

## FACTORS AFFECTING BUTTERFAT CONTENT IN EGYPTIAN BUFFALOES

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A. A. ASKER,\* L. H. BEDEIR, A. A. EL-ITRIBY,  
I. A. AHMED,\*\* AND S. S. KHISHIN\*

*Department of Animal Production, Ministry  
of Agriculture. Cairo U.A.R.*

An analysis was undertaken using 232 complete normal records covering the first six lactations with known butter tests from 128 buffaloes maintained at the college of Agriculture in Alexandria. This report includes the effect of some environmental factors on fat percentage. Results obtained are summarized as follows:

1. The mean percentage of butterfat was 6.4%. Age at first calving affects butterfat percentage while buffaloes calving at older ages gave a higher test. The average fat content for first calvers was the lowest being 6.3% while for buffaloes having four lactations it came to 6.6%.

2. The stage of lactation was found to be one of the important factors affecting fat content. The fat content for the first lactation was found to be 6.10% for the first month and decreased thereafter to a minimum during the second month of the lactation. The fat content then increases during the latter portion of lactation as milk decreases.

3. Although the butterfat percentage was found to be lower in summer months than the rest of the year, there was no significant difference between months in this respect.

4. A negative correlation was found between butterfat content and length of calving interval. The fat content when buffaloes milked thrice was higher than twice milking.

5. The repeatability of fat content was 0.511 based on 90 lactations. There was a negative phenotypic correlation between butterfat and milk yield (-0.106).

Butterfat content is taken into account when making rations for dairy cattle beside its value as basis for the price of milk. High fat percentage is one of the outstanding traits of buffaloes milk. This analysis is an attempt to study some factors affecting this important characteristic in Egyptian buffaloes. Age at first calving, age in terms of lactations, stage of lactation, month of calving, calving interval and frequency of milking were the environmental factors studied in this report. The repeatability of butterfat percentage and the relationship between 305 day milk yield and butterfat content were also investigated.

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\* Professors, Animal Production Department, Faculty of Agriculture, Ein Shams University, Shoubra, Cairo, U.A.R.

\*\* Professor, Animal Production Department, Faculty of Agriculture, Alexandria University, Alexandria, U.A.R.

Studies such as these on buffaloes are very limited and of course the present report will throw some light on various factors affecting this economic trait.

#### Material and Methods

The data used in this study was collected from records of a herd of buffaloes maintained at the Faculty of Agriculture of Alexandria University and covered the period between 1942 and 1962. The completed normal records with known butterfat test were 232 lactations for 128 buffaloes covering the first six lactations.

Fat percentages were usually derived from samples taken every two weeks and were estimated using Gerber's method of analysis. Most of the animals are milked twice daily, the yield of the animals milked three times a day was corrected to twice daily milking using a conversion factor (0.81) derived from the present data. Statistical methods used were calculated according to Snedecor (1956).

#### Results and Discussion

##### 1. Effect of Age in Terms of act Lactations on Fat Percent

The mean fat content of 232 records produced by buffaloes at different lactations is 6.4 % with a coefficient of variability 7.3 % as presented in Table 1. This average obtained is in line with those reported by several investigators, Oloufa *et al.* (1954) and Ragab *et al.* (1958) studying different herds of Egyptian buffaloes.

A recent study was reported by Alim (1965) who found that the mean percentage 6.56%.

TABLE 1.—EFFECT OF AGE ON FAT CONTENT

Sequence of lactation	No. of records	F % $\pm$	C.V. %
1	88	6.3 $\pm$ 0.06	8.6
2	38	6.4 $\pm$ 0.07	6.7
3	32	6.5 $\pm$ 0.08	6.6
4	31	6.6 $\pm$ 0.08	6.4
5	28	6.5 $\pm$ 0.08	6.5
6	15	6.4 $\pm$ 0.12	7.2
Average	232	6.4 $\pm$ 0.03	7.3

It can be seen also from the above Table that the average fat content for first calvers is the lowest being 6.3% compared with 6.6% for buffaloes during their fourth lactation. The effect of age at calving on fat percentage

was found to be significant at 5% level of probability ( $F=2.77$ ). This result is similar to that reported by Ragab et al (1958) on buffaloes. They have demonstrated that first calvers gave the lowest fat content being 6.2 % compared to 6.4% for buffaloes in the fourth lactation. Results obtained by Alim (1965) did not follow regular trend in this respect.

