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THE EARLY WEANING OF BUFFALO CALVES

By

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The study included 48 males and 46 females. Seven treatments were tried with each sex. In Tratment A each calf received 100 lb whole milk + 915 lb skim milk in 24 weeks suckling period. In Treatments B and C the whole milk was the same as A, but the skim was 600 in 15 weeks and 300 in 7 weeks suckling period respectively. Treatments D, E, F, and G were weaned at 7 weeks. The latter two treatments received466 and 340 lb whole milk alone respectively., but D received 220 lb whole milk + 300 skim milk. Calves in Treatment E were given the same amounts given to D, but 30 lb dried skim milk were added to the concentrate mixture. All calves received 120 kg Starch Value (S.V.) from milk and plant feedstuffs during the first 24 weeks and ca. 300 kg S.V. during the next 28 weeks. The results in the first 24 weeks indicated that early weaning at 7 weeks with Treatments D, E, F and G produce the same or higher growth than control. Treatments E or F could be used if animals are slaughtered at earlier ages. Treatment D and G could be used if the animals are kept to one year old. The results of the second 28 weeks indicated clearly that calves which grew at a reduced level in the first 24 weeks started to compensate for this producing higher gain. This makes all treatments grow at similar rates if the growth during the whole first year was cmpared.

Reduction in the quantities of milk consumed by calves during their suckling period, is of great economic importance. This target can be attained by shortening the suckling period and replacing whole milk by other feed constituents cheeper than milk. This will encourage the farmer to delay the slaughter of calves, producing more meat for consumers.

Since the first scientific paper on weaning calves at 40 days was published by Mead *et al.*, 1924, much information have accumulated on weaning during the first or the second month of life. Several workers (Fernandez, 1959; Murdoch, 1958; Preston, 1056 and 1957; Preston and Macleod, 1958 ; Quale, 1955 ; Volcani and Eyal, 1953 ; Whiting and clark, 1955), showed that calves weaned early and received restricted quantities of whole milk compared favourably with those weaned later and received more milk.

In Egypt several attempts were undertaken to reduce whole milk consumption by calves and relating more on milk (Ghoneim *et al.*, 1965 and 1966). Ahmed and el-Shazly, 1960; and Makky and Abdel-Malik,

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1962, tried to combing early weaning with whole milk reduction and application of suitable calf starters. Recently, Borhami *et al.*, 1967 (a) and (b) tried to study the effect of artificial inoculation and using certain feeds on growth and feed efficiency of the early weaned calves. Agabawi *et al.*, 1968, indicated that early weaning reduced cost appreciably.

The present investigations were undertaken to find out the suitable weaning age, the amount of whole milk alone or along with the suitable amount of skim milk and their effect on growth and feed efficiency.

Experimental and Methods

The experimental buffalo calves were taken from the dairy hard of the Experimental Stations of the Ministry of Agriculture at Sakha, Mahallet Mousa and Seds. The study included 48 male and 46 female calves born from 1958 in three successive seasons.

Seven treatments with each sex were tried (A, B, C, D, E, F and G). Treatment A (control) received 100 lbs whole milk along with 915 lbs skim milk and weaned at 24 weeks, being similar to that of Ghoneim *et al.* 1966. The other six treatments are shown in the following schedule :

Treatment	No. of (animal)		Weaning age week	Amount of milk		Plant feedstuffs		S.V. of feedstuffs	
	Males	Females		Whole lb	Skim lb	Clover kg	Conc. mixture Kg	From milk Kg	Plant feed Kg
A	6	10	24	100	915	455	50.4	44.3	76.3
B	10	9	15	100	600	455	68.6	32.3	88.1
C	14	7	7	100	300	455	86.1	20.9	99.5
D	5	9	7	220	300	455	68.6	32.3	88.1
E	4	7	7	220	300+	455	50.4	44.3	76.3
F	5	5	7	466	—	455	50.4	44.3	76 3
G	4	4	7	340	—	455	68.6	32.3	88.1

* In addition 30 lbs dried milk were given in the concentrate mixture.

