Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
www.entomoljournal.com
JEZS 2021; 9(1): 202-205

Received: 16-11-2020
Accepted: 21-12-2020

Vijay Kumar
Principal Investigator, Centre for Organic Animal Products Technology, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Vijay Kumar Chaudhary
Department of Livestock Production and Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Mohan Lal Chaudhary
Department of Livestock Production and Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Vikramjit Singh
Department of Livestock Production and Management, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Deepika Dhuria
Department of Veterinary Medicine, College of Veterinary and Animal Science, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Corresponding Author:
Vijay Kumar
Principal Investigator, Centre for Organic Animal Products Technology, Rajasthan University of Veterinary and Animal Sciences, Bikaner, Rajasthan, India

Economics of feeding of Sahiwal calves under different dietary regimes and management systems

Vijay Kumar, Vijay Kumar Chaudhary, Mohan Lal Chaudhary, Vikramjit Singh and Deepika Dhuria

Abstract
The present experiment was conducted on twenty four female Sahiwal calves of 4 to 8 months age. Calves were subjected to four treatment groups *viz*. 100 percent of ICAR feeding and routine management (T_1), 100 percent of ICAR feeding and improved management (T_2), 120 percent of ICAR feeding and routine management (T_3) and 120 percent of ICAR (Indian Council of Agricultural Research) feeding and improved management (T_4). The time spent by a labourer per calf per day was recorded as 11.09±0.311, 11.90±0.360, 10.43±0.133 and 12.56±0.174 minutes in respective groups. The time spent by labourer for water splashing and time spent per calf per day were highly significant ($P<0.001$) influenced by levels of feeding and management systems, while time spent on feeding of calves was only influenced by levels of feeding. The cost per kg weight gain was lowest in 120 percent of ICAR feeding (Rs.108) and improved management (Rs. 110) rather than 100 percent of ICAR feeding (Rs. 117) and routine management systems (Rs. 114). The total cost of rearing up to 350 kg body weight was lowest in calves fed 120 percent of ICAR feeding (Rs.27030) followed by calves kept in improved management (Rs.27677), routine managements (Rs.28384) and calves fed 100 percent of ICAR feeding (Rs.29225). Both the feed conversion efficiency as well as cost of rearing was most favourable for this management package and even calves were more comfortable reared under improved management systems.

Keywords: ICAR feeding, calving, economics, Sahiwal

Introduction
Calf production is most expensive part of the dairy farm operation. It requires more inputs for a longer period of time with no visible returns than any other farm operation. Growth rates of replacement of calf affect economic returns on dairy farms. Balanced feeding, improved management and minimum disease prevalence can be helpful in reducing the age at first calving. Proteins and energy are most critical nutrients influencing the growth of calves to become heifers. However, minerals and vitamins are also important. Other than essential nutrients, the performance modifiers that can accelerate the growth rate of claves and help attaining early puberty in heifers.

Raising young calves is one of the most often neglected jobs on the dairy farm. The future of the herd's milk production begins before the calves are born. How a heifer calf develops into her potential for milk production depends upon how well we raise and manage her. Too often, the future of the herd's production is in jeopardy because of the lack of attention to the care and feeding of the young calf.

The first major issue is the lower growth rate of calves during early months of their age and just after weaning. Lower growth rate in the early life of the calves is either due to underfeeding or imbalanced feeding, this lower growth rate results in higher age at puberty and thus higher age at first calving in heifers. Average age of puberty in buffalo and cow heifers is 37 and 34 months, respectively [2, 6] this age at puberty is higher than exotic or crossbred cattle (18 months). Age at calving in Nili-Ravi buffaloes, Sahiwal and Holstein cows is 55, 46 and 29 months, respectively [2, 6]. Age at puberty and calving is related with body weight. Heifers can be bred when they have attained 60 percent of their adult body weight. Assuming an average adult weight of a buffalo as 550 kg, Nutrition plays a major role in attaining the proper weight at proper time and age at puberty is negatively correlated with plane of nutrition.

Hence, the present experimental design was planned to carry out the economics of feeding of

Sahiwal calves under different dietary regimes and management systems.

Materials and Methods

Animals and treatments

Twenty four female Sahiwal calves between 4 to 8 months of age were selected from the herd of Sahiwal cattle breeding farm, Livestock Research Station Kodamdesar, RAJUVAS, Bikaner. These calves were divided into four groups of six calves each on the basis of nearness in their body weight and age. The particulars of these animals are given in table 1. The experimental groups were randomly allocated to one of the following treatments.

Table 1: Feedings and managements of calves

Treatments	Feedings and managements
T1 (F1M1)	100 percent of ICAR feeding and routine management
T2 (F1M1)	100 percent of ICAR feeding and improved management
T3 (F2M1)	120 percent of ICAR feeding and routine management
T4 (F2M2)	120 percent of ICAR feeding and improved management

Managemental systems

Routine management

Routine management houses having covered area with coated tin shed roofing and concrete floor and open area with kachha floor, surrounded by four feet high fencing of galvanized iron pipes.

