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Research Article

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Evaluation of mineral supplement prepared from limestone waste

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ABSTRACT

An experiment was conducted to evaluate mineral supplement prepared using limestone waste. Limestone waste (dust) available was collected from industries processing Lime. It was sieved with mesh size upto 1 mm and the material was used as source of Calcium for preparation of the mineral supplement. A total of 121.98 kg of mineral supplement was prepared for the feeding trial.Milch animals of similar parity (3-4) were selected from the field area in Bikaner district and supplemented with mineral supplement. The animals were milked twice a day, during morning and evening after interval of 12 hours. In the first phase 8 animals (2 each owned by each farmer) were divided into two groups of 4 each. All the animals were provided a mixed diet of wheat straw and groundnut fodder (1:1) along with Cottonseed cake 5 kg which was soaked in water for 3-4 hours before mixing with equal quantity of dry fodder (wheat straw and groundnut fodder). One animal of each farmer was offered mineral supplement and the other served as control. In the first phase mineral supplement was offered in the treatment group (along with the concentrate) for a period of 56 days. Observations on milk production were recorded daily during the period. The study was continued in second phase with one animal to observe long term effect of the supplement for which one cow was provided mineral supplement for a period of 150 days. Since all the animals were not similar in milk production, fixed quantity of 50g/h/d was given in two equal doses of 25g each. Data reflected that 51.1% of milk was produced during morning and 48.9% during evening milking. Feeding of supplement had a significant effect on milk production per cow. Milk production was sustained at an higher level due to feeding of mineral supplement which otherwise would have decreased due to higher demand of Ca and P for milk secretion. It could be concluded from the studies that cheaper source of Calcium as limestone dust could be used effectively for preparation of mineral supplement. Feeding of mineral supplement containing Lime stone dust did not have any negative effect on animal health. Its feeding consistently improved milk production and sustained it for a long period in cattle. Thus limestone waste could serve as a useful ingredient for production of mineral waste for livestock. Milk production was similar at the start of experiment. Differences in milk production were observed which increased gap among the groups. Significantly higher (P≤0.01) milk production was observed in animals supplemented with mineral mixture. Week had a significant effect on milk production per cow. Milk production was sustained at a higher level due to feeding of mineral supplement which otherwise would have decreased due to higher demand of Ca and P for milk secretion. Data reflected that 51.1% of milk was produced during morning and 48.9% during evening milking. To study the long term effect of mineral supplementation observations on milk production were recorded for nearly 150 days with one farmer. It was observed that milk production follows a zig zag curve. Considering that the management factors were optimized, results on long term feeding of supplement containing lime stone waste indicated that milk production could be sustained for a long period as it dropped slowly to a tune of 0.006kg/d after obtaining peak, thus reflecting that it had positive effect.

Key words: Limestone waste, Mineral mixture, Supplementation. Milk production, Cow

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INTRODUCTION

Minerals perform an array of functions in the animal body. Since minerals elements are not synthesized in the animal body, feed and water remain the only source of supply to the body. Since mineral elements play vital role in augmenting production and reproduction in farm animals [4]. Mineral deficiencies have been reported in arid zone of Rajasthan [6]. Deficiencies of different minerals in feed and water are responsible for great loss in animal health and production. Consumption of milk is increasing day by day, to cater needs of growing population. To sustain production mineral supplements are required especially by the lactating animals. Farmers are now being advocated to include mineral mixture in the feeding regime of livestock to prevent losses due to mineral deficiencies. Therefore

the addition of mineral mixture in the diet of lactating animals is the practical approach to increase he production. Since cost of supplementation from mineral supplements prepared from analytical grade salts are 3-10 times expensive than feed grade salts due to variability in the element content [1] and basic composition [16], thus there is need to find alternate sources which could be economical for the farming community. Commonly used mineral resources include rock phosphate [17] and Di Calcium phosphate [11] both contain higher level of Fluorine however BIS has recommended value of less than 0.05%. Milk production and milk fat content was not affected in cows fed different sources of calcium in the diet in a 120 day feeding trial [15]. Experiment was thus planned to use to replace Calcium to an extent possible from Di calcium phosphate with lime which is much cheaper source of Calcium and evaluate its effect on milk production in cattle.

