UTILIZATION OF SOYMILK AS MILK REPLACER FOR CALVES

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Abstract

An experiment was conducted to study the utilization of soymilk as milk replacer for raising calves. Nine crossbred calves were selected and divided into three groups on the basis of their body weight and genotype. The calves of group A were reared by cow milk, group B reared by strained soymilk and group C reared by unstrained soymilk. It was found that, total body weight gain of group A, B and C were 13.933 ± 1.222, 13.800 ± 0.917 and 13.233 ± 1.537 Kg, respectively. There was no significant difference among the three groups of calves. Non-significant differences were also seen for increment in wither height (5.588 ± 0.508, 5.419 ± 0.529 and 5.080 ± 0.440 cm, respectively), length (6.096 ± 0.440, 5.927 ± 0.388 and 5.503 ± 0.388 cm, respectively) and heart-girth (5.842 ± 0.440, 5.588 ± 0.916 and 5.419 ± 0.388 cm, respectively) of calves. Economic analysis showed that soymilk was cheaper than cow milk (Tk. 8.0 *vs* Tk. 44.0). It can be concluded that soymilk as milk replacer could be used successfully for raising dairy calves.

Key words: Soymilk, Cow milk, Calves, Body weight

Introduction

Calves contribute in establishing a future herd by replacing culled cows and bulls. The calf feeding programme is a most critical factor in the management of young calves. Although the milk production of our native cows are low but due to acute shortage of animal feeds they even cannot show their full genetical potentiality what they have. As a result, calves can not get required amount of milk. Raising young calves is one of the most often neglected jobs on the dairy farm. The future of herd's milk production begins before the calves are born. The first three or four months of calf's life is a critical period and the feeding programme at this time is important for rapid growth and development of baby calves and reducing death losses. Feeding of whole milk to calves is very expensive in a country like ours where demand of milk for human consumption is very high. Under these circumstances, we have to pay great attention on economic calf feeding programme. In a calf feeding programme, milk replacer and calf starter have been developed in many countries to reduce the amount of whole milk used in calf raising (Plaza and Fernandez, 1994; Sajko *et al.,* 1998 and Mete *et al.,* 2000). In some countries, soymilk is being used as a novel milk replacer in calf raising facilities (Ghorbani *et al.,* 2007). Soymilk is a diet having a composition very close that of cow's milk, which is concerned with feeding the calf from the time it is taken from its mother, or

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ceases to be fed colostrum. No research work has yet been done to develop soymilk as milk replacer in our country. Hence, research work in this area is urgently needed. This is why this work was undertaken for raising dairy calves economically by using soymilk.

Materials and Methods

This experiment was conducted with crossbred dairy calves at Bangladesh Agricultural University Dairy Farm for a period of eight weeks. Nine crossbred dairy calves of nearly similar in body weight (37.7 to 39.7 kg) and age (about 1.5 to 2 months of age) were selected and divided into three groups (group A, B and C) considering their body weight and genotype in a Completely Randomized Design (CRD). The calves of group A were reared by feeding cow milk, group B reared by soymilk after straining and group C reared by soymilk without straining.

Soymilk was prepared from the large size, thin hull and not more than 1 year old whole soybean. One kg whole soybean was grinded in a soy flour mill and 125g powder was dissolved with 1000 ml of water and strained with fine muslin cloth. Thereafter, soymilk was boiled at 100°C for 15 minutes with constant stirring. After proper cooling soymilk was supplied to the calves of group B. On the other hand, another batch of soymilk was prepared in the same way and offered to the calves of group C without straining and calves of group A were supplied cow's milk collected from the Bangladesh Agricultural University Dairy Farm.

Whole milk and soymilk were given two times daily, once in the morning and again in the afternoon. Group A was continued with cow milk feeding system (1 litre cow milk for each calf), which was treated as control group and another two groups (group B and group C) were fed strained and unstrained soymilk, respectively at the same rate up to eight weeks study period. Green grasses were also supplied in the morning and afternoon at free choice throughout the experiment and 0.5 kg concentrate mixture was given only in the morning (wheat bran: rice polish: til oil cake: common salt= 6:3:1:0.3). The calves were weighed and their height, length, and heart girth were measured initially at starting of the experiment and subsequently once a week in the morning before offering their feed.