Results obtained on the effect of age on fat percent of buffaloes do not agree with most of the reports on dairy cattle. American and European workers have shown that cows at their first lactation attained the highest butterfat test and a decline occurred in this character with the advance in age (Mahadevan 1951, Johnson 1961, Rook 1961 and Holl 1963).

## 2. Variation in Fat Content due to Stage of Lactation

The lactation period (44 weeks) was divided into 11 intervals each interval representing 4 weeks. The average weekly milk yield in pounds and the percentages of fat for each period of the lactation are presented in Table 2.

TABLE 2.—EFFECT OF STAGE OF LACTATION ON BUTTERFAT CONTENT

Stage of Lactation	1st Lactation		2nd Lactation		3rd Lactation		4th Lactation	
	Weeks in Lactation	Aver. M.Y.	F %	Aver. M.Y.	F %	Aver. M.Y.	F %	Aver. M.Y.
4	109	6.10	146	6.02	174	6.19	147	6.47
8	122	5.91	149	6.14	164	6.33	179	6.52
12	117	6.03	138	6.13	149	6.30	166	6.21
16	113	6.13	131	6.10	133	6.27	153	6.37
20	101	6.38	120	6.46	111	6.50	133	6.49
24	93	6.36	106	6.73	104	6.60	123	6.61
28	87	6.26	100	6.74	95	6.99	108	7.82
32	81	6.67	87	6.71	83	6.85	94	6.97
36	73	6.67	74	6.23	70	7.19	81	7.25
40	67	7.13	71	7.10	60	7.29	75	7.19
44	64	6.95	55	7.19	58	7.56	67	7.17

It can be seen from the above table that fat content of the first lactation was 6.10% for the first month after calving decreasing to a minimum at the second month being 5.91%. Thereafter, the fat content increased gradually for the rest of the lactation. In subsequent lactations the decline occurs during the third month after calving followed by a gradual increase.

In all lactations studied the fat content tended to increase during the later stage of lactation as the milk yield decreased.

The rate of increase is more noticeable from the 7th to the 8th month until the end of the lactation period.

Our results are in agreement with that reported by Maghrabi (1949), Aske *et al.* (1956), Alim (1965) in their work on Egyptian buffaloes and Rife (1959r) working on Indian buffaloes.

### 3. Variation in Fat Content due to Month of Calving

The average fat content is the lowest in May (6.0%) and highest in January (6.5%) when the majority of calvings occur as presented in Table 3. In summer months fat percentage is lower (6.3%) than winter months (6.5%). Although it appears that low temperature is associated with higher fat content yet, there is no significant difference between months in this respect (F-1.20). Studying the effect of month of calving on fat content, Hassan (1944) and Alim (1955) reported similar results on buffaloes. Ragab *et al.* (1958) indicated that summer calvers gave a higher average butterfat content than animals calving during winter months.

### 4. Effect of Calving Interval on Butterfat Content

Table 3. was prepared to show the effect of calving interval on fat percentage. The calving intervals were grouped into classes with 50 days interval up to 750 days. The average calving interval was 511 days with a standard deviation of 123 days. The mode occurs at 400-449 days (22 animals or 30% of the total) corresponding to 6.6% fat.

TABLE 3—EFFECT OF CALVING INTERVAL ON FAT CONTENT

Class intervals of C.I.	No.	Mean of fat %
350 days . . . .	10	6.6
400 days . . . .	22	6.3
450 days . . . .	11	6.4
500 days . . . .	14	6.5
550 days . . . .	7	6.5
600 days . . . .	5	6.3
650 days . . . .	4	6.2
700 days . . . .	6	6.3

Although Table 3 shows that the fat content decreased with the increase in the length of calving interval yet there is no significant difference between different groups in fat percentage.

A negative and non significant correlation (-0.142) based on 79 lactations was found between calving interval and fat content for the first four lactations grouped together. Our results based on a limited number of records agree with that reported by Rife (1959) on Indian buffaloes and Birr (1962) working on dairy cattle. They demonstrated that a long calving interval was accompanied by a decrease in fat percentage.

#### 5. *Effect of frequency of milking on fat content*

With regards to the effect of frequency of milking on fat content in the first four lactations it was found that the average fat content when buffaloes milked thrice daily was 6.55% which is higher than that for buffaloes milked twice daily (6.34%). The difference is significant at 1% level of probability. The number of animals in the two groups was 59 and 131 respectively.