Improved management

Improved management in summer months having additional facilities of white painting over roof of tin sheds, feeding dry fodder in cool hour (i.e. 7:00 PM to 6:00 AM), prevention of calves from western hot wind (Loo, local wind) and water splashing twice daily than routine managements.

Feeds and feeding

All the experimental calves in each group were fed as per ICAR recommendations [4]. The calves were fed groundnut fodder and wheat straw during the experimental period. A concentrate mixture containing crushed wheat, groundnut cake and wheat bran was prepared. The ingredient composition of concentrate mixture along with its nutritive value is given in Table 2. The concentrate mixture contained 21.50 percent crude protein and 77.10 percent of total digestible nutrients. The allowance of concentrate mixture was fixed in such a way that calves of treatment group T_3 and T_4 got 20 percent higher levels of protein per head per day than calves of T_1 and T_2. A weighed amount of groundnut fodder was fed to all the calves daily and its protein content was taken into consideration while fixing the allowance of concentrate mixture for each group. The quantity of different feeds fed to each calf was adjusted at fortnightly intervals in order to meet the requirements of the calves with the change in their body weight.

Table 2: Percent ingredient composition of concentrate mixture used

Ingredient	Proportion
Wheat	40%
Wheat bran	30%
Groundnut cake	30%
Mineral mixture	2%
Common salt	1%
Nutrient content on dry matter basis	
Dry Matter	90.79%
Crude Protein	21.50%
Total Digestible Nutrients	77.10%

Labour utilization

The efficiency of labour utilization in terms of time spent by the labourer for carrying out various management operations (cleaning, feeding and water splashing) in each treatment groups was recorded once in a month on twenty-four hours basis.

Cost of raising a calf

Feed, fodder and labour records were maintained to calculate the economics of raising Sahiwal calves.

Statistical analysis

The experiment was planned and analyzed as 2x2 Factorial Randomized Block Design [10]. The differences among treatment means were tested for significance by performing Duncan´s Multiple Range Test.

Results and Discussions

Present study was conducted to find out the effect of nutritional status and management systems on performance of Sahiwal calves.

Labour utilization

An ideal management for animals should allow efficient utilization of labour for various farm operations, with this objective in view, the time spent by a single labourer for various management practices for each treatment was recorded in the present study.

The data on time spent by labourer for feeding of calves, cleaning of shed, water splashing and time spent per calf per day under different treatment groups and effect of feeding levels and management systems on labour utilization have been presented in Table 3 and their analysis of variance in Table 4.

Table 3: Mean ± SE values and effect of feeding levels and management systems on crude protein intake

Variable	Feeding calves (Minutes per day)	Cleaning sheds (Minutes per day)	Water splashing (Minutes per day)	Time spent/calf/day (Minutes per day)
Feeding Level	S**	NS	S*	S*
100% ICAR	29.50±0.288a	31.66±0.355	5.41±1.639a	11.09±0.311a

120% ICAR	32.66±0.284b	32.33±0.256	6.41±1.940b	11.90±0.360b
Management systems	NS	NS	S**	S*
Routine Management	30.83±0.600	31.75±0.304	00.00±0.000a	10.43±0.133a
Improved Management	31.33±0.497	32.25±0.328	11.83±0.365b	12.56±0.174b
Interaction (FLXMS)	NS	NS	NS	NS
T1 (F1M1)	29.16±0.477	31.50±0.562	00.00±0.000	10.11±0.153
T2 (F1M2)	29.83±0.307	31.83±0.477	10.83±0.307	12.08±0.119
T3 (F2M1)	32.50±0.500	32.00±0.258	00.00±0.000	10.75±0.119
T4 (F2M2)	32.83±0.307	32.66±0.421	12.83±0.307	13.05±0.159

Means with different superscripts differ significantly ($P<0.05$), highly significant ($P<0.01$)

Table 4: Analysis of variance of data on labour utilization

Source	d. f.	Mean sum of square			
		Feeding calves (Minutes per day)	Cleaning sheds (Minutes per day)	Water splashing (Minutes per day)	Time spent/calf/day (Minutes per day)
Feeding Levels (FL)	1	60.16**	2.666667	6.0**	3.89*
Management Systems (MS)	1	1.5	1.5	840.16**	27.44*
FL x MS	1	0.166667	0.166667	6	0.166667
Error	20	1	1.183333	0.283333	0.116204

* Significantly at ($P<0.05$), **highly significant ($P<0.01$)

The average of time spent for feeding, cleaning of shed, water splashing and time spent per calf per day were recorded as 29.50±0.288, 31.66±0.355, 5.41±1.639 and 11.09±0.311 minutes in 100 percent of ICAR feedings and it was 32.66±0.284, 32.33±0.256, 6.41±1.940 and 11.90±0.360 minutes in calves fed 120 percent of ICAR feeding. The average time spent for feedings of calves, time spent by labourer in water splashing and time spent per calf per day was significantly high ($P<0.01$) in calves fed 120 percent of ICAR feeding.

