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Effect of mineral supplement on milk production, milk composition, and cost-benefit ratio in lactating Murrah buffaloes

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Abstract
The present experiment was conducted at a dairy farm during 2017 - 18 C.S.A. University of agriculture and technology Kanpur. The effect of the mineral supplement on milk production in Murrah buffalo Twelve Murrah buffalo was selected for study on milk production and milk composition trial. For more performance a balanced mineral is essential. A shortage of or imbalance in the supply of energy, protein, vitamins, and minerals will subject the buffalo the mineral supplement stress resulting in a decrease in milk production. Milk production average per week was 24±715, 25±310, and 25±817 liter in T0, T1, and T2 groups respectively. Significantly higher was observed in the T2 group compared to other groups of Murrah buffaloes. The fat content average in the week was 7±045, 7±090, and 7. ±950 cent in TO, T, and T2 Group respectively, group T2 was highly significant as compared to other groups. The lactose content average in the week was 5±045. 5±070 and 5±092 percent in To, TI, and T2 Group respectively, group T2 was highly significant as compared to other groups. The protein content average in the week was 4 ±036, 4±052 and 4±085 percent in TO, TI and T2 Group respectively, group T2 was no-significant as compared to other groups. The total solid content average in the week were 16 ±840, 16±855, and 16±903 percent in To, TI, and T2 Group respectively, group T2 was highly significant as compared to other groups. The SNF content average in the week was 9±480, 9±503, and 9±515 percent in TO, TI, and T2 Group respectively. Group T2 was non-significant as compared to other groups. The water content average per week was 83±137, 83±037, and 82±958 percent in TO, TI, and T2 Groups respectively group T2 was highly significant as compared to other groups. The ash content average in the week was 0±738, 0±750, and 0±770 percent in To, TI, and T2 Group respectively, group T2 was highly significant as compared to other groups. From the present study, it can be concluded that 50 gm and 75 gm mineral supplement fed to milch buffaloes as recommended by the manufacturer can be the mineral supplement for obtaining optimum milk production in Murrah buffaloes and increase milk composition buffaloes.

Keywords: Mineral supplement, milk fat, Murrah buffaloes, milk production, and milk composition

Introduction
Buffalo Murrah in India was started as early as 2200 B.C., when the Murrah breed was started to have been evolved around Hissar, Panjab, and Delhi region using round horn bull on native buffalo. Murrah buffaloe's origin place is the Delhi region and Panjab. But animal a is a pure breed in U. P., Rajasthan and other places Rohatak in Panjab is a well-known market from where thousands of high yielders are exported, Characters of Murrah buffalo is the deep massive frame with short let it has short characteristic tightly curled horns; well-developed udder and a long tail the popular color is jet black with white markings on the tail, Face, and extremities. The skin is soft, smooth with scanty hair. The bodyweight of bulls amounts on average to 550k. Developing countries like India, Srilanka. Thailand, Malesia, and Pakistan are between 1500 - 2000 kg. India's per lactation yield 1600 - 2500 kg more than as against to 2600kg per lactation as the world average. Energy demand is very high during early stage of lactation but supply does not commensurate with demand thus affecting the production potential of animals (Sirohi *et al*., 2010) [11]. Hence, during early lactation, dairy animals are often forced to draw on body reserves to satisfy energy requirements thereby leading to a substantial loss in bodyweight which adversely affects production, resulting in lower yield (Kim *et al*., 1993) [4]. Inclusion of unprotected fat in the dairy ration is limited to 3% of dry matter (DM) intake, beyond which the digestibility of DM and fiber are reduced (NRC, 2001) [8]. Besides, unprotected fat has a depressing effect on rumen cellulolytic microbial activity

(Ranjan *et al*., 2010) [10]. Effect of acute negative energy balance on lactation (Tyagi *et al*., 2010) [15]. The present work was undertaken to study the effect of mineral supplementing on milk yield and its composition in Murrah buffaloes.

Methods and Materials

The trial was conducted at Dairy farm, Department of Animal Husbandry, and Dairying. C.S. Azad University of Agriculture and Technology, Kanpur. To study the effect of the mineral supplement on milk production and its composition in Murrah buffaloes. Twelve healthy buffaloes were divided randomly into three groups based on their milk production. All the animals were dewormed and disinfested for ectoparasites before the start of the experiment adopting the standard protocol.

Method of feeding

Group T0 (control) was fed with a basal diet (berseem, wheat straw, and conventional concentrate mixture) without any supplement and treatment groups T1 and T2 were fed with the basal diet with mineral supplement @50g/day/animal and @75g/day/animal, respectively. The Mineral supplement was added and mixed in concentrate mixture uniformly in the morning and fed individually to each animal of the treatment group. The roughage: concentrate ratio of the diet was 60:40. Selected of twelve Murrah buffaloes Table 1 and Chemical composition of the feed ingredients are presented in Table 2. Information about milk production and milk composition was collected for an individual animal at a weekly interval. The experiment was carried out for 4 weeks with Murrah buffaloes.

