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Feeding impact of micro and macro minerals mixture on 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_2 were supplemented with 50 gm micro minerals/cow/day and in group T_3 were supplemented with 50 gm macro minerals/cow/day as whereas cows in group T_1 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_2 (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_3 (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_1 (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_2 (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_3 (treatment group) at 0 day 48.99 kg. 15 days 49.82 kg. 30 days 50.90 kg. & 45 days 52.34 kg. & lowest in T_1 (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. & 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: micro, macro minerals mixture, body weight, metabolic body weight, cross bred cattle

Introduction
The main challenge in cattle feeding is keeping the chemical composition of the ration, such as organic compounds and minerals, consistent. For normal body maintenance, growth, and reproduction, dairy cattle and buffaloes require a variety of dietary mineral elements. The essential minerals are calcium, phosphorus, and magnesium, among others. Mineral supplements are extremely important in improving the performance of dairy animals and the poultry industry. They are very important at the moment for the feed to maintain the health and yield of the livestock. The most important components of the mineral mixture are enzymes, growth promoters, antibiotics, toxin reducers, supplements, flavors, antioxidants, and so on. Ruminant mineral supply is mostly determined by the concentration of macro- and microelements in plants and soil (Jones, 2002) [2]. The use of mineral-deficient diets frequently results in disorders known as production diseases (Kondracki and Bednarek, 1996) [3]. It has been established that farm feeds only partially meet the mineral requirements of dairy animals. As a result, any shortage must be addressed directly by supplementing the diet with mineral mixtures (Górski *et al*., 2006) [1]. It's also worth remembering that both preventive and therapeutic therapies for mineral deficiency should be preceded by a survey to determine the mineral supply in the soil-plant-animal trophic chain (Marques *et al*., 2013; Maan *et al*., 2013) [5, 4]. Several of these items are imported from wealthy nations. Mineral supplementation aids in the growth of livestock and their yield capacity, such as reproduction efficiency and milk production. It also aids in the efficient utilisation of absorbed nutrients and in a variety of other ways, resulting in improved growth, milk production, and reproduction efficiency. With this in mind, the current study looked into the effects of mineral mixture supplementation in crossbred cows.

Material and Methods
The goal of this study was to look at the body weight of crossbred heifers and metabolic body weight in lactating crossbred cows fed various feed additives. The research was carried out on crossbred heifers and lactating cows kept at the dairy farm of the Institute of Agricultural

Sciences, Banaras Hindu University, Varanasi. The trial lasted 45 days (November 2016 to December 2016), which corresponds to the winter season.

Treatment details

A total of 18 crossbred cows were chosen. The cows were in good health, and they were randomly separated into three groups, each with six animals. To maintain uniformity in the study, cows were chosen based on their similar characteristics and attributes in terms of body weight, age, milk output, and lactation period. Green fodder (ad libitum) and a measured amount of concentrate mixture were supplied to all of the animals. Groups I, II, and III received a daily supplement of 0, 50 gm (micro minerals) and 50 gm (macro minerals). Tables 1 and 2 show the composition of micro and macro mineral supplements, respectively.

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

Vitamin D_3	16000 IU
Vitamin B_{12}	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_3	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

Weighing of animals

The animals' body weight was measured every 15 days to see how much they had grown. There was also a pre- and post-experimental trial. The animals were weighed using a weighing machine before being fed and watered at 8:00 a.m.

Metabolic body Weight:

Metabolic body weight measured by the formula –

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

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:

$\sum$= represents the summation

x = represents scores

n = represents number of scores.

Result 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)

With the use of a weighing machine, the cows' body weight (kg) was determined at the start of the trial. The average pre-experiment body weight of all 6 cows was 177, 186, 173, 169, 181 and 177 kg, with an overall average of 177.16 kg in the T1 (control) group; 164, 178, 186, 193, 191 and 188 kg, with an overall 183.33 kg in the T2 (Treatment) group; and 176, 186, 172, 167, 192 and 183 kg, with an overall 179.33 kg respectively in T_3 (Treatment) group.

The body weight from one to fifteen days (experimental period) was 181.1, 189.6, 176.6, 172.5, 184.4, and 181 kg with an overall average 180.86 kg in T1 (control) group; 168.3, 181.7, 189.8, 194.5, 194.9, and 192.3 kg with an overall average 186.91 kg in T2 (Treatment) group; and 179.6, 189.7, 176.2, 171.3, 195.8, In the T3 (Treatment) group, the average weight was 187.6 kg, with a total weight of 183.36 kg.

The body weight from fifteen to thirty days (experimental period) was 186.2, 193.7, 181.2, 176.9, 189.1 and 185 kg with an overall average 185.35 kg in T1 (control) group; 173.4, 186, 194, 9, 200.8, 199.4 and 197.1 kg with an overall average 191.93 kg in T2 (Treatment) group; and 183.9, 194.3, 181.2, 177.7, 202.7 and 192.5 kg, with a total weight of 188.71 kg in the T3 (Treatment) group.

The body weight gain from thirty to forty-five days (experimental period) was 191.4, 199.81, 186.72, 182.95, 195.4, and 191 kg, with an overall average 191.21 kg in T1 (control) group; 181.17, 193.84, 201.4, 208.3, 206.97, and 205.32 kg, with an overall average 199.42 kg in T2 (Treatment) group; and 190.85, T3 (Treatment) group members weighed 203.17, 189.12, 184.12, 208.96, and for a total of 198.91 kg. 203.17, 189.12, 184.12, 208.96 and 198.91kg with an overall 195.85 kg respectively in T_3 (Treatment) group.

The data was statistically examined, as shown in tables 3, 4, 5, and 6. Animals in the T2 (Treatment) group gained more weight than those in the T3 (Treatment) and T1 (control) groups. Different types of variations were tested to see the influence of various mineral mixes on body weight. The differences in body weight gain across groups are significant (P<0.05).

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

	0 Day	15 Day	30 Day	45 Day	Mean T
T_1	177.167	180.867	185.350	191.213	183.649
T_2	183.333	186.917	191.933	199.500	190.421
T_3	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.

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

Metabolic body weight

Metabolic body weight of the heifers was measured at fifteen days interval (kg) with the help of formula. 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_1 (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_2 (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_3 (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_1 (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_2 (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_3 (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_1 (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_2 (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_3 (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_1 (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_2 (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_3 (Treatment) group.

Tables 7, 8, 9, and 10 show the results of statistical analysis of the data for metabolic body weight. T1 and T3 appear to have a lower metabolic body weight rise than T2. Different types of variations were investigated to see how different mineral mixes affected metabolic body weight. The differences in body weight gain across groups are significant (P<0.05).

Table 7: Metabolic body weight mean

	0 Day	15 Days	30 Days	45 Days
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

Source of Variation	DF	Sum of Squares	Mean Squares	F Calculated	Significance
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

	Day 0	Day 15	Day 30	Day 45	Mean T
T_1	48.552	49.310	50.225	51.412	49.875
T_2	49.805	50.533	51.552	53.067	51.239
T_3	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.

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

Conclusion

To achieve high levels of milk production and preserve cow health and reproductive function, it's critical to meet the minerals and vitamin demands of dairy cattle. Prior to selecting an appropriate feed additive, it is critical to assess the feeding situation, the level of management, and the objectives. Feed additives have been demonstrated to be beneficial in growing and finishing operations, and they are widely recognised as a way to boost profitability in most cattle operations. As a result, the findings of this study will assist individual farmers, commercial herds, and the feed industry in providing balanced nutrition to dairy animals under widely varied environmental and feed resource situations.

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