

Response of Feeding Amino Acids Supplemented Cottonseed Meal on Growth Performance and Digestibility of Early Weaned Cow Calves

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ABSTRACT : This study was designed to examine the response of feeding early weaning diets without and with amino acids supplemented cottonseed meal on growth performance and digestibility of early weaned cow calves. Fifteen 14-21 days old cross bred cow calves were randomly allotted to three experimental diets. Diet A comprised of milk replacer and concentrate feed whereas two iso-caloric and iso-nitrogenous early weaning diets viz., B and C were prepared without and with lysine and methionine supplemented cottonseed meal, respectively. These early weaning diets were used as substitute of milk replacer for calves. Calves were placed in individual cages and fed twice daily for a period of 60 days. Daily feed intake, feed refused and weekly weight gain was recorded. Two digestibility trials I and II were performed at 5th and 9th week of the experiment, respectively. During the digestibility trial I, calves were fed on ad libitum basis whereas in trial II, calves were fed at 90% of their voluntary DMI. Feed, orts and feces samples were collected, weighed daily, composited, subsampled and analysed for DM and CP. Results indicated that weight gain of calves ($p < 0.05$) higher on diets A (0.63 kg/d/calf) and C (0.64 kg/d/calf) compared to calves on diet B (0.57 kg/d/calf). Significantly ($p < 0.05$) less daily DMI was observed on diet A (1.48 kg) compared to early weaning diets B (1.70 kg) and C (1.72 kg). The feed efficiency was ($p < 0.05$) better on diet A (2.33) compared to diets B (2.95) and C (2.65). The economic efficiency was noticed to be better on diets B and C compared to diet A. In trial I, digestibility of DM and CP of diet A was ($p < 0.05$) higher than diets B and C. Whereas in trial II, digestibility of DM and CP of diet A was ($p < 0.05$) less than diets B and C. It was concluded that early weaning diet based on lysine and methionine supplemented cottonseed meal produced better weight gain and feed efficiency compared to non-supplemented cottonseed meal based diet. (*Asian-Aust. J. Anim. Sci. 2002. Vol 15, No. 2 : 184-187*)

Key Words : Cow Calves, Early Weaning Diets, Growth Performance

INTRODUCTION

Pakistan possesses an adult female cattle population of 10.02 million annually producing 2.79 and 2.36 million male and female cow calves, respectively (Agricultural Statistics of Pakistan, 1998-99). During the last two decade, rapid mechanization in agriculture husbandry has made young male cow calves surplus while they were previously reared as working bullocks. Young male calves are usually neglected by the farmers particularly in the commercial dairy production system where the owners are interested to sell maximum milk rather than to feed it to calves to earn more profit.

In Pakistan, rearing of young calves includes whole milk feeding through mother suckling and it is a costlier rearing proposition. Therefore, most of the farmers from the commercial dairy production system sell their calves within 2-3 days after birth for slaughtering hence calves which can be potentially reared for quality beef production are wasted. However, rearing of calves at the age of 3-4 weeks on early weaning diets as a substitute of milk seems to be a potential approach. Advantages to this system include reduction in feeding cost, less feeding labour and fewer diarrhoea and

digestive problems. Veal and beef production provide an alternative use of dairy male calves which often are unwanted by the dairy industry (Albright, 1983). The calves efficiently utilise processed grain in complete diet and the performance was comparable to that obtained from calves fed whole milk (Bouchard et al., 1980; Beauchemin et al., 1990; Pommier et al., 1995). Rearing of neglected calves on concentrate diets also comes under the issue of calf welfare (Duncan and Dawkins, 1982). In Pakistan, solvent extracted cottonseed meal is produced in large quantities and considered to be good protein source for livestock feeding. However, cottonseed meal is reported to be deficient in lysine and methionine and has low biological value as compared to soybean meal (Khan et al., 1995). The present study was therefore, aimed to investigate the effect of feeding early weaning diets as a substitute of milk replacer on the growth performance and digestibility of young cow calves.

MATERIALS AND METHODS

This experiment was executed at Military Dairy Farm, Rawalpindi, Pakistan. Fifteen early weaned mother detached cross bred cow calves weighing an average 32 kg (30-35 kg) live body weight were used in the experiment. All the calves were approximately 14-21 days of age and were allotted at random to three diets viz: A, B and C. Diet A comprised of imported commercial milk replacer and

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concentrate feed prepared at Pakistan Army Feed Mill whereas diets B and C were based on non-supplemented solvent extracted cottonseed meal and with lysine 0.67% and methionine 0.07%, supplemented solvent extracted cottonseed meal, respectively. Since diet A differs from diets B and C in their ingredients composition, therefore, its chemical composition is different from the early weaning diets. Mash early weaning diets B and C were prepared as iso-caloric and iso-nitrogenous at Feed Technology Unit, National Agricultural Research Centre. Ingredients and nutrient composition of the experimental diets is shown in table 1 and 2. All the calves were dewormed with recommended doses of Nilverm (ICI Pharmaceuticals, Pakistan).

