

FEEDING SUCKLING CALVES IN EGYPT ON A CERTAIN LEVEL AND REDUCED ALLOWANCES OF MILK

By

AHMED GHONEIM, A.K. ABOU-RAYA AND E.R.M. ABOU-HUSSEIN

*Department of Animal Production (Animal Nutrition) Faculty of Agriculture,
Cairo University.*

SUMMARY

A study was made to find out the effect of reducing the milk source for suckling calves down to 44.3 kg. starch value keeping the total requirements (plant food and milk) as 121 kg. starch value during the suckling period of 24 weeks using 28 cow calves and 41 buffalo ones. Normal growth was achieved when using a combination of whole milk (130 lb. cow milk or 100 lb. buffalo milk) and skimmed milk (915 lb.) but retardation in growth occurred when the milk mixture was replaced by equivalent amounts of whole milk (595 lb. cow milk or 469 lb. buffalo milk). The plant food included suitable amounts of fine wheat bran, green clover, wheat straw and undecorticated cotton seed cake which was introduced at 13 weeks of age.

INTRODUCTION

Some investigations had been undertaken to raise calves with limited amounts of milk (1, 4, 7, 9) and to replace whole milk by skimmed milk (2, 4, 6, 8).

In a previous paper, some efforts had been carried out to minimize the feeding cost of suckling Egyptian calves (4). It was indicated that the suckling calves of cows and buffaloes could be successfully reared on about 120 kg. starch value (S.V.) from milk and plant food, during a suckling period of 24 weeks. The suitable and economic amounts of milk to be offered per calf was found to be a mixture of 1030 lb. skimmed milk along with 194 lb. of whole cow milk or 150 lb. of whole buffalo milk. In terms of starch and heat values, the above milk mixture is equivalent to 53.3 kg. starch value and about 281,000 Calories. The whole milk was equal to 14.2 kg S.V. and 75 000 Calories (26.6% of the starch or the heat value of the milk mixture), the rest being from skimmed milk.

The previous investigation indicated that such mixture produced similar growth to the animals as to those which were fed more adequate ration. It was possible to obtain the same normal growth with the reduced allowances, without any harmful effect on the animals. The feeding cost was then appreciably reduced.

Rearing calves on the whole milk alone (721 lb. cow milk or 563 lb. buffalo milk) providing the same starch value from milk source as above, along with the same amount of plant food, appeared to be unsuccessful.

ful as when a mixture of the whole and skimmed milk was used. It was concluded that the mixture of the whole milk and skimmed milk, beside being cheaper, would provide the calf with greater quantities of the animal protein, resulting in a better growth.

It was decided to repeat the application of such promising mixture and test the effect of making a further reduction in the whole and skimmed milk mixture. The mixture used was composed of 130 lb. cow milk or 100 lb. buffalo milk along with 915 lb. skimmed milk keeping the total requirements from both milk and plant source to be 121 kg. S.V. as before. This would mean a reduction of 16% of the milk source. This would equal 44.3 kg. S.V. or 233,000 C., the whole milk being 21.3% of the total milk S.V. It was also of interest to test such reduction in milk source by depending on whole milk alone of the same starch or calorific value, *i.e.*, 595 lb. cow milk or 469 buffalo milk which were equivalent to 44.3 kg. S.V. or 233,000 C.

EXPERIMENTAL AND METHODS

Animals

The experimental animals were taken from the born calves of the dairy herd at the Animal Nutrition Experiment Station of the Faculty of Agriculture, Giza. The study includes 69 calves, 16 males and 12 females from cows and 17 males and 24 females from buffaloes.

Feeding

Calves were separated from their dames just after calving. Feeding followed similar lines as in the previous paper (4). Milk was hand-fed to calves individually, but plant food was fed in groups of similar ages. Calves were given the colostrum during the first week, the whole milk started at the second week up to the 13th, while the skimmed milk was given from the 3rd week up to the 24th week. The plant foodstuffs included clover, green maize (darawa), wheat bran and undecorticated cottonseed cake. The latter was offered at the 13th week at a rate of 0.125 kg. daily per calf; it was increased gradually to reach 0.500 kg. at the 24th week.

