



REVIEW ARTICLE

MINERAL AND VITAMIN REQUIREMENT IN CROSSBRED HIGH YIELDING DAIRY COWS: A REVIEW

*Dr. (Mrs.) Kranti Sharma

C.G.K.V. Anjora Durg (Chhattisgarh), India

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ABSTRACT

There are over 70 known mineral interrelationships in which an additional dietary quantity of one mineral element will influence absorption or utilization of another mineral element. As the animal ages, the readiness of availability of stored mineral elements in the bone decreases. Animal do adapt to reduced dietary intake of minerals. Availability of nutrients and the effect of area specific mineral mixture supplementation along with vitamins should be provided. Macro minerals (sodium (Na), potassium (K), Calcium (Ca), and magnesium (Mg) are important nutrient in dairy rations that must fed at an appropriate level to optimize animal production and health. Overfeeding leads to excessive concentrations in soils which impact crop production. Dairy cattle require at least 17 minerals and 30 vitamins in their diet for optimal milk production, reproductive performance and herd health. Although classical mineral and vitamin deficiency symptoms are rare, in many cases under and over feeding of certain mineral and vitamin does occur. Even small imbalances or deficiency can develop in to reproductive, health and milk production problems. They play a very important role in the intermediary metabolism of fat, protein and carbohydrate so it is always critical to balance and fine-tune the dairy herd mineral and vitamin-feeding programme. During stressful condition when feed intake is low, B vitamin supplement may be beneficial niacin is a B vitamin which helps to regulate body fat mobilization specially in over condition, early lactation cows. In these cows when ketosis is problem niacin added at 6-12 gm/head daily may be of some benefit. The mineral contains of a feed or supplement is of little value for ration formulation unless the availability and digestibility of mineral is known. Biological availability tells how well a mineral is digested and use by the animal to promote healthy production. As the availability of mineral decreases the amount of that mineral needed to meet the cows requirement obviously will increase.

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INTRODUCTION

Dairy cattle require at least 17 minerals and 30 vitamins in their diet for optimal milk production, reproductive performance and herd health. Although classical mineral and vitamin deficiency symptoms are rare, in many cases under and over feeding of certain mineral and vitamin does occur. Even small imbalances or deficiency can develop in to reproductive, health and milk production problems. They play a very important role in the intermediary metabolism of fat, protein and carbohydrate so it is always critical to balance and fine-tune the dairy herd mineral and vitamin-feeding programme.

Mineral Feeding: Generally, the two sources of minerals include natural feed (forage and grains) and mineral supplement to balance the minerals present in the forages and grains.

For the dairy cows, the major mineral (macro mineral) required is calcium, phosphorus, magnesium, potassium, sodium, chlorine and sulfur. Minerals requires in much smaller trace amount. (Micro minerals) include iodine, iron, cobalt, copper, manganese, zinc and selenium. Whether the requirement for a mineral is large (measured as a percent of dry matter) or small (measured in ppm), the proper level must be fed to achieve optimum performance and herd health.

Biological Availability of Mineral Sources: The mineral contains of a feed or supplement is of little value for ration formulation unless the availability and digestibility of mineral is known. Biological availability tells how well a mineral is digested and use by the animal to promote healthy production. As the availability of mineral decreases the amount of that mineral needed to meet the cows requirement obviously will increase. Dicalciumphosphate and bone meal has the highest calcium availability. Limestone is intermediate and forages tend to have lower availabilities but are not necessarily poor sources of calcium. Most common sources of phosphorus are quite available except for the rock phosphate, which are low.

*Corresponding author: Dr. (Mrs.) Kranti Sharma,
C.G.K.V. Anjora Durg (Chhattisgarh), India.*

Calcium requirement are based on an average calcium availability of 38%. Average calcium availability is 51% for most mineral supplements, 43% for grains and 35% for forages.

Mineral Requirement For Lactating Dairy Cattle

Ration level				
Mineral	Unit	Recommended	Maximum	Estimated Amount/Day
Calcium	%	0.43-0.77	2	116 Gms
Phosphorus	%	0.28-0.49	1	75 Gms
Magnesium	%	0.20-0.25	0.5	41 Gms
Potassium	%	0.90-1.00	3	184 Gms
Sodium	%	0.18	--	37 Gms
Chlorine	%	0.25	--	51 Gms
Sulfur	%	0.20-0.25	0.4	41 Gms
Cobalt	Ppm	0.10	10	2 mg
Copper	Ppm	10.00	100	204 mg
Iodine	Ppm	0.6	50	12 mg
Iron	Ppm	50.00	1000	1020 mg
Manganese	Ppm	40.00	1000	816 mg
Selenium	Ppm	0.3	2	6 mg
Zinc	ppm	40-60	500	816 mg