No reports concerning this respect are available on buffaloes. However our results are in agreement with those on cattle as reviewed by Espe (1948.). Generally, it is indicated that as the interval between milkings is decreased, the amount of milk and the percentage of fat in the milk for the day increases

#### *Repeatability of Butterfat Content and the Phenotypic Correlation between fat test and 305 day milk yield.*

The repeatability of fat content was found to be 0.511 based on 90 lactations. Alim (1965) obtained a similar value for the buffalo (0.462) based on 79 D.F. Although our results are based on a limited number of records yet they are similar to those reported by Rendel *et al.* (1957) in England, whose estimate of repeatability of fat content in milk yield was 0.55. On the other hand our estimate of 0.511 in buffaloes is rather lower than that obtained by other workers on dairy cattle whose estimates ranged from 0.60 to 0.70 Johnson *et al.* and (1961) and Wilcox (1962).

Studying 232 lactations, a negative non-significant correlation (0.106) was found between milk yield and fat content. This result is expected as a rule at any time of the lactation period. When the rate of milk secretion happens to increase the fat content decreases. However, our result on this subject is in agreement with most of the work on dairy cattle. The negative correlations between these two variables as reported by Johanson and Hansson (1941), Tyler and Hayatt (1947) and Rendel *et al.* (1958) were -0.17, -0.14 and -0.197 respectively. The correlation coefficient reported by Asker *et al.* (1957) between milk production and fat percent on Egyptian buffaloes was higher (0.350) than our estimate which was based on limited number of lactations.

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## دراسة العوامل التي تؤثر على نسبة الدهن في الجاموس المصرى

### الملخص

حللت السجلات الخاصة بقطيع الجاموس الموجودة بمزرعة كلية الزراعة بالأسكندرية لدراسة العوامل المختلفة التي تؤثر على نسبة الدهن. وقد كان عدد السجلات التي حللت فيها نسبة الدهن محدودا إذ بلغت ٢٣٢ سجلا لـ ١٢٨ حيوان للمواسم الست الأولى. وتتلخص النتائج فيما يلي:

- ١ - استنبط معامل لتحويل ادرار الحيوانات التي حلبت ثلاث مرات الى مرتين يوميا ( ٨١ ) .
- ٢ - قدر متوسط نسبة الدهن فكان ٦٤٪ كما لوحظ أن الحيوانات التي تلد لأول مرة كانت أقل ( ٦٣٪ ) بمقارنتها بنسبة الدهن للجاموس الذى أمضى أربعة مواسم ( ٦٦٪ ) .
- ٣ - فى الموسم الأول وجد أن نسبة الدهن فى الشهر الأول بعد الولادة كانت ٦١٪ ولم تلبث أن انخفضت الزيادة مقدار الحليب اليومى للحيوانات الى أقل نسبة لها فى الشهر الثانى فوصلت الى ٥٩٪ ثم أخذت بعد ذلك تزداد تدريجيا مع تناقض كمية اللبن .
- ٤ - لوحظ أن أقل نسبة للدهن فى اللبن كانت للحيوانات التى وضعت فى شهر مايو حيث بلغت ٦٠٪ بينما كانت أقل نسبة للدهن ٦٥٪ فى يناير وهو الوقت الذى تصل نسبة المواليد أعلاها أى أن نسبة الدهن فى اللبن تزداد مع انخفاض درجة الجو .
- ٥ - وجد أن الفترة بين الولادتين فى ٣٠٪ من عدد الحيوانات تقع بين ٤٠٠ - ٤٤٩ يوم ووصلت نسبة دهن اللبن فيها ٦٦٪ وعند حساب معامل الارتباط بين الفترة وبين الولادتين ونسبة الدهن وجد أنه ضعيف وسالب وبمعنى آخر أن نسبة الدهن تقل كلما طالت الفترة بين الولادتين ولو أن الفروق لم تكن مؤكدة .
- ٦ - وجد أن نسبة الدهن للجاموس الذى يتم حلبه ثلاث مرات يوميا أعلى منها عند حلبه مرتين وكان الفرق معنويا .
- ٧ - كان متوسط المعامل التكرارى بدراسة ٩٠ سجل لنسبة الدهن فى الأربعة مواسم الأولى ٥١١ كما وجد أن الارتباط بين الأدرار فى ٣٠٥ يوم ونسبة الدهن سالبا وغير مؤكد ( ١٠٦٠ ) .