The higher time spent on feeding of calves may be because of increased frequency of feeding i.e. early in the morning and late in the evening (cool hour feeding).

The average time spent in feeding, cleaning of shed, water splashing and time spent per calf per day were recorded as 30.83±0.600, 31.75±0.304, 00.00±0.00 and 10.43±0.133 in calves reared in routine management system and it was 31.33±0.497, 32.25±0.328, 11.83±0.365 and 12.56±0.174 minutes for calves kept under improved management system. The mean values of time spent for water splashing and time spent per calf per day were significantly higher ($P<0.01$) in calves reared under improved management systems in comparison to routinely managed calves. The time spent on water splashing was higher in improved management due to washing of calves twice daily.

The mean values of time spent by a labourer were 29.16±0.477, 29.83±0.307, 32.50±0.500 and 32.83±0.307 minutes for feeding the calves, 31.50±0.562, 31.83±0.477, 32.00±0.258 and 32.66±0.421 minutes for cleaning of shed and 00.00±0.00, 10.83±0.307, 00.00±0.00 and 12.83±0.307 minutes for water splashing in T1, T2, T3 and T4 treatment groups, respectively. The times spent by a labourer per calf per day were recorded as 10.11±0.153, 12.08±0.119, 10.75±0.119 and 13.05±0.159 minutes in respective treatment groups.

The analysis of variance revealed that levels of feeding and management systems had highly significant ($P<0.01$) influence on the average time spent for water splashing and time spent per calf per day. Significant difference ($P<0.05$) was observed for time spent in feeding of calves in different levels of feeding. The interaction between feeding levels and management systems was found non-significant.

Similar results were obtained by [3, 9] Who reported that the total time spent for different farm operations was less for stall feeding calves as compared to grazing or individually stall fed ones [2] reported that time spent in farm operations and milking operation was significantly less in summer season as compared to winter and spring season.

Economics of raising a calf

The cost of raising of Sahiwal calves in terms of total cost and cost per kg gain in body weight under different treatment groups have been presented in Table 5. The corresponding values for the effect of two levels of feeding and management systems were calculated and presented in Table 6.

Table 5: Cost (Rs) of raising a calf under different treatment groups

Variables	T1	T2	T3	T4
Cost of concentrate ₹	5430	5700	6194	6320
Cost of fodder ₹	3615	3800	3915	4120
Labour cost ₹	997	1071	967	1130
Total cost ₹	10042	10571	11076	11570
Total body weight gain (kg)	83.50	92.50	101.83	107.83
Cost/kg body weight gain ₹	120	114	109	107

Table 6: Effect of feeding levels and management systems on cost (Rs.) of raising a calf

Variables	Feeding levels		Management systems	
	100% ICAR	120% ICAR	Routine management	Improved management
Cost of concentrate ₹	5565	6257	5812	6010
Cost of fodder ₹	3707.5	4017.5	3765	3960
Labour cost ₹	1034	1049	982	1100
Total cost ₹	10307	11323	10544	11071
Total body weight gain (kg)	88.00	104.83	92.66	100.16
Cost/kg body weight gain ₹	117	108	114	110

The total cost of rearing a calf for a period of six months was ₹10042, 10571, 11076 and 11570 in treatment groups T1, T2, T3 and T4, respectively. The corresponding values for per kg weight gain were ₹120, 114, 109 and 107 in respective groups. The cost per kg gain was lowest in treatment T4 followed by T3, T2 and T1, respectively.

The cost per kg gain was ₹117 and 108 in calves fed 100 percent and 120 percent ICAR feedings, respectively and it was ₹113 and 110 in calves kept in routine and improved

management systems, respectively. Cost per kg weight gain was lowest (₹108) in calves fed 120 percent of ICAR feeding followed by improved management systems (₹114), routine managements systems (₹114) and calves fed 120 percent of ICAR feedings. Less cost per kg weight gain in calves fed 120 percent of ICAR feeding and reared under improved management systems may be because the calves of these groups gained significantly higher body weight as compared to the calves fed 100 percent of ICAR feeding and raised under routine management.

[9] Reported that the total cost of raising ₹2330.00, 2447.80 and 2400.90 in control, body wetting twice daily and cool hour feeding groups, respectively. The cost per kg gain in body weight was ₹53.90, 43.10 and 48.50 in respective groups. Cost per kg gain in body weight was lowest in twice body wetting group.

