

## THE FEEDING VALUE OF MILK AND COLOSTRUM FED TO YOUNG CALVES

### I.—A Study on The Whole Milk.

By

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#### SUMMARY

Digestibility trials with 9 Freisian and 6 buffaloe male calves aged 2 to 4 weeks were undertaken to study the digestion coefficients of nutrients and the feeding value of the whole milk of the two species. The results indicated that with cow milk the average digestion coefficients for dry matter, protein, fat and carbohydrates were 96.3, 93.4, 98.0 and 98.0 respectively. The total digestible nutrients were 17.22 as fed and 133.08 on dry matter basis, with a corresponding starch value of 17.73 and 137.02. The results with buffaloe milk were 96.0, 94.6, 97.4 and 96.4 for protein, fat and carbohydrates with a total digestible nutrients value of 23.36 as fed and 139.21 on dry matter basis the starch value being 24.15 and 143.92 respectively. The digestion coefficient of the specific milk nutrients were practically the same in both species. Buffaloe milk as fed contained ca. 33% more starch value and 20% more digestible protein, but buffaloe dry milk contained only 4% more starch value and about 3% less digestible protein.

#### INTRODUCTION

Although the digestibility of nutrients in cow milk by calves has been studied abroad (2,4,5,7,8,) but little informations about this in Egypt particularly with buffaloes is available. Choneim(3) and Ghoneim and El-Katib (3a) published data about the digestible nutrients and feeding value of cow and buffaloe's milk fed to sheep along with hay. The starch value reported was 16.36 and 22.03% for cows and buffaloe's milk as fed, with a corresponding value of 116.03 and 129.66 on dry matter basis. The digestibility coefficients for protein, fat and carbohydrates, calculated from his data were 86.7, 97.6 and 37.9 respectively with cows milk being 82.7, 96.4 and 36.9 with buffaloes. These figures appeared to be lower than those published by Schneider, Kelner, Morrison and Halnan which ranged between 94 to 96 for protein, 97 to 100 for fat and 98 to 100 for carbohydrates, being not less than 94% in any case.

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Therefore, these investigations were undertaken to estimate the feeding value and variations in digestion coefficients of different nutrients among calves of both species and to study some difficulties in performing digestion trials with calves.

#### EXPERIMENTAL AND METHODS

##### *Animals*

Nine Freisian male calves from the Ministry of Agriculture Experiment Station at Sakha and six buffaloe calves from that at Mahallet Moussa nearby, were chosen at an age between 2 and 4 weeks. They were placed in metabolism boxes made from concrete (1 × 1 × 1.25 metre) and provided with an iron door and covered with wooden floor. The calves were muzzled to avoid ingesting foreign materials.

##### *Feeding*

The calves were fed the mixed milk from the herd during a collection period of 7 days preceded by 4-5 days preliminary period. Each group of calves was fed on the milk from its species. The calves were artificially fed using rubber teats in order to assure passage of milk directly to the abomasum (10). Feeding was at 8 a.m. and 6 p.m. in equal parts, the requirements were ca. 10% of the body weight ranging from 2.5 to 4.5 kg. fresh milk. Composite milk sample was proportionally obtained from daily milk and was preserved by addition of 1 part of formalin to 1000 parts of milk.

##### *Collection of faeces*

Faeces were collected in plastic bags supported with suitable bags from cotton fabrics 16 × 25 cm. The bag was nicely fitted around the tail and over the rump of the calf, being held in place by an adjustable harness. The faeces were collected twice daily and kept frozen in the refrigerator. After the end of the collection period a composite sample was prepared for analysis. Carmine was used as a food-faeces marker in the first and last feed of milk during the collection period at a rate of ca. 2 gm. per calf. Faecal collection started at the first sign of colouring and continued till the last patch of coloured faeces of the last feed. The marked faeces was easily identified. The procedure followed the instructions of Parrish *et al* (1953) (7).

##### *Analytical methods*

They followed the ordinary official method of the A.O.A.C. (1) for solids ash and protein. Milk fat was determined as an ether extract of mixed sample of milk or faeces with anhydrous sodium sulphate. This was done by grinding in a mortar and quantitative collection into the extraction thimble and completing in the usual manner in Soxhlet apparatus as followed by Parrish *et al* (7). Soluble carbohydrates were determined by difference.

## RESULTS AND DISCUSSION

*The digestion coefficients and feeding value of cow's milk*

The average digestion coefficients of dry matter, protein, fat and carbohydrates of the cow's milk were  $96.3 \pm 0.81$ ,  $93.4 \pm 0.74$ ,  $98.0 \pm 0.20$  and  $98.0 \pm 0.45$  respectively (Table 1). The variation in digestion coefficients among different calves was small, the variability coefficient being not exceeding 2.5%.

