

## Effect of Milk Replacer, Whole Milk and Evaporated Milk on Body Gain of New Born Calves

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### ABSTRACT

The total and daily weight gain of calves receiving natural milk was significantly higher ( $P < 0.05$ ) than in calves which received milk-powder or evaporated milk. However, the total and daily gain in the group receiving milk-powder was higher ( $P < 0.05$ ) than in the group receiving evaporated milk. The total cost was reduced by 50% when milk-powder was used instead of natural milk.

The practice of feeding milk-replacer to calves, after 3 days of suckling colostrum, will save milk for human consumption.

### INTRODUCTION

One of the most important phases of dairy production is that of feeding and managing the dairy calves raised for replacement purposes.

A recent survey (Secretariat of Planning, Government of the Libyan Jamahiriya, 1979-unpublished report) revealed that approximately 25% of dairy calves in Jamahiriya, and especially in the Secretariat of Agriculture Projects, die of diseases before reaching maturity. Many of those deaths are caused by faulty management and nutrition.

In dairy farms, where production costs are high, many dairymen are changing to milk-replacers as a means of reducing the cost of raising young stock (4).

Milk-replacers usually consist of dry feed mixtures that are reconstituted with warm water (w/v. 1:9) (4), and fed as a replacement for milk. The successful raising of calves on milk-replacers depends on how nutritionally complete the product is (1).

There are four common systems for feeding calves from the third day until they are 9 weeks of age (3,4). The systems are; 1. Liberal milk feeding; 2. Using milk-replacers; 3. Limited milk feeding plus a dry calf starter; and 4. The nurse cow method.

In Jamahiriya the private farmers who have small herds (5-10 cows) cannot get the milk-replacer from the local markets. Thus they usually feed whole-milk to calves.

The purpose of this experiment is to investigate the problem of using milk-replacer, and the possibility of using evaporated milk as a replacement for whole-milk; evaporated milk being easily obtained in the local markets as well as being lower in cost than whole-milk. This means the lowering of costs in the raising of young stock.

### MATERIALS AND METHODS

Sixteen new born Holstein Friesian calves in the University of Al-Fateh Farm, Tripoli were divided randomly into 3 groups which were adjusted to different milk-

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Table 1 Average composition of natural cow milk, evaporated milk and milk-replacer.

Analysis	Whole milk	Evaporated milk	Milk-replacer
	%	%	% (skim milk)
Protein	3.4	2.9	3.2
Fat	3.8	7.0	2.6
Ash	0.72	0.8	0.7
Total Solids	12.5	13.0	12.3

feeding systems. Five calves (3 ♂ and 2 ♀) in group I (Gp. I) were fed 8 cans (170 g/head/day of Carnation milk (evaporated milk, made in France) mixed with (1:2. v/v) water up to 4 litres and given to the animal, 2 litres in the morning (a.m.) and 2 litres in the afternoon (p.m.), for 2 months. Then the quantity was increased to 10 cans (6.0 L./head/day, 3 L. a.m., and 3 L. p.m.) for another 2 months.

Gp. II has 6 calves (3 ♂ and 3 ♀) that were fed for 2 months with 400 g/head/day of dry milk-replacer (Skim milk, Interfood Handels-Gesellschaft MbH., Sonneberger Str. 15., 2800 Bremen) which after was mixed with water (1:9, w/v) up to 4 litres, and which was given to the animals as 2 litres in the morning (a.m.) and 2 litres in the afternoon (p.m.). Then the amount was increased to 6 litres/head/day (3 a.m. and 3 p.m.) for the next 2 months. The quality and quantity of milk-replacer and evaporated milk after dilution was approximately similar to that of natural milk (Table 1).

Gp. III had 5 calves (3 ♂ and 2 ♀) that were fed 4 litres/head/day of whole milk (2.0 L. a.m. and 2.0 L. p.m.) for 8 weeks. Then the supplement was increased to 6 litres/head/day (3.0 a.m. and 3.0 p.m.) for another 2 months. The whole-milk was given as 1 lb per 8 lbs of bodyweight individually.

However, protein, fat, ash and total solids content in the milk-supplement used during this experiment was calculated and analysed in our laboratory. Each group received equal amounts of total solids from milk-substitutes or whole-milk (Table 1).

All calves were nursed by their mothers for the first 3-7 days. This practice ensured the calf obtained the colostrum at body temperature and free from contamination. All groups were given equal amounts of concentrate (90-120 g/head/day) and amounts were adjusted with the age and body gain of the calves. Hay, straw, water and minerals supplement were given *ad libitum* (Table 2).

After weaning (4 months old) all calves were fed 350-400 g/head/day of concentrate with hay, straw, water and mineral were given *ad libitum*.

The calves were fed individually during the experiment and they were weighed at 2-week intervals. The management was similar in all groups.

The data were analyzed by the technique of the analysis of variance outlined in Steel and Torrie (7) and Duncan's new multiple range test for significance (6).

Table 2 The average composition of Hay, Straw and Concentrate as used in this experiment.

