

## EFFECT OF SOME TANGIBLE CAUSES OF VARIATION ON BUFFALO'S MILK YIELD

By

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### Summary

This study was carried out on a herd of Egyptian buffaloes belonging to the Egyptian Agriculture Society at Bahteem near Cairo. Records were collected during the period from 1937 to 1957.

The mean age at first calving was shown to be 38.4 months. Calvers of 35-37 months old at first calving produced more milk and scored longer lactation periods than those calving earlier or later. Variation in milk yield as well as in lactation length due to the effect of age at first calving was not statistically significant.

The total milk yield increased with advance in age till the maximum production was attained and then declined. Buffaloes reached their peak of production at the 4th lactation when they were 7.2 years of age.

Buffaloes calving during April gave the highest milk yield while those calving in December showed the longest lactation period. Winter and Spring calvers were the best milk producers. Winter calvers recorded the longest lactation period. Neither month nor season of calving showed a significant effect on either milk yield or lactation length.

### Introduction

Causes of variation in milk yield of buffaloes were studied by many workers. The results were not necessary in agreement since the conditions of the herd vary from farm to farm.

It was thought to add more information in this field by analysing the milk records of the Bahtim Exp. farm. The information obtained from this study will add to any knowledge as to the effect of age, month and season of calving.

### Materials and Methods

Normal milk records of the herd of buffaloes located at Bahteem near Cairo were used in this work. Data comprised 223 lactations of 84 buffaloes. The study covered the period from 1937 to 1957. The herd management was previously described by Khishin *et al.* (1963). Statistical analyses were carried out according to Snedecor. (1946).

### Results and Discussion

#### 1. Effect of age at first calving

Fig. (1) shows the frequency distribution of ages of heifers when they calved for the first time. The mode was 36 months (20% of calvings). 27% of the heifers calved for the 1st time at younger ages, 36% when

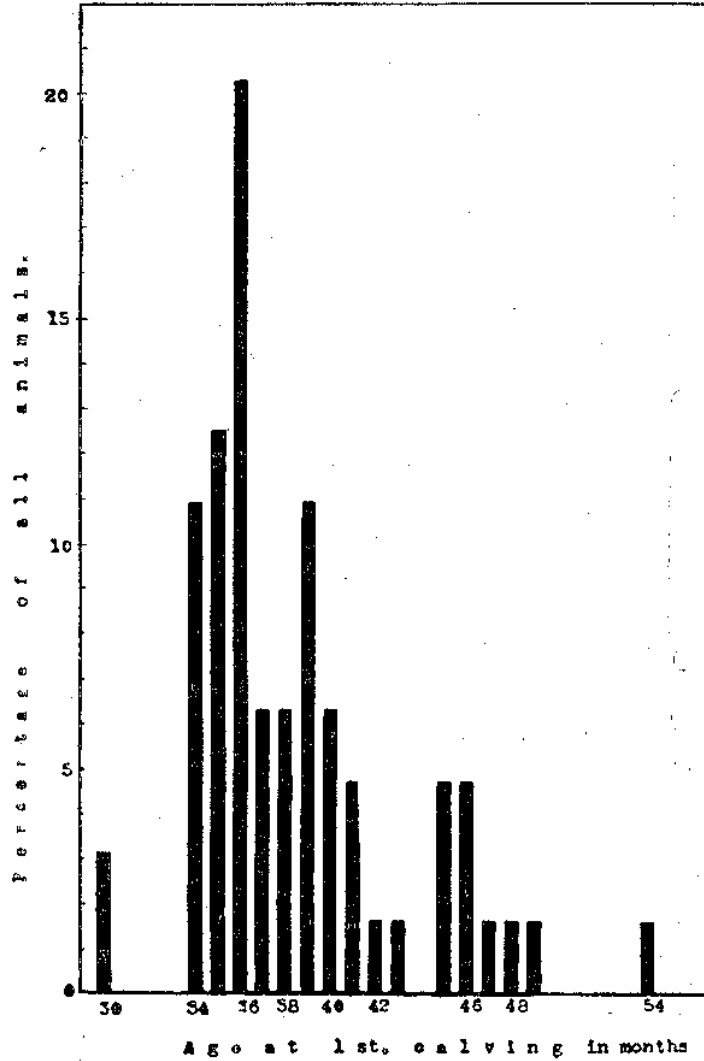


Fig. 1 — Frequency distribution of age at 1st calving.

