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Economic Analysis of Soymilk as Partial Milk Replacer for Buffalo Calf Rearing

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ABSTRACT

The study was conducted to assess the economics of soymilk as partial milk replacer on Murrah buffalo calf rearing. The study was conducted at Livestock farm, Adhartal, College of Veterinary Science and Animal Husbandry, N.D.V.S.U., Jabalpur (M.P.) for three months period. Eighteen Murrah buffalo calves with similar body weight of either sex at the age of 5 days were selected and randomly distributed in three different groups (M, SM20 and SM40) with six calves in each group. Calves of the M group were reared on buffalo whole milk, SM20 group was offered buffalo whole milk and soymilk in the proportion of 80:20, and SM40 group was offered buffalo whole milk and soymilk in the proportion of 80:20. Calves were maintained under uniform managemental condition except milk feeding. Economic analysis indicated that the recurring cost of rearing of the buffalo calves was significantly decreased in SM20 and SM40 groups in comparison to the M group. Percent decrease of total recurring expenditure in comparison to M group was 11.57 and 19.47, respectively for the SM20 and SM40. Decrease of recurring expenditure (percent/kg body weight gain) in comparison to M group was 9.04 and 12.02, respectively for the SM20 and SM40. It can be concluded that soymilk can replace up to 40 percent whole buffalo milk to reduce the cost of buffalo calf rearing.

Keywords: Murrah buffalo calves, soymilk, milk replacer, economics

Nature designed whole milk as food for young calves. Feeding of whole milk to calves is very expensive as demand of milk for human consumption is very high. Thus, raising young calves is one of the most often neglected jobs on the dairy farm. Farmers need a cheap alternative for fresh milk. Milk replacer and calf starter have been developed in many countries with an aim to cut down the cost of whole milk in calf rearing programme (Mete *et al.* 2000). The main objectives of the calf management are to maintain excellent health condition, good progress on growth to achieve the target body weight, and developing the rumen and thus, the calf can easily adapt to the feedstuffs in the ration after weaning.

Milk replacers provide a convenient way to feed pre-ruminant calves. A good-quality milk replacer should be similar in chemical composition to whole milk. Several attempts have been made throughout the world for artificial rearing of young animals by milk replacer. In previous decades many researchers have investigated the impact of the replacement of milk proteins by vegetable proteins in milk replacers for calves. Taking into consideration of the basic composition of milk and its physical form, milk replacers should contain such ingredients to provide protein, fat, lactose, minerals and vitamins and dissolve readily in water to facilitate feeding in a physical form similar to milk. High-quality milk replacers are excellent liquid feed for young calves. A high quality milk replacer is preferred to full milk because of two major factors namely economics and convenience. Availability of fresh, high-quality starter feed from an early age is important for rumen development and preparation for weaning (Drackley, 1999). Milk proteins contain the highest quality protein which are easily digestible than other source of proteins. Soy proteins are the next most commonly used proteins in calf milk replacers.

Keeping in view of the above facts the study was designed to evaluate the economics of soymilk as partial milk replacer in Murrah buffalo calves.

MATERIALS AND METHODS

The study was conducted at Livestock farm, Adhartal,

Table 1. Effect of soymilk as partial milk replacer on economics of rearing of Murrah buffalo calves