The daily starch value of plant food was 0.05 kg. at the 3rd week and was increased gradually up to 0.900 kg. at the 24th week. For convenience, the feeding schedule for the three different treatments of feeding is presented :

Treatment	Whole milk		Skimmed milk	Starch value (S.V.)			
	(Cows or buffaloes)			As milk	As plant food	Total S.V. *	Daily S.V.
	Cow	Buffaloe					
	lb.	lb.	lb.	Kg.	Kg.	Kg.	Kg.
D	194	150	1030	53.5	67.9	121.4	0.759
G	130	100	915	44.3	77.7	122.0	0.762
H	595	469	—	44.3	77.7	122.0	0.762

* S.V. given in 160 days (birth day and 1st. week colostrum not included).

It was noticed that the digestible protein allowances were not less than those recommended by Ghoneim for growing calves (5).

Recording weights

Calves were individually weighed every four weeks before feeding at 8 a.m.; the average of three successive daily weighings was taken to the nearest kilogram.

RESULTS AND DISCUSSION

Cow calves

In treatment D₁ (Table 1. Animals no. 1,2,3,4,5,6) the maximum daily gain with male cows was 0.602 kg. (Animal No.2). The average daily gain of the calves growing at a rate within 20% less than the maximum rate of growth (Animals no.2, 3, 4, 5, 6), was 0.560 kg. The corresponding maximum and average daily gain in treatment G₁ was 0.639 kg. (Animal No.17) and 0.612 kg. (Animals No. 7, 8, 9, 10, 11), while in treatment H₁, these were 0.456 kg. (Animal No.15) and 0.428 kg. (Animals no, 13, 14, 15, 16).

These results showed that reducing the milk allowances in Treatment G₁ down to 44.3 Kg.S.V.did not affect the growth of the animals. The average daily gain was practically similar to that with TreatmentD₁.

In Treatment H₁, the average daily gain was appreciably lower than that with Treatment G₁, indicating that a mixture of whole milk plus skimmed milk appeared to produce better growth than depending on whole milk alone, having the same starch value as that of the whole skimmed milk mixture.

It is to be noted that the average daily gain obtained in both Treatment D₁ and G₁ with male cow was noticeably higher than the general average gain in male cows of 0.518 already obtained (3), but in Treatment H₁, it was lower. The average in Treatment G₁ was 16% more than that with the general animals, indicating that the reduction of the whole-skimmed milk mixture to this extent did not impair growth.

The results with female calves was as follows (from Table II) :

Item	Treatment D ₂		Treatment G ₂		Treatment H ₂	
	Daily gain	Animal no.	Daily gain	Animal no.	Daily gain	Animal no.
	kg.		kg.		kg.	
Maximum	0.534	22	0.589	26	0.385	28
Average	0.494	19—22	0.567	24—26	0.379	27—28

These results were parallel to those obtained with the males, the reduction in the amount of milk offered had no retarding effect on the growth. Moreover, the average daily gain with both treatments D₂ & G₂ was equal or higher than the general average for daily gain of 0.491 kg. already recorded for female cows (3), while that of treatment H₂ was lower. Thus, replacing this reduced mixture of whole and skimmed milk by its equivalent value of whole milk alone appeared to reduce the daily gain of the animals confirming the previous results with males.

Therefore, it appears that reducing the milk allowances down to 44.3 kg.S.V. (233,000 C.) obtained from a mixture composed of 130 lb. whole milk plus 915 lb. skimmed milk is more economical for rearing Egyptian cow calves. This would save about 60 lb. of whole milk and about 100 lb. skimmed milk per calf. This cut in milk is to be compensated by its equivalence of plant food which is cheaper in price.

Buffaloe Calves

In Treatment D₃ (Table III, Animals no. 29 - 33) the maximum daily gain with male buffaloes was 0.576 kg. (Animal no. 31). The average daily gain of the calves growing at a rate within 20% less than the maximum rate of growth (Animals no. 29-33) was 0.539kg. The corresponding maximum and average daily gain in Treatment G₃ was 0.688 kg. (Animal no. 34) and 0.673 kg. (Animals no. 34, 36), while in Treatment H₃ they were 0.444 kg. (Animal no. 43) and 0.395 kg. (Animals no. 39, 41, 42, 43, 44, 45).