EXPERIMENTAL SECTION

Preparation of mineral supplement: To evaluate mineral supplements prepared from wastes in livestock, Limestone dust available waste was collected and sieved with mesh size upto 1 mm The material was used as Calcium source for preparation of the supplement. Commercial salts as Di Calcium phosphate, Di Sodium hydrogen phosphate, Magnesium Oxide, Ferrous sulfate, Zinc oxide, Manganese chloride, Cobalt chloride, Potassium iodide and common salt (Sodium chloride) were procured. Sodium chloride was grinded and passed through the requisite sieve to reduce particle size. Salts were then were then weighed to keep the elemental concentration as per specifications [3] for Mineral supplement (Type 1: with common salt) contained Calcium-19.054%, Phosphorus-9.003%, Zn-0.304%, Cu-0.061%, Fe-0.402%, Co-0.009%, I-0.023%, Mn- 0.100. A total of 121.98 kg of mineral supplement was prepared for the feeding trial.

Selection of animals: Milch animals of similar parity (3-4) were selected from the field area in Bikaner district and supplemented with mineral supplement. The animals were milked twice a day, during morning (6 AM) and evening (6 PM) after interval of 12 hours. In the first phase 8 animals (2 each owned by Kalu Ram, Rameshwar, Satu Ram and Raja Ram) were divided into two groups of 4 each. All the animals were provided a mixed diet of wheat straw and groundnut fodder (1:1) along with Cottonseed cake 5 kg which was soaked fed 3-4 hours before mixing with equal quantity of dry fodder (wheat straw and groundnut fodder). One animal of each farmer was offered mineral supplement and the other served as control. The animals were grouped randomly in such a way that milk production at the initial stage was similar among groups. In the first phase mineral supplement was offered in the treatment group (along with the concentrate) for a period of 8 weeks (56 days). Observations on milk production were recorded during the period. The study was continued in second phase with one animal to observe long term effect of the supplement for which one cow was provided mineral supplement for a period of 150 days (cow owned by Rameshwar).

Dosage of Mineral supplement: Since all the animals were not similar in milk production, fixed quantity of 50g/h/d was given in two equal doses of 25g each. The mineral supplement was mixed with the Concentrate supplement just before offering it to the cows during morning and evening. Daily milk production records of each cow were collected, tabulated and analyzed statistically by randomized block design [13].

RESULTS AND DISCUSSION

Milk production in different groups: Milk production was similar at the start of experiment, but with advancement of experiment, differences in milk production were observed which increased gap among the groups. Despite of differences among group's effects due to farmer and week were not observed however, significantly higher milk production was observed in animals supplemented with mineral mixture. Week had a significant effect on milk production per cow, but the milk production was sustained at an higher level due to feeding of mineral supplement which otherwise would have decreased due to higher demand of Ca and P for milk secretion. Data reflected that 51.1% of milk was produced during morning and 48.9% during evening milking. To study the long term effect of mineral supplementation observations on milk production were recorded for nearly 150 days with one farmer. It was observed that milk production follows a zig zag curve. At times it increases and later decreases, which is due to change in the major feed supplements, season, availability of drinking water, milker etc. Considering that the management factors were optimized, results on long term feeding of supplement indicated that milk production could be sustained for a long period as it dropped slowly to a tune of 0.006kg/d after obtaining peak, thus reflecting that it had positive effect.

Studies conducted under field conditions with levels of mineral mixture supplementation revealed that milk production performance improved in crossbred cows supplemented with mineral supplement at the rate of 25g and 35g/h/d without affecting milk composition [14]. In another observation for 8 weeks conducted under field conditions at Jaipur in cows given additional mineral mixture supplementation 25 and 50g/h/d improved milk

production performance proportionate to supplementation [10]. In the present study mineral supplement was provided at the rate of 50g/h/d, the results were similar to earlier findings, thus reflecting requirement for a dietary mineral supplement to sustain higher milk production in cattle and buffaloes.