Mineral Requirement

Macro Minerals

Calcium and Phosphorus: The calcium and phosphorus requirement for the mature dairy cows depend on body weight, milk yield and composition, and stage of pregnancy. Calcium and phosphorus requirement need to be balanced for the complete lactation cycle. Minerals mobilize during early lactation must be replenished prior to next calving to maintain cow health and performance. It is especially important to monitor the calcium and phosphorus level during the let dry period (last four weeks) to reduce the incidence of milk fever. Calcium requirement during the dry period is 0.39% of ration dry matter; vial the requirement for phosphorus is 0.24%. Feeding calcium level above 0.39% may substantially increase the incidence of milk fever in your herd. For high producing dairy cows, dietary calcium level of 0.80 phosphorus levels of 0.50% of dietary dry matter are needed. Maintained the calcium to phosphorus ratio between 1.4:1 and 2.5: 1 for optimal health and performance during the both the dry period and lactation.

Magnesium: the requirement ranges from 0.10% for calf less than three month of age to 0.25 – 0.30% for high producing cows. Higher magnesium level required during early lactation and supplemental fat is fed, or when grass tetany conditions occur.

Potassium: legume forages are good potassium source when corn silage is the major forage, or when high levels of brewers grains are fed, potassium levels may be border line deficient. When heat stress is a problem potassium requirement are increases to 1.3-1.5% of dry matter.

Sulfur: Legumes as well as protein feed are good sulfur sources. An optimum nitrogen to sulfur ratio is about 10:1 therefore a 14 % crude protein ration should contain about 0.15% sulfur. Supplemental sulfur is usually needed only when the ration contains urea corn silage and poor quality hay. Good sources of sulfur includes calcium sulphate (19% sulfur), sodium sulfate (10% sulfur) and methioninehydroxy analogue.

Excessive sulfur increases the chances for molybdenum toxicity and interferes with copper utilization.

Sodium chloride (Common Salt): The daily salt requirement for dairy cattle are mate easily by adding 1% salt to grain mix and offering additional salt free choice. Lactating cows need 2-4 ounces of salt daily. Dry cows need 1.5 ounces salt daily.

Micro Minerals: Generally adding trace mineralized salt to the grain mix plus free choice trace mineral salt along with the micro mineral present in the feed will need the requirement for the dairy cattle for these trace minerals.

Cobalt: Most dairy rations will require no supplemental sources of cobalt. In the ruminants cobalt is requires by the rumen microorganisms for the synthesis of vitamin B12. Normally the feeds and fodder contains traces of cobalt ranging from 0.1-0.25ppm.

Copper: Most dairy rations need to be supplemented with copper either from trace mineralized salt or a premix containing a copper source such as copper sulfate. By enlarged copper contain in roughage is in borderline though concentrate are rich sources of copper, straw are poor sources of copper.

Iodine: Trace mineralized salts or some other source of Iodine should provide 12 mg iodine daily. Do not feed more than 50 mg because excessive iodine feeding increases iodine level in milk and causes toxicity problems such as excessive nasal discharge and watering eyes.

Iron: After two month of age, iron deficiency in dairy cattle are rare a normal dairy ration contains much more iron than is actually needed by cows.

Manganese: Most forages grains and protein supplements are only fair sources of manganese so use supplement specially with high producing cows. Rice and wheat bran are good sources of manganese. Green fodder contains adequate amount of manganese.

Zinc: Excessive amount of zinc interfere with utilization of other trace minerals such as copper and iron. Generally there is no need to feed zinc above the recommended 40-60 ppm in the ration dry matter. Zinc sulfate, zinc oxide is good sources. Brans are rich sources of zinc. Feeds and fodder contains adequate amount of zinc.

Selenium: Dry cows should be supplemented with 3-5 mg of selenium per day and lactating cows with 6-8 mg daily when soils are deficient. Adequate dietary selenium contributes to lower incidences of mastitis along with proper milking arrangement and environment. Selenium treatment may improve reproductive efficiency and reduced retained placenta in dairy cattle. Levels of greater than 2ppm cause loss of appetite, loss of hairs of tail sloughing of hoofs and even death.

Vitamin: Vitamins fall in to two groups; fat-soluble and water-soluble. The fat soluble vitamins are A,D,E and K. requirement for vit A,D and E are shown in the table below. Vitamin K is not required in the ration because it is synthesise in the rumen. Water soluble or B vitamins are synthesise in the rumen and are not needed in the ration.

Vitamin	Unit	Ration level		
		Recommended	Maximum	Estimated Amount/Day
A	IU/Pound	1450-1800	30,0003	65250 IU
D	IU/Pound	450	4500	20250 IU
E	IU/Pound	7	900	315 IU

During stressful condition when feed intake is low, B vitamin supplement may be beneficial niacin is a B vitamin which helps to regulate body fat mobilization specially in over condition, early lactation cows. In these cows when ketosis is a problem niacin added at 6-12 gm/head daily may be of some benefit.

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