These results showed that reducing the milk allowances in Treatment G₃ down to 44.3 kg. S.V. did not harm the growth of the animals. The average daily gain was even slightly higher than that with Treatment D₃.

In Treatment H₃, the average daily gain was lower than that with Treatment G₃ indicating clearly that a mixture of whole milk and skimmed milk appeared to produce higher growth than depending on whole milk alone.

Comparing the results with the recorded general average for daily gain in male buffaloes, *i. e.*, 0.601 kg, (3), it would be seen that the reduction in milk in Treatment G₃ did not affect growth so long a mixture of whole and skimmed milk was used. When the reduction was done using whole milk alone (Treatment H₃), the growth was depressed.

The results with female buffaloes were as follows (from Table IV)

Item	Treatment D ₄		Treatment G ₄		Treatment H ₄	
	Daily gain kg.	Animal No.	Daily gain kg.	Animal No.	Daily gain kg.	Animal No.
Maximum .	0.516	54	0.617	56	0.422	66
Average . .	0.491	48,51,52,54,55	0.564	56·57·60·61	0.376	62—69

These results were concordant to those obtained with the males, the reduction in the amount of milk offered had no harmful effect on the animal growth. Replacing this reduced mixture of whole and skimmed milk by its equivalent value of whole milk alone, appeared to reduce the daily gain of the animals, confirming the previous results with males.

TABLE I.—Total and daily gain of male cow calves during the suckling period

Treatment	Animal No.	Birth Wt. kg.	Weaning Wt. kg.	Total gain kg.	Daily gain kg.	Relative daily gain assuming the highest 100
D ₁	1	23	85	62	0.385	63.95
	2	20	117	97	0.602	100.00
	3	22	112	90	0.559	92.86
	4	23	105	82	0.509	84.55
	5	21	108	87	0.540	89.70
	6	18	113	91	0.589	97.84
G ₁	7	21	120	99	0.614	96.09
	8	23	113	90	0.559	87.48
	9	21	121	100	0.620	97.03
	10	22	125	103	0.639	100.00
	11	20	121	101	0.626	97.97
	12	20	101	81	0.503	78.72
H ₁	13	20	80	60	0.373	81.80
	14	19	89	70	0.438	96.05
	15	20	93	73	0.456	100.00
	16	18	89	71	0.444	97.37

TABLE II.—Total and daily gain of female cow calves during the suckling period

Treatment	Animal No.	Birth Wt.	Weaning Wt.	Total gain	Daily gain	Relative daily gain assuming the highest 100
		kg.	kg.	kg.	kg.	
D ₂	17	18	83	65	0.405	75.84
	18	18	74	56	0.349	65.17
	19	20	89	69	0.429	80.34
	20	19	99	80	0.497	93.07
	21	20	101	81	0.503	94.19
	22	24	110	86	0.534	100.00
G ₂	23	17	99	82	0.509	95.32
	24	20	109	89	0.552	93.72
	25	19	109	90	0.559	94.91
H ₂	26	21	112	91	0.589	100.00
	27	20	80	60	0.373	96.88
	28	19	81	62	0.383	100.00

TABLE III.—Total and daily gain of male buffalo calves during the suckling period

Treatment	Animal No.	Birth Wt.	Weaning Wt.	Total gain	Daily gain	Relative daily gain assuming the highest 100
		kg.	kg.	kg.	kg.	
D ₃	29	35	113	78	0.484	84.03
	30	28	117	89	0.557	96.70
	31	24	117	93	0.576	100.00
	32	34	102	68	0.422	73.26
	33	28	115	87	0.540	93.75
G ₃	34	28	139	111	0.688	100.00
	35	32	116	84	0.522	75.87
	36	30	136	106	0.657	95.49
	37	36	108	72	0.447	64.97
	38	24	79	55	0.343	49.85
H ₃	39	23	81	58	0.361	81.31
	40	21	72	51	0.319	71.85
	41	22	85	63	0.394	88.74
	42	23	84	61	0.379	85.36
	43	18	90	72	0.444	100.00
	44	28	94	66	0.410	92.34
	45	30	91	61	0.379	85.36

TABLE IV.—Total and daily gain of female buffaloe calves during the suckling period

