includes protein supplement (legumes, oil seed cause, meat meal, fish meal), mineral supplements (salt (Na), limestone (ca), bone meal (ca and p), and others), vitamin supplement (natural and synthetic) and energy supplement (fat and carbohydrate like concentrate feed those the high amount of energy and low fiber content and high digestibility with high protein content [15].

Protein supplement: Conditions under which milk production can be increased by feeding protein supplements are well defined, although it is not possible to estimate liters of milk

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per kg of supplement with great accuracy. Results from feeding trials in Australia indicate that milk responses from protein supplements can be up to 1.5 liter per kg supplement than from equal weights of cereal grains. Usually the responses are much lower when energy is first limiting. In most cases milk production from tropical pastures is limited primarily by energy. When energy is limiting, protein supplements gives similar milk responses equal amount of cereal grains and surplus nitrogen is converted to ammonia and excreted as urea [16] However, as energy supply from cereal grains is increased, the protein content of the diet becomes limiting for milk production. Protein supplement then allow increases in milk yield with only small changes in milk composition. The conditions where protein supplements give greater milk responses than cereal grains are determined by stage of lactation, Genetic potential, forage quality degradability of the protein supplement, substitution rate.

Energy supplement: In order to improve milk production levels, energy input such as concentrate feeds have to be considered essential for any enterprise, even for those based on dual purpose systems, since reduced intake of energy by dairy cows consuming low quality forages is the principal cause of low milk production .Traditionally, energy supplements are based on cereal grains that include barley, sorghum, wheat, cats, maize, and etc, Molasses is a very popular energy source for cattle grazing tropical pastures. Agro- industrial by products are fed as supplement to roughage-based diets, particularly in dairy production system for milking. Concentrates rich in energy mixture or adulteration with other depends on the quality of the basal roughage and the level of production. Agro industrial by products can be utilized by mixing of two or more of the ingredients to make concentrate at home or using a single in gradient. They have special value in feeding cattle mainly in urban and pre urban dairy production systems as well as in situation where the productive potential of the animals is relatively high ad require high nutrient supply. These by products are rich in energy and protein contents or both, they have low fiber content, high digestibility and energy values compared to with the other class of feeds .To prevent the effect of heavy concentrate feeding on low forage, concentrate ratios can be mitigated by splitting up the concentrate allowance in to several smaller meals spread more evenly over the twenty four hours. By this means, digestive up sets are avoided, protein is more efficiently waltzed, and lactation partition is more normal. Rig milk fat is improved [17].

Mineral supplement: In providing proper nutrition to dairy cows, the dairy man needs to consider minerals in addition to protein, energy, water, and vitamins. Even through minerals are needed only in small amounts, they are very important for optimum reproduction, immune function, and optimal milk production. Minerals are divided in to two groups by the amount needed of each. Macro minerals are required in larger amounts, while micro minerals are required in smaller amounts. The micro minerals required includes calcium, phosphorus, magnesium, potassium, sodium, chloride and sulfur. The micro minerals required includes Iron, cobalt, copper, manganese, zinc, Iodine, and selenium cows get some of the micro minerals and micro minerals from the feeds they eat. However, minerals must be added to the ration in order to meet the requirements, because, the forages and grain do not provide adequate amounts. If these minerals are not, supplemented, problems may occur. For instance, selenium deficiency can cause retained placentas [18].

Several items must be taken into consideration when buying mineral supplement. First, the supplement must contain all the macro minerals and micro minerals that are deficient in the ration. Also, the supplement must contain the appropriate amounts of each mineral to be effective. The in gradients with supply the semimetals should also be considered because some a lower bio availability than others. Bio availability is the ability of the cow to digest and utilize the minerals provided. If the bio availability of the cow is low, then the amount of the mineral fed must be increased, so the cow will get an adequate amount. For example, copper oxide has very low bio availability. Copper sulfate is a better source of copper [19]. The best way to feed the mineral supplement is by force feeding rather than free choice. When minerals are supplemented free choice, the cow does not eat to meet her mineral requirement needs. Force feeding refers to mixing the mineral supplement with the grain mix or the total mixed ration. This ensures that the cow gets enough of each mineral to meet her requirements. It is equally important not to just dump a lot of mineral supplement with the grain mix or total mixed ration because too much of certain minerals will cause toxicity problems or inhibit the functioning ability of other minerals. Thus, the forages fed to the cows should first be analyzed for their mineral content, if it is not already known. Next, the ration should be balanced so that all of the mineral requirements are met. Then the deficiency can be identified and corrected by feeding the correct mineral supplement

Specific Disadvantage of Heavy Concentrate Feeding in Early Lactation

Even though cows should be fed heavily with concentrates in the first few weeks of lactation, to encourage high peak yield, there are some specific problems, some of which are dealt with more heavy concentrate feeding in early lactation. These includes ailments such as ketosis, abomasal displacement, laminitis, and mal partition syndrome involving low fat milk and reduced lactation efficiency [20].

