



Efficacy of Area Specific Mineral Mixture and Vitamin AD₃E Supplementation on Milk Production Performance of Dairy Cattle

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ABSTRACT

The present study was carried out to assess the effect of Area specific mineral mixture (ASMM) and Vitamin AD₃E supplementation on milk production and composition of dairy cattle's in Betul district of Madhya Pradesh. A total of thirty lactating dairy cattle (n=30) were divided into three groups (10 milch cows/group) viz., control, Treatment 1 and Treatment 2. Animals from control group were not supplemented any vitamin or minerals, animals from treatment group T1 were fed Vitamin AD₃E only @5 grams/animal/day, while animal from T2 group were fed with Vitamin AD₃E @5 grams/animal/day and area specific mineral mixture @ 100 grams/animal/day for a period of 100 days. Basal diet was same for all treatments. Milk yield of these animals were recorded by their owners and these values were averaged for 0-100 day's interval. Milk components such as milk fat and milk solids not fat (SNF) were also evaluated from milk samples collected daily and economy of the each treatment calculated. Area specific mineral mixture along with Vitamin AD₃E supplemented animals showed significant increase in milk yield, Fat% and SNF% as compared to only Vitamin supplemented and Control group of animals. Also benefit cost ratio of milk production was also found significantly higher (p<0.05) in ASMM and Vitamin supplemented dairy animals as compared to only Vitamin supplemented and control group.

HIGHLIGHTS

- Feeding of ASMM and Vit. AD₃E increased milk yield, Fat% and SNF% in dairy cattles.
- ASMM and Vit. AD₃E supplementation increased benefit cost ratio of milk production.

Keywords: Area specific mineral mixture, Vitamin, Dairy cattle, Milk production

Livestock sector plays a very important role in improving the socioeconomic conditions of developing countries like India (Herrero *et al.*, 2013). Livestock sector not only contributes to agricultural or national economy in general, but also provides employment generation opportunities, asset creation, coping mechanism against crop failure and social and financial security (Singh *et al.*, 2020). The productivity of dairy cows is dependent on balanced feeding by providing adequate quantities of all necessary nutrients to meet their requirements for a particular physiological function but in our country, animal feeding is traditional in nature and generally depends upon locally available feed resources, that constitute a major portion

of diet which are poor in essential minerals (Garg *et al.*, 2013). So, Supplementation of the mineral mixture is of vital importance for animals and it helps in improving the growth rates, feed utilization efficiency, milk production, reproductive efficiency, resistance against infectious diseases, and also minimizing the incidence of certain metabolic diseases, and reduces inter-calving interval (Mohanta and Garg, 2014).

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Composition of soil, air temperature and rainfall affect the crop ability to reach maturity and composition of crops/ fodders. There is variation in mineral content in soil or in plant in different agro-climatic zones. Here area specific mineral mixture (ASMM) which contain the most deficient minerals by assessing the mineral content in feeds and fodders of animals in different agro-climatic zones will provide best approach to ameliorate deficiency of minerals (Singh *et al.*, 2016).

The animals in Betul district (Madhya Pradesh) are fed mainly on straw and some amount of green fodder and concentrate. Farmers do not use mineral mixture in the animal feed. This is the main reason that animals are undersize and underweight at maturity time and deficient of mineral and they are attaining more time for first conception and the milk production is very low. Lower fat and SNF are significant problems in this area due to lack of minerals. After surveying the area, we came to know about these facts and decided to take out study on use of area specific mineral mixture and vitamin in animal feed to sort out these problems.

MATERIALS AND METHODS

This experiment was carried out in lactating dairy cattle in Rondha Village of Betul district (Madhya Pradesh). All the animals were selected at a mid stage of 2nd lactation, milk yield and parity. A total of thirty lactating dairy cattle (n=30) were divided into three groups (10 milch cows/group) viz., control, Treatment 1 and Treatment 2. Animals from control group were not supplemented any vitamin or minerals; animals from treatment group T1 were fed Vitamin AD₃E only @5 grams/animal/day, while animal from T2 group were fed with Vitamin AD₃E @5 grams/animal/day and area specific mineral mixture @ 100 grams/animal/day for a period of 100 days. Basal diet was same for all treatments. Standard animal management practices were followed in the farmer's field. Animals were fed green fodder, hay and concentrate feed as per specific recommendation of standard feeding ration schedule (ICAR, 2013). Water was offered ad libitum throughout the experimental period. The feeding trial was lasted for 100 days.

Milk yield was recorded daily, twice both in morning and evening at 6:00 and 17:00 hours by the farmers and at weekly interval by the researcher. Data on milk

composition that is Fat% and SNF% were recorded in milk collection centre by owner on weekly basis. The benefit cost ratio for all the groups were calculated. A training programme was conducted for the farmers before starting the experiment to educate them for feeding and correct method of data recording on different parameters in the adopted villages.

Statistical Analysis

Suitable statistical procedures were followed for analysis of the data recorded under various experiments in this study. Different statistical designs were considered for analysis of data as per Snedecor and Cochran (1994) and analysis was done using SPSS programme.

