

THE EFFECTS OF WEANING AGE, QUANTITIES OF MILK AND CALF STARTER CONSUMED ON THE PERFORMANCE OF SAHIWAL CALVES

A. I. Chattha, M. Sarwar¹, W. Abbas and C. S. Ali²

Department of Animal Nutrition, University of Agriculture, Faisalabad, Pakistan

Summary

An experiment was planned to investigate the effect of early weaned calves on their growth performance. Twelve newly born Sahiwal male calves were employed for this study. These calves were divided into four groups (A, B, C, D); three animals in each group. Calves weaned at 13 weeks (A), a traditional method of calf rearing in Pakistan, received whole milk throughout the experimental period of 90 days while calves weaned at 8 (B), 6 (C) and 4 (D) weeks received the starter ration to compensate the reduced milk allowance. Weight gain of calves of all groups remained unaffected statistically. However, the average daily body weight gains of calves weaned at 6 (300 grams) and 8 (377 grams) weeks of age were similar to those weaned at 13 (368 grams) weeks of age. The results of this study suggest that calf weaning could successfully be obtained at 6 weeks of age with the abundant provision of palatable and nutritious starter ration.

(Key Words : Sahiwal Calves, Early Weaning, Starter Ration, Growth Performance)

Introduction

The supply and demand gap, for high quality animal protein such as milk and meat, is constantly widening because of ever increasing human population at an alarming rate of 3.1 percent in Pakistan. The annual per capita availability of milk in this country is 105 liters (Anonymous, 1992), which is far lower than that of the developed countries. One of the methods to improve the milk shortage can be through the manipulation of feeding regimen management. This can include the introduction of early calf weaning feeding regimens by substituting/supplementing grain and feed by-products. These dietary alterations can spare some milk for human consumption.

The ability of the young calves to utilize forage was reported by Armstrong (1954) and Preston (1957). They reported that the week old calf could digest pasture grasses. Swanson and Harris (1958) reported that 18 out of 26 calves fed diets containing milk, hay and starter began ruminating by 14th day of age. However, wide variations exist in the feeding systems for calves rearing all over the world. Therefore, a study needs to be

designed to get assessment of total milk required, optimum weaning age and types of solid feeds for weaning of calves under local conditions. The objective of this study was to ascertain what effects early weaned calves could have on growth performance of calf raising in Pakistan.

Materials and Methods

Animals

Twelve healthy newly born Sahiwal male calves were divided into 4 groups (A, B, C, D) three in each group. The calves were removed from the dams just after parturition. The birth weight ranges from 20.5 to 24 kg. Each calf was housed separately in 12' × 5' size pen in a 60' × 100' shed with 60' × 12' covered and 60' × 88' uncovered area. The pens were made by dividing the covered area with wire netting. Each pen was provided with a manger to offer green fodder and starter ration and a trough for drinking water. A lump of common salt (NaCl) was also made available in each pen. The calves were allowed to go to the open area one hour in the morning and one hour in the evening during which the pens were cleaned. The calves were offered fresh and clean water and common salt throughout the experimental period of 90 days.

Neo-Terra-25 (Antibiotic) was supplied in drinking water twice weekly to all calves during the experimental

¹Address reprint requests to Dr. M. Sarwar, Department of Animal Nutrition, University of Agriculture, Faisalabad, Pakistan.

²Department of Physiology and Pharmacology, University of Agriculture, Faisalabad, Pakistan.

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period. Each animal was weighed at weekly intervals and milk allowance of the following week was calculated on the basis of the body weight of the previous week. The data on daily feed consumption (Whole milk, pre-starter, calf starter ration and berseem hay) were also maintained. The health status of the animals was observed during the study.

Rations

Two concentrate rations, a pre-starter and a calf-starter containing 16 and 18% crude protein, respectively, were prepared. The composition of the ration is shown in table 1.

TABLE 1. INGREDIENT AND CHEMICAL COMPOSITION OF PRE-STARTER AND CALF-STARTER RATIONS

Item	Pre-starter	Calf-starter
Ingredient composition (dry matter basis)		
Corn gluten meal (60%)	5	—
Linseed meal	10	10
Maiz grain	30	20
Molasses	5	7
Oats grain	30	15
Wheat bran	20	20
Berseem hay	—	8
Cotton seed meal	—	18
Vitamins and Minerals	—	2
Chemical Composition		
CP	16.34	18.27
CF	8.97	10.62
TDN	70.95	66.45

Feeding regimens

Animals in group A, B, C and D received whole milk at the rate of 10 percent of their body weight for 6, 4, 3 and 2 weeks and thereafter milk intake was reduced progressively to zero till they achieved the age of 12, 8, 6 and 4 weeks, respectively. Reduction in the supply of milk consumption was equally distributed in weekly intervals of the respective groups. Animals in groups B, C and D were allowed to take pre-starter during the period of milk supply reduction and thereafter they were given starter ration.