Contents	Hay	Straw	Concentrate
	%	%	%
Moisture	12.0	12.0	12.0
Crude protein	4.3	3.8	16.0
Crude fat	1.9	1.8	2.5
Crude fibre	33.7	38.4	14.0
NFE	43.8	35.0	—
Ash	4.5	8.9	10.0

Table 3 Total weight gain and daily gain (kg) of calves before and after weaning

		T <sub>1</sub> Evaporated milk	T <sub>2</sub> Milk-replacer	T <sub>3</sub> Whole-milk
Before weaning				
	Total gain	26.1 ± 3.6 <sup>(a)</sup>	36.0 ± 2.1 <sup>(b)</sup>	39.9 ± 2.0 <sup>(c)</sup>
	Daily gain	0.211 ± 0.0213 <sup>(a)</sup>	0.31 ± 0.007 <sup>(b)</sup>	0.332 ± 0.006 <sup>(b)</sup>
After weaning				
	Total gain	8.0 ± 0.9 <sup>(a)</sup>	9.4 ± 0.7 <sup>(a)</sup>	12.1 ± 0.75 <sup>(c)</sup>
	Daily gain	0.123 ± 0.03 <sup>(a)</sup>	0.172 ± 0.013 <sup>(b)</sup>	0.168 ± 0.002 <sup>(b)</sup>
Combined				
		34.1 ± 4.3 <sup>(a)</sup>	45.4 ± 2.52 <sup>(b)</sup>	52.0 ± 2.67 <sup>(c)</sup>

Any two means not having the same letter are significantly different at  $P < 0.05$  level.

## RESULTS AND DISCUSSION

The results of the weight gain of calves receiving evaporated milk, milk-powder and natural whole-milk are given in Table 3.

The total weight gain and daily gain of calves receiving a natural milk was significantly higher ( $P < 0.05$ ) than the calves which received milk-powder or evaporated milk.

The mean daily weight gain of groups of calves receiving evaporated milk, milk-powder and whole-milk was 211, 310 and 332 grams respectively before weaning.

Significantly ( $P < 0.05$ ) higher totals and daily gains in the groups receiving powdered-milk rather than evaporated milk, was also observed. Within the same group, the male calves appeared to have performed better than female calves in respect of weight gain. However, these differences were based on a small number of male or female calves in each group.

The differences in weight gains in different groups before weaning, appeared to have carried over even after weaning.

Although the animals of all groups were managed under the same management and dietary conditions, the animals which had received evaporated milk could still not make up their gain during the first 2 months after weaning. The feeding of whole-milk to calves resulted in better weight gain presumably due to the freshness of nutrients contained in the milk (5).

However, the practice of feeding whole-milk cannot be encouraged in Libyan Jamahiriya because of high demand for whole milk for human consumption. The idea of this trial was to investigate the possibility of replacing whole-milk altogether by milk-replacers. Milk-powder (milk-substitute) was found to be superior to evaporated milk. The reason for this difference cannot be explained unless both products are analysed for detailed chemical composition and nutrition value.

The cost of whole-milk, milk-powder, and evaporated milk was calculated on the basis of present market prices. It was observed (Table 4) that the cost of raising calves was appreciably reduced in the groups of calves which received either milk-substitute or evaporated milk.

The total cost was reduced by about 50% when milk-powder was used instead of natural milk. The cost of evaporated milk, milk-powder and whole-milk per kg weight gain was 1.54, 0.68, and 1.26 Libyan Dinars respectively. Feeding of evaporated milk for raising calves was more expensive than milk-powder and the performances of calves in respect of weight gain was the poorest of all groups compared.

The advantages of using milk-substitutes are that they are easier to transport and can be stored and fed to calves beyond the required duration (4). There is less risk of calf scour and it is more economical to feed milk-powder than whole-milk. However, the calves should be allowed to obtain sufficient colostrum from their dam immediately after birth.

Table 4 The amount of milk fed to three groups and total cost of different kinds of milk during the experiment.

	T <sub>1</sub> Evaporated milk	T <sub>2</sub> Milk-powder	T <sub>3</sub> Natural milk
Total amount of milk consumed	1008 cans (Equivalent to 61.6 kg solids)	61.6 kg (solids)	504 litre (Equivalent to 61.6 kg solids)
Total cost in (L.D.)	40.32	24.64	50.40
Cost per animal (L.D.)	8.60	4.11	10.08
Cost per kg body weight gain (Equivalent to L.D.)	1.546	0.684	1.264

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تأثير تغذية ثلاثة أنواع من الحليب  
( الحليب الطبيعي ، البودرة ، والكرنيش ) على الزيادة  
اليومية والنهائية في عجول الفريزيان تحت  
الظروف الليبية

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د . عاشور مسعود شريحة

ان الزيادة في الوزن اليومي لعجول الفريزيان ( من الولادة حتى  
القطام ) المغذية بحليب الام ( الحليب الطبيعي ) أعلى عما كان عليه  
في العجول المغذية بحليب الدقيق ( بودرة ) وحليب الوردات ( كرنيش ) .  
وان الزيادة في الوزن اليومي في العجول المغذية بحليب الدقيق  
كانت عالية جدا اذا ما قورنت بالعجول المغذية بحليب الوردات .  
( جدول ٣ ) .

علما بأن قيمة التكلفة للكيلو جرام الواحد في زيادة الوزن  
النهائي للعجول خلال مدة التجربة كانت منخفضة في حليب الدقيق عما  
كانت عليه في حليب الام وحليب الوردات ( جدول ٤ ) .

لذا يجب على الدولة توفير حليب الدقيق في الأسواق الليبية ،  
وكما ينصح الفلاحين باستخدامه كبديل لحليب البقر الطبيعي الذي يجب  
أن يوفر لاستخدام الانسان .