

## Original Research Article

# Role of Micro and Macro Minerals in Body Weight and Metabolic Body Weight of Cross Bred Cattle

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## ABSTRACT

Crossbred cows (18), aged 2 to 4 years with average body weight of 190 kg, were randomly divided into 3 uniform groups of 6 each. All the cows were fed *ad libitum* green fodder and measured quantity of concentrate mixture. The cows in group T<sub>2</sub> were supplemented with 50 gm micro minerals/cow/day and in group T<sub>3</sub> were supplemented with 50 gm macro minerals/cow/day as whereas cows in group T<sub>1</sub> kept as control. The feeding trial lasted for 45 days. The body weight and metabolic body weight were measured at 0, 15, 30 & 45 day. The average body weight was recorded in T<sub>2</sub> (treatment group) at 0 day 183.33 kg. 15 days 186.91 kg. 30 days 191.93 kg. & 45 days 199.5 kg. Followed by T<sub>3</sub> (Treatment group) at 0 day 179.33 kg. 15 days 183.36 kg. 30 days 188.71 kg. & 45 days 199.85 kg. Lowest in T<sub>1</sub> (control group) at 0 day 177.16 kg. 15 days 180.86 kg. 30 days 185.35 kg. & 45 days 191.21 kg. & average metabolic body weight gain highest was recorded in T<sub>2</sub> (treatment group) at 0 day 49.80 kg. 15 days 50.53 kg. 30 days 51.55 kg. & 45 days 53.07 kg. Followed by T<sub>3</sub> (treatment group) at 0 day 48.99 kg. 15 days 49.82 kg. 30 days 50.90 kg. & 45 days 52.34 kg. and lowest in T<sub>1</sub> (control group) at 0 day 48.55 kg. 15 days 49.31 kg. 30 days 50.22 kg. & 45 days 51.41 kg. Body wt. and metabolic body wt. From the treatment of ANOVA design treatment significance but intrusion is non-significance. So effect of days and treatment are significantly different.

### Keywords

Macro- and  
microelements,  
Toxin reducer,  
Supplements,  
Flavours,  
Antioxidants

## Introduction

The main trouble in cattle feeding is to maintain the chemical composition of the ration like organic compounds and minerals. Dairy cattle and buffaloes require a number of dietary mineral elements for normal body maintenance, growth and reproduction.

Calcium, phosphorus and magnesium etc. are the essential minerals. Mineral supplements play a very important role in enhancing the performance of dairy animals and poultry sector. Present time they are very important for the feed to maintain the health and yield of the livestock. Mainly enzymes, growth promoters, antibiotics, toxin reducer, supplements, flavours, antioxidants etc. are

the most important components of the mineral mixture. The mineral supply of ruminants is largely dependent on the concentration of macro- and microelements in the plants and the soil (Jones, 2002). Using feeds that are less source of minerals often leads to conditions referred to as production diseases (Kondracki and Bednarek, 1996). It is proved that farm feeds only partly satisfy the needs of dairy animals for minerals. Hence it is need to overcome any deficiency directly - by supplementing the diet with mineral mixes (Górski *et al.*, 2006). It should also be kept in mind that both preventive and curative measures against mineral deficiencies should be preceded by a survey to fully identify the mineral supply in the soil-plant-animal trophic system (Marques *et al.*, 2013; Maan *et al.*, 2013).

A number of these products are imported from developed countries. Supplementation of minerals is helpful in improving the growth of the livestock and their yield capacity viz. reproduction efficiency, milk production etc. helps in efficient utilization of absorbed nutrients and in so many other ways, for improving growth, milk production and reproduction efficiency.

Keeping this in view, the present trial was conducted to analyze the effect of supplementation of mineral mixture in crossbred cows.