From days 91 to 365, all calves were placed on similar rations formulated according to NRC (1987) requirements. The animals were fed *ad libitum* and the supply of fresh water was ensured for 24 hours during the study. The

animals were weighed at weekly intervals to monitor the growth response during the post weaning period.

Chemical & Statistical Analyses

Proximate analyses of pre-starter and calf-starter rations were determined by using AOAC (1984) methods. The data generated during the experiment were subjected to statistical analyses by using analysis of variance technique with completely randomized design. The difference between group means were compared by Duncan's Multiple Range (DMR) test (Steel and Torrie 1981).

Results and Discussion

Feed intake

The intake of whole milk, pre-starter, starter ration and berseem hay by calves under different feeding regimens are shown in table 2. The results indicated that the calves on feeding regimen D consumed the minimum quantity of whole milk (56.85 liters) and berseem (Egyptian clover) hay (19.65 kg). However, calves in this group consumed the maximum (44.98 kg) of starter ration. Calves on feeding regimens B and C consumed 134.38 and 85 liters of whole milk and 35.20 and 39.9 kg of starter rations, respectively. Greater consumption of berseem hay and starter ration in feeding regimens B, C and D was desirable because solid feeds stimulated early rumen development and enabled the calf to change from a single stomach animal to its polygastric status (Dzuik and Seller, 1955). Preston et al. (1957) also reported that the development of adult type rumen function was governed more by the rate at which the calf consumed solid feed than by its age. Sinhal et al. (1978) reported that microflora took longer time (12 weeks) to establish in the rumen of the calves fed whole milk compared with the calves fed milk plus starter ration (4 weeks). Reticulo ruminal development had been reported to be dependent upon the presence of solid feed (Harrison et al., 1960).

Growth performance (1-90 days)

The average daily weight gains were 368, 377, 300 and 242 grams per calf fed on A, B, C and D feeding regimens, respectively. Calves weaned at 4 weeks of age gained relatively less weight as compared to those weaned at 6, 8 and 13 weeks of age. However, statistical analysis of the data on weight gain revealed a non-significant difference among all weaning regimens. The calves weaned at 4 weeks of age were pot bellied and lost shininess of body coat. Calves weaned at 13, 8, 6 and 4 weeks of age consumed 204.40, 134.38, 85.00 and 56.85

liters of whole milk, respectively. Limited supply of whole milk did not adversely effect the growth performance and probably it was due to sufficient consumption of good quality concentrate to compensate the required deficient nutrients. The result of this study supported the findings of Homb (1960), Arias Fandino (1960) and Engelhard and Thiele (1961). Homb (1960) reported that the calves fed ration based on limited whole milk and supplemented with skim milk or dry calf-starter for 18 weeks gained similar weights. The results were further supported by Arias Fandino (1960) who pointed out that no significant differences in growth or health were noted between the two groups of calves fed either 1357 lb of whole milk during 112 days or 466 lb of whole milk during 56 days. The present study supported the findings of Qureshi et al. (1967) who concluded that the buffalo calves could be successfully weaned at 8-9 weeks of age without impairing growth rate or general health condition. Paliev (1962) also reported that the reduction in the total whole milk intake to 127 kg per head did not have any adverse effect on the weight gain of the calves provided the skim milk and vegetable feed were given adequately, indicating that early weaning may help save the milk for human consumption.

Post weaning growth (91-365 days)

All the animals were placed on a similar routine farm ration during post weaning period. The average daily weight gain for 275 days post-weaning were 305, 321, 324 and 270 grams per calf kept previously on A, B, C and D feeding regimens, respectively (table 2). Statistical analysis of the data on weight gains of calves revealed that there were no significant differences on weight gain. However, the calves weaned earlier showed greater daily weight gain during post weaning period than those weaned by traditional method. These results supported the findings of Mathieu and Wagat Liter (1961), who reported that feeding whole milk resulted in the highest weight gains during the weaning period but later the calves reared on milk substitutes grew faster. Engelhard and Thiele (1962), observed nonsignificant differences in weight gains and body development between the experimental groups receiving 70 kg whole milk with skim milk, concentrate and hay when compared to the control group receiving the 120 kg whole milk during the experimental period of 180 days. Horn et al. (1962) reported that calves weaned at 4, 7 and 12 weeks of age consumed the total of 177, 388 and 966 lb of milk and gained on an average of 1.3, 1.4 and 1.7 lb per day to 12 weeks. However, the advantage on weight gain of calves weaned at 12 weeks of age over those weaned at 4 and 7 weeks disappeared at