Treatment	Animal No.	Birth Wt. Kg.	Wearing Wt. Kg.	Total gain Kg.	Daily gain Kg.	Relative daily gain assuming the highest 100
D ₄	46	28	86	58	0.361	69.96
	47	27	93	66	0.410	79.46
	48	40	112	72	0.447	86.63
	49	28	88	60	0.373	72.29
	50	34	100	66	0.410	79.46
	51	27	107	80	0.497	96.32
	52	25	106	81	0.503	97.48
	53	28	93	65	0.401	77.71
	54	43	126	83	0.516	100.00
	55	28	107	79	0.491	95.16
G ₄	56	25	125	100	0.617	100.00
	57	34	126	92	0.568	92.06
	58	27	105	78	0.481	77.96
	59	33	108	75	0.463	75.04
	60	38	120	82	0.506	82.01
	61	22	102	80	0.494	80.06
H ₄	62	25	85	60	0.373	88.39
	63	18	79	61	0.379	89.81
	64	20	80	60	0.373	88.39
	65	18	75	57	0.356	84.36
	66	22	90	68	0.422	100.00
	67	20	76	56	0.348	82.46
	68	24	80	56	0.348	82.46
	69	25	91	66	0.410	97.16

TABLE V.—Feeding chart for weekly allowances of each calf from cows or buffaloes during the suckling period of 42 weeks

Week	Whole milk *		skimmed milk	Feeding value in plant food		Feeding-stuffs in plant food			
	Cow's	Buffaloe's		Starch value	Digestible protein	Wheat straw	Uncortificated cottonseed cake	Fine wheat bran	Green fodder (clover)
	lb.	lb.							
1	Colost.	Colost.	—	—	—	—	—	—	—
2	56	42	—	—	—	—	—	—	—
3	28	20	30	0.35	0.063	—	—	—	3.50
4	14	13	46	0.35	0.063	—	—	—	3.50
5	10	8	46	1.40	0.245	0.350	—	0.350	14.00
6	7	5	56	1.40	0.245	0.350	—	0.350	14.00
7	4	3	56	1.40	0.245	0.350	—	0.350	14.00
8	3	2	60	1.40	0.245	0.350	—	0.350	14.00
9	2	2	60	2.10	0.490	0.700	—	0.350	21.00
10	2	2	60	2.10	0.490	0.700	—	0.350	21.00
11	2	1	60	2.10	0.490	0.700	—	0.350	21.00
12	1	1	60	2.10	0.490	0.700	—	0.350	21.00
13	1	1	60	3.85	0.707	0.700	0.875	1.975	21.00
14	—	—	56	3.85	0.707	0.700	0.875	1.975	21.00
15	—	—	56	3.85	0.707	0.700	0.875	1.975	21.00
16	—	—	49	3.85	0.707	0.700	0.875	1.975	21.00
17	—	—	42	5.60	1.197	1.400	1.750	1.750	28.00
18	—	—	35	5.60	1.197	1.400	1.750	1.750	28.00
19	—	—	28	5.60	1.197	1.400	1.750	1.750	28.00
20	—	—	21	5.60	1.197	1.400	1.750	1.750	28.00
21	—	—	14	6.30	1.323	1.400	3.500	1.750	28.00
22	—	—	7	6.30	1.323	1.400	3.500	1.750	28.00
23	—	—	7	6.30	1.323	1.400	3.500	1.750	28.00
24	—	—	6	6.30	1.323	1.400	3.500	1.750	28.00
Total	130	100	915	77.70	—	—	—	—	—

* Cow's or buffaloe's according to the species.

Therefore, it appears that reducing the milk allowances down to 44.3 kg. S.V. (233,000 C.) which are obtained from a mixture containing 100 lb. whole milk and 915 lb. skimmed milk, is more recommended for rearing Egyptian buffaloe calves provided that an amount of plant food equal to 77 kg. S.V. are to be offered during the suckling period. The total food requirements be would about 121 kg. S.V.

It is to be noticed that the general average for daily growth for buffaloe calves during the suckling period is 0.551 kg. (being comparable with that obtained with Treatment G₄ (0.564). With Treatment H₄, the maximum or the average growth was noticeably below that

with the general animals. This confirms the fact that a mixture of whole and skimmed milk is more preferable than amounts of whole milk having the same starch value but lower protein.