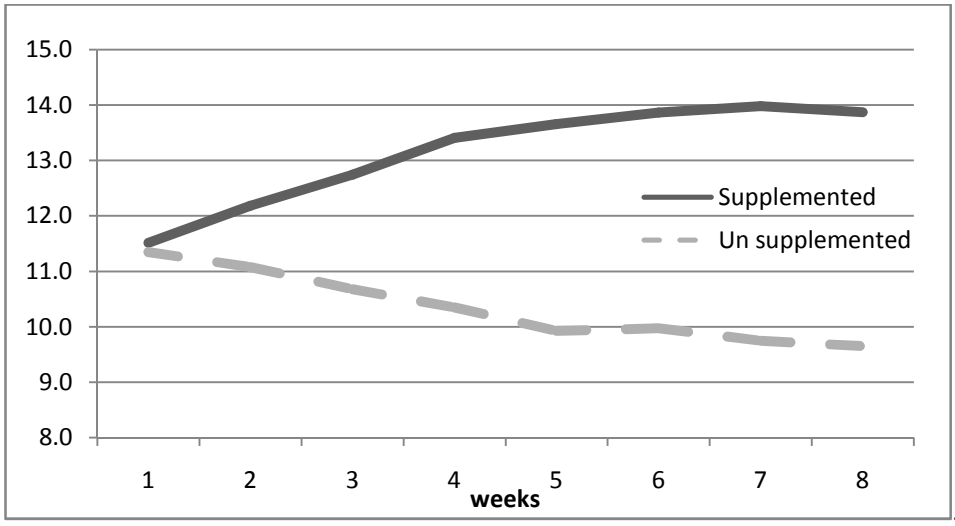
Table 1 Proportion of different salts used to prepare mineral supplement

Salt	Percentage	Quantity (kg)
Di Calcium Phosphate	32.500	39.640
Calcium carbonate	29.760	36.300
Di Sodium Hydrogen Phosphate	8.000	9.758
Magnesium oxide	4.700	5.733
Zinc oxide	0.380	0.464
Ferrous sulfate	2.000	2.440
Copper sulfate	0.240	0.293
Manganese sulfate	0.360	0.439
Cobalt chloride	0.030	0.037
Potassium iodide	0.030	0.037
Sodium Chloride	22.000	26.840
Total	100.00	121.98

Table 2 Milk production in different groups (kg/d)

Week	1	2	3	4	5	6	7	8	Mean
Supplemented group									
1	10.586	11.343	11.514	11.829	12.186	12.157	12.271	11.986	11.734
2	8.4714	8.7571	9.1286	9.8714	10.114	10.286	10.386	10.229	9.655
3	13.586	14.000	14.457	15.014	15.143	15.271	15.429	15.386	14.786
4	13.429	14.643	15.871	16.943	17.186	17.743	17.843	17.886	16.443
Mean I	11.518	12.186	12.743	13.414	13.657	13.864	13.982	13.871	13.154
Un supplemented group									
1	12.400	12.100	12.100	11.800	11.100	10.900	10.500	10.500	11.425
2	11.100	11.100	10.200	9.800	9.300	9.400	9.300	9.200	9.925
3	12.000	11.300	10.900	10.300	9.900	10.200	10.200	9.800	10.575
4	9.900	9.800	9.500	9.500	9.400	9.400	9.000	9.100	9.450
Mean II	11.350	11.075	10.675	10.350	9.925	9.975	9.750	9.650	10.344
SEM	0.625	0.695	0.840	0.963	1.029	1.073	1.119	1.136	0.318