Calves were separated from their mothers shortly after calving. They were artificially fed on their mother's colstrum in the first week and then given the ordinery mixed herd milk alone or in addition to skim milk

and plantstuffs according to the treatment. Feeding skim milk started from the second or the third week up to the weaning age. The buffalo whole milk started from 6 to 9 lbs daily and decreased gradually during the following weeks to become 1-2 lbs during the last week. As the daily whole milk was decreasing the skim milk was increasing gradually to a maximum of 9 to 10 lbs at about the middle of the sucking period. Then the allowances decreased gradually until weaning time. Plant feedstuffs such as clover and a concentrate mixture were offered twice daily from the second and third week after drinking milk. The concentrate mixture contains 25% rice bran, 20% wheat bran, 20% decorticated cottonseed cake, 10% rice starch residue, 9% corn gluten meal, 5% barly 5% linseed meal, 2% limestone, 1% salt and 3% molases. It was mixed and pelleted (3/8× 5/8 inch). concentrate mixture was given at a rate of 10 to 50 grams daily per calf at the start on the third week, increasing gradually to reach 0.5 to 0.9 kg per calf daily at 24th week. The daily S.V. in the ration from plant feedstuffs was 0.06 kg in the third week and was increased to reach up 0.677 kg on the 24th weeks. Calves were individually bucket fed on milk but group fed on plant feddstuffs. Water was *ad lib.* Calves were encouraged for early chewing of plant feed.

After the first 24 weeks, calves continued to be fed according to the practice usually undertaken in the Stations up to one year old. (Ca 300 kg starch value, *i.e.* 1.53 kg S.V./day as shown by Abou-Raya *et al.* (1964).

Calves were individually weighed soon after birth then every two weeks (up to 52 weeks old) before drinking and eating at 8 a.m., taking the average of three successive days.

The feeding value of the concentrate mixture was determined in digestion trial with 3 adult rams (using clover hay as a basal ration) and was found to be 64.71% starch value (70.76% total digestible nutrients, T.D.N.). The digestible protein in the mixture was 14.28%. The Feeding value of baffalo whole and skim milk was taken as 21.1 and 8.4% S.V. respectively as determined by Ghoneim and El-Katib, (1944). The feeding value of clover was considered 10% S.V.

The statistical analysis and notations were according to Snedecor, 1957.

For reference purpose the summary of ordinary growth data at the Stations presented by Abuo-Raya *et al.*, 1964, are presented concerning the average daily gain.

	No. of calves at start	Period I	Period II	Period III (I×II)
Males . .	207	483	256	365
Females .	171	487	271	375

Results and Discussion

Growth studies during the suckling period (0—24 *weeks*)

Results in Table 1 with males concerning average gain during the period, indicated that gains in group (D, E, F) and (G) were greater than with the control being lower with (B) and (C). As S.V. consumption was the same

TABLE 1.—GROWTH DATA OF MALE CALVES WITH DIFFERENT TREATMENTS

Treatment	Av. Initial weight, Kg.	Av. daily gain, G.	Av. Growth Measure, kg.	Growth equation* W =
Period 1.—(0 – 24 weeks) :				
A	36.5	398	1.796	2.665 T + 42.26
B	36.3	350	2.041	2.200 T + 44.76**
C	36.0	345	2.083	2.145 T + 43.44**
D	35.6	396	1.802	2.665 T + 40.64
E	34.5	432	1.655	2.595 T + 47.85
F	32.2	421	1.744	3.005 T + 37.88
G	34.2	405	1.762	2.545 T + 45.43
Period 11.—From 24 – 52 weeks) :				
A	103.3	369	4.580	2.535 T + 36.74
B	95.1	487	3.358	3.555 T + 5.04**
C	93.6	407	3.942	3.040 T + 19.78**
D	102.2	420	3.900	2.995 T + 35.24**
E	107.0	342	4.952	2.385 T + 53.97
F	101.0	413	3.790	2.800 T + 30.33
G	102.3	290	5.258	1.995 T + 50.14**
Period III.—(0 – 52 weeks) :				
A	36.5	389	3.107	2.412 T + 43.22
B	36.3	428	2.780	2.540 T + 36.15
C	36.0	380	3.102	2.590 T + 37.70
D	35.6	409	2.884	2.917 T + 37.85
E	34.5	383	3.088	2.501 T + 48.78
F	32.2	407	2.874	2.472 T + 40.31
G	34.2	346	3.383	2.057 T + 48.99

