EFFECT OF MINERAL FORTIFICATION ON THE GROWTH AND FEED EFFICIENCY OF SAHIWAL MALE CALVES

Muhammad Aslam Mirza, M. Ashraf Iqbal and Nasir Ali Tauqir
Sheep and Goat Development Center, Rakh Khairewala, Dist. Layyah
Animal Nutrition Center, Rakh Dera Chahl, Badian Road, Lahore, Pakistan

ABSTRACT

A complete lack of response was observed to both macro-minerals (Ca, P, Na, Mg, K, S) and micro-minerals (I, Co, Cu, Mn, Fe, Zn) supplementation in the compound feed of Sahiwal male calves. This demonstrates that in cases where animals are kept on adequately balanced compound feed, requirement of the animals seem to be met by minerals coming from feed ingredients and as such supplemental minerals are not required. However, animals kept exclusively on grazing/browsing on range land may suffer from mineral deficiency.

INTRODUCTION

The supplementation of various micro- and macro-minerals is beneficial for the growth and development of growing animals. Minerals are important factors in the nutrition of animals both as a whole and as individual ingredients. They form part of a number of amino acids and are integral part of certain vitamins, enzymes and antibiotics. Therefore, diets of the growing cattle must be supplemented with required quantities of elements. They function as carriers of protein, regulates digestion, respiration, water balance muscle reaction, nerve transmission, skeletal strength, protect against disease and play a vital role in resistance and adaptation. Mineral supplementation is taken within a wide context of physiological requirements of farm animals, which in most cases are well established, and it is now general practice to fortify feeds with minerals.

The present project was designed to develop a simple practical mineral mixture adequate to meet the physiological and biological requirements of male calves reared for fattening.

MATERIALS AND METHODS

Preparation of Mineral Premix

The premix was prepared by grinding the coarser mineral compounds ($CuSO_4$ 101.6 g, $MnSO_4$ 498.5 g, $ZnSO_4$ 415.5 g, $FeSO_4$ 729.0 g, KI 1.26 g, $CoCl_2$ 4.28 g with $MgSO_4$ 18 kg and NaCl 12 kg) and dry blending all components with di-calcium phosphate (DCP) 60 kg for 10-15 minutes in a blender. Rice polishings was used as diluent that was mixed with the mixture at the end to make 100 kg of mineral premix. This mineral premix was prepared based on the elemental recommendation adopted from Annenkov (1982).

Animal trial

An experimental ration as per NRC standards (NRC, 1976) was prepared (Table 1). Twelve Sahiwal male young calves of almost same age and weights were divided into three equal groups. The control (Group A) had no premix added in diet. Group B was fed on a diet supplemented with DCP and common salt. Groups C was fed on a diet supplemented with mineral premix. The admixing ratio of mineral supplement (Group C) to the diet was 3%. The experimental rations were fed *ad libitum* and record of daily feed intake was maintained. The experiment lasted for 105 days.

Table 1: Ingredient composition(%) and chemical composition (%) of the experimental rations

Ingredient composition	Ration		
	A	B	C
Corn Gluten Feed (20%)	15	15	15
Rice Polishings	10	10	10
Wheat Bran	16	16	16
Molasses	15	15	15
Wheat Straw	23	21.5	20
Urea (46%)	1	1	1
Mineral Premix	-	-	3
DCP	-	1	-
Salt	-	0.5	-
Total	100	100	100
Proximate composition			
Dry Matter	90.6	91.5	92.4
Crude Protein	13.4	13.7	13.4
Crude Fat	3.7	3.2	3.6
Crude Fibre	29.0	27.3	24.0
Crude Ash	11.2	12.5	12.5

First 10 days of the experiment were taken as transitional period. The animals were weighed fortnightly throughout the experimental period. All the experimental rations were analyzed for proximate analysis by standard procedure (AOAC, 1984). The data were subjected to statistical analysis using MSTATC.

