



## EFFECT OF DIETARY SUPPLEMENTATION OF ORGANIC SELENIUM ON MINERAL UTILIZATION IN CROSSBRED CALVES

Nampoothiri, V. M.<sup>1</sup> and Gangadevi, P.<sup>2</sup>

<sup>1</sup> Assistant Veterinary Officer, Total Mixed Ration Plant (MRDF), Palakkad (Kerala)

<sup>2</sup> Professor and Head, Department of Animal Nutrition, College of Veterinary and Animal Sciences, Mannuthy (Kerala)

### Abstract

*A feeding experiment was conducted in 12 crossbred calves for 112 days to assess the effect of dietary supplementation of organic selenium on mineral utilization in growing calves. Twelve crossbred calves of one week of age weighing on an average 23 kg, were divided into two uniform groups and maintained on standard calf starter supplemented with 0 or 0.3ppm of organic selenium(selplex) and fresh hybrid napier grass as roughage for a period of 16 weeks. All the calves were offered whole milk up to three months of age. Clean drinking water was made available to all calves throughout the experiment. A digestion trial was carried out at thirteenth week of experiment to estimate the apparent availability of major and trace elements. No significant difference could be seen in apparent availability of minerals due to dietary supplementation of Se, except for the high availability of Fe in control ration.*

**Key words:** Organic Selenium, apparent mineral availability, crossbred calves, Selplex.

### I. INTRODUCTION

Trace element Se has gained attraction of the nutritionist and feed manufactures to improve the economic efficiency of animal production. Se is approved as a feed additive for cattle since 1979 at a level of 0.1ppm and later in 1983 at 0.3 ppm (FDA, 1987). Se functions as an antioxidant and it found to improve growth, muscle development and immune mechanism. Se occurs in organic and inorganic form. Se in inorganic form, selenite or selenate, is a common and inexpensive ingredient in common feeds and supplements. Se in organic form mainly exist as seleno yeast. Studies have shown that organic Se is better absorbed and utilized in ruminants than inorganic sources (Guyot *et al.*, 2007). Less number of studies were reported regarding the effect of organic Se supplementation on the availability and utilization of other minerals in animals. Hence a feeding experiment was conducted to study the effect of dietary supplementation of organic Se on mineral utilization in growing crossbred calves.

### II. MATERIALS AND METHODS

#### 2.1 Experimental animals and feeding

Twelve healthy crossbred calves of one week of age selected from the University Livestock Farm and Fodder Research and Development Scheme (ULF&FRDS), College of Veterinary and Animal Sciences, Mannuthy, formed the experimental subjects for the study. After the colostrum feeding, calves were housed individually in well ventilated, clean and dry shed with facilities for feeding and watering. The calves were divided into two groups of six each as uniformly as possible with regard to age, sex and body weight and allotted randomly to one of the two dietary treatments, T<sub>1</sub> and T<sub>2</sub>. All the experimental calves were maintained under identical management conditions throughout the experimental period.

They were fed with whole milk up to twelve weeks of age. Calves of T<sub>1</sub> and T<sub>2</sub> were offered standard calf starter (BIS-1983), supplemented with organic selenium at 0 and 0.3 ppm respectively and fresh green grass (Hybrid Napier) as roughage, for a period of 112 days. The calf starter was prepared with yellow maize- 35.5 parts, wheat bran- 15 parts, soya bean meal- 45.5 parts, calcite -2 parts, dicalcium phosphate- 1.5 parts, common salt- 0.5 parts and indomix AB<sub>2</sub>D<sub>3</sub> K @10g/100 kg feed. In T<sub>2</sub> ration Selplex (Altec Ltd.) was added at the rate of 15g per 100kg feed to obtain 0.3ppm of organic selenium. Chemical composition of calf starter and green grass fed to experimental calves are given in Table 1.

## 2.2 Feeding schedule

All the experimental calves were fed required quantity of whole milk daily in two equal portions (morning and evening). The quantity of milk fed was at the level of 1/10<sup>th</sup> of their body weight for the first six weeks, 1/15<sup>th</sup> of body weight from seven to eight weeks and 1/20<sup>th</sup> of body weight from nine to twelve weeks of age. Calf starter in morning time and good quality green grass during evening were offered to all the calves from first week of age. Clean drinking water was made available to all calves throughout the experiment. Individual data on quantities of calf starter, milk and green grass offered daily were recorded. The left over portion of the calf starter and green grass were weighed daily and their moisture content was analyzed to calculate the dry matter intake. Daily dry matter intake from whole milk, calf starter and green grass with respect to each calf were calculated throughout the experimental period. Body weight of all the calves were recorded at fortnight intervals before feeding. Calves were fed as per ICAR standard (Ranjan, 1998). The concentrate allowance and green grass offered were revised weekly taking into consideration the increased nutrient requirement commensurate with the growth increment.

