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EFFECTS OF STRATEGIC DIETARY SUPPLEMENTATION OF BUFFALOES ON ECONOMICS OF THEIR MILK PRODUCTION

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ABSTRACT

A study was carried out to elucidate the effect of strategic dietary supplementation on the economics of milk production in lactating buffaloes. The body weight of the animals was recorded before and after the experiment. Body weight recorded before the start of experiment in different groups was 554.5 ± 4.66, 540.16 ± 5.62, 552.9 ± 4.36 and 542.1 ± 7.26 kg while, at the end of experiment it was 557.20 ± 5.0, 545.24 ± 4.1, 547.99 ± 4.1 and 538.88 ± 5.0 kg, respectively. Milk yield of the animals recorded in different groups during the experimental period was 7.48 ± 0.65, 7.54 ± 0.54, 7.23 ± 0.54 and 7.18 ± 0.65 kg, respectively. The quantity of feed reduction was 1.28 and 1.65 kg/ animal/day in Groups 3 and 4 as compared to control group of animals. The economics of milk production calculated in different groups was 12.27, 12.09, 11.25 and 10.86 Rs of feed/ kg of milk production by the animals.

Keywords: lactating buffaloes, strategic dietary supplementation, nutrient requirements, economics of milk production

INTRODUCTION

India is predominantly an agrarian society where lactating animals are the backbone of national economy. It has the largest livestock population in the world. According to 17th Livestock Census 2003, the total livestock population in India was 485.002 million. Madhya Pradesh contributed around 16.704 million to this total. The livestock population at Jabalpur was 7.11 lacs [7,110,000].

The buffalo population India, i.e., 97.92 million (17th Livestock Census, 2003) was the world's largest and was around 57 percent of the world's total buffalo population. While in Madhya Pradesh, the total buffalo population was 7.57 million which ranked fourth in India, The buffalo population in Jabalpur division of M.P. was around 99,374 (17th Livestock Census, 2003).

In 2005-06, the estimated milk production and per capita availability of milk in India was 97.1 million tons and 241 gm/day, respectively. In Madhya Pradesh milk production was 6.28 million tons (Basic Animal Husbandry Statistic, 2006). The major source of milk is buffaloes. For better and more efficient milk production buffaloes, should be provided an adequate balanced ration. Minerals play a very important role as co-factor for various vitamins as well as being required as a constituent of milk. Hence, it is essential that a lactating buffalo diet should be supplemented well with a good quality mineral mixture along with common salt. In most commercial dairies as well as in rural areas, mineral mixture is not used in the diet of buffaloes.

In India, ruminants depend on straw for their maintenance. The production requirement most often is met from protein supplements like groundnut cake, mustard cake or cottonseed cake (Lailer and

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Singh, 1998) and very seldom from compounded concentrate mixture (Prasad *et al.*, 1993), and this affects the farm economics. Therefore, to reduce the cost of milk, Das and Singh (2004) replaced half of the GNC with berseem and got better performance in growth rate of crossbred calves.

Every animal requires a different level of nutrients according to their physiological needs (Sharma and Thakur, 1991) but this concept is not put into practice on commercial dairy farms because they offer the same level of nutrients to all animals. This was the major factor responsible for increasing the cost of milk and also causes serious disturbances in the health status of animals. Thus, nutrient supplementation beyond the need of the animals may yield only diminishing returns and hence, to elicit the maximum benefit out of the supplementation a specific strategy must be chalked out prior to the start of the nutrient supplementation. This study was therefore planned to see the effect of strategic dietary supplementation on the economics of milk production in buffaloes.

MATERIALS AND METHODS

On a private dairy farm at Pariyat, Jabalpur, M.P., 900 breedable buffaloes were surveyed for their feeding regimes, and forty lactating Murrah buffaloes were selected from among. They were assigned to four dietary treatments, considering their body weights, milk yield, parity and stage of lactation.