TABLE I  
Effect of age at first calving on total milk yield

Age Interval	Less than 35 months			35-37 months			38-40 months			41-43 months			Over than 43 months		
	No. of animals	Milk yield (Lb)	Relative yield %	No. of animals	Milk yield (Lb)	Relative yield %	No. of animals	Milk yield (Lb)	Relative yield %	No. of animals	Milk yield (Lb)	Relative yield %	No. of animals	Milk yield (Lb)	Relative yield %
1st.	9	2862	77	25	3756	101	15	2830	76	5	2851	77	10	3251	87
2nd.	8	3252	87	19	4447	119	7	3468	93	3	3643	98	5	3522	94
3rd.	6	4332	116	13	4171	112	4	4053	109	3	3089	83	3	3800	102
4th.	3	6116	164	10	4437	119	2	3387	91	3	4178	112			
Total and Average	26	3697	99	67	4134	111	28	3204	86	14	3360	90	18	3417	92

they were from 37-42 months old, and for 17% age at 1st calving was more than 42 months.

The average age at first calving was  $38.4 \pm 4.6$  months ranging from 30 to 54 months and the coefficient of variability was 11.98%. This is in close agreement with the findings of Khishin (1951), Sidky (1952-1955), Hilmy (1954), Alim (1957.a). It also falls within the range of 37.2 - 40.2 months found by Ibrahim (1950), Asker and Ragab (1951), Ghazy (1953), Alim and Ahmed (1954), Alim (1957. b), and Youssef and Asker (1959).

This estimate is less than that obtained by Ashfaq and Mason (1954) (47 months) for buffaloes in Pakistan, Venkayya and Anantkrishnan (1957) a. (44.3 months) for Murrah buffaloes, and Rife (1959) (45.7 months) for buffaloes in India. The delay in calving for the first time in buffaloes in India and Pakistan may be due to the system of management practiced in those countries. Comparing age at first calving obtained in this investigation with that found by Mahadevan (1953) for Sindhi cattle, Asker *et al.* (1958) for the Native cattle, and Itriby and Asker (1958) for the European breeds of cattle; it seems that the Egyptian buffaloes calve earlier than Indian cattle and Native cattle but later than European breeds.

Table 1 shows the effect of age at first calving on total milk yield when calvings were grouped into 5 classes of 3 months intervals. It was shown that animals which were 35-37 months of age at first calving excelled the other 4 groups in milk production. This group produced 12, 25, 21, and 19% more milk than the 1st, 3rd, 4th, and 5th group respectively.

The differences between these 5 groups studied for the total milk yield was not statistically significant (Table 2).

TABLE 2.  
Analysis of variance of milk yield for groups of animals according to age at first calving for buffaloes (the unit is 10 gal.)

Sources of variation	Degrees of freedom	Sum of squares	Mean square	F. Value
Between groups . . . . .	4	2240	560	2.46
Between buffaloes/groups	59	13425	228	2.48(**)
Between lactations/ buffaloes/groups	89	8174	92	
Total . . . . .	152	23839		

(\*\*) significant at 1% level.

TABLE 3  
Effect of age at first calving on lactation period

Age Interval	Less than 35 months		35-37 months		38-40 months		41-43 months		Over 43 months	
	No. of animals	Av. Lactation period(days)	No. of animals	Av. Lactation period(days)	No. of animals	Av. Lactation period(days)	No. of animals	Av. Lactation period(days)	No. of animals	Av. Lactation period(days)
1st.	9	250.3	25	304.3	15	257.3	5	258.6	10	277.8
2nd.	8	224.9	19	304.4	7	264.6	3	269.7	5	273.0
3rd.	6	258.8	13	288.9	4	316.5	3	235.3	3	221.3
4th.	3	347.7	10	301.3	2	233.0	3	290.0		
<b>Total and Average</b>	26	255.7	67	300.9	28	265.8	14	262.7	18	267.1

Table 3 shows the effect of age at first calving on length of lactation period. From this table it can be noted that the longest lactation period was recorded by buffaloes calving for the first time when they were 35-37 months of age.

Analysis of variance showed that there were no significant differences between the 5 groups in lactation period (Table 4).