Sample Collection and Analysis

Feed samples were collected from each group at a weekly interval. The feed samples were analyzed for proximate principles as per A.O.A.C. (2005). Animals were hand milked twice daily (6.00 h and 18.30 h) and the yields were recorded. The milk samples were drawn at two consecutive days at weekly intervals from individual animals during both times of milking. After thoroughly mixing the samples of both times milking, a sample of 100 ml was taken using a dipper and transferred to a sample bottle with rounded corners (to avoid lodging of the milk solids) up to 3/4 the level, and then the bottle was corked tightly by a rubber stopper. The sample bottles were labeled properly. Milk samples were analyzed for milk composition in a Lacto scan milk analyzer.

Statistical Analysis

The data were analyzed statistically using standard methods (Snedecor and Cochran, 1994) [12]. The data were expressed as Mean ± SE and were analyzed by one-way ANOVA using the general linear model of SPSS version 16 and Duncan's multiple range tests were applied to test the significance. Significance was declared when the P-value was less than 0.05.

Table 1: Selected of twelve Murrah buffaloes given below

Treatment	Ear number	Lactation	Date of Calving	Milk /Yield/Day	Initial bod Weight (kg)
T_0	2	2	17-06-2017	6.20	469
	22	4	02-08-2017	6.45	461
	122	3	07-08-2017	5.20	436
	31	4	12-08-2017	6.10	455
T_1	19	2	21-10-2017	5.60	438
	16	2	27-10-2017	6.30	471
	18	2	30-11-2017	5.90	460
	17	3	17-12-2017	6.15	452
T_2	3	3	13-01-2018	5.80	438
	26	2	16-02-2018	6.95	478
	39	3	17-02-2018	5.08	446
	7	2	11-03-2018	6.12	459

Table 2: Composition of mineral supplement – (Agrimin) one kg bag contains.

S. N.	Particulars	Amount
1.	Vitamin -A	700000 I.U.
2.	Vitamin –D3	70000 I.U.
3.	Vitamin –D2	0.8 gm
4.	Vitamin -E	250 gm
5.	Potassium	100 gm
6.	Sodium	5.9 gm
7.	Manganese	1500 gm
8.	Sulphur	0.72%
9.	DL-Methionine	1000 mg
10.	Calcium	25.5%
11.	Magnesium	6000 mg
12.	Iodine	325 mg
13.	Iron	1500 mg
14.	Zinc	9600 mg
15.	Copper	1200 mg
16.	Cobalt	150 mg
17.	Phosphorous	12.75%

Table 3: Amount of different feed ingredients and feed supplement groups of Murrah buffaloes are given below.

S. No.	Feed Offered	D.M. %	CP %	EE %	CF %	NEE %	Total Ash%
1.	Wheat Straw	90.00	3.00	1.00	38.00	46.00	12.00
2.	Green Berseem	20.00	17.50	2.25	24.00	46.00	10.25
3.	Concentrate Mixture	90.00	20.00	1.80	15.80	51.10	11.50
5.	Wheat bran	90.80	11.50	2.90	12.70	60.50	10.40
6.	Barley	89.50	9.50	1.50	5.50	78.00	5.50
7.	Mustard cake	90.00	36.00	11.00	10.00	33.00	10.00

Result and Discussion

Milk production: - Overall mean values (%) of daily milk production pooled over periods were 24±715, 25±310, and 25±817 in treatment groups T0, T1, and T2, respectively. Statistical analysis of data revealed that the difference between milk production. There was (P<0.05) significantly increased in the T2 group as indicating that milk production was affected by Mineral supplementation of Murrah buffaloes. This finding is in agreement with Garg *et al*. (2003) [2] and Yadav *et al*. (2012) [17].

Milk fat: - Overall fat content of milk samples taken from Murrah buffaloes, due to mineral supplement and the week was recorded. The milk fat percent in 7±045, 7±090, and 7 ±950 percent in to. T1 and T2 Group respectively, group T2 was highly significant as compared to other groups. There was significant (P<0.05) improvement in milk fat percent due to feeding of Mineral supplement. The result of this study corroborated with the results by Nauta *et al*. (2006) [7].

Table 4: Effect of feeding of mineral supplement on milk yield and compositions'.