Milk samples were analyzed were the specific gravity, dry matter, fat, protein, ash and solids-not-fat (SNF) content by using the procedure described by Aggarwala and Sharma (1961). Green grass and concentrate mixture were analyzed to determine the proximate composition following the methods as described in AOAC (2003). The data were analyzed statistically by using MSTAT computer program (Steel and Torrie, 1980). Chemical composition and cost (Tk) of cow's milk and soymilk are shown in Table 1 and proximate composition of feed ingredients is shown in Table 2.

Table 1. Chemical composition and cost (Tk.) of cow's milk and soymilk (on the fresh matter basis)

Parameters	Cow's milk	Soymilk
Fat (g/kg)	48.0	28.0
Protein (g/kg)	31.0	39.0
Lactose/Carbohydrate (g/kg)	45.0	36.0
Ash (g/kg)	7.0	6.5
Total solids (g/kg)	131.0	109.5
Solids-not-fat (SNF, g/kg)	83.0	81.5
Water (g/kg)	869.0	890.5
Acidity (%)	0.155	0.145
Specific gravity	1.027	1.023
Cost	Tk. 8.0/kg	Tk. 44.0/kg

Table 2. Proximate composition of other feed ingredients

Ingredients	DM	CP	CF	Ash	EE	NFE
	g/kg fresh	g/kg DM				
Wheat bran	899.2	156.6	57.5	42.3	46.2	697.4
Rice polish	912.5	131.3	51.1	73.7	108.2	635.7
Til oil cake	914.0	269.4	206.3	148.0	99.9	276.64
Common salt	960.00	-	-	-	-	-
German grass	215.2	85.9	317.3	130.1	28.2	438.5
Para grass	266.5	82.4	319.5	110.9	28.1	459.1

Results and Discussion

The results of the changes in body weight, wither height, body length and hear girth of calves during the experimental period are shown in Table 3.

Body weight (Kg)

The average total body weight gain of the control (group A) and soymilk groups (group B and group C) were 13.933 ± 1.222, 13.800 ± 0.917 and 13.233 ± 1.537 Kg, respectively. Daily weight gain were 0.249 ± 0.022, 0.246 ± 0.016 and 0.236 ± 0.027 Kg for control (group A) and soymilk groups (group B and group C), respectively (Table 3). There were no significant differences in total and daily weight gain among the three groups of calves. The result of the present study agrees with the findings of Wadud and Rahman (1978) and Rahman *et al.* (1988) who found that weight gain of whole milk feeding group was little higher than that of different milk replacer groups but the weight gain was not significant (P>0.05).

Table 3. The changes in body weight, wither height, body length and hear girth of calves during the experimental period

Parameters	Treatment groups[#]			Level of sig.
	A	**B**	**C**	
Body weight (kg)				
Initial	39.667 ± 0.577	37.667 ± 1.528	38.667 ± 0.577	NS
Final	53.600 ± 1.778	51.467 ± 1.665	51.900 ± 1.852	NS
Total change	13.933 ± 1.222	13.800 ± 0.917	13.233 ± 1.537	NS
Daily change	0.249 ± 0.022	0.246 ± 0.016	0.236 ± 0.027	NS
Wither height (cm)				
Initial	72.221 ± 1.531	70.467 ± 1.361	71.503 ± 1.463	NS
Final	77.829 ± 1.054	75.856 ± 1.829	76.587 ± 1.397	NS
Total change	5.588 ± 0.508	5.419 ± 0.529	5.080 ± 0.440	NS
Daily change	0.100 ± 0.009	0.097 ± 0.009	0.091 ± 0.008	NS
Body length (cm)				
Initial	59.013 ± 1.444	59.944 ± 2.423	57.635 ± 1.761	NS
Final	65.126 ± 1.892	65.871 ± 2.798	63.123 ± 1.761	NS
Total change	6.096 ± 0.440	5.927 ± 0. 388	5.503 ± 0.388	NS
Daily change	0.109 ± 0.008	0.106 ± 0.007	0.098 ± 0.007	NS
Hear girth (cm)				
Initial	82.635 ± 1.552	79.756 ± 1.586	81.873 ± 1.691	NS
Final	88.477 ± 1.973	85.373 ± 1.453	87.269 ± 1.455	NS
Total change	5.842 ± 0.440	5.588 ± 0.916	5.419 ± 0.388	NS
Daily change	0.105 ± 0.008	0.100 ± 0.017	0.097 ± 0.007	NS