* The range of calculated "t" for period, 1, 11,and 111 (1+11) were 11.6 — 36.3, 15.8 — 51.5 and 6.4 — 1702 respectively.

** The rate of gain is significant from that of the control (A).

in all treatments results concerning the growth measure (Starch Value consumed per unit gain) was inversely related to the gain in treatments. Therefore the afficiency of utilization in treatments (D, E, F) and (G) was higher than that in the control, being lower in Treatments (B) and (C).

The concentrate mixture appeared to be suitable for young calves as recommended by Brown *et al.* (1958),Everett *et al.* (1957), Hibbs *et al.* (1953) and Preston, (1960).

As the regression of live-weight in kilograms (Y) on growth periods in weeks (T) was found to be highly significant in all treatments the difference between its rate of growth of the control treatment and that in other treatments was tested. Results (Table 1) indicated that animals in Treatment (B) or (C) grew at a significantly lower rate than with the control. Other treatments grew at similar rate as the control, as differences were not significant.

Results with Females (Table 2) indicated that the average daily gain higher with Treatment E and F than the control, difference tested statistically between the coefficients of calculated growth regressions, indicated significant difference between either E or F and the control. Although Treatments B, C, D and G had a lower average daily gain than the control, yet the difference in rates of growth was only significant with B and C.

The results in both sexes inticated generally that early weaning at 7 weeks with Treatments D. E. F. and G. produced the same or higher growth than the control, indicating no ill effect of such treatmenst. The lower growth with Treatment C might be attributed to the severe reduction in milk. In Treatment B, although the amount of milk starch value given was as in Treatment D, but it was disributed to the animal during a larger period of 15 weeks. Perhaps offering reduced milk allowances in a shorter period might be more suitable to the calves being in favour of earlier weaning at 7 weeks.

It was clear from this study that early weaning at 7 weeks was successful avoiding labour and incidence of nutritional scour. It is a suitable practice to encourage the farmer to keepmale buffaloes which could be further reared on cheap plant feed-stuffs. Treatment E or F could be used if the animals are to be sold at relatively earlir ages having quicker growth and lower growth measure than the other treatments particularly with females.

Results of early weaning with buffaloes recorded by Borhami *et al.* 1967 (a) and (b) (using 103 kg. whole milk in 31 to 45 days along with calf starter, feeding being *ad lib.*, indicated less growth rate and feed afficiency than obtained here, inspite of the fact that their results were taken during the first 120 days of age. In their first study the gain in 120 days ranged between 340 and 420 G. daily with a growth measure of 2.8 to 4.12 T.D.N per unit gain. In their later study changing the time of replacing the

starter with a common cheaper calf cixture, they obtained during the days of age an avearge gain of 240—410 G. daily corresponding to a growth measure of 3.2 to 5.2 TDN per unit growth.