Total digestible nutrients of cow's milk as fed were found to be 17.22 being 133.07 in dry milk, the respective feeding value, as starch values were 17.73, 137.02% (Table 2). Practically speaking, both systems of expressing the feeding value gave numerically the same results.

TABLE 1.—Variations in apparent digestion coefficients of milk nutrients using digestibility trials with cow and buffalo calves.

Item	Dry matter	Crude protein	Ether extract	Soluble carbohydrate
	%	%	%	%
<i>Cow calves</i> No. 1 . . . . .	95.8	93.5	98.4	97.3
2 . . . . .	95.4	94.6	98.4	95.9
3 . . . . .	95.2	93.2	97.9	96.4
4 . . . . .	96.3	93.6	97.5	98.2
5* . . . . .	94.9	89.7	96.9	97.6
6 . . . . .	96.8	92.4	98.7	98.9
7 . . . . .	97.4	93.8	98.4	99.6
8 . . . . .	98.1	98.0	98.2	98.2
9 . . . . .	96.7	92.2	97.4	99.9
Average (C) . . . . .	96.3	93.4	98.0	98.0
Standard error of the mean . . . . .	0.81	$\pm 0.74$	$\pm 0.20$	$\pm 0.45$
<i>Buffalo calves</i> No. 1 . . . . .	95.7	97.0	97.1	97.3
2 . . . . .	96.0	94.1	97.9	96.9
3* . . . . .	94.6	93.7	97.8	93.5
4 . . . . .	96.6	95.7	98.4	95.7
5 . . . . .	97.5	92.5	97.8	98.3
6 . . . . .	95.0	94.4	95.7	96.9
Average (B) . . . . .	96.0	94.6	97.4	96.4
Standard error of the mean . . . . .	$\pm 0.43$	$\pm 0.20$	$\pm 0.44$	$\pm 0.68$
Calculated "t" for the difference between (C) and (B)** . . . . .	—	1.430	1.511	2.051

\* Slight scouring was observed, but there was no distinct change in the faecal composition.

\*\* Theoretical "t" at 0.05 = 2.160.

Schneider (8) recorded a total digestible nutrients figure of 15.8 and 128.3 for cow's milk containing 3.6% fat and 123% dry matter being lower in feeding value as it contained less fat and dry matter.

The results obtained in this study are in harmony with those published by Parrish *et al.* (7) and Schneider (8). The protein digestion coefficient was slightly less than that of fat and carbohydrates. Protein digestion coefficient of cows milk published by Ghoneim was ca. 7 degrees of percentage less, while that of carbohydrates was distinctly very low being 37.9%.

TABLE 2.—The analysis, digestion coefficients and feeding value of cows, and buffaloes, milk fed to their young calves

Item	Moisture	Dry matter	Protein	Fat	Soluble Carbohy.	Ash	Total diges. nutrients.	Starch value
	%	%	%	%	%	%		
<i>Cows</i>								
Analysis as fed and feeding value . . . . .	87.06	12.94	3.34	4.42	4.45	0.73	17.22	17.73
Analysis dry and feeding value . . . . .	—	100.00	25.81	34.16	34.39	5.64	133.07	137.02
Average digestion coefficients . . . . .	—	96.3	93.40	98.00	93.00	—	—	—
Average digestible nutrients as fed . . . . .	—	—	3.12	4.33	4.36	—	—	—
<i>Buffaloes</i>								
Analysis as fed and feeding value . . . . .	83.22	16.78	4.00	6.53	5.47	0.78	23.36	24.15
Analysis dry and feeding value . . . . .	—	100.0	23.84	38.92	32.59	4.65	139.27	143.98
Average digestion coefficients . . . . .	—	96.00	94.00	97.40	96.40	—	—	—
Average digestible nutrients as fed . . . . .	—	—	3.78	6.36	5.27	—	—	—

#### *The digestion coefficients and feeding value of buffaloes milk*

The average digestion coefficients of dry matter, protein, fat and carbohydrates of buffaloes' milk were  $96.0 \pm 0.43 \pm 94.6$ ,  $0.20$ ,  $97.4 \pm 0.44$  and  $96.4 \pm 0.68$  respectively; the coefficient of variation was low being not exceeding 1.8% (Table 1). This indicates that the variations between calves were negligible. The total digestible nutrients of buf

falo's milk as fed was 23.36, being 139.27 in dry milk, the respective starch values being 24.15 and 143.98% (Table 2). Here also, both systems of expressing the feeding value gave practically the same results. The digestion coefficients published by Ghoneim (3) for buffaloe's milk were ca. 12 degrees of percentage less in case of protein. They were also distinctly low with the carbohydrates being 36.9% only.

