

Original Research Article

Study the Impact of Micro and Macro Mineral Mixture Supplement on Milk Composition

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ABSTRACT

Present study was conducted at Dairy farm of Institute of Agricultural Sciences, Banaras Hindu University, Varanasi. To study the role of micro and macro minerals supplement on milk composition and yield. Total 18 crossbred cows was selected and randomly divided into 3 uniform groups of 6 each. Animals in group T₂ were supplemented with 50 gm micro minerals/cow/day and in group T₃ were supplemented with 50 gm macro minerals/cow/day as whereas cows in group T₁ kept as control. All the cows was fed *ad libitum* green fodder and measured quantity of concentrate mixture. The milk composition was analyzed on pre-experiment and post experiment of this trial. i.e. 0th and 45th day in laboratory. In this investigation highest milk fat % was recorded in T₃ (Treatment group) 3.48% followed by T₂ (Treatment group) 3.31% and lowest in T₁ (control group) 3.18%. Highest SNF % was recorded in T₃ (Treatment group) 8.33% followed by T₂ (Treatment group) 8.18% and lowest in T₁ (control group) 7.9%. Highest milk protein % was recorded in T₃ (Treatment group) 3.46% followed by T₂ (Treatment group) 3.38 % and lowest in T₁ (control group) 3.12%. Highest milk density % recorded in T₃ (Treatment group) 32.22% followed by T₂ (Treatment group) 31.97 % and lowest in T₁ (control group) 30.62%. In study Fat, SNF, Protein and Density was analyzed by using two factorial Complete Randomized Design and treatments are differ significantly.

Keywords

Ekomilk machine,
Macro minerals,
Micro minerals,
Milk Composition
and Mineral
mixture

Introduction

India is leading country in milk production and animal population. However, in other aspect animal productivity of Indian cattle is very low. Low productivity is mainly result of involuntary culling due to low fertility, poor health conditioning some feed issue;

eventually it affects profitability from the animals. Balanced nutrition is most important for keeping animal health in good condition and renders them to maintain their optimum production. Among all nutrients minerals and vitamin play a crucial role in metabolism, lactation, reproduction and even for microbial fermentation in rumen (Bhandari, Garg *et al.*,

2014). Constraints of metabolic diseases and mineral deficiency in all categories of dairy livestock have been reported by many scientists due to poor content and low bioavailability of some essential macro and micro mineral in different feedstuffs.

More than 90 % of mineral deficiencies exist at subclinical level in animals (Underwood and Suttle, 1999). Poor animal productivity and imbalanced reproductive behavior due to mineral deficiency and corrected these ailments through supplementation of various minerals, reported by Garg and Bhandari (2005). Subclinical or marginal mineral deficiencies may be a greater problem than an acute mineral deficiency in livestock because specific clinical symptoms are not evident to allow the producer to identify the deficiency.

However, animals continue to grow and reproduce but at a reduced rate. The trace mineral also declines immunity status in farm animal. A survey work in various states, conducted by NDDDB indicated that Zn, Cu, S, Mn, and Co were deficient in the ration of dairy animals (Bhandari Garg *et al.*, 2006). Hence, animal depend for their mineral and vitamins requirement on feed and fodders supply.

Most of the feed ingredients available for feeding dairy animals are deficient in one or more mineral. So, present study was designed with objective to find out the effects of micro and macro mineral mixture feeding on the milk production and composition of crossbred cattle.

Materials and Methods

The present trial was carried out to study the effect of mineral mixture feeding on cross bred cow's milk composition with diet containing different feed supplements. The study was conducted on crossbred 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 lactating cows was randomly selected. All Cows 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 cows was randomly divided into 3 groups with 6 animals in each group. 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 presented in table 1 & 2 respectively.

Milk Composition

Milk fat

Percentage of milk fat was estimated by using Gerber's method in IS: 1224 (1977).

Specific gravity

Sp. Gr. Of milk determined by mixing the sample of milk in a jar and lower the lactometer gently into milk to float. Read the scale of lactometer and note down the temp. If temp. Is above or below the standard temp. (60⁰F) the lactometer reading is corrected by adding 0.1 for each degree temp. (CLR).

Sp. Gr. Of milk = 1 +

Total solids in milk

Total solids in milk were determined by following Richmond's Formula:

$$T.S. = + 1.2 F + 0.14$$

Where,

T.S. represents total solids % in milk;

G = Corrected lactometer reading of milk at 60° F

F = % fat in milk

Solid Not fat (SNF)

The SNF in milk sample was calculated by subtracting milk fat from total solids in the milk.

Milk Protein

The protein in the milk sample was determined by following method of AOAC, 1995.

Density percentage (DEN %)

Density percentage in milk was measured by using electronic 'ekomilk' machine.

Statistical analysis

Data was analyzed for milk composition, yield and growth using the model of the Two Factorial CRD Statistical analysis and simple calculation for mean is done by formula given below,

Here:

Σ = represents the summation

x = represents scores

n = represents number of scores.

Results and Discussion

Effect of mineral mixture supplements on milk of composition cows:

Milk fat percentage

Fat % was recorded at pre experiment (0th day) and post experiment (45th day). The overall average fat % in T₁ (control), T₂ and T₃ group was 3.06 %, 3.21 % and 3.25 % respectively at 0th day. Average fat % was recorded at 45th day (post experiment) with an overall average 3.18 %, 3.31 % and 3.48 % in T₁ (control) T₂ and T₃ group respectively. In three group Fat % of T₃ (Treatment) group was increase followed by T₂ (Treatment) and T₁ (control) group. To see the effect of various mineral mixtures on milk fat % different types of variances were analyzed and presented in table 3. The milk fat % in various groups differ significantly (P < 0.05).