RESULTS AND DISCUSSION

Effects on Milk yield

The present experiments were performed with dietary supplementation of area specific mineral mixture and Vitamin AD₃E to find out whether it have any effect or any change on milk yield, Fat%, SNF% and benefit cost ratio in dairy cattle in Betul district. The observations on milk yield and Fat% & SNF% in dairy cattle are presented in Table-1. The average milk yield for 1-100 days in treatment group T2 was found significantly higher ($p < 0.05$) as compared to its yield observed in T1 and control group. These finding were in agreement with the results reported by Srivara (2019) and Gupta *et al.* (2017) in crossbred cattle. Pandey *et al.* (2018) also reported increase in milk yield due to supplementation of area specific mineral mixture in dairy cattle. Feeding of area specific mineral mixture increased milk yield 25% in field trials (Tiwari *et al.*, 2013). Similar findings observed by Hackbart *et al.* (2010), who found increased milk production at 14 week supplementation of organic trace minerals to cattle. The supplementation of TANUVAS – mineral mixture to a dairy cattle resulted in increase in milk yield by 1.46 ± 0.14 and one litre per day in cow respectively (Akila *et al.*, 2013 and Senthilkumar *et al.*, 2016). Sahoo *et al.* (2017) and Singh *et al.*, 2020 also found increased milk yield by supplementation of area specific mineral mixture in dairy cattle of the hilly region.

Significantly higher ($p < 0.05$) milk production in supplemented animal with mineral mixture and vitamin indicating that supplementation attributes improved milk production potential of cattle could be due to having impact on the mammary myoepithelial cells in the udder during lactation. Further, synergistic effect of mineral mixture and vitamin contribute in the working of memory cells to enhance their productivity. This finding was in accordance with Ghosh *et al.* (2016) observation. Our finding is in supports of Yang *et al.* (2011) reported positive effect of vitamin and trace element on milk performance of cattles.

Furthermore, we found significant increase in Milk fat% and SNF% in diets supplemented with area specific mineral mixture and vitamin AD₃E than control and only vitamin supplemented group, while Mohsina *et al.* (2017) observed no significant differences in milk fat % and milk SNF % between the supplemented and non-supplemented mineral mixture in groups of animals. This might be due

to synergistic effect of we supplemented mineral mixture and vitamin together.

Cost of milk production and Benefit Cost ratio (BCR)

The economic analysis of the data showed that dietary supplementation of Vitamin AD₃E (T1) and combination of Vit AD₃E & area specific mineral mixture (T2) enhances the milk yield by 13.94 % and 31.60% per day respectively than the control group. It could be inferred from Table 2 that benefit cost ratio was higher ($p < 0.05$) in vitamin and ASMM supplement animals as compared to only vitamin supplemented and control group. The feeding cost of per litre of milk was significantly lower (₹ 16.43) in T2 group as compared to (₹ 17.24) in T2 group and (₹ 18.54) in control group. Gross return from sale of milk in T2, T1 and Control group were ₹ 340.8, ₹ 287.60 and 258.80 respectively and net profit per litre of milk was found to be

Table 1: Effect of area specific mineral mixture and Vitamin AD₃E supplementation on milk yield and Fat% & SNF% in dairy cattle

Parameter	Control group (n=10)	Treatment group (T1) (n=10)	Treatment group (T2) (n=10)	SEM	Significance
(a) Milk yield (litre/day)					
1. Initial (0 day)	6.23a	6.31a	6.17a	0.85	NS
2. Final average (1-100 days)	6.47a	7.19b	8.12c	0.32	*
3. Change in milk production (%)	03.85a	13.94 b	31.60c	3.68	*
4. Average milk Fat%	3.82a	4.17a	4.85b	0.35	*
5. Average milk SNF%	8.40a	8.72a	9.15b	0.29	*

Note: Numbers of observations are given in parentheses. Means bearing the different superscript within a row differ statistically significant; * $P < 0.05$, NS-Non significant.

Table 2: Economics impact of area specific mineral mixture and Vitamin AD₃E supplementation on benefit cost ratio in dairy cattle

Parameter	Control group (n=10)	Treatment group (T1) (n=10)	Treatment group (T2) (n=10)	SEM	Significance
(a) Milk yield (litre/day)					
1. Initial (0 day)	6.23a	6.31a	6.17a	1.43	NS
2. Final average (1-100 days)	6.47a	7.19b	8.52c	0.65	*
(b) Benefit cost ratio					
1. Cost of feeding /day/cow (₹)	120.00a	124.00a	140.0b	0.97	*
2. Average feed cost per litre of milk production (₹)	18.54c	17.24b	16.43a	0.22	*
3. Gross return from sale of milk (₹40/Litre)	258.80a	287.60b	340.8c	1.13	*
4. Net profit per day (₹)	138.80a	163.60b	200.8c	1.76.	*
5. Net profit per litre of milk (₹)	21.45a	22.75b	23.56c	0.35.	*
6. Benefit: Cost ratio	2.15a	2.31b	2.43c	0.11	*

Note: Numbers of observations are given in parentheses. Means bearing the different superscript within a row differ statistically significant; * $P < 0.05$; NS-Non significant.



higher in T2 group (₹ 23.56) than T1 group (₹ 22.75) and control group (₹ 21.45). The Benefit Cost ratio was also found higher in treatment group T2 (₹ 2.43) as compared to T1 (₹ 2.31) and control group (₹ 2.15). Similar result to the present finding was in accordance with Singh *et al.* (2020) and Srivara (2019) in milch cattle.

CONCLUSION

It may be concluded from the present study that dietary supplementation of combination of area specific mineral mixture and vitamin AD₃E to the lactating dairy cattle under field conditions not only increases the milk yield, but also increase Fat% & SNF% and reduce cost per litre of milk production and consequently improving socio-economic conditions of smallholders' dairy farmer in tribal district like Betul.

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