Body measurements of all the forty buffaloes were taken in the beginning and at the end of the experiment. For body weights of the animals, measurements were taken before feeding and watering in the morning, and body weight was calculated by the Schaeffer's formula:

$$\text{Live weight (in pounds)} = \frac{\text{Length} \times \text{Girth}^2}{300}$$

The concentrate mixture which was used on the dairy farm included maize, mustard oil seed cake, rice polish, wheat bran, chuni, moong seed, and common salt. To increase the bulk of the concentrate mixture, wheat straw was also added to it. The detailed composition of the concentrate mixture is given in Table 1.

Group 1 was the control. The animals were fed the diet regularly used on the farm. It consisted of wheat straw ad lib., green berseem provided daily in the evening, and concentrate mixture was provided at the time of milking daily in the morning and evening. Group 2 animals were fed a similar diet to Group 1 but it was supplemented with mineral mixture 2% of the diet. Group 3 animals were maintained on strategic supplementation, i.e. the ration given exactly equalled their nutrient requirements. Group 4 animals of this group were fed a diet similar to that of Group 3; however it was devoid of minerals supplementation.

The concentrate mixture was offered at 2.30 AM and 3.00 PM, whereas the chaffed mixed roughage was offered at 3.00 PM. Samples of feed were analyzed for proximate composition, using A.O.A.C. (1990). The data obtained during experiment was analyzed by using the CRD method as described by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Body weight of the Animals:

The body weight of all the animals was recorded before and after the experiment to observe the effect of strategic supplementation on change in their body weights. The average body weight of buffaloes in Group 1 at the start of the experiment was 554.5 kg, while after the termination, it was recorded as 557.20 kg. The average body weight recorded in Group 2 was 542.4 kg before the experiment, while at the end of the experiment, it

was 545.24 kg. In Group 3, the average weight of the animals before the start of experiment was 552.9 kg, while that at the end of experiment was 547.99 kg. In the last group, i.e. Group 4, the average body weight of the animals before the start of experiment was 542.1 kg, while that at the end of the experiment was 538.88 kg. Studies revealed that there was no significant effect of strategic supplementation on the body weight of animals. This result was comparable with the findings of Saha *et al.* (1997a); Saha *et al.* (1997b); Akter *et al.* (2004); Renquist *et al.* (2005). The average body weight of the animals before the start of the experiment is presented in Table 2.

The average body weight of the animals after the termination of the experiment is presented in Table 3.

Milk production of the animals:

Milk yield was recorded on a fortnightly basis, and the average milk yield of the animals before the start of experiment is presented in Table 4. In Group 1 (control group) the average milk yield of the animals was 7.91 litres, which was highest among all the four groups. In Group 2, the average milk yield was 7.25 litre. In Group 3, the average milk yield of the animals was 7.70 litre. In Group 4, the average milk yield of the animals before the start of experiment was 7.18 litre. The average milk production recorded before the start of experiment is presented in Table 4.

The average milk production recorded after the start of experiment is in Table 5. In Group 1 (control group), the average milk production of the animals was 7.48 litre. In Group 2, the average milk production of the animals after the experiment was 7.54 litre. In Group 3, the average milk yield of the animals was 7.23 litre. In Group 4, the average milk yield of the animals was 7.18 litre. The present study revealed that milk yield of the animals did not differ significantly due to strategic supplementation. This was in agreement with the work done by Sampath *et al.* (2004); Singh and Singh (2006); Soder *et al.* (2006). The average milk yields of the the groups are presented in Table 5.

Nutrient requirements of the animals:

Nutrient requirements of different animals of the different groups were calculated using ICAR (1998) feeding standards. The maintenance requirements of buffaloes were calculated on the basis of their body weights while production requirements were calculated on the basis of their milk yield. The nutrient requirements for different groups of buffaloes are furnished in Table 6.

Strategic supplementation to the animals

Animals were strategically supplemented exactly as per their nutrient requirements according to their maintenance and their production.