TABLE 4  
Analysis of variance of lactation period for groups of animals  
according to age at first calving

Sources of variation	Degrees of freedom	Sum of squares	Mean square	F. Value
Between groups . . . .	4	57374	14344	1.91
Between buffaloes/groups. Between lactations/ buffaloes/groups. . .	59	442521	7500	2.13(**)
	89	312938	3516	
Total . . .	152	812833		

(\*\*) significant at 1% level.

## 2. Effect of age

The effect of age on total milk yield is shown in Table 5 when the lumped and paired lactation methods were used.

This table indicates that total milk yield increased with advance in age till the mature milk production was reached and then declined. Workers on Egyptian buffaloes and cattle [Ghazy (1953), Ragab *et al.* (1953), Hilmy (1954), Ragab *et al.* (1954 b), and Asker *et al.* (1958)] reported similar results.

In this work maximum milk production was reached at the 4th lactation, Ragab *et al.* (1953) in Egypt, Maymone (1942) in Italy, and Dave (1938) in India showed that mature milk production was reached at the 3rd, 4th, and 5th, lactation respectively. Our results agree with those of Hilmy (1954) in this respect. Most of the work on the effect of age on milk yield in European and Zebu cattle indicated that maximum yield was obtained during the 4th and 5th lactation [Petersen (1950), Nevens (1951), Mahadevan (1953), and Venkayya and Anantakrishnan (1957). b)]. Our findings show that the buffalo gives about 71%, 85% and 89% of mature milk production during the first, second, and third lactation respectively when using the lumped lactation method. The corresponding figures

TABLE 5  
Relation between age and total milk yield in successive lactations.

Sequence of lactation	Av. age in years	Lumped Method			Paired Method		
		No. of lactations	Av. Milk yield in Lb.	Relative yield %	No. of lactations	Av. Milk yield in Lb.	Relative yield %
1	3.2	64	3265	100	42	3410	100
2	4.7	42	3889	119	29	3978	117
3	6.1	29	4038	124	18	4124	121
4	7.2	18	4557	140	14	4863	143
5	8.5	14	4248	130	8	4461	131

obtained when applying the paired lactation method were 70%, 82% and 85% in the same order. Ragab *et al.* (1953) stated that the buffalo produces 78%, and 93% of her maximum production during the first and the second lactation respectively.

Table 5 also indicates that the average increase in production from the 1st to the 2nd lactation is 19% obtained by the lumped method and 17% in case of the paired one. The highest rate of increase was that occurring from the first to the second lactation and from the 3rd. to the 4th one when using the lumped and paired methods respectively. On the other hand, the lowest rate of increase occurred from the 2nd to the 3rd lactation in case of using both methods. Mature yield, however, in the lumped lactation method was 40% higher than the 1st lactation, while the corresponding figure obtained by the paired method was 43%. This increase

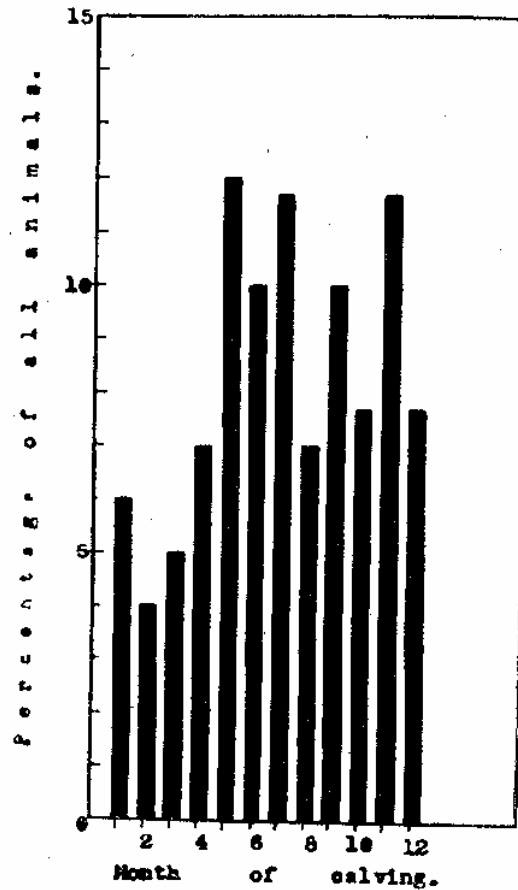


Fig. 2 — Frequency distribution of buffaloes calving at different months.



was more than that obtained by Hilmy (1954) in buffaloes and by Asker *et al.* (1958) in the Native cattle, while it was less than that estimated by Hilmy (1954) for cattle.