[8] observed that cost per kg gain in body weight of buffalo heifers was lowest in thatched roof (₹23.49) followed by Loose house+aluminium foil pasted roof (₹23.82), Loose house (₹25.51) and Loose house+white painted roof (₹27.02) group animals.

Contrary results were obtained by [5] reported that the cost per kg gain were lower in the calves buffalo heifers offered low plane of nutrition. [7] Reported that the rearing cost per kg body weight gain was less (₹22.90) for 100 percent NRC fed calves as compared to 120 percent fed calves (₹25.96).

The calf rearing system would ultimately determine the cost of keeping them up to the age of maturity. Considering 350 kg as the optimum body weight for breeding, the time and money required for rearing them up to this stage have been calculated and presented in Table 7.

Table 7: Time and money required for rearing calves up to age of maturity under different levels of feeding and management systems

Variables	Feeding levels		Management systems	
	100% ICAR	120% ICAR	Routine management	Improved management
Average daily gain (Kg)	0.490	0.580	0.515	0.556
Days up to attainment of 350 kg body weight at observed growth rate	714	603	680	629
Average initial body weight (Kg)	100.47	99.74	100.56	99.60
Net weight gain required to attain 350 kg body weight	249.53	250.26	249.44	250.4
Cost of rearing up to 350 kg body weight as per actual observation	29225	27030	28384	27677

The calves fed 120 percent of ICAR feeding and reared under improved management were superior than calves fed 100 percent of ICAR feeding and the routinely managed in respect of average daily gain, time required to attain 350 kg body weight and cost of rearing up to 350 kg body weight. The total cost of rearing up to 350 kg body weight was lowest in calves fed 120 percent of ICAR feeding (₹27030) followed by calves kept in improved management (₹27677), routine managements (₹28384) and calves fed 100 percent of ICAR feeding (₹29225) and it takes as late as 603, 585, 680 and 714 days, respectively to achieve this, which leads to as age at first calving about 31 months in calves fed 100 percent of ICAR feeding and routinely managed, whereas calves fed 120 percent of ICAR level of feeding and kept under improved management systems seems to be most economical considering that such a practice can lead to age at first calving even 29 month indicating that the total productive life span of cattle will be more, as compared to 100 percent feeding and routinely managed groups.

Conclusion

The present study was concluded that the Sahiwal calves between age group of 4 to 8 months grow faster when fed 120 percent of ICAR feeding and reared under improved management. Both the feed conversion efficiency as well as cost of rearing was most favourable for this management package and even calves were more comfortable reared under improved management systems.

Acknowledgement

The authors thankfully acknowledge the financial support and facilities provided by LRS, Kodamdesar, Rajasthan University of Veterinary and Animal Sciences, Bikaner to carry out the research work.

Conflict of interest

We declare that we have no conflict of interest.

References

1. Bashir MK. Genetic and phenotypic aspects of some performance traits of Nili-ravi buffaloes in Pakistan. Ph. D. Thesis, Submitted to University of Agriculture, Faisalabad, Pakistan 2006.
2. Dall JS, Gill RS. Studies on the labour utilization under different housing and management systems in lactating buffaloes. Indian Journal of Animal Production and Management 1995;11:165-169.
3. Nugussie F. Effect of different rearing systems on the performance of female crossbred calves. M. Sc. Thesis, submitted to CCS Haryana Agriculture University, Hisar 1999.
4. ICAR. Nutrient requirements of livestock and poultry. Indian Council of Agricultural Research, New Delhi 1985.
5. Iqbal Z, Abdullah M, Javed K, Jabbar MA, Ahmed N, Ditta YA *et al*. Effect of varying levels of concentrate on growth performance and feed economics in Nili-Ravi buffalo heifer calves. Turkish Journal of Veterinary and Animal Science 2017;41:775-780.
6. Rehman Z. Inter-herd performance and genetic evaluation of Sahiwal cattle in Pakistan. Doctoral dissertation, Ph. D. Thesis, submitted to University of Agriculture Faisalabad, Pakistan 2006.
7. Shenu T, Yadav RS, Yadav N, Gulati HK. Effect of managemental regimes on the performance of crossbred calves. Indian Journal of Animal Science 2003;73(9):1058-1060.
8. Singh Y. Studies on certain summer managemental practices on performance of buffalo heifers. M. V. Sc. Thesis, submitted to CCS Haryana Agricultural University, Hisar 2000.
9. Sirohi R. Effect of summer management practices on performance of buffalo heifers. M.V.Sc. Thesis, submitted to CCS Haryana Agricultural University, Hisar 2003.
10. Snedecor FW, Cochran WG. Stastical Methods (8th ed.). Oxford and IBH Publishing Co., Calcutta 1994.