Calves on diet A received fluid milk replacer which was prepared by diluting powder milk replacer with water as 1:9 ratio and served warm (39°C) in stainless steel buckets fitted with rubber nipple in equal quantity twice daily as per

practice of the farm. Before feeding milk replacer, the buckets and nipples were sterilized in boiling water for 30 minutes. Along with the milk replacer, calves received mash concentrate feed on ad libitum basis. Calves were offered milk replacer @ 10% of the body weight. Initially, calves on diets B and C were offered their respective diets along with milk replacer for 7 days as dietary adjustment period. Following adjustment period, calves were individually fed twice a day only on their respective diets throughout the growth and digestibility period. Calves were individually housed in cages (L=1.2 m, W=0.76 m and H=0.9 m) raised by 0.6 m from the ground under cover. Feed offered and refused were recorded daily to measure daily dry matter intake (DMI) for each calf. Calves were weighed weekly until the termination of the experiment to determine average daily body weight gain. Feed efficiency and economic efficiency of the calves fed on different diets was calculated from the data obtained for DMI, weight gain and cost of feeding. Feeds were sampled weekly, composited and analysed for dry matter, crude protein and crude fibre by AOAC (1990) methods.

Two digestibility trials I and II were performed at 5th week of the growth trial and then at 9th week to determine the apparent DM and CP digestibility of the diets. During the digestibility trial, twelve calves were involved and daily feed intake was recorded. Feed and orts samples were also collected. Total feces voided were collected, weighed, mixed manually and subsampled. Feces samples were frozen daily and subsequently composited for each calf. Samples were oven dried at 70°C and subsequently analysed for DM and CP content according to AOAC (1990). Data was analysed using analysis of variance for completely randomised design and Duncan's Multiple Range Test was employed to compare treatment means (Steel and Torrie, 1980).

Table 1. Ingredients composition of experimental diets for cow calves

Ingredients %	Diets		
	A*	B	C
Maize		53.00	53.00
Cottonseed meal (solvent extracted)		37.00	37.00
Molasses (cane)		5.00	5.00
Vegetable oil		3.00	3.00
Dicalcium phosphate		1.00	1.00
Salt (common)		0.50	0.50
Vitamin and mineral premix**		0.50	0.50
Supplemented (%)			
Lysine		-	0.67
Methionine		-	0.07

* Milk replacer + concentrate feed.

** Vitamin and mineral premix contains 19.2% P, 25.5% Ca, 2.3% Na, 1.2% Mg (300,000 IU vitamin A, 50,000 IU vitamin D3, 100 mg vitamin E per kg) Ca: P=1.3: 1.+Trace elements (Zn, Mn, Cu, Co, Se), Made by Bayer Leverkusen, Germany.

Table 2. Nutrient composition of the experimental diets for cow calves (% DM basis)

Parameters	Diets		
	A	B	C
	Milk Replacer	Concentrate	
Crude protein ¹	23.50	13.42	24.35
Crude fiber ¹	-	9.00	5.50
TDN ²	110.00	68.50	82.50

¹Analysed values, ²Calculated values.

RESULTS AND DISCUSSION

Data on daily body weight gain, daily DMI, feed efficiency and economic efficiency of the calves fed different diets is presented in table 3.

Body weight gain and feed efficiency

Daily body weight gain of calves fed on diets A, B and C was 0.63 kg, 0.57 kg and 0.64 kg, respectively. Weight gain was ($p < 0.05$) higher in calves fed on diets A and C compared to those fed on diet B. No ($p > 0.05$) difference was found in the gain of calves fed on diets A and C. No ($p > 0.05$) difference was found in DMI of calves fed on diets B and C. However, calves fed on milk replacer and concentrate feed consumed ($p < 0.05$) less DM (1.48 kg/d/calf) compared to early weaning diets B (1.70 kg/d/calf) and C (1.72 kg/d/calf). Feed efficiency was

Table 3. Effect of feeding early weaning diets on weight gain, feed intake and feed efficiency of cow calves

Parameters	Diets			PSE
	A	B	C	
Daily weight gain (kg)	0.63 ^a	0.57 ^b	0.64 ^a	0.015
Av. daily feed (DM)	1.48 ^b	1.70 ^a	1.72 ^a	0.087
Intake (kg)				
Feed efficiency	2.33 ^a	2.98 ^b	2.65 ^b	0.093
Economic efficiency*	33.39	19.19	17.92	

* Cost of feed (Rs.) to gain per kg of live body weight.