SNF (Solid Non Fat) Percentage

SNF % was recorded on 0th day and it is observed that overall average for SNF was 7.78 % for T₁ (control) group, 8.03 % for T₂ group and 8.2 % for T₃ group. Average SNF % was also recorded on 45th day and the overall average SNF % is 7.9 % for T₁ (control) group, 8.18 % for T₂ group and 8.33 % for T₃ group. In three group SNF % of T₃ (Treatment) group was increase followed by T₂ (Treatment) and T₁ (control) group. The data related to SNF % was presented in table 4 to see the effect of various mineral mixtures on milk. The milk SNF % in various groups differ significantly (P < 0.05).

Protein Percentage

The data related to milk Protein % is presented in table 5 and it is depicted from data the overall average protein % for group T₁, T₂ and T₃ was 3, 3.15 and 3.23 % respectively on 0th day.

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

Table.3 Effect of minerals mixture supplement on milk fat percentage

Cow Numbers	T1		T2		T3	
	0 Day	45 Days	0 Day	45 Days	0 Day	45 Days
1	3.1	3.2	3.3	3.4	3.2	3.3
2	2.9	3	3.4	3.5	3.1	3.4
3	3	3.2	3	3.1	3.2	3.5
4	3.1	3.1	3.3	3.4	3.3	3.5
5	3.1	3.3	3.1	3.2	3.5	3.7
6	3.2	3.3	3.2	3.3	3.2	3.5
Total	18.4	19.1	19.3	19.9	19.5	20.9
Mean	3.066	3.183	3.216	3.316	3.25	3.483

The milk fat % in various groups differ significantly (P< 0.05).

Table.4 Effect of minerals mixture supplement on milk Solid not fat percentage

Cow Numbers	T1		T2		T3	
	0 Day	45 Days	0 Day	45 Days	0 Day	45 Days
1	7.8	8	8.1	8.3	8.2	8.3
2	7.6	7.8	8	8.1	8.4	8.5
3	7.7	7.8	8.1	8.2	7.9	8.1
4	7.9	8	7.9	8.1	8.3	8.4
5	7.8	7.8	8	8.2	8.3	8.5
6	7.9	8	8.1	8.2	8.1	8.2
Total	46.7	47.4	48.2	49.1	49.2	50
Mean	7.78	7.9	8.03	8.18	8.2	8.33

The milk SNF % in various groups differ significantly (P< 0.05).

Table.5 Effect of minerals mixture supplement on milk protein percentage

Cow Numbers	T1		T2		T3	
	0 Day	45 Days	0 Day	45 Days	0 Day	45 Days
1	2.9	3	3.1	3.3	3.3	3.5
2	2.8	2.9	3.3	3.4	3.3	3.5
3	3	3.2	2.9	3.2	3.2	3.5
4	3.1	3.2	3.1	3.4	3.3	3.4
5	3.2	3.3	3.3	3.5	3.2	3.5
6	3	3.1	3.2	3.5	3.1	3.4
Total	18	18.7	18.9	20.3	19.4	20.8
Mean	3	3.12	3.15	3.38	3.23	3.46

The milk protein% in various groups differ significantly (P< 0.05).

Table.6 Effect of minerals mixture supplement on milk density percentage

Cow Numbers	T1		T2		T3	
	0 Day	45 Days	0 Day	45 Days	0 Day	45 Days
1	28.1	28.8	29.8	32.2	31.6	32.3
2	27.9	29.6	29.6	31.7	30.6	32
3	31.3	32.2	30	32.3	30.2	32.6
4	30.1	32.2	30.6	32.2	30.1	32.1
5	28.2	29.8	29.6	31.2	28.6	30.1
6	28.6	31.1	31	32.2	32.6	34.2
Total	174.2	183.7	180.6	191.8	183.7	193.3
Mean	29.03	30.62	30.1	31.97	30.62	32.22

The milk den% in various groups differ significantly (P< 0.05).

Average protein % was also recorded at 45th day and the overall average 3.12, 3.38 and 3.46 for group T1, T2 and T3 respectively. In

three group protein % of T₃ (Treatment) group was increase followed by T₂ (Treatment) and T₁ (control) group. To see

the effect of various mineral mixtures on milk protein % different types of variances were analyzed.

Density Percentage

The milk density was analyzed on 0th day and the values are furnished in table 6. The overall average density % was 29.03, 30.1 and 30.62 % for group T₁, T₂ and T₃ respectively. Average Density % was also recorded on 45th day, the overall average for group T₁, T₂ and T₃ was 30.62, 32.2 and 32.22% respectively. In three group DEN % of T₃ (Treatment) group was increase followed by T₂ (Treatment) and T₁ (control) group. To observe the effect of various mineral mixtures on milk density % different types of variances were analyzed.

After completion of this 45 days trial, it is observed that, Mineral mixture supplement has significantly boosted the milk yield, milk fat, SNF, protein, TSS, density of the milk. It is concluded from this investigation, mineral mixture fulfills the macro and micro nutrient need of the animal's body and it helps subsequently to improve the milk quality and quantity. Milk fat % highest was record in T₃ (Treatment group) 3.48% followed by T₂ (Treatment group) 3.31% and lowest in T₁ (control group) 3.18%. Milk SNF % highest was record in T₃ (Treatment group) 8.33% followed by T₂ (Treatment group) 8.18% and lowest in T₁ (control group) 7.9%. Milk protein % highest was record in T₃ (Treatment group) 3.46% followed by T₂ (Treatment group) 3.38 % and lowest in T₁ (control group) 3.12%. Milk DEN % highest record in T₃ (Treatment group) 32.22% followed by T₂ (Treatment group) 31.97 % and lowest in T₁ (control group) 30.62%. In study of FAT%, SNF%, Protein % and DEN% analysis of variance days and treatment are significant.

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