S. N.	Observation	Experiment groups		
		T_0	T_1	T_2
1.	Milk yield (Later.)	24±715	25±310	25±817
2.	Milk fat (%)	7±045	7±090	7 ±950
3.	Milk protein (%)	4 ±036	4±052	4±085
4.	SNF (%)	9±480	9±503	9±515
5.	Total solid (%)	16 ±840	16±855	16±903
6.	Milk lactose (%)	5±045	5±070	5±092
7.	Water content of milk	83±137	83±037	82±958
8.	Total milk Ash content of milk	0±738	0±750	0±770

Milk protein: Overall milk protein content of milk due to mineral supplement and per week recorded. The average milk protein content in the week was 4±036, 4±052, and 4±085 percent in To, TI, and T2 Group respectively; group T2 was highly significant as compared to other groups. Statistical analysis of data revealed that the difference among milk protein was non-significant indicating that milk protein was unaffected by mineral supplementation of rumen-protected fat to lactating Murrah buffaloes. This finding is in agreement with Naik *et al*. (2009) [6], Tyagi *et al*. (2009) [14], Thakur and Shelke (2010) [13], Sirohi *et al*. (2010) [11].

Solid, not fat (SNF): Overall SNF content of milk samples, due to mineral supplements and per week recorded. The SNF content average in the week was 9±480, 9±503, and 9±515 percent in To, TI, and T2 Group respectively. Group T2 was non-significant as compared to other groups. In the present investigation, there was found to be a non-significant effect of SNF content on the amount of affected by Mineral supplementation during a different week. The results obtained in the investigation were closed to the research workers Pillai *et al*. (2004) [9], Naik *et al*. (2009) [6], Thacker and Shelke (2010), Sirohi *et al*. (2010) [11].

Total solid: - Overall total solid content of milk samples, due to mineral supplement and per week recorded. The average content total solid in the week were 16±840, 16±855, and 16±903 percent in To, TI, and T2 Group respectively, group T2 was highly significant as compared to other groups. In the present investigation, there was found to be a significant effect of total solid content on the amount of affected by Mineral supplementation during a different week. The overall total solid content of Murrah buffalo's milk was recorded to be 17±0.20 percent which was close to the result obtained and reported by Wanapat *et al*. (1999) [16] and, Sirohi *et al*. (2010) [11].

Milk lactose: Overall milk lactose content of milk due to mineral supplement and was per week recorded. The average lactose contains due to mineral supplement was recorded to be was 5±045. 5±070 and 5±092 percent in TO, TI and T2 Group respectively, group T2 was highly significant as compared to other groups. There was (P<0.05) significantly increased in the T2 group as indicating that milk lactose was affected by Mineral supplementation of Murrah buffaloes. The overall lactose content of Murrah buffalo's milk lactose was recorded to 5±140 percent. Which was close to the result obtained and recorded by Kalita *et al*. (2009) [3].

Total Milk Ash: Overall total milk Ash content of milk samples, due to mineral supplement and per week recorded. The ash average content in the week was 0±738, 0±750, and 0±770 percent in To, TI, and T2 Group respectively; group T2 was highly significant as compared to other groups. In the present investigation, there was found to be a significant effect of total Milk Ash content on the amount of affected by Mineral supplementation during a different week. The overall total Milk Ash content of Murrah buffalo's milk was recorded to be 0.800 percent, which was close to the result obtained and reported by Wanapat *et al*. (1999) [1] and Sirohi et.al. (2010).

TheWater content of milk: - Overall Water content of milk of content of milk samples, due to mineral supplement and per week recorded. Water content average per week was 83±137, 83±037, and 82±958 percent in To, TI, and T2 Groups respectively group T2 was highly significant as compared to other groups. In the present investigation, there was found to be a significant effect of Water content milk of content on the amount affected by Mineral supplementation during a different week. The result obtained and investigated by Singh and Singh (2003), Naik *et al*. (2009) [6], Tyagi *et al*. (2009) [14], Thakur and Shelke (2010) [13], Sirohi *et al*. (2010) [11].

Determination of economical Murrah buffalo mineral supplement

Mineral supplement given to the Murrah buffalo Agrimin at the rate of 50 gm was given to the T1 group and mineral supplement Agrimin at the rate of 75 gm given to the T2 group of Murrah buffaloes. The calculation regarding the cost & profit of mineral supplements is given in the table**.**

Table 5: Cost and benefit of mineral supplement of different doses.

S.N.	Mineral Supplement Dose (gm/day)	Cost of minerals (Rs./day)	Amount of additional milk (ml/day)	Cost of additional milk (Rs./day)	Net profit (percentage)
1	Agrimin (50 gm)	3.13	163	6.52	108.30
2	Agrimin (75 gm)	4.67	260	10.40	122.69

From the table, it is clear that based on net profit percentage the mineral supplement Agrimin 75 gm was economically cheaper than mineral supplement Agrimin 50gm. The result was very close to Meet *et al* (2015) [5].

Conclusion

Based on the above finding it can be concluded that mineral groups (TI and T2) shown better milk production performance. They were not affecting milk production. It is, therefore, recommended that the supplementation of this mineral supplement is beneficial in Murrah buffaloes, has shown the best performance over mineral supplementation 75 gm Agrimin.

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