RESULTS AND DISCUSSION

The present trial failed to demonstrate usefulness of supplementing growing cattle's diet with minerals. During the course of experiment no deficiency, imbalance of nutrients was noted in any treatment as a result of variation in the dietary supply of essential nutrients. At the same time no dietary intoxication of any kind was noted in the treatment group. When the data on feed consumption, weight gain and feed efficiency of the experimental animals were subjected to statistical analysis, the differences between various treatments were observed to be non-significant. The results of the experiment (Table 3) showed that supplementing diets with either di-calcium phosphate + salt or a comprehensive mineral supplement containing both macro- and micro-minerals had almost no effect on the fattening of male calves. A complete lack of response to mineral supplementation demonstrated that in cases where animals were kept on adequately balanced compound feed, the micro- and macro-element status of the animals was generally adequate. In such cases the daily requirements seemed to be met by feed ingredients and as such minerals were not required as supplements.

Table 2: Recommended norms for micro- and macro-elements of growing calves (fattening for meat)

Body weight (kg)	Daily weight gain (kg)	Daily consumption of feedstuffs (kg DM)	Ca	P	Mg	Na
			(g/kg DM of diet)			
150	1.0	4.5	6.8	3.5	1.1	0.8
200	1.2	6.0	6.0	3.0	1.4	0.8
300	1.1	8.0	4.5	3.0	1.4	0.8
400	1.0	10.0	4.5	3.0	1.4	0.8
500	1.0	11.0	4.5	3.0	1.6	0.8

Microelements recommended for growing calves of all body weights are as follows (mg/kg DM of the diet): Iodine 0.2-0.4; Cobalt 0.4-0.8; Copper 5-10; Manganese 40-60; Zinc 30-60; Ferrous 40-50

However, this does not disprove the essentiality of minerals in the diets of livestock. A regular inclusion of mineral premix in the diet is a cheap insurance against a possible trace-mineral deficiency.

The mineral requirements tend to vary with breed, sex, age, type of diet fed, previous plan of nutrition, current production level, dietary status and activity. It is anticipated that supplementation of minerals would be needed for localized areas where a specific deficiency has been established/reported (Malik, 1990). Animals on marginal feeding regimes such as those exclusively on grazing/browsing in rang-lands (poor to depleted) may suffer from mineral deficiency of variable degree. This necessitates that further experimentation with grazing animals especially those on poor and depleted range land may be carried out for extended periods. Improvement in analytic techniques has greatly facilitated mineral nutrition research (Ammerman and Goodrich, 1983). However, much remains to be discovered on aspects of post-ruminal availability of minerals (Huntingdon, 1983; Johnson and Socha, 1998) and requirements of minerals at different stages of pregnancy, lactation and growth.

Table 3: Weight gain, feed consumption and feed efficiency of calves fed experimental rations

Particulars	Ration		
	A	B	C
Total Feed Consumed (kg)	2297	2196	2229^{NS}
Total Wt. Gain (kg)	347	302	328^{NS}
Daily Wt. Gain/Animals (g)	827	719	781^{NS}
Feed Efficiency	6.6	7.3	6.8^{NS}

REFERENCES

Ammerman, C.B. and R. D. Goodrich, 1983. Advances in mineral nutrition in ruminants. J. Anim. Sci., 57 (Suppl.2): 519.

Annenkov, B. N., 1982. Mineral metabolism in the digestive tract. In: Mineral Nutrition of Animals [Georgieveskii, V. Annenkov, B.N.; Samokhin, V. I.] Buttterworths.

AOAC, 1984. Official Methods of Analysis. Association of Official Analytical Chemists, Washington, D.C.

Huntingdon, G. B., 1983. Feedlot performance, blood metabolic profile and calcium status of steers fed high concentrate diets containing several levels of calcium. J. Anim. Sci., 56: 1003.

Johnson, B. A. and M. Socha, 1998. Judging trace mineral bioavailability. Feed International, Sept. 34-38.

Malik, M. Y., 1990. Mineral imbalances in the livestock of Pakistan. 31st All Pakistan Science Conf. held in Lahore.

NRC, 1976. Nutrient Requirements of Beef Cattle. 5th Ed. National Academy Press, Washington D.C.