PSE=Pooled standard error.

Different superscripts in the same row differ ($p < 0.05$).

($p < 0.05$) better in calves fed on diet A (2.33) compared to early weaning diets B (2.98) and C (2.65). Economic efficiency (cost of feed to gain one kg of live body weight) was calculated to be Rs.33.39, Rs.19.19 and Rs.17.92 for diets A, B and C, respectively. Economic efficiency of calves fed on early weaning diets B and C was about 42.5% and 46.3% less than calves fed on diet A, respectively. The calves fed on milk replacer with concentrate feed showed better performance compared to calves fed on early weaning diets due to balance nutrients profile of milk replacer. Daily weight gain of cow calves fed on early weaning diets in this experiment was observed greater than reported by Chattha et al. (1996) when they weaned cow calves at 12th and 4th week of age which were fed on cow milk along with pre-starter ration. This variation might be due to difference in the breed of calves used in the experiment. Present results on growth performance are comparable to the results of Lapiere (1984) and Guertin (1987). Our results of lysine and methionine supplementation of cottonseed meal on growth performance are substantiated by Khan and Azim (2000) who reported that feeding of these amino acid supplemented cottonseed meal to buffalo calves yielded beneficial results. Present finding on economic efficiency is corroborated by Wina et al. (1996) who reported that cheaper milk substitute resulted higher per head profit than a commercial milk replacer.

Dry matter and crude protein digestibility

Results of the dry matter and crude protein digestibility of the experimental diets are given in table 4.

During digestibility trial I, dry matter digestibility of diets A, B and C was 86.98%, 84.02% and 84.77%, respectively. Dry matter digestibility of diet A (milk replacer+ concentrate feed) was ($p < 0.05$) higher than that of the early weaning diets B and C. Similar trend was observed in crude protein digestibility of the experimental diets and it was ($p < 0.05$) higher of diet A than of early weaning diets. During trial I, dry matter and crude protein digestibility of diet A was ($p < 0.05$) better than those of early weaning diets presumably due to high digestible contents and higher biological value of milk replacer than

Table 4. Digestibility of early weaning diets fed to cow calves

Parameters	Diets			PSE
	A	B	C	
Digestibility (%)				
Trail I				
Dry matter	86.98 ^a	84.77 ^b	84.02 ^b	0.602
Crude protein	83.07 ^a	80.26 ^b	80.71 ^b	0.629
Trial II				
Dry matter	78.91 ^b	83.57 ^a	84.62 ^a	0.960
Crude protein	75.83 ^b	79.95 ^a	80.00 ^a	0.983

PSE=Pooled Standard error.

Different superscripts in the same row differ ($p < 0.05$).

early weaning diets and this might be the possible reason for having higher weight gain on diet A with low intake as compared to diets B and C. Results of digestibility trial II showed that dry matter digestibility (78.91%) of diet A was ($p < 0.05$) less than diets B (89.62%) and C (83.57%). Crude protein digestibility of early weaning diets B and C was also ($p < 0.05$) higher than diet A. Supplementation of cottonseed meal with lysine and methionine did no help to ($p > 0.05$) increase the digestibility of dry matter and crude protein of the early weaning diets at 5th and 9th week of age.

Reticulo-ruminal development had been reported to be dependent upon the presence of solid feed (Harrison et al., 1960). Leibholz (1975) reported that the ruminal digestibility of dry matter in calves weaned at 5 weeks of age reached the adult level by 8 weeks of age when calves were fed high concentrate diet. Sinhal et al. (1978) reported that micro flora took longer time (about 12 weeks) to establish in rumen of the calves fed whole milk compared with calves fed starter ration (about 4 weeks). Obitsu et al. (1995) reported that apparent digestibility of organic matter and nitrogen did not differ between age of 10 to 15 weeks when calves weaned at the age of 6th weeks. Higher digestibility of early weaning diets (B and C) compared to diet A during trial II can, therefore, be contributed to the development of rumen with advancement of age of calves.

Findings of the present study demonstrated the potential of rearing cow calves on early weaning diets based on cottonseed meal specially when it is supplemented with lysine and methionine. Cost of producing one kg of live body weight was markedly lower (44%) when the calves were fed on early weaning diets compared to milk replacer. However, more research is needed to perfect the diets and to gain more body weight gain from young cow calves.

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