TABLE 2.—GROWTH DATA OF FEMALE CALVES WITH DIFFERENT TREATMENTS

Treatment	Av. Initial weight, Kg.	Av. daily gain, G.	Av. Growth Measure, kg.	Growth equation* W =
Period I.—(0 – 24 weeks) :				
A	33.3	428	1.676	2.800 T + 38.77
B	32.4	326	2.194	2.285 T + 34.43**
C	34.6	307	2.367	1.745 T + 44.22**
D	34.3	396	1.826	2.825 T + 36 09
E	34.0	474	1.508	3.335 T + 41.27**
F	34.2	452	1.579	3.085 T + 38.17**
G	34.2	418	1.707	2.765 T + 48.26
Period II.—(24 – 52 weeks) :				
A	104.9	416	4.336	2.875 T + 28.77
B	87.1	423	3.741	3.165 T + 6.67
C	85.3	386	4.179	2.840 T + 20.85
D	100.0	339	4.518	2.295 T + 49.42**
E	113.6	300	5.615	2.275 T + 60.14**
F	110.2	276	6.276	1.865 T + 67.09**
G	104.5	318	4.880	2.525 T + 41.90**
Period III —(0 – 52 weeks) :				
A	33.3	424	2.870	2.653 T + 38.62
B	32.4	378	3.129	2.645 T + 29.39
C	34.6	363	3.220	2.444 T + 36.09
E	34.3	365	3.162	2.542 T + 39.49
F	34.2	357	3.423	2.415 T + 45.46
G	34.2	368	3.158	2.327 T + 50.91

* The range of calculated "t" for period 1, 11 and 111 (1 + 11) were 9.6 — 56.7, 18.9 — 61.3 and 6.2 — 13.8 respectively

** Means that the rate of gain is significant from that of the control "A".

Growth studies during the 2nd 28 weeks (24—25 weeks)

Results in Table 1 with males indicate that the gain with Treatment B, C, D and F was higher than the control, being lower with Treatment E andG. The difference in growth rates judged from regression coeficients) were significant and with Treatment B, E, and G.

With females, although Treatment B grew at a higher rate than the control, the difference was not statistically significant. with the other 5 Treatments the growth was lower than the control, the difference being significant with Treatments, D, E, F and G. It should be indicated here that the average rate of growth of the control treatment in both sexes was lower than that of the ordinary animals at the Stations (having 660 lb whole milk in 15 weeks) but the difference was not significant.

Such results indicated that the Treatments which were affected by the treatment during the 1st 24 weeks and were growing at a slower rate than control started to compensate for this producing higher gain during the 2nd period. Such compensatory effect had been found by several investigators with growing claves carroll *et. al.* (1963) ; Tibbits, (1957) ; Tylor *et al.* (1957); Winchester *et al.*, (1955) and (1957).

Growth studies during the whole period (0—25)

The summation of results in both periods (Table 1 and 2) with males and females indicated that there was no significant difference between the growth rate of the conrol treatment and any of the other treatments. This confirmed the idea of the compensatory effect in the apparently retarded groups of calves as earlier ages, indicating that they would compensate later. This shows that some treatments of reared calves including early weaning along with reduction in milk, might be rejected or considered unsuitable if results were confined up to a relatively short period of growth. If calves are to be kept for breeding or staying more than one year, treatments of early weaning studied here would be more economical producing same normal growth at one year old.

Comparing the different treatments to chose the more suitable and economic, it was clear that Treatment E or F (when no skim milk is available) could be chosen if the calves were to be slaughtered at 6 months. But with delayed slaughter to 1 year old, one could chose Treatment D or G being less costing. Although treatment C. was cheaper in feed cost its growth was the lowest during the first period.

Results here eppeared to be encouraging for further investigations on similar lines using different plant feed mixtures and greater number of calves.

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REFERENCES

ABOU-RAYA, A.K., RAAFAT, M.A., MAKKY, A.M. AND ABDEL-MALIK, W.H., (1964).—*Growth study with buffalo calves during the first year of growth.* Cairo Univ., Faculty of Agric. The Bul. (under publication).

AGABAWI, K.A., EL-SAYED OSMAN, H. AND ABOU AKKADA, A.R., (1968).—Feed efficiency, ruminal activity and effects on some blood constituents of early weaned calves. *J. D. Dairy Sci.*, **51**, 744.

AHMED, I.A. AND EL-SHAZLY, K., (1960).—Early weaning in cow and buffalo calves. *Alexandria J. Agric. Res.*, 8, 217.