Percent excess and deficit of nutrients supplied to the animals

After calculating the total nutrients offered as well as the total nutrients required by the animals according to their maintenance as well as their production status, the percent ages of excess and deficit of nutrients were calculated by subtracting the total nutrients offered and total nutrients required by the animals. In Group 1, 12.85% excess DCP and 15.67% excess TDN were supplied in the feed. In Group 2, after calculating their nutrient requirements and nutrients supplied, the percent ages of excess of nutrients in terms of DCP was 22.75% while that in term of TDN was 23.29%; this was the highest among all the four groups. In Group 3, the percent ages of excess DCP and TDN in the diet were 14.43% and 16.90%. In Group 4, the percent ages of excess of nutrients in terms of DCP and TDN were 18.59% and 20.26%, respectively. These excess nutrients can be minimized to maintain the economics of milk production. In the present study, we found that the farmers fed of excess DCP

Table 1. Ingredient composition of concentrate mixture used at farm.

Ingredients	Quantity/day (kg)	Percentage (%)
Maize (yellow)	1120.00	19.05
Mustard oilseed cake	560.00	9.52
Cotton seed cake	280.00	4.76
Rice polish	360.00	6.12
Wheat bran	1540.00	26.19
Chuni	1080.00	18.36
Moong	140.00	2.38
Wheat straw	700.00	11.91
Common salt	100.00	1.71
Total	5880.00	100
Calculated		
DCP%	10.54	
TDN%	62.19	

Table 2. Average body weight of animals before the start of experiment.

Group 1	Group 2	Group 3	Group 4
554.5 ± 4.66	540.16 ± 5.62	552.9 ± 4.36	542.1 ± 7.26

Table 3. Average body weight of animals after termination of experiment.

Group 1	Group 2	Group 3	Group 4
557.20 ± 5.0	545.24 ± 4.1	547.99 ± 4.1	538.88 ± 5.0

Table 4. Average milk production of animals on a fortnightly basis before supplementation.

Group 1	Group 2	Group 3	Group 4
7.91 ± 1.02	7.25 ± 0.49	7.70 ± 0.78	7.16 ± 1.05

Table 5. Average milk production of the animals on fortnightly basis after strategic supplementation.

Group 1	Group 2	Group 3	Group 4
7.48 ± 0.65	7.54 ± 0.54	7.23 ± 0.54	7.18 ± 0.65

and TDN to the animals and were not using mineral mixture in the diet of animals, as was also reported by Ramesh *et al.* (2006) and Nagalakshmi *et al.* (2006b). These results were in agreement with the Nagalakshmi *et al.* (2006a); Singh *et al.* (2006); Tewatia *et al.* (2006). The studies reported by Singh *et al.* (1997) also indicated that CP and TDN intake was 16.74% and 22.01% higher in buffaloes. Similarly, Shahi and Saraswat (1997) also observed 31.25% higher TDN intake in milch cows and buffaloes. The percentages of excess and deficit of the nutrients are presented in Table 7.

Strategic supplementation

By strategic supplementation, we have reduced the feed supplied to different groups of animals on the dairy farm. Group 1 was control, so their feeding was as per their normal feeding schedule. In Group 2, there was only supplementation of mineral mixture along with feed (2% of concentrate mixture). In Group 3, there was a reduction of 1.28 kg of concentrate mixture per animal. While, in Group 4, there was reduction of 1.65 kg of concentrate mixture per animal. The total concentrate mixture reduction of Group 3 was 16.64 kg per day. While, that of Group 4 was 14.85 kg per day. The details on the reductions of concentrate mixture are presented in Table 8.

Economics of milk production

Cost of concentrate mixture

In the present study firstly we observe the ingredients used on the dairy farm which is mentioned in Table 1. For the computation of concentrate mixture and the mineral mixture used for supplementing the animals taking into consideration the existing market rate of the different feed ingredients used, thus the overall cost of the concentrate mixture was 823.53 per [1 quintal = 100 kg] including the mineral mixture; this cost was calculated on the basis of percent composition of the different ingredients used in the concentrate mixture. The percent composition, approved market rate of the feed ingredients and the cost of feed in Rs. per quintal is presented in Table 9.