TABLE 2. EFFECT OF DIFFERENT WEANING REGIMENS ON THE AVERAGE INTAKE OF WHOLE MILK, STARTER RATIONS, BERSEEM HAY, AND WEIGHT GAIN

Description	Weaning Regimens*			
	A	B	C	D
Days on experiment	365	365	365	365
No. of calves	3	3	3	3
Average birth weight (kg)	23.50	22.30	24.00	20.50
Consumption (Pre-weaning)				
Whole milk (liters)	204.40	134.38	85.00	56.85
Pre-starter DM basis (kg)	-	9.80	4.63	2.12
Starter ration DM basis (kg)	-	35.20	39.90	44.98
Berseem Hay DM basis (kg)	22.04	24.80	28.65	19.65
Average daily body weight gain (g/day)				
Growth performance				
(1-90 days)	368	377	300	242
SE	28	31	37	25
Post-weaning				
(91-365 days)	305	321	324	270
SE	32	34	37	30

*Calves in group A, B, C and D were weaned at the age of 13, 8, 6 and 4 weeks of age, respectively.

least in one year of age. Similar trend was observed in the present study.

Conclusion

The calves weaned at 4 weeks of age spared about 148 liters of milk per cow in each lactation for human consumption. Early weaning system did not have any adverse effect on the health of the calves. However, the advantage on weight gain of calves weaned at 13 weeks of age, compared to calves weaned at 4 weeks of age, showed a gradual decrease during 275 days post-weaning period. The saving of 148 liters of milk from each cow per lactation, not only helps shrink the gap of supply and demand of milk in the developing countries but also is economical as per calculations made at the existing rates of milk (Rupees 12/liter), calf starter ration (Rupees 6/kg) and live weight (Rupees 20/kg) in Pakistan.

Literature Cited

AOAC. 1984. Official methods of analysis. 14th ed. AOAC, Washington, DC.

- Anonymous, 1992. "Agriculture statistics of Pakistan" Govt. of Pakistan, Ministry of Food, Agric., and Livestock (Economic Wing) Islamabad, Pakistan.
- Arias Fandino, J. 1960. Part replacement of milk in rearing calves. *Acta Agron., Colombia* 10:131.
- Armstrong, D. G., T. R. Preston and R. H. Armstrong. 1954. Digestibility of a sample of pasture grass by calves. *Nature*. 174:1182.
- Dzuik, H. E. and A. F. Sellers. 1955. Physiological studies vagal nerve supply to the bovine stomach. 2-studies on the eructation mechanism in adult cattle. *J. Vet. Res.* 16:499.
- Engelhard, J. and E. Thiele. 1961. Rearing calves with limited whole milk. *Dairy Sci. Abst.* 25(4):1117.
- Harrison, H. S., R. G. Warner, E. G. Sander and J. K. Loosli. 1960. Changes in the tissue and volume of the stomach of calves following the removal of dry feed or the consumption of inert bulk. *J. Dairy Sci.* 43:1301.
- Homb, T. 1960. Feeding calves with limited quantities of milk. *Dairy Sci. Abst.* 22(9):2576.
- Mathieu, C. M. and Wegat-litre. 1961. Method of feeding for rearing calves. 1 Determination of the amount of milk necessary. *Erna Ann. Zootech.* 10:161.
- National Research Council. 1989. Nutrient requirement of dairy cattle. 6th ed. Natl. Acad. Press, Washington, DC.
- Paliev, Kh. 1962. Rearing calves on rations with reduced whole milk. *Georgi Dimitrov Kostinbrod* 16:141.
- Preston, T. R., J. D. H. Archibald and W. Tinkler. 1957. The digestibility of grass by young calves. *J. Agric. Sci.* 48:262.
- Qureshi, M. S., Zia-ud-Din and N. A. Butt. 1967. Raising buffalo calves on limited amount of whole milk. *West. Pak. J. Agric. Res.* 5:128.
- Sinhal, R. N., D. D. Sharma and B. Ranganathan. 1978. Cellulolytic count and ruminal fermentation studies in buffalo calves fed milk and milk substitutes. 20th Intl. Dairy Cong. PP 1106-1107.
- Steel, R. G. D. and J. H. Torrie. 1981. Principles and procedures of statistics. McGraw Hill Book Co., Inc. New York.
- Swanson, E. W. and J. D. Harris. 1958. Development of rumination in the young calf. *J. Dairy Sci.* 41:1768.