## 2.3 Mineral analysis

A digestion trial involving five days collection period was carried out at 13<sup>th</sup> week of experiment to estimate the apparent availability of minerals. Proximate analysis of the calf starter, green grass and dung were done as per the standard procedures (AOAC, 1990). The acid detergent fiber (ADF) was estimated by the method suggested by Van Soest (1963) and neutral detergent fiber (NDF) by the method suggested by Van Soest and Whine (1967). Ca and trace minerals in feed and dung was estimated using Atomic Absorption Spectrophotometer (PERKIN ELMER 3110, U.S. instrument division). Phosphorus content was estimated by Vanado-Molybdate method (AOAC, 1990). From the data obtained on the intake and outgo of dry matter and different minerals during the digestion trial, apparent availability of minerals were calculated.

## 2.4 Statistical analysis

Data obtained on different parameters during the course of experiment were subjected to statistical analysis using Student's t test (Snedecor and Cochran, 1994).

## III. RESULT AND DISCUSSION

Apparent availability of different macro and trace minerals as percentage of intake during the digestion trial of five days in T<sub>1</sub> and T<sub>2</sub> are given in Table 3. Apparent availability of Ca for T<sub>1</sub> and T<sub>2</sub> are 22.51 per cent and 14.71 per cent respectively. Statistical analysis of the data revealed no significant difference in calcium availability between selenium supplemented (T<sub>2</sub>) and control group (T<sub>1</sub>). In accordance with the present study Mudgal (2005) and Shinde *et al.* (2008) reported that selenium supplementation in the diet of buffalo calves had no significant effect on the intake and balance of calcium. Apparent availability of phosphorus for T<sub>1</sub> and T<sub>2</sub> are 17.00 per cent and 23.03 per cent respectively (Table 3). Though there is a numerical increase for selenium supplemented diets values were not statistically significant. In accordance with the above result, Mudgal (2005) reported that selenium supplementation in the diet of buffalo calves had no significant effect on the intake and

balance of P. Shinde *et al.* (2008) also observed no significant difference in intake (g/d), outgo (g/d) and balance (g/d) of phosphorus in selenium supplemented and non supplemented male buffalo calves. The apparent availability of iron in the experimental animals (Table 3) estimated from the digestion trial was 56.43 percent and 43.58 percent respectively for T<sub>1</sub> and T<sub>2</sub> and statistical analysis revealed significant difference (p<0.01) between the groups. Se shows antagonistic effects with Fe, that may be the reason for reduced availability of Fe in Se supplemented group. Result on apparent availability of copper (Table 3) showed no significant difference between the control and the selenium supplemented rations, the values being 27.57 per cent and 28.85 per cent respectively. The apparent availability of zinc in the experimental animals (Table 3) was 9.60 and 6.72 per cent for T<sub>1</sub> and T<sub>2</sub> respectively and the values are not statistically significant. Apparent availability of selenium was 44.69 per cent and 39.01 per cent for T<sub>1</sub> and T<sub>2</sub> respectively (Table 3) and there was no significant difference between the selenium supplemented and unsupplemented group.

Overall evaluation of the results on mineral availability indicate that all the experimental animals were under good nutritional status and inclusion of organic selenium at a level of 0.3 ppm in the diet of growing calves did not influence the various parameters except a reduction in Fe availability which is because of the inverse relationship between Se and Fe.

**Table 1. Percentage chemical composition of calf starter and green grass fed to experimental calves on dry matter basis**

Parameter	Calf starter	Green Grass (Hybrid Napier)
Dry matter	90.34	20.83
Crude protein	24.43	10.21
Ether extract	2.99	6.60
Crude fibre	7.96	31.01
Total ash	9.89	11.37
Nitrogen Free Extract	54.73	40.81
Acid insoluble ash	2.60	6.16
Neutral detergent fibre	24.92	64.18
Acid detergent fibre	13.02	37.32

**Table 2. Mineral composition of calf starter and green grass fed to experimental calves**

Minerals	Calf starter	Green grass (Hybrid Napier)
Calcium (%)	1.45	0.58
Phosphorus (%)	1.09	0.27
Iron (ppm)	3548.90	205.12
Copper (ppm)	11.83	8.51
Zinc (ppm)	45.58	33.25

**Table 3. Apparent availability of minerals on experimental animals, %**

Minerals	T <sub>1</sub>	T <sub>2</sub>	P value
Calcium	22.51±4.50	14.71±5.80	N.S
Phosphorus	17.00±5.72	23.03±14.73	N.S

Iron	56.43±2.70 <sup>a</sup>	43.58±5.47 <sup>b</sup>	0.035
Copper	27.57±7.92	28.85±3.75	N.S
Zinc	9.60±4.84	6.72±6.22	N.S

\*Average of six values

a, b- Means with different superscripts in same row differ significantly (P<0.05)

N.S: Non significant

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