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Comparative growth characteristics and feed conversion efficiencies in Brown Swiss calves weaned at five, seven and nine weeks of age*

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The eastern region of Turkey has very cold climate (-15° to -25°C) especially during winter and early spring. The Brown Swiss (BS) calves reared in this area are generally weaned at approximately 4-6 months of age. Morril *et al.* (1984) and Oppedeal (1986) observed that the practice of early weaning is feasible at moderate environmental conditions, which means that the cost of calf feeding and labour required prior to weaning could be reduced. Therefore in the harsh climate of Eastern Turkey, if BS calves can be weaned early without having a detrimental effect, the profitability to farmers would increase considerably.

This study was undertaken to compare the performance of calves weaned at 5, 7 and 9 weeks of age in terms of growth, feed efficiency and body measurements.

BS calves from the cattle herd of the research farm of the Agricultural College at Ataturk University, Erzurum, Turkey, were utilized. The calves, 27 males and 27 females, were allocated randomly to each of the 3 different weaning age groups (5, 7 and 9 weeks of age).

The calves were born between November and February. They were allowed to suckle their dams and received colostrum for the first 2 days. After the calves were started on the experiment, they were fed whole milk containing 3.7% protein, 4.0% fat and 12% dry-matter. The whole milk was offered to the calves twice a day. The amount of whole milk given to the calves was kept constant at 8% of their birth weight during the preweaning period as suggested by Reddy *et al.* (1985).

The calves were housed in a building specifically constructed for calves and included individual pens. Two different calf-starters (starters 1 and 2) were used. Their compositions are given in Table 1. Starter 1 was given from birth to 4 months of age and starter 2 after 4 months of age. The animals were fed individually *ad lib.* for 6 months.

Table 1. Composition of starter rations

Ingredients	Starter 1	Starter 2
	% by weight	
Barley grain	30.0	36.0
Wheat bran	20.0	24.5
Wheat grain	10.0	9.0
Cotton-meal	30.0	19.0
Molasses	5.7	7.3
Limestone	3.0	3.0
Salt	1.0	1.0
Vitamin premix 602	0.2	0.1
Trace min.-mixture	0.1	0.1
% composition (by analysis)		
Crude protein	20.0	18.0

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The weights and body measurements were determined and recorded at birth; weaning, 4 and 6 months of age. The quantity of feed consumed daily was recorded.

The data were analysed statistically by using a 2×3 completely randomized factorial experimental design. The ANOVA analysis was carried out by using the SAS statistics package programme (SAS 1986). Duncan's multiple comparison tests was also utilized (Duncan 1955).

The average birth weight of male calves was 3.8 kg higher ($P<0.01$) that of female calves (Table 2). Our findings are in agreement with results of Sabaz (1973), but higher than those of Equbunike and Togun (1981).

The weaning weights increased ($P<0.01$) as weaning age increased (Table 2). However, the weaning weights were not affected by sex ($P>0.05$). The results were supported by the findings of Ugarte (1976) and Winter (1985). The body weights at 4 and 6 months of age

Table 2. Weight and daily weight gains of calves

	Weaning ages (weeks)				Sex		
	5 n = 18	7 n = 18	9 n = 18	S	Male n = 27	Female n = 27	S
Weights (kg) at							
Birth	37.7±1.1	37.9±1.4	38.4±1.3	NS	39.7±1.0	35.9±0.9	**
Weaning	45.5±1.9[a]	48.7±2.4[a]	57.9±2.9[b]	**	53.1±2.4	48.3±1.9	NS
4 months of age	90.2±4.1	89.6±3.9	95.3±4.4	NS	97.5±3.6	85.7±2.7	*
6 months of age	132.4±4.7	129.4±5.1	132.7±4.6	NS	135.9±4.0	127.1±3.5	NS
Daily weight gains (kg) between:							
Birth - weaning	0.237±0.03	0.218±0.03	0.290±0.04	NS	0.270±0.03	0.240±0.02	NS
Weaning-4 months	0.525±0.03	0.576±0.03	0.601±0.04	NS	0.636±0.03	0.535±0.03	**
4 months - 6 months	0.703±0.04	0.661±0.04	0.624±0.05	NS	0.663±0.04	0.685±0.03	NS
Birth - 6 months	0.513±0.02	0.507±0.02	0.516±0.02	NS	0.517±0.02	0.506±0.02	NS

S, Significance; NS, nonsignificant; *, $P<0.05$; **, $P<0.01$.

Table 3. Feed efficiencies and body measurements of calves

	Weaning ages (weeks)				Sex		
	5 n = 18	7 n = 18	9 n = 18	S	Male n = 27	Female n = 27	S
Feed efficiencies[1]:							
Prior to weaning	3.38±0.06[a]	3.60±0.2[a]	4.54±0.4[b]	*	3.53±0.3	4.24±0.4	NS
Weaning - 4 months	5.57±0.3	5.25±0.2	5.22±0.47	NS	5.19±0.2	5.59±0.3	NS
4 months - 6 months	7.34±0.5	6.45±0.4	7.29±0.5	NS	7.19±0.4	6.79±0.4	NS
Gains in body measurements (cm) between birth and 6 months:							
Heart girth	40.1±4.2	39.8±2.2	37.5±1.5	NS	38.5±1.1	37.7±1.8	*
Body length	36.2±1.7[a]	30.3±1.0[b]	32.2±1.4[b]	*	33.2±1.6	32.5±0.7	NS
Height at withers	19.5±0.8	20.5±1.4	20.2±1.5	NS	19.9±1.1	20.3±1.0	NS
Chest depth	14.5±0.9	14.3±0.5	14.5±0.6	NS	14.0±0.4	14.9±0.4	NS

[1]Feed efficiency = Consumed dry matter of feed (kg) / weight gain (kg).
S, Significance; NS, nonsignificant; *, $P<0.05$.

were not influenced (P<0.05) by the weaning age treatments. The significant weight differences that existed at weaning disappeared at 6 months of age. This can be explained by compensatory growth of the calves. Males were heavier than females and the influence of sex on the weight was significant (P<0.05) at 4 months of age; however, this significant effect disappeared at 6 months of age.

Age of weaning did not have any effect on the daily weight gains at different stages of growth (P>0.05). All calves had a reduced daily gain between birth and weaning. Then, the rate of weight gain tended to increase with time (Table 2). Similar findings were observed by Jorgenson *et al.* (1970) and Winter (1978). The general conclusion drawn from these researches is that there is no adverse effect of early weaning of calves in terms of daily weight gain. The daily weight gains between birth and 6 months of age, birth and weaning, and between 4 and 6 months of ages were not influenced by sex.

Feed conversion efficiency ratio in the preweaning period was significantly (P<0.05) influenced by weaning age treatments but sex had no influence. The amount of dry matter consumed per kg weight gain was higher for calves weaned at 9 weeks of age when compared to earlier weaned calves. However, this difference in feed conversion efficiency ratio disappeared after weaning.

The gains in body measurements, such as heart girth, height at withers, and chest depth were not significantly influenced (P>0.05) by the weaning age treatments (Table 3) and the findings were in agreement with results of Winter (1985).

The results obtained from this research suggest that Brown Swiss calves reared under harsh environmental conditions of Eastern Turkey could be weaned at 5 weeks of age without having any major detrimental effect on their growth.

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