

DEPARTMENT OF ANIMAL NUTRITION

Role of Trace Minerals in Cattle Reproduction

Introduction



The minerals are major nutrients required after energy and protein and should be given priority in order to optimize reproduction in dairy cattle.



As per their requirement, minerals are divided in two main groups



1) **Macrominerals** = calcium, phosphorus, magnesium, potassium (more than 100 ppm in diet), sulphur, sodium and chloride.



2) **Micro minerals** = cobalt, copper, iodine, (less than 100 ppm) iron, manganese, selenium and zinc

ZINC

- ❖ Zn plays a major role in the immune system and certain reproductive hormones.
- ❖ Zn has a critical role in the repair and maintenance of the uterine lining following parturition, speeding return to normal reproductive function and oestrus.
- ❖ In bulls, a Zn deficiency results in poor semen quality and reduced testicular size and libido
- ❖ Zn has also been shown to increase plasma β -carotene level which is correlated to improvement in conception rates and embryonic development .
- ❖ A severe Zn deficiency in cattle results in slow growth reduced feed intake, loss of hair, skin lesions that are most severe on legs, neck, head and around the nostrils, excessive salivation, swollen feed with open scaly lesions, and impaired reproduction .
- ❖ A deficiency of Zn in males reduces testicular development and sperm production

Copper(Cu)

Copper is an important component of number of enzymes including superoxide dismutase, ceruloplasmin, lysyl oxidase and thioloxidase.

The action of these enzymes is to scavenge free radicals and thus prevent tissue susceptibility to infections, increase structural strength of connective tissues and blood vessels, increase strength of the horn and hooves.

Deficiencies of Cu associated with retained placenta, embryonic death and decreased conception rates and an-oestrous.

Cu deficiency in cattle is generally due to the presence of dietary antagonists, such as S, Mo and Fe that reduce Cu bioavailability.

Feeding a total of 10 to 15 ppm copper in the ration dry matter

If rations contain antagonists such as elevated Fe, S, or Mo, replacing 35 percent of supplemental copper with organic copper sources improved Cu availability.

The following mineral ratios may be helpful in maintaining Cu levels in blood:

Zn: Cu 4:1, Cu: Mo 6:1 and Fe: Cu 40:1

Selenium (Se)

Safety margin (difference between normal requirement and toxic dose)

for Se it is so narrow, its deficiency is less common in livestock than its toxicity

It is responsible for weak, silent or irregular oestrus cycle, retained placenta, early embryonic death in foetus, still birth or weak offspring and abortions in dairy animals

Se deficiency animals are more prone for the incidence of retained placenta, cystic ovaries, mastitis and metritis which can be reduced by supplementation of selenium

Blood Se levels in these herds generally been extremely lower level ($<5\text{mg}/100\text{ mL}$).

Feedstuffs should contain at least 0.1ppm Se on a dry matter basis.

Two major sources of Se are naturally originating Se which is

obtained from plants, in the form of Seleno-amino acids, including selenomethionine and selenocysteine, and second source is the inorganic Se in the form of selenate or selenite.

Selenized yeast is one of the most bioavailable source of Se as compared to Se selenite



- Legume and grass hays have more Mn than corn or corn silage and Mn is reported to be more available in hay than silage

Manganese (Mn)

- Gestating cattle may need up to 50 mg of Mn/Kg of DM because it helps in skeletal cartilage and bone formation of fetus

Mn is an activator of enzyme systems in the metabolism of carbohydrate, fats, protein and nucleic acids. Mn also has a vital role in reproduction, cholesterol synthesis

Mn also required for synthesis of the steroids, estrogen, progesterone and testosterone.

Insufficient steroid production results in decreased circulating concentrations of these reproductive hormones resulting in abnormal sperm in males and irregular estrus cycles in female's Corpus luteum may also be influenced by Mn deficiency

COBALT

- Co deficiency is associated with an increased incidence of silent heats, a delayed onset of puberty, non-functional ovaries and abortion.
- In ruminants there is need of Co to meet the vitamin B requirements of both the ruminal bacteria and the host animal because Vitamin B is a water soluble vitamin which is produced by rumen microbes.
- The depletion of Co and vitamin B at parturition through colostrums causes depressed milk production, colostrum yield and quality.
- The recommendation for cobalt requirement in dairy cows varies between 0.10 mg/kg DM and 0.20 mg/kg DM



IODINE

- Signs of I deficiency include delay in puberty, suppressed or irregular oestrus, failure of fertilization, early embryonic death, still birth with weak calves, abortion and increased frequency of retained placenta in females, decrease in libido and deterioration of semen quality in males.
 - Iodine supplementation recommended for cows consume 15-20 mg of iodine each day.
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THANK YOU