Figure 1 Effect of feeding mineral supplement on milk yield



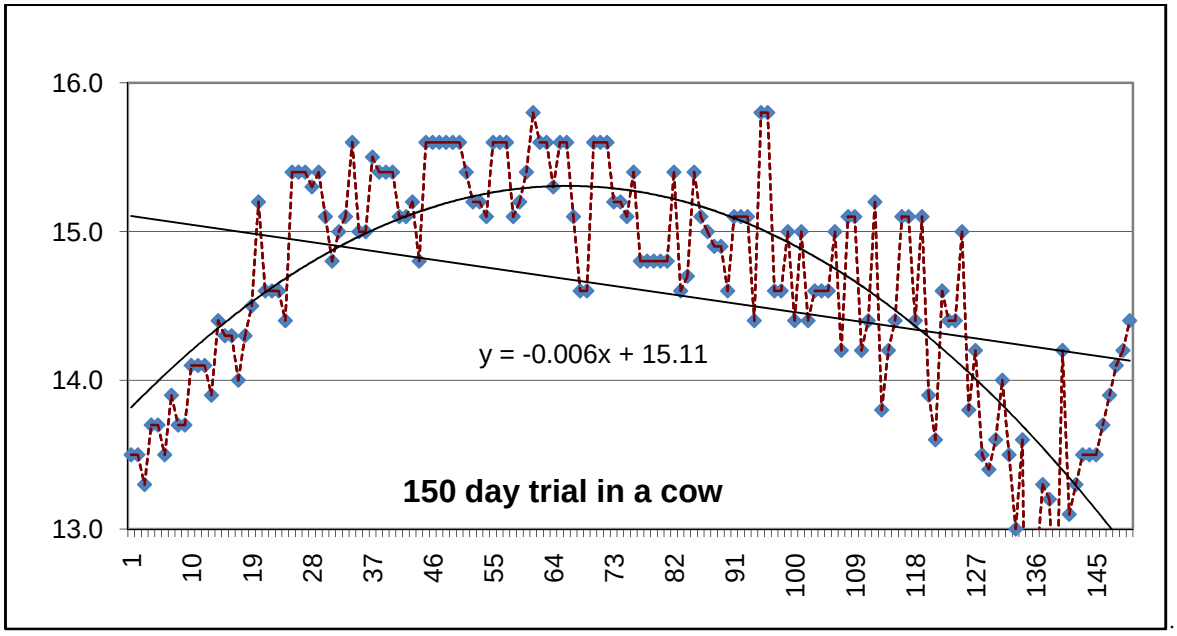
Results of milk production studies indicate that low cost mineral waste especially Calcium source could be used fruitfully for the purpose. This would help to reduce the cost of preparing the supplement. Secondly the waste, which would otherwise, would have been dumped as a filling material would be a useful substitute for animals.

Assuming Total solid content to be 13.2%, Calcium 120 mg and phosphorus 93 mg per kg milk [12], output of Calcium and Phosphorus which are the major minerals is substantial (Table 3). This certainly reflects that apart from contribution from feeds offered there is need to supplement them to sustain milk production.

Table 3 Output of major minerals

Group	Milk production (kg/d)	Total Solids (kg)	Output		Input	
			Ca (g)	P (g)	Ca (g)	P (g)
Supplemented group						
Cow 1	11.734	1.549	1.859	1.440	3.60	1.80
Cow 2	9.651	1.274	1.529	1.185	3.60	1.80
Cow 3	14.786	1.952	2.342	1.815	3.60	1.80
Cow 4	16.443	2.170	2.605	2.019	3.60	1.80
Un supplemented group						
Cow 1	11.425	1.508	1.810	1.403		
Cow 2	9.925	1.310	1.572	1.218		
Cow 3	10.575	1.396	1.675	1.298		
Cow 4	9.450	1.247	1.497	1.160		

Figure 2 Effect of long term feeding of mineral supplementation on milk yield



Wheat straw which is a common ingredient used for feeding of cattle and buffaloes was found to contain 0.26% Ca and 0.1% P [9]. Additional Calcium supplementation is required when paddy straw is used as source of dietary roughage in lactating dairy cows as it decreased milk yield and milk fat content due to lower gut absorption of Ca [8]. Since straws are commonly fed as basal roughage which are low in Ca content.