### **Materials and Methods**

This investigation was carried out to study the cross bred heifer's body weight, metabolic body weight in lactating crossbred cows on diet containing different feed supplements. The study was conducted on crossbred heifers and lactating cows maintained at dairy farm, Department of Animal Husbandry and Dairying, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. The experiment was

carried out for a period of 45 days (November, 2016 to December, 2016) 45 days i.e. winter season.

### **Treatment details**

Total 18 crossbred cows was selected. The animals were quite healthy and all the cows was randomly divided into 3 groups with 6 animals in each group. Cows group was selected according to their same characteristics and attributes in respect of body weight, age, milk production and lactation period to maintain the similarity in the trial. All the animals fed on green fodder (*ad libitum*) and measured amount of concentrate mixture. Group I, II & III was supplemented with 0, 50 gm (micro minerals) & 50 gm (macro minerals) per head per day respectively. The composition of micro and macro mineral supplement is depicted in table 1 & 2 respectively.

### **Weighing of animals**

Body weight was recorded on every 15 days interval to observed body weight gain of the animals. Pre and post experimental trial was also conducted. Weighing of the animals was carried out before feeding and watering at 8.00 A.M. morning with the help of weighing machine.

### **Metabolic body weight**

Metabolic body weight measured by the formula

$$\sqrt{\text{body weight} \times \text{body weight} \times \text{body weight}}$$

### **Statistical analysis**

Data was analysed using the model of the Two Factorial CRD Statistical analysis and simple calculation for mean is done by formula given below

$$\bar{x} = \frac{\sum x}{n}$$

Here:

$\Sigma$ = represents the summation

$x$  = represents scores

$n$  = represents number of scores.

## Results and Discussion

The experiment was conducted to observe the effect of mineral mixture supplement on cross bred lactating cows. For this purpose 18 young heifer and 18 cross bred cows were selected from the university dairy farm and divided into three groups and consisting of 6 cattle in each group.

### Body weight (Kg)

Body weight of the cows was measured at on the onset of the trial (kg) with the help of weighing machine. The average body weight pre experiment of all 6 cows were 177, 186, 173, 169, 181 and 177 kg with an overall average 177.16 kg respectively in T<sub>1</sub> (control) group; 164, 178, 186, 193, 191 and 188 kg and with an overall 183.33 kg respectively in T<sub>2</sub> (Treatment) group and 176, 186, 172, 167, 192 and 183 kg with an overall 179.33 kg respectively in T<sub>3</sub> (Treatment) group.

The data was arranged fifteen days wise the body weight from one to fifteen day (experimental period) was 181.1, 189.6, 176.6, 172.5, 184.4 and 181 kg with an overall average 180.86 kg respectively in T<sub>1</sub> (control) group; 168.3, 181.7, 189.8, 194.5, 194.9 and 192.3 kg with an overall average 186.91 kg respectively in T<sub>2</sub> (Treatment)

group; and 179.6, 189.7, 176.2, 171.3, 195.8 and 187.6 kg with an overall 183.36 kg respectively in T<sub>3</sub> (Treatment) group. The data was arranged fifteen days wise the body weight from fifteen to thirty day (experimental period) was 186.2, 193.7, 181.2, 176.9, 189.1 and 185 kg with an overall average 185.35 kg respectively in T<sub>1</sub> (control) group; 173.4, 186, 194.9, 200.8, 199.4 and 197.1 kg with an overall average 191.93 kg respectively in T<sub>2</sub> (Treatment) group; and 183.9, 194.3, 181.2, 177.7, 202.7 and 192.5 kg with an overall 188.71 kg respectively in T<sub>3</sub> (Treatment) group.

The data was arranged fifteen days wise the body weight gain from thirty to forty-fives day (experimental period) was 191.4, 199.81, 186.72, 182.95, 195.4 and 191 kg with an overall average 191.21 kg respectively in T<sub>1</sub> (control) group; 181.17, 193.84, 201.4, 208.3, 206.97 and 205.32 kg with an overall average 199.42 kg respectively in T<sub>2</sub> (Treatment) group; and 190.85, 203.17, 189.12, 184.12, 208.96 and 198.91kg with an overall 195.85 kg respectively in T<sub>3</sub> (Treatment) group.