#### *Comparison between cow's and buffaloe's milk*

The results concerning the digestion coefficients with buffaloe calves using buffaloe's milk, were proactically very similar to those obtained with cow's milk. The percentage difference between the average digestion coefficients in both species was 1.3% with protein, 0.61% with fat and 1.63% with carbohydrates. Such differences were not statistically significant as calculated "t" was not exceeding 2.05 (Table 1) Therefore, we could conclude that the same coefficients for both species are applicable. Therefore, for general application, the average digestion coefficients from both cows and buffaloes could be taken, being 94.0 for protein 97.7 for fat and 97.2 for carbohydrates.

Here, the results indicated that buffaloe's milk contained ca. 30% more dry matter than the cow's milk. This was reflected on the calculated feeding value as buffaloe's milk had a feeding value of ca. 33% more than cow's milk. This indicates that practically speaking 3 kgs. of buffalo's milk would equal 4 kgs. of cow's milk in feeding value for calves.

It was also found in these experiments that buffaloe's milk contained higher digestible protein than that of cow's milk, being 3.78 against 3.12%. Buffaloes's milk contained ca 12.0% digestible protein more than cow's milk, *i.e.* six units of cow's milk would contain about the same amount of digestible protein as 5 units of buffaloe's milk.

In case of dried milk, the picture was different. Buffaloe's dry milk contained only ca. 4.7% more T.D.N. and 5.1% more starch value than cow's milk.

Therefore, in practice 1 unit of dried buffaloe's milk would equal one unit of that from cow's. Moreover, dry milk from cows was found to contain ca. 24% digestible protein while buffaloe's milk contained ca. 22.8% being ca. 3% less than with cows.

Further studies on similar lines with cow's and buffaloe's milk when fed to growing calves up to their weaning time appear to be important. It may reveal new information about the associative effect of roughages and other foods on the feeding value of milk.

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### القيمة الغذائية للبن السرسوب المفدى للعجول الصغيرة

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#### الملخص

أجريت تجربة هضم على ٩ عجول بقرى فريزيان ، ٦ عجول جاموس عمرها من ٢ - ٤ أسابيع باستخدام أكياس من القماش المبطنة بأكياس نايلون وباستعمال مادة الكارمين Carmine كمرقم للبراز ، وكانت توزن لها كمياتها من اللبن والتي تبلغ ١٠٪ من وزن الجسم وتوضع للعجول فى بزارة . وكان يجمع الروث ويحفظ فى الثلاجة حتى يحلل . وقد غذيت العجول البقرى على لبن بقرى من لبن القطيع والعجول الجاموسى على لبن جاموسى من لبن القطيع وكانت تؤخذ من كل رضة عينة ممثلة . واستعمل الفورمالين بنسبة ١ : ١٠٠٠ كحافظ لعينات اللبن .

وقد وجد أن معاملات الهضم فى العجول البقرى اللبن البقرى ٩٦ ، ٩٣ ، ٩٨ ، ٩٨ للمادة الجافة والبروتين الخام ومستخلص الاثير والكريوايدرات الذائبة على التوالي أما بالنسبة للبن الجاموسى فقد وجد أن هذه النسب هى ٩٦ ، ٩٥ ، ٩٧ ، ٩٦ على التوالي أيضا .

وكان متوسط القيمة الغذائية للبن البقرى المفدى للعجول البقرى كمركبات مهضومه كلية فى اللبن الطازج ١٧٢٢ وفى حال المادة الجافة تماما ١٣٣.٧ أما بالنسبة للبن الجاموسى فقد وجد ان المركبات المهضومة الكلية فى اللبن الطازج كانت ٢٣٣٦ وفى الحالة الجافة تماما كانت ١٣٩٢٧ .

وكان معادل النشا للبن البقرى فى الحالة الطازجة ١٧٧٣ ولبن البقرى الجاف تماما ١٣٧.٢ ، وكان معادل النشا للبن الجاموسى المستعمل فى الحالة الطازجة ٢٤١٥ وفى اللبن الجاموسى الجاف تماما ١٤٣٩٨

ويلاحظ أن القيمة الغذائية كمركبات مهضومة كلية او كمعادل نشا تتساويان من الناحية العملية .