Economics of milk production

The economics of milk production was calculated before and after the start of experiment to observe the change in cost of feed per kg of milk which governs the overall dairy practice. Thus, when we calculated the economics of the dairy farm in the same animals selected for the experiment before the start of the experiment, the cost of feed per kg of milk in Group I was Rs. 11.38. In Group 2, the cost of feed per kg of milk was Rs. 12.41 which was more than Group 1. In Group 3, the cost was less than that of Group 2 but slightly higher then Group 1; it was Rs. 11.67. In the last Group i.e. Group 4, the cost of feed was highest among all the four Groups; it was Rs 12.60. The variation observed in the cost of feed per kg of milk between Group 1 and 3 was Rs. 0.29. The data collected on the economics of milk production before the start of experiment is presented in Table 10.

The economics of milk production between the different experimental groups was again calculated after the start of experiment. The cost of feed per kg of milk production was Rs. 12.27 in Group 1. While, it was Rs. 12.09 in Group 2 slightly less than that of Group 1. In Group 3, the cost of feed per kg of milk was Rs. 11.25, which was lower than that of Group 1 or 2. In the last group, i.e. Group 4, the cost of feed per kg of milk was lowest among all the four groups; it was Rs. 10.86. The Most economic milk production was in Group 4, i.e. Rs. 10.86, but without the supplementation of mineral mixture. While, in Group 3, the cost was Rs. 11.25, which can be said to be the most profitable as it was strategically supplemented along with mineral mixture. The difference between the cost of feed

Table 6. Nutrient requirement of animals.

	Anim. B.W. (kg)	DCP (gm)	TDN (kg)	Avg. milk yield (ltr)	DCP (gm)	TDN (Kg)	DCP (gm)	TDN (Kg)
		Maintenance requirement			Production requirement		Total requirement	
GROUP 1								
Mean	554.53	320	3.9	7.91	498.4	3.639	818.4	7.53
GROUP 2								
Mean	542.48	345	3.90	6.67	420.25	3.068	726.09	6.85
GROUP 3								
Mean	552.92	318	3.88	7.70	485.10	3.53	750.63	7.42
GROUP 4								
Mean	542.12	313	3.83	7.16	451.15	3.29	764.48	7.12

Table 7. Percentage of excess or deficit of energy and protein in the diet of buffaloes of different groups.

Group	Supplied		Required		Excess (+) or Deficit (-)	
	DCP (gm)	TDN (kg)	DCP (gm)	TDN (kg)	Excess/ deficit of DCP (%)	Excess/deficit of TDN (%)
I	939.15	8.93	818.40	7.53	+ 120.75 (12.85%)	+ 1.4 (15.67%)
II	939.15	8.93	726.09	6.85	+ 213.66 (22.75%)	+ 2.08 (23.29%)
III	939.15	8.93	803.56	7.42	+135.59 (14.43%)	+ 1.51 (16.90%)
IV	939.15	8.93	764.48	7.12	+ 174.67 (18.59%)	+ 1.81 (20.26%)
Mean	939.15	8.93	774.07	7.20	161.16	1.70

Table 8. Feed reductions by strategic supplementation.

Groups	Excess DCP (gm)	Quantity of conc. mix. reduced (kg)
1	120.75	-
2	213.66	-
3	135.59	1.28
4	174.67	1.65

Table 9. Cost of concentrate mixture.

Ingredients	Composition in diet (%)	Rate (Rs/Q = quintal = 100 kg)	Cost of feed (Rs/Q = quintal = 100 kg)
Yellow Maize	19.05	939	178.87
M.O. Cake	9.52	1206	114.81
CSC	4.76	977	46.50
Rice polish	6.12	821	50.24
Wheat bran	26.19	779	204.02
Chuni	16.60	911	151.22
Moong grind	2.38	880	20.94
Common salt	1.70	340	5.78
Mineral mix.	2.00	1438.24	28.76
Wheat straw	11.91	187.99	22.39
Total	100		823.53

Table 10. Economics of milk production in the dairy before the experiment.