The data were statistically analyzed and it is depicted from the table 3, 4, 5&6. Animals from T<sub>2</sub> (Treatment) group was shows better increased body weight than T<sub>3</sub> (Treatment) and T<sub>1</sub> (control) group. To see the effect of various mineral mixtures on body weight different types of variances were analyzed. The body wt. gain in various groups differ significantly ( $P < 0.05$ ).

### Metabolic body weight

Metabolic body weight of the heifers was measured at fifteen days interval (kg) with the help of formula.

**Table.1** Composition of Mineral Mixture (micro- nutrient) Supplements @ /100 gm Contain

Vitamin D <sub>3</sub>	16000 IU
Vitamin B <sub>12</sub>	400 MCG
Phosphorus	14.25 GM
Calcium	26.000 GM

**Table.2** Composition of Mineral Mixture (macro- nutrient) Supplements@ /Kg contain

Minerals	Quantities
Vitamin A	2.500 MIU
Vitamin D <sub>3</sub>	0.260 MIU
Vitamin E	14.00 MIU
Biotin	0.400 gm
Niacin	100 gm
Ferrous	25 gm
Copper	5 gm
Manganese	14 gm
Zinc	18 gm
Magnesium	30 gm
Cobalt	0.360 gm
Iodine	0.800 gm
Selenium	0.140 gm
Chromium	0.180 gm
Potassium	60 gm

**Table.3** Body weight mean

	0 Day	15 Days	30 Days	45 Days
T1	177.16	180.86	185.35	191.21
T2	183.33	186.91	191.93	199.5
T3	179.33	183.36	188.71	195.85

**Table.4** Body weight analysis of variance table

Source of Variation	DF	Sum of Squares	Mean Squares	F Calculated	Significance
Treatment	2	551.568	275.784	3.555	0.03473
Days	3	2448.120	816.040	10.521	0.00001
Treatment × Days	6	13.737	20289	0.030	0.99988
Error	60	4653.939	77.566		
Total	71	7667.364			

(P<0.05)

**Table.5** Two way mean table

	<b>0 Day</b>	<b>15 Day</b>	<b>30 Day</b>	<b>45 Day</b>	<b>Mean T</b>
T <sub>1</sub>	177.167	180.867	185.350	191.213	183.649
T <sub>2</sub>	183.333	186.917	191.933	199.500	190.421
T <sub>3</sub>	179.333	183.367	188.717	195.855	186.818
Mean B	179.944	183.717	188.667	195.523	

**Table.6** SEM, SED and C.D.

<b>Factors</b>	<b>C.D.</b>	<b>SE(d)</b>	<b>SE(m)</b>
Treatment	5.098	2.542	1.798
Days	5.887	2.936	2.076
Treatment × Days	N/A	5.085	3.595

**Table.7** Metabolic body weight mean

	<b>0 Day</b>	<b>15 Days</b>	<b>30 Days</b>	<b>45 Days</b>
T1	48.55	49.31	50.22	51.41
T2	49.80	50.53	51.55	53.07
T3	48.99	49.82	50.90	52.34

**Table.8** Metabolic body weight analysis of variance table

<b>Source of Variation</b>	<b>DF</b>	<b>Sum of Squares</b>	<b>Mean Squares</b>	<b>F Calculated</b>	<b>Significance</b>
Treatment	2	22.352	11.176	3.486	0.03695
Days	3	100.473	33.491	10.447	0.00001
Treatment × Days	6	0.569	0.095	0.030	0.99988
Error	60	192.343	3.206		
Total	71	315.737			