Processing Concentrate Feeds

It is generally accepted that some processing of cereal grains is required before cattle can effectively utilize the energy and nutrient content of concentrate feeds. While increasing the degree of processing improves utilization, it may also lead to digestive problems when high levels of grain are fed and may accentuate fat depression in milk. The type and extent of processing required depends on number of factors including the grain type, the proportion of grain in the diet, palatability, and the risk of developing digestive problems. If a whole untreated grain is

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fed, large proportion of it can pass undigested in the faces. The minimum level of processing required to ensure efficient grain digestion is cracking the seed coat t expose the endosperm. This must be achieved by mechanical or chemical treatments as dairy cattle have only delimited ability to chew small cereal grains. The main nutritional significance of the seed coat is the extent to which it dilutes the amount of starch in the diet [21].

The second level of processing involves grinding and rolling, to reduce particle size which in turn determines the surface area, which is exposed to microbial and digestive enzymes. This ultimately influences the number of starch granules freed from the protein and no starch carbohydrate matrix of the endosperm [22]. When starch granules are tightly held with in endosperm matrix, it may be necessary to use gelatinization and or hydration (i.e. high temperature with or without water) to disrupt the granules. Conversely, grinding or milling can produce extremely fine particles which can be rapidly fermented digested and can reduce the palatability of the grain if excessively dusty.

The third method of processing is steam flaking. With this treatment, the whole grain is heated with steam for 10-40 minutes and subsequently rolled to varying degree [22]. This breaks the seed coat and endosperm, although the whole grain remains as one. This process gelatins much of the starch making it more susceptible to enzymatic attack. Grains such as barley, whet and oats, which have a naturally high fermentation and intestinal digestion when ground or dry rolled, are not affected as much by steam flaking rolled grain. At present time, practical problems such as risks in handing NaoH as well as corrosion concerns restrict use of this processing method. For this reason, alternatives such as ammonia treatment might be more practical.

The fourth method is polluting which is common commercial process where small particles are combined into large particle by means of a mechanical process in combination with moisture, heat and pressure. It is believed in that concentrate polluting decrease waste, reduces dust, minimizes spoilage [23], improves feed efficiency and provides a means for uniform distribution of protein and minerals. There are several potential advantages of feeding pellets over meal or a loose ix like Balanced proportion of protein, minerals, vitamins, and buffers can be in corporate in to the pellets, the higher the level of concentrate feeding, the greater the live hood that nutrient balancing will be necessary [24], risk of excessive un palatable and toxic substances associated with supplements for example urea are avoided by careful blending of ingredients, pellets usually are loss dusty than mechanically processed grains. Therefore, it appears that relatively small change in the processing of concentrate can have a substantial influence on the degradation characteristics of the concentrate and can alter the yield of milk components significantly. Polluted for mutations, when compared to textured concentrates, tend to improve degradability, lower rumen PH, increase milk and protein yield and can depress milk fat yield and percentage, without affecting intake [25-27].

Summary and Conclusion

Milk composition and production are the interaction of many elements within the crow and her external environments. Composition of milk influenced by many factors like genetic and breed differences, stage location, milking interval, seasonal variation, disease and nutrition from these factors, nutrition is the major factor on both milk yield and milk composition. Under feeding reduces the amount milk production, fat, protein and SNF contents of milk. Of all milk components, milk fat is the most influenced by dietary manipulations. Several nutritional factors can influence milk composition. These includes: - plan of nutrition, forage concentrate ratio, forage quality (like particle size, level and type of dietary fat). Major components of milk are water lactose, lipids, proteins, salts, minerals and vitamins. These components arising from several factors including breed, individuality of the animal, stage of location, health of the animal, (especially mastitis) and nutritional status.

Dairy cows use nutrition for purpose of maintenance, reproduction, location (production) and etc. while factors influencing nutritional requirement of dairy cow are stage of lactation, condition of the environment size of the cow and the like. Strategies for ensuring adequate nutrition of dairy cows are matching dairy production system to available resources, selection of crops and cropping system that will maximize biomass production, and developing the simple techniques to optimize are use of different components of crops residues, making more efficient and wide spread use of agricultural and industrial by products as source of elating feed, conserving feeds when it is available for drought seasons when saucily of feed is happen and using grazing system for pastures for avoiding wastage of resources. Supplementary feed is any feed stuff added to the total died of the animal to increase the nutritive value of the feed and to increase content of a single nutrient or compound nutrient. These types of supplementary feeds are protein, energy supplement (carbohydrate and fat), mineral, and vitamin. It is believed in that some processing of supplementary feeds is required before cattle can effectively utilize it. But, type and the extent of processing depends on number of factors like supplementary feed type, the proportion of supplementary diet, palatability and etc. the methods and system of processing includes creaking, grinding, steam flaking, polluting and etc.

Recommendation

In tropical areas except commercial dairy farm, state farm, and farms follow modern method of keeping dairy cattle, others like farmers dairy cow fail under shortage of nutrition, poor management, and the production and product obtained from these dairy cows are less. This under feeding susceptible the dairies for disease and lose of the animal also there. To reduce some extent degree of these problems, the following activities should be done.

a. Supplementary feeds should be supplied.

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b. Management should be considered as major activity of keeping.

c. Having more dairy cows without enough feed available should be reduced to be profitable from optimum number of head of dairies under good management.

d. Feeds should be conserved when it is available for the period shortage of feed is occurring.

e. Ways of providing supplementary feeds should be proper to avoid extra problem happen with in the cow of improper ration.

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