Treat	Roughage fed (kg)	Cost of Roughage (Rs)	Conc. fed (kg)	Cost of conc (Rs)	Tot. feeding cost (Rs)	Misc. exp. (Rs)	Total cost	Milk yield (kg)	Cost of feed/kg milk (Rs)
I	19.17	12.93	9.00	74.11	87.04	3	90.04	7.91	11.38
II	18.07	12.19	9.00	74.11	86.30	3	89.30	7.25	12.41
III	18.94	12.78	9.00	74.11	86.89	3	89.89	7.70	11.67
IV	19.46	13.13	9.00	74.11	87.24	3	90.24	7.16	12.60

Table 11. Economics of milk production of various group of animal after strategic supplementation.

Treat	Roughage fed (kg)	Cost of Roughage (Rs.)	Conc. fed (kg)	Cost of Conc (Rs.)	Total feeding cost (Rs.)	Misc. exp. (Rs.)	Total cost	Milk yield (kg)	Cost of feed /kg milk (Rs)
I	19.34	13.05	9.00	75.75	88.80	3	91.80	7.48	12.27
II	18.42	12.43	9.00	75.75	88.18	3	91.18	7.54	12.09
III	19.82	13.37	7.72	64.97	78.34	3	81.34	7.23	11.25
IV	19.53	13.17	7.35	61.86	75.03	3	78.03	7.18	10.86

per kg of milk production of Group 1 and 3 was Rs 1.02 per animal per day. Thus the owner of a dairy of 800 animals can save Rs. 24,480 per month by strategic supplementation. The cost of feed/kg milk in buffaloes was also reported by Nayak and Baghel (2004) who surveyed the dairies of the Mahakoshal region of MP. They also observed similar pattern of cost of milk production in buffaloes. Sohane (2006) concluded that the cost of milk production was reduced by providing the concentrate mixture to the animals. Olfadehan and Adewumi (2008) also studied the effect of strategic supplementation in prepartum Bunaji cows and observed that trategic supplementation was beneficial in improving the production of animals and reducing the cost of milk production. The Economics of milk production was calculated after the strategic supplementation, which is presented in Table 11.

REFERENCES

A.O.A.C. 1990. *Official Methods of Analysis,* 15th ed. Association of Official Analytical Chemists. Arlington, USA.

Basic Animal Husbandry Statistic. 2006. Department of Animal Husbandry Dairying and Fisheries, Ministry of Agriculture, Govt of India, New Delhi.

Das, A. and G. Singh. 2004. Effects of partial replacement of groundnut cake with green berseem on growth of crossbred calves. *Indian J. Anim. Nutr.,* **21**(4): 224-228.

ICAR. 1998. *Nutrient Requirement of Livestock and Poultry,* 2nd revised ed. Indian Council of Agricultural Research, Krishi Anusandhan Bhawan, PUSA, New Delhi.

Lailer, P. and G. Singh. 1998. Effects of different dietry nitrogen sources on growth performance of crossbred cattle. *Indian J. Anim. Sci.,* **68:** 76-78.

Nagalakshmi, D., D. Narsimha Reddy, M. Rajendra Prasad and P. Pavani. 2006a. Feeding Practices and nutritional status of dairy animals in North Telangana zone of Andhra Pradesh, p.180. *In Proceedings of VIth Biennial Conference of Animal Nutrition Association,* India.

Nagalakshmi, D. D. Narsimha Reddy, M. Sudhakar Reddy and P. Pavani. 2006b. Assesment of feeding Practices and nutritional status of animals in North coastal zone of Andhra Pradesh, p. 180. *In Proceedings of VIth Biennial Conference of Animal Nutrition Association,* India.

Nayak, S. and R.P.S. Baghel. 2004. Feeding practices and economics of milk production in buffaloes of Mahakosal region of M.P., p. 149. *In Proceedings of XIth Animal Nutrition Conference, Jabalpur, M.P., 5-7 January, 2004. Animal Nutrition Society of India, Souvenir and Abstracts.*

Olafadehan, O.A. and M.K. Adewumi. 2008. Milk production and economic impact of strategic supplementation of prepartum Bunaji cows in the peri-urban areas of derived savanna of southwestern Nigeria. http://www.lrrd.org/lrrd20/3/olaf20041.htm

Prasad, C., K. Sampath, M. Shivaramaiah and T. Walli. 1993. Dry matter digestibility and supplementation of slender and coarse straw. *In Proceedings of International Workshop*, India.