BORHAMI, B.E.A., ABOU AKKADA, A.R., EL-SHAZLY, K. AND AHMED, I.A., (1967).—Effect of feeding broken rice grains and decorticated cottonseed meal on feed efficiency, ruminal activity and blood constituents of early weaned buffalo calves. *J. Dairy Sci.*, **50**, 1142.

————, EL-SHAZLY K., ABOU AKKADA, A.R. AND AHMED I.A., (1967*b*).—Effect of early establishment of ciliate protozoa in the rumen on microbial activity and growth of early weaned buffalo calves. *J. Dairy Sci.*, **50**, 1954.

BROWN, L.D. LAISSITER, C.A., EVERETT, J.P. (JR.), SEATH, D.M. AND RUST, J.W., (1958).—Effect of protein level in calf starters on the growth and metabolism of young calves. *J. Dairy Sci.*, **41**, 1425.

CARROLL, F.D. ELLSWORTH, J.D. AND KROGER, D., (1963).—Compansatory carcass growth in steers following protein and energy restriction *J. Animal Sci.*, **22**, 197.

EVERETT, J.P., BROWN, I.D. (JR.). LASSITER, C.A., JACNBSOO, D.R. AND RUST, J.W., (1957).—Effects of protein levels of starters with and without aureomycin supplementation on growth and metabolism of young dairy calves, *J. Dairy Sci*, **40**, 1360.

FERNANDEZ-QUINTANILLA, C. (1959).—Studies on the early weaning of calves. *Bol. Inst. Nac. Invest. Agronom.*, Madrid, **19**, 271. (*N.A. and reviews*, **30**, 1505, (1960).

GHONEIM, A., ABOU-RAYA, A.K. AND ABOU-HUSSEIN, E.R. M., (1966).—Feeding suckling calves in Egypt on a certain level and reduced allowences of milk. 2nd Animal *Prod. Meet. Cairo* May 1963.

————, AND EL-KATIB, M.T., (1944).—Digestibilitty of cow's and buffalo's milk. Nature, **159**, 273.

————, RAAFAT, M.A., ABOU-RAYA, A.K. AND ABOU-HUSSEIN, E.R.M., (1956).—Feeding of Egyptian cows and buffaloes on different levels of starch values: I-Economic food requirements for growing calves during the suckling period, Cairo University, Faculty of Agric. Bul. No. 94.

HIBBS, J.W., CONRAD, H.R. AND POUNDEN, W.D., (1953).—A high roughage system for raising calves based on the early development of rumen function. 11 Growth, feed consumption and untilization by claves fed at 3 :2 ratio of hay to grain with or without molasses penicillin supplement, J. *Dairy Sci.*, **36**, 1319.

MAKKY, A.M. AND ABDEL-MALIK, W.H., (1962).—Early weaning of cow and buffalo calves. *First Scientific Anim. Nutr. Meeting at Minia* pp. 127 (In Arabic).

MEAD, S.W., REGAN, M.J. AND BARTLETT, J.W., (1924).—A study of the factors affecting the growth of dairy heifers. *J. Dairy Sci.*, **7**, 440.

MURDOCH, A.R., (1958).—Early weaning of calves in central Taranaki, N.Z.J. Agric., **97**, 352 (N.A. and Reviews, **29**, 1029, 1959).

PRESTON, T.R., (1956).—Dry feeding of calves. Agriculture *J. Minist. Agric.*, Engl., **62**, 462.

————, (1957).—Milk substitutes and early weaning of calves. Agriculture, *J. Minist. Res. Inst. England*, **64**, 429. (*N.A. and Reviews* **28**, 629, 1958).

————, (1960).—"Calf rearing". Ministry of Agric., *Fisheries and food, Bul.* No. **10**.

————, AND MACLEOD, N.A., (1958).—Rearing calves on pasture. *Agric. Rev.*, **4**, 32 (*N.A. and Reviews*, **28**, 1278, 1958).