Sl. No	Particulars	M	SM20	SM40
1	**Total feed consumption per calf during the three months experimental period**			
1.1	Whole milk consumed (kg)	233.86	182.92	137.20
1.2	Soymilk consumed (kg)	0.00	45.79	91.75
1.3	Calf starter consumed (kg)	15.78	17.66	17.77
1.4	Green fodder consumed (kg)	67.32	65.45	74.38
2	**Expenditure on milk, soymilk, feed and fodder per calf during three months experimental period**			
2.1	Whole milk (@₹ 44/kg)	10,289.92	8,048.66	6,036.65
2.2	Soymilk (@₹ 10/kg)	0.00	457.87	917.46
2.3	Calf starter (@₹ 21.64/kg)	341.42	382.18	384.64
2.4	Green fodder (@₹ 2/kg)	134.63	130.90	148.77
	Total expenditure (₹) on feed and fodder	$10,765.97^{A}$	$9,019.62^{B}$	$7,487.51^{C}$
3	**Expenditure (₹) on labour /calf for three months experimental period (@ 1 labour/20 calves and wage ₹ 6000/ month)**	6,000.00	6,000.00	6,000.00
4	**Miscellaneous expenditure (₹) (medicines, deworming, tagging etc.) (@₹ 75/ calf)**	75.00	75.00	75.00
5	**Total recurring expenditure (₹) during three months experimental period (2+3+4)**	$16,840.97^{A}$	$15,094.62^{B}$	$13,562.51^{C}$
6	**Less total recurring expenditure (₹) in comparison to whole milk fed group**	—	1,746.36	3,278.46
7	Per cent less total recurring expenditure in comparison to whole milk fed group	—	11.57	19.47
8	Body weight changes during the experimental period			
8.1	Average initial weight of calf (kg)	35.58	34.27	35.22
8.2	Average final weight of calf (kg)	62.75	61.05	60.09
8.3	Average weight gain of calf (kg)	27.18	26.78	24.88
9	**Recurring expenditure (₹) per kg body weight gain (no.5/ no. 8.3)**	619.71^{A}	563.72^{B}	545.22^{C}
10	**Less recurring expenditure (₹) per kg body weight gain in comparison to whole milk fed group**	—	55.99	74.48
11	Per cent less recurring expenditure per kg body weight gain in comparison to whole milk fed group	—	9.04	12.02

Means bearing different superscripts within same row differ significantly (^{ABC}, $P<0.01$)

College of Veterinary Science and Animal Husbandry, N.D.V.S.U., Jabalpur (M.P.) for period of six months. Eighteen Murrah buffalo calves with similar body weight of either sex at the age of 5 days were selected and randomly distributed in three different groups (M, SM20 and SM40) with six calves in each group. Calves of the M group were reared on buffalo whole milk, SM20 group was offered buffalo whole milk and soymilk in the proportion of 80:20 and SM40 group was offered buffalo whole milk and soymilk in the proportion of 80:20. Calves were maintained under uniform managemental condition except milk feeding.

Milk was offered two times daily at $1/10^{th}$ of the body weight once in the morning and again in the afternoon.

Green grasses and concentrate mixture were also supplied in the morning (6.30am) and evening (5.00pm).

After the end of experiment, economics of buffalo calf rearing upto three months was evaluated. Cost of calf starter and soymilk was calculated based on the ingredients used to prepare the same. Cost of milk, labour cost and other expenses was considered as the prevailing market rate. Selling price of buffalo milk was ₹ 44.00/kg and cost of preparation soymilk was 10.00/kg. Total recurring expenditure was calculated for rearing of buffalo calves up to three months. Total body weight gain was calculated based on the initial and final weight of the calves. Finally, recurring expenditure per kilogram body weight gain was calculated and compared among the groups.

RESULTS

The data regarding economics of rearing of Murrah buffalo calves are presented in Table 1. The average total buffalo whole milk (kg) consumed per animal during the experimental period (3 months) were 233.86, 182.92 and 137.20, respectively, in M, SM20 and SM40 groups. The average soymilk (kg) consumed per animal during the experimental period were 45.79 and 91.75, respectively, in SM20 and SM40 groups. Similarly, during the whole experimental period, calf starter (kg/calf) intake was 15.78, 17.66 and 17.77 and green fodder (kg/calf) intake were 67.32, 65.45 and 74.38 in M, SM20 and SM40 groups, respectively.