Ramesh, S., D. Nagalakshmi, Y. Ramana Reddy and A. Rajashekher Reddy. 2006. Assesment of feeding Practices and nutritional status of dairy animals in Mahaboobnagar district of Andhra Pradesh, p. 177. *In Proceedings of VIth Biennial Conference of Animal Nutrition Association*, India.

Renquist, B.J., J.W. Oltjen, R.D. Sainz, J.M. Connor and C.C. Calvert. 2005. Effects of supplementation and stocking rate on body

condition and production parameters of multiparous beef cows. http://journals.cambridge.org/action/displayAbstract?fromPage=online&aid=777696

Saha, R.C., R.B. Singh, P.K. Roy and R.A. Day. 1997a. Milk production of cows fed a concentrate mixture made of local feeds available in Nadia, Maldah and Murshidabad, p. 98. *In Proceedings of VIIIth Animal Nutrition Research work Conference,* India.

Saha, R.C., R.B. Singh, P.K. Roy and R.A. Day. 1997b. Milk production of cows fed a concentrate mixture made of local feeds available in Birbhum and west Dinajpur district of West Bengal, p. 99. *In Proceedings of VIIIth Animal Nutrition Research work Conference,* India.

Sampath, K., U. Praveen, and M. Chandrasekharaiah. 2004. Effect of strategic supplementation of finger millet straw on milk yield in crossbred cows on farm trial. *Indian J. Dairy Sci.,* **57**(3)**:** 192-197.

Shahi, M.V. and B.L. Saraswat. 1997. Nutritional status of dairy animals in rural area of Siddhrath nagar district of eastern Uttar Pradesh, p. 96. *In Proceedings of VIIIth Animal Nutrition Research Work Conference*, India.

Sharma, D and K. Thakur. 1991. Nutritional requirements of cross bred cattle. *In Proceedings of Ist International Animal Nutritional Workers Conferences for Asia and Pacific*, India.

Singh D., D. Kumar and Harpal Singh. 1997. Feeding pattern of concentrate and fodder to different categories of milch animals of Nainital district in Uttar Pradesh, p. 95. *In Proceedings of VIIIth Animal Nutrition Research Work Conference*, India.

Singh, J., K.K. Yadav and A.B. Mandal. 1997. Feeding of milch buffalo in Hissar district of Haryana, p. 91. *In Proceedings of VIIIth Animal Nutrition Research Work Conference*, India.

Singh, M.K., V.K. Vidyarthi and V.B. Sharma. 2006. Nutritional status of milch buffaloes in the rural areas nearby Chitrakoot, p. 201. *In Proceedings of VIth Biennial Conference of Animal Nutrition Association*, India.

Singh, S.P. and D. Singh. 2006. Effect of feeding balanced ration on milk production of buffaloes in Kanpur Dehat, p. 223. *In Proceeding of VIth Biennial Conference of Animal Nutrition Association*, India.

Snedecor, G.W. and W.G. Cochran. 1994. *Statistical Methods*, 6th ed. Oxford and IBH, New Delhi.

Soder, K.J., M.A. Sanderson, J. L. Stack, and L.D. Muller. 2006. Intake and performance of lactating cows grazing diverse forage mixtures. *J. Dairy Sci.,* **89:** 2158-2167.

Sohane, R.K. 2006. Effect of total mixed ration in milk production and fat percentage in cross bred dairy cows, p. 42. *In Proceedings of VIth Biennial Conference of Animal Nutrition Association*, India.

Tewatia, B.S., K.R. Yadav and V.S. Panwar. 2006. Assesment of feeding system and plane of nutrition of high yielding buffaloes of Hisar District, p. 170. *In Proceedings of VIth Biennial Conference of Animal Nutrition Association*, India.

17th Livestock Census. 2003. Department of Animal Husbandry Dairying and Fisheries, Ministry of Agriculture, Govt. of India. http://www.dahd.nic.in/relcensus.htm