QUALE, P.D. (1955).—The early weaning of calves. *J. Kings college Agric. Soc.*, **2**, 24.

SNEDECOR, G.W., (1957).—"*Statistical Methods*" 5th Ed. Iowa State College press, Ames, Iowa; U.S.A.

TIBBITS, J.P., (1957).—The development of calves reared on varying amounts of whole milk. *J. Agric. Sci.* **49**, 329.

TYLOR, J.E. ALDER, F.E. AND RUDMAN, J.E., (1957).—Fill and carcass changes of yard and Pasture fed cattle turned into spring pasture. *Nature*, **179**, 197.

VOLCANI, R. AND EYAL, E., (1953).—Rearing calves on limited milk rations. (*N.A. and Reviews*, **26**, 225, (1956).

WHITING, F. AND CLARK, R.D., (1955).—Raising dairy calves with a limited amount of milk. *Canad. J. Agric. Sci.*, **35**, 454.

WINCHESTER, C.F., HINER, R.I. AND SCARBOROUGH, V.C., (1957).—Some effects on beef cattle of protein and energy restriction. *J. Animal Sci.*, **16**, 426.

————, AND HOWE, P.C., (1955).—Relative effects on continuous and interrupted growth on beaf steers. *U.S.D.A. Tech. Bul.* No. **1108** (c.f. in Ref. 4).

الفطام المبكر للعجول الجاموسى

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الملخص

اشتملت الدراسة على ٤٨ عجلا ، ٤٦ عجلة جاموسى . وزعت على ٧ معاملات . ففى المعاملة الأولى (المقارنة) أعطى لكل حيوان ١٠٠ رطل لبن كامل ، ٩١٥ رطل لبن فرز فى مدة ٢٤ أسبوعا وفى المعاملة الثانية والثالثة ثبتت كمية اللبن كما فى المعاملة الأولى ولكن خفضت كمية اللبن الفرز الى ٦٠٠ رطل فى ١٥ أسبوعا ، ٣٠٠ رطل فى ٧ أسابيع على التوالى .

والمعاملات الرابعة الى السابعة فطمت عند عمر ٧ أسابيع وأعطت المعاملتان السادسة والسابعة ٤٦٦ ، ٣٤٠ رطل لبن كامل فقط على التوالى أما المعاملة الرابعة فقد أعطى للعجول ٢٢٠ رطلا من اللبن الكامل ، ٣٠٠ رطل لبن فرز وقد أعطيت العجول فى المعاملة الخامسة نفس كميات اللبن الكامل والفرز فى المعاملة الرابعة ولكن مع اضافة ٣٠ رطل لبن فرز مجفف مع العليقة المركزة . هذا مع ملاحظة ان كل العجول أعطيت خلال الأربع والعشرين اسبوعا الأولى ١٢٠ كجم معادل نشا من اللبن والعليقة النباتية كما انها أعطيت حوالى ٣٠٠ كجم معادل نشا وذلك خلال الثمانية والعشرين أسبوعا التالية وحتى عمر سنة . وقد اتضح من النتائج خلال الـ ٢٤ أسبوعا الأولى ان الفطام عند عمر ٧ أسابيع فى المعاملات الرابعة وحتى السابعة أعطت نموا متساويا أو أكبر عن مثيله لمجموعة المقارنة ويمكن استعمال المعاملة الخامسة والسادسة اذا كانت العجول ستذبح فى عمر مبكر والمعاملتين الرابعة والسابعة فى حالة تأخير ذبحها حتى عمر سنة . كما أوضحت النتائج فى المدة من ٢٤ ـ ٥٢ أسبوعا أن العجول التى نمت بمعدل أقل فى الـ ٢٤ أسبوعا الأولى نتيجة لأحد المعاملات فانها تبدأ فى تعويض هذا النمو بحيث لم توجد فروق معنوية فى معدل النمو بين جميع المعاملات فى السنة الأولى من النمو .

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