**Table.9** Two way mean table

	<b>Day 0</b>	<b>Day 15</b>	<b>Day 30</b>	<b>Day 45</b>	<b>Mean T</b>
T <sub>1</sub>	48.552	49.310	50.225	51.412	49.875
T <sub>2</sub>	49.805	50.533	51.552	53.067	51.239
T <sub>3</sub>	48.990	49.817	50.903	52.340	50.513
Mean Day	49.116	49.887	50.893	52.273	

**Table.10** SEM, SED and C.D.

<b>Factors</b>	<b>C.D.</b>	<b>SE (d)</b>	<b>SE(m)</b>
Treatment	1.036	0.517	0.365
Days	1.197	0.597	0.422
Treatment × Days	N/A	1.034	0.731

The average metabolic weight before start the trial were 48.52, 50.36, 47.7, 46.87, 49.34 and 48.52 kg with an overall average 48.55 kg respectively in T<sub>1</sub> (control) group; 45.82, 48.73, 50.36, 51.78, 51.37 and 50.77 kg and with an overall 49.80 kg respectively in T<sub>2</sub> (Treatment) group and 48.32, 50.36, 47.49, 46.45, 51.57 and 49.75 kg with an overall 48.99 kg respectively in T<sub>3</sub> (Treatment) group.

The data was arranged fifteen days wise the metabolic body weight gain from one to fifteen day(experimental period) was 49.36,51.09, 48.44, 47.59, 50.04 and 49.34 kg with an overall average 49.31 kg respectively in T<sub>1</sub> (control)group;46.72, 49.48, 51.13, 52.08, 52.16 and 51.63 kg and with an overall 50.53 kg respectively in T<sub>2</sub> (Treatment) group and 49.06, 51.11, 48.36, 47.34, 52.34 and 50.69 kg with an overall 49.81 kg respectively in T<sub>3</sub> (Treatment) group.

The data was arranged fifteen days wise the metabolic body weight gain from fifteen to thirty day(experimental period) was 50.4, 51.92, 49.38, 48.5, 50.99 and 50.16 kg with an overall average 50.22 kg respectively in T<sub>1</sub> (control) group;47.78, 50.36, 52.16, 53.35, 53.06 and 52.6 kg with an overall average 51.55 kg respectively in T<sub>2</sub> (Treatment) group; and 49.93, 52.04, 49.38, 48.67, 53.72 and 51.68 kg with an overall 50.90 kg respectively in T<sub>3</sub> (Treatment) group.

The data was arranged fifteen days wise the

metabolic body weight gain from thirteen to forty-fives day(experimental period) was 51.45, 53.14, 50.51, 49.74, 52.26 and 51.37 kg with an overall average 51.41 kg respectively in T<sub>1</sub> (control) group; 49.38, 51.94, 53.46, 54.56, 54.82, and 54.24 kg with an overall average 53.06 kg respectively in T<sub>2</sub> (Treatment) group; and 51.34, 53.81, 50.99, 49.98, 54.96 and 52.96 kg with an overall 52.34 kg respectively in T<sub>3</sub> (Treatment) group.

The data were statistically analyzed for metabolic body weight and presented in table 7, 8, 9 & 10.It is observed that T<sub>1</sub> and T<sub>3</sub> shows less increase in metabolic body weight than T<sub>2</sub>.To check the effect of various mineral mixtures on metabolic body weight different types of variances were analyzed. The body wt. gain in various groups differ significantly (P < 0.05).

Meeting the minerals and vitamin needs of dairy cattle is crucial to achieving high levels of milk production and maintaining cow health and reproductive performance. It is important to evaluate the feeding situation, the level of management and what is to be accomplished prior to the selection of an appropriate feed additive. Feed additives have consistently proven to be an asset in growing and finishing operations and are well accepted as a means to increase the profitability of most cattle operations. So the results of this study will help individual farmers, commercial herds as well as the feed industry to ensure balanced nutrition to dairy

stock under widely varying conditions of environment and feed resources.

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