Supplementation of Calcium and Phosphorus in the dietary of buffaloes improved milk production, milk fat and total solids content, thus mineral supplementation is important to reduce economic losses due to mineral deficiencies and helpful in increasing income of farmers [2]. Field studies on the ration of 2356 lactating cattle and buffaloes indicated that the animals were over fed protein and energy by their owners but under fed for Calcium and phosphorus; after ration balancing there was improvement in milk production and income from dairy husbandry enterprise; it also improved persistency of lactation [7].

Thus the source of Calcium has less relevance it also indicates that cheaper sources of Calcium could be explored for usage in the mineral supplement. This would help in reducing the cost and make it more economical for the dairy entrepreneur to use it. To meet the ever increasing demand for milk, dairy sector is mushrooming in the sub urban areas of the cities. Though knowledge is spreading at a faster rate however, farmers need to be educated to promote use of mineral supplements especially for feeding dairy animals. The recommended level of mineral mixture in the ration is 2% of concentrate mixture or 50-100g/day in an adult animal. On farm, the farmers rarely use mineral mixtures in the animal ration even though intensive farming practices have changed, suggesting need to educate them regarding positive effects of minerals in the diet on production of animals.

CONCLUSION

It could be concluded from the studies that cheaper source of Calcium as limestone dust could be used effectively utilized for preparation of mineral supplement. Feeding of mineral supplement containing Lime stone dust did not

have any negative effect on animal health. Its feeding consistently improved milk production and sustained it for a long period in cattle. Thus limestone waste could serve as a useful ingredient for production of mineral waste for livestock.

REFERENCES

[1] S Aoyagi; DH Baker, *Poult Sci*, **1993,** 72, 1075-1083.
[2] I Begum; A Azim; S Akhter; MI Anjum; M Afzal, *Pak Vet J*, **2010**, 30(2), 105-109.
[3] *Mineral mixtures for supplementing cattle feed*, (3rd Ed) Bureau of Indian Standards, Manak Bhavan, I. B. S. Zafar Marg, New Delhi, **1992,** 4-5.
[4] L Corah, *Anim Feed Sci Technol*, **1996**, 2, 19-26.
[5] DK Dubey; SD Sharma; PV Raman Rao, Proc *XI Anim Nutr Conf*, 5-7th Jan, Jabalpur, **2004**, p 99.
[6] MR Garg; BM Bhanderi; PL Sherasia, *Anim Nutr Feed Technol*, **2009a,** 9, 209-220.
[7] MR Garg; SA Birader; A Kannan, Proc. *Anim Nutr Assoc World Conf*, 14-17 Feb, New Delhi, **2009b**, p 225.
[8] NKS Gowda; CS Prasad; LB Ashok, Proc *XI Anim Nutr Conf*, 5-7th Jan, Jabalpur, **2004**, p 100.
[9] D Lall; T Prasad, T. *Indian J Anim Nutr*, **1990**, 7(1), 1-6.
[10] J Palod; VS Singh; MS Joshi, *Feed Trends* (CLFMA), **2000**, 6(5), 3-5.
[11] KSN Prasad; A Chhabra; T Prasad, *Indian J Anim Nutr*, **1995,** 12(1), 49-51.
[12] RK Sawal, *Sheep Milk*, In: *"Prospects and dimensions for utilization of arid foods"*, Eds M. Goyal & S. K. Sharma. Yash Publishing House, Bikaner, **2006**, 146-151.
[13] *Statistical Packages for the Social Sciences Base 10*, SPSS Software Products, SPSS Inc, Chicago, IL, **1997**.
[14] PK Upadhayay; RJ Gupta; HB Dwevedi, Proc *XII Anim Nutr Conf*, 7-9th Jan, Anand, **2006**, p79.
[15] DK Dubey**;** SD Sharma; PV Raman Rao, Proc *XI Anim Nutr Conf*, 5-7th Jan, Jabalpur, **2004**, p99.
[16] SD Boiling; HM Edward; JL Emmert; RR Bichi; DH Baker, *Poult Sci*, **1998**, 77, 1388-1392.
[17] CB Ammerman; R Valdivia; IV Resa; RR Henry; JP Feaster, *J Anim Sci*, **1984**, 59, 1092.