Market rate buffalo whole milk (₹/kg), preparation cost (₹/kg) of the soymilk, preparation cost (₹/kg) of calf starter based on the approved tender rate of feed ingredients at college level market rate of green fodder (₹/kg) and present labour wages (₹/month) were 44, 10, 21.64, 2 and 6000, respectively. The expenditure (₹/calf) incurred for whole milk was 10,289.92, 8,048.66 and 6,036.65 in M, SM20 and SM40 groups, respectively and for soymilk the expenditure (₹/calf) was 457.87 and 917.46 in SM20 and SM40 groups, respectively.

The expenditure (₹/calf) incurred for calf starter was 341.42, 382.18 and 384.64 and the expenditure (₹/calf) incurred for green fodder was 134.63, 130.90 and 148.77 in M, SM20 and SM40 groups, respectively. Total expenditure (₹/calf) on feed and fodder was 10,765.97, 9,019.62 and 7,487.51 in M, SM20 and SM40 groups, respectively. Total recurring expenditure (₹/calf) during the 3 months experimental period was 16,840.97, 15,094.62 and 13,562.51 in M, SM20 and SM40 groups, respectively. Reduction of total recurring expenditure (₹) in comparison to whole milk fed group was 1,746.36 and 3,278.46 in SM20 and SM40 groups, respectively. Percent decrease of total recurring expenditure in comparison to whole milk fed (M) group was 11.57 and 19.47 in SM20 and SM40 groups, respectively.

The average initial weight (kg) of calf 35.58, 34.27 and 35.22, respectively in M, SM20, SM40 groups and average final weight of calf 62.75, 61.05 and 60.09, respectively in M, SM20, SM40 groups. The average body weight gain (kg) were 27.18, 26.78 and 24.88 and the recurring expenditure (₹) per kg weight gain was calculated as 619.71, 563.72 and 545.22 in M, SM20 and SM40 group respectively. Reduction of recurring expenditure (₹/calf) per kg body weight gain in comparison to whole milk fed group was 55.99 and 74.48 in SM20 and SM40 groups respectively. Percent decrease of recurring expenditure per kg body weight gain in comparison to whole milk fed group was 09.04 and 12.02 in SM20 and SM40 groups respectively. For M the expenditure for per kg body weight gain was higher as comparison to SM20 and SM40 group. And if we compare the expenditure of SM20 and SM40 group, the SM40 group has less expenditure in comparison to SM20.

DISCUSSION

One of the main reasons of not rearing the buffalo calves in the dairy farms is high milk price and demand. Hence, economics of calf rearing was carried out to examine the recurring expenditure incurred to rear buffalo calves up to three months of age by replacing buffalo whole milk with soymilk in different proportions. Information on calf growth and cost of calf rearing is important for the successful raising of calves as replacement stock.

During the study period cost of buffalo whole milk was ₹ 44/kg and cost of each kg prepared soymilk was ₹ 10. The comparative cost of the buffalo milk and soymilk indicated that soymilk was 4.4 times cheaper than buffalo whole milk. The ingredients used for making this soymilk are easily available in the local markets and manufacturing process is also easy.

Soymilk as milk replacer has also been used for artificial rearing of young animals in many countries (Ghorbani *et al.* 2007). Due to the lower nutrient content of soymilk than whole milk, its partial substitution for whole milk is possible. Substitution of milk with soymilk drives calf appetite toward dry starter feed. It stimulates butyrate and propionate production, and thereby hastens reticulo-rumen development (Baldwin *et al.* 2004). Early reticulo-rumen development enables early weaning and reduces calf-raising cost (Davis and Drackley, 1998).

Several studies indicated that milk replacer had several benefits to the famers as easy to store, desirable calf performance, proper health monitoring and most important is economics (Davis and Drackley, 1998; Compinis *et al.* 2002; Langhout, 2003; Wagener and Lang out, 2007 and Aquino *et al.* 2008). The findings of the present study are in accordance with these findings.

CONCLUSION

The result of the present study indicated that partial replacement of buffalo whole milk with soymilk can be possible to economise the rearing of Murrah buffalo calves. Thus, soymilk can be partially used as milk replacer to reduce the cost of rearing of the buffalo calves without affecting the growth rate.

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