Table 5 shows that buffaloes attain their maximum production at 7.2 years old. This is in agreement with the results reported by Hilmy (1954) (7.2 years) for the Egyptian buffaloes, while it was less than the figure given by Ibrahim (1950) (9 years) in buffaloes and more than that calculated in this respect by Ragab *et al.* (1953) (6.5 years) for buffaloes and Asker *et al.* (1958), (6-7 years) for the Native cattle.

### 3. Effect of month and season of calving

The frequency distribution of calving at different months of the year for buffaloes is represented in Fig. 2. It was found that 29.4%, 17.7%, 24%, and 28.8% of the calvings occurred during the periods from September to November (Autumn), from December to February (Winter) from March to May (Spring), and from June to August (Summer) respectively.

The trend for frequency of calving round the year showed that calvings were most frequent during Autumn. The lowest percentage of calving was observed during Winter. The latter observation is unusual when compared with the results of most workers on buffaloes in Egypt who stated that most buffaloes calve during Winter. This unusual observation may be due to management.

The average milk yield and lactation period for buffaloes when grouped by months of calving are set out in Table 6.

TABLE 6  
Average total milk yield and lactation period of buffaloes calving at different months of the year.

Month of calving	Number of animals	Average milk yield in Lb.	Relative yield %	Average length of lactation period
Januray . . . . .	10	3669	96	258.8 days
February . . . . .	11	4092	107	288.8 "
March . . . . .	12	3845	101	275.2 "
April . . . . .	20	4237	111	284.8 "
May . . . . .	28	3931	103	272.1 "
June . . . . .	25	3618	95	257.5 "
July . . . . .	26	3557	93	263.8 "
August . . . . .	17	3848	101	284.5 "
September . . . . .	22	4117	108	292.1 "
October . . . . .	12	3491	91	282.6 "
November . . . . .	26	3538	93	266.5 "
December . . . . .	14	4060	106	308.3 "
Total & average . .	223	3822	100	276.1 "

These results indicate that the peak yield (4237 lb) and the longest lactation period (308.3 days) were scored by animals calving during April and December respectively; while the minimum milk yield (3491 lb) and the shortest lactation length (257.5 days) were recorded by those calving during October and June in the same order.

TABLE 7

Analysis of variance for the effect of month of calving on total milk yield for buffaloes (The unit is 10 gal).

Sources of variance	Degrees of freedom	Sum of squares	Mean square	F. Value
Between months . . . . .	11	1382	126	0.71
Within months . . . . .	211	37301	177	
<b>Total</b> . . . . .	222	38683		

Differences in both total milk yield and lactation period due to the effect of month of calving were not statistically significant (Tables 7 and 8). This agrees with that reported for the Egyptian buffaloes by Ghazy (1953), Ragab *et al.* (1954. a), Hillmy (1954), and Alim (1957.a).

TABLE 8

Analysis of variance for the effect of month of calving on lactation period.

Sources of variance	Degrees of freedom	Sum of squares	Mean square	F. Value
Between months . . . . .	11	42989	3908	0.69
Within months . . . . .	211	1200377	5689	
<b>Total</b> . . . . .	222	1243366		

When grouping records of buffaloes studied into 4 groups according to the season of calving milk yield of buffaloes calving during spring was the highest compared to those calving during any other season. (Table 9)

TABLE 9

Effect of season of calving on total milk yield and lactation period

Season of calving	Number of animals	Av. Milk-yield (Lb.)	Relative yield %	Av. Length of lactation period (days)
Autumn . . . . .	60	3741	98	278.8
Winter . . . . .	35	3958	104	288.0
Spring . . . . .	60	4016	105	277.0
Summer . . . . .	68	3652	96	266.7
Total & average. . . . .	223	3822	100	276.1

TABLE 10

Analysis of variance for the effect of season of calving on total milk yield for buffaloes (The unit is 10 gallons).