A = Feeding cow milk, B = Feeding soymilk after straining, C = Feeding soymilk without straining
NS = Non-significant

Wither height (cm)

Total height changes from initial to week 8 were 5.588 ± 0.508, 5.419 ± 0.529 and 5.080 ± 0.440 cm for group A, group B and group C, respectively. On the other hand, daily height changes were 0.100 ± 0.009, 0.097 ± 0.009 and 0.091 ± 0.008 cm for control (group A) and soymilk groups (group B and group C), respectively (Table 3). Statistically no significant differences were seen for total and daily height gain of three groups of calves. Similar results were also reported by Rahman *et al.* (1988) and Mete *et al.* (2000) who did not find any changes in wither height.

Body length (cm)

The average total increase of length were 6.096 ± 0.440, 5.927 ± 0. 388 and 5.503 ± 0.388 cm for the calves of group A, group B and group C, respectively. Daily changes in length in the same order for three groups were 0.109 ± 0.008, 0.106 ± 0.007 and 0.098 ± 0.007 cm, respectively (Table 3). Statistical analysis showed that no significant

differences were seen for total and daily increment in length for all groups of calves. Wadud and Rahman (1978), Rahman *et al.* (1988) and Mete *et al.* (2000) also observed similar results among the groups of calves when calves were fed milk and milk replacer.

Heart girth (cm)
Total heart girth changes from initial to week 8 were 5.842 ± 0.440, 5.588 ± 0.916 and 5.419 ± 0.388 cm for group A, group B and group C, respectively. On the other hand, daily heart-girth changes were 0.105 ± 0.008, 0.100 ± 0.017 and 0.097 ± 0.007 cm for control (group A) and soymilk groups (group B and group C), respectively (Table 3). Statistically no significant differences were seen for total and daily changes in heart girth for all groups of calves. Similar performance was also found by Rahman *et al.* (1988) and Mete *et al.* (2000) who observed that gain in heart girth among the groups of calves were non-significant (P>0.05).

The daily intake of liquid feed (milk and milk replacer) and concentrate mixture in all groups were nearly similar. On an average, it was found that calves of control and soymilk groups consumed about 0.5 Kg concentrate mixture per head per day. On the other hand, green grass consumption was 4.2, 4.4 and 4.0 Kg per head per day for control (group A) and soymilk groups (group B and group C), respectively. In all cases, statistical differences were non-significant. Cost of each Kg of soymilk was about eight taka (Tk. 8) but the same figure for 1 Kg of cow milk was forty four taka (Tk. 44) (Table 1). Economic analysis showed that soymilk as a milk replacer was 5.5 times cheaper than whole milk feeding. Soymilk is not only cheaper but it has also nearly similar effect on body weight changes. The ingredients used for making this soymilk are easily available in the local markets and manufacturing process is also easy. Raising calves based on soymilk feeding will reduce the pressure on the fluid milk. As a result, availability of fluid milk in the local markets will be increased; at the same time, calves will get the required amount of nutrients from the soymilk. This will ultimately help to produce future replacement stock for a dairy farm. So, farmers of our country could easily use soymilk for rearing their calves which is already being practiced in the developed countries in the world.

Conclusion

From the results of the present experiment it may be recommend that soymilk as a milk replacer could be used successfully for raising the dairy calves.

Acknowledgement

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