It was also of significance, that with Treatment H (H_1 - H_4) with both sexes of the two species of calves, each individual calf out of 21 animals, without exception, produced a daily gain which was below that of the average of the general animals. Therefore, using 595 lb. whole cow milk (or 469 lb. buffalo milk) for rearing suckling calves (up to 24 weeks old) along with plant food of 77kg. is not a recommendable practice. For the economic importance of treatment G, the feeding schedule is presented in Table V.

REFERENCES

1. Aitken, J.N. (1949).—Experiments in rearing calves without whole milk and with limited amounts of milk. *U.S. Dept. Agr. Circ. No. 822* : 31, September (*In Nutrition Abst.* 20 : 31, 1950).
2. Eckles, C.H. and Gullickson, T.W. (1924).—Raising the dairy calf where whole milk is sold. *Minn. Agr. Expt. Sta. Bull.* 215.
3. Ghoneim, A., Raafat, M.A., Abou. Raya, A.K. and Abou-Hussein, E.R.M. (1957).—Study of growth in Egyptian cows and buffaloes up to 1.5 years old. *Cairo University, Faculty of Agric. Bull.* 133.
4. Ghoneim, A., Raafat, M.A., Abou-Raya, A.K. and Abou-Hussein, E.R.M. (1956).—Economic food requirements for growing calves during the suckling period. *Cairo University, Faculty of Agric. Bull.* 94.
5. Ghoneim, A. (1950).—Animal Nutrition. 3rd Ed. *Maktabet El-Oloum, Cairo.* (In Arabic).
6. Jarl, F., Nordfeldt, S. and Gagell, W. (1956). Effect of feeding different fat contents and varying amounts of skimmed milk to S.K.B. calves. *Kgl. Lantbrukshögsk. Stantens Husdjursforsk. Medd. No. 61*, p.34 (*In Nutrition Abst.*, 27 : 234, No. 1135, 1957).
7. Jarvis, R.N., Waugh, R.K. and Murely, W.R. (1952).—Relationship of growth of dairy calves to length of milk feeding period. *J. Anim. Sci.*, 11 : 766.
8. Kirsch, W., Bachner, F., Fewson, D. and Rabold, K. (1957).—Comparative studies on the rearing of calves on small amounts of whole milk with dried skimmed milk in different ways in South Germany. *Ztschr. Tierernahrung Futermittell.*, 12 : 76-88. (*Nutrition Abst.* 27 : 1256, No 3822, 1957).
9. Neville, W.E., McCullough, M.E., Sell, O.E. and Baired, D.M. (1952).—The effect of three levels of milk feeding to young calves on their growth rate and feed consumption. *J. Anim. Sci.*, 11 : 772.
10. Prasad, K. (1945).—Calf feeding with minimum whole milk. *Ind. Farming*, 6 : 217. (*In Nutrition Abst.*, 15 : 568).

(Printed in 1966)

تغذية العجول الرضيعة في مصر على مستوى معين مع تخفيض مقننات اللبن

احمد غنيم - احمد كمال ابو رية - السيد رفعت ابو حسين

الملخص

لقد درس تأثير تخفيض كمية اللبن للعجول الرضيعة الى ما يكافئ ٤٤٢ كجم نشا مهضوم مع ابقاء الاحتياجات الكلية من لبن وغذاء نباتي على مستوى يكافئ ١٢١ كجم نشا مهضوم وذلك خلال مدة الرضاعة حتى عمر ٢٤ اسبوعا باستخدام ٢٨ من عجول البقر و ٤١ من عجول الجاموس . وقد كان النمو طبيعيا عند استخدام مخلوط من اللبن الكامل (١٣٠ رطلا بقرى أو ١٠٠ رطل جاموسى) واللبن الفرز (٩١٥ رطلا) ولكن تأخر النمو عند احلال هذا المخلوط بما يكافئه من اللبن الكامل أى ٥٩٥ لبن بقرى أو ٤٦٩ رطلا لبن جاموسى . واشتمل الغذاء النباتى على كميات مناسبة من ردة القمح الناعمة والبرسيم الأخضر وتبن القمح وكسب القطن غير المقشور الذى بدىء اضافته من الأسبوع الثالث عشر .