Sources of variance	Degrees of freedom	Sum of squares	Mean squares	F. Value
Between seasons . . . . .	3	526	175	1.0
Within seasons . . . . .	219	38157	174	
Total . . . . .	222	38683		

TABLE 11

Analysis of variance for the effect of season of calving on lactation period for buffaloes

Sources of variance	Degrees of freedom	Sum of squares	Mean squares	F. Value
Between seasons . . . . .	3	11491	3830	0.68
Within seasons . . . . .	219	1231875	5625	
Total . . . . .	222	1243366		

Also, it can be seen from this table that Winter calvers showed a higher average milk yield than Summer ones. At the same time Table 9 shows that length of lactation was the longest for Winter calvers, while the shortest length of lactation period was obtained by buffaloes calving during Summer.

However, Tables 10 and 11 show that variation in milk yield and lactation period due to season of calving was statistically non-significant.

### General Discussion

The average age at first calving for buffaloes used in the study was 38.4 months. Our result and the results obtained by other investigators indicate that age at first calving in the Egyptian buffaloes is rather high compared with the European breeds of dairy cattle. The reasons of calving for the first time at such a late age are due to the slow rate of growth, the delay in sexual maturity, the low fertility, and the long gestation period. It may be advisable to raise buffalo calves on a high level of management as good feeding will help to accelerate their growth, and consequently will help young animals to reach the suitable size, and lead to early maturity and get calving at an earlier age. Such a cut in age at first calving will shorten the generation interval and raise the productive life.

In this study, it was shown that the animals calving at 35-37 months of age produce more milk than those calving earlier or later but the differences were not significant. Most investigators showed that later calvers produce higher milk than earlier ones.

Milk production increased with advance in age till it reached its mature level and then declined. It was found that buffaloes reached their peak of production within the same limits in terms of lactations when compared to pure breeds of dairy cattle (4th - 5th lactation).

Other workers on buffaloes in Egypt noticed that calvings were most frequent during Autumn and Winter months. They stated that this trend is due to the farming practice in this country to get the calvings during this time where green fodder (Egyptian Clover) is available in abundance, and when the weather is mild.

Like most investigators who studied the effect of month and season of calving on total milk yield of the Egyptian buffaloes, our results indicate that neither month nor season of calving had a significant effect on milk yield. This is due to the fact that all herds studied were either commercial or experimental which are well fed and kept under favourable conditions. Month and season of calving may have a more pronounced effect on milk

production in buffalo herds owned by small holders, where feeding is inadequate specially in Summer.

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## تأثير بعض مسببات التباين فى انتاج الجاموس من اللبن

### الملخص

تناول هذا البحث دراسة تأثير كل من عمر الامهات عند أول ولادة وعمرها عند كل ولادة وموسم الولادة على كل من محصول اللبن وفترة الحليب وذلك فى قطيع الجاموس المصرى التابع للجمعية الزراعية المصرية فى بهتيم ، وقد استخدمت فى هذه الدراسة سجلات انتاج اللبن للقطيع المذكور خلال المدة من عام ١٩٣٧ الى عام ١٩٥٧ - ويمكن تلخيص النتائج التى تم الحصول عليها فى الاتى :

كان متوسط عمر العجلات عند أول ولادة ٣٨ر٤ شهرا - وقد وجد ان العجلات التى ولدت لأول مرة فى سن يتراوح بين ٣٧،٣٥ شهرا قد فاقت غيرها من العجلات التى بكرت أو تأخرت عن ذلك حيث سجلت اعلى محصول للبن واطول فترة حليب .\*

لم يكن لعمر الامهات عند أول ولادة تأثيرا معنويا على أى من محصول اللبن وفترة الحليب .\*

يزداد اجمالى محصول اللبن تدريجيا بزيادة عمر الامهات عند الولادة حتى الموسم الرابع للحليب ، وعنده يكون متوسط عمر الامهات ٧ر٢ سنة ، ثم بعد ذلك يبدأ اجمالى محصول اللبن فى الانخفاض .\*

أعطت الأمهات التى ولدت خلال شهر أبريل أعلى محصول للبن وقد سجلت تلك التى ولدت خلال شهر ديسمبر أطول موسم حليب .\*

سجلت الامهات التى ولدت خلال فصلى الشتاء والربيع اعلى انتاج لـمحصول اللبن وكانت تلك التى ولدت خلال فصيل الشتاء صاحبة اطول موسم حليب .\*

لم يكن تأثير شهر الولادة أو موسم الولادة ذو دلالة احصائية مؤكدة من اجمالى محصول اللبن أو طول فترة الحليب .\*