

JOURNAL OF ANIMAL PRODUCTION
OF THE
UNITED ARAB REPUBLIC
Vo. III. 1963 No. I

SERVICE PERIOD, CALVING INTERVAL,
LACTATION PERIOD AND THEIR EFFECT
ON MILK YIELD IN SUDANESE DAIRY CATTLE

By

M.S. DANASOURY ⁽¹⁾ and M.S. BAYOUMI ⁽²⁾

SUMMARY

In spite of the fact that there is a rapidly increasing demand on milk and its products; very little work has been done to study the ability of Sudanese dairy cattle to produce and the factors affecting such production. The authors (Danasoury & Bayoumi 1962; Bayoumi & Danasoury 1963) studied some aspects of the performance of the Sudanese dairy cattle.

This paper is compiled to study some more factors i.e. service period, calving interval and lactation period and their effect on the milk yield of the Sudanese cow.

^{(1),(2)} Faculty of Veterinary Medicine, University of Khartoum, Sudan.

MATERIAL AND METHODS

This study was carried out on the University of Khartoum Dairy Herd of Sudanese cattle during the period 1940 - 60. Boyns (1947) and Danasoury & Bayoumi (1962) reported all necessary information regarding the establishment and management of the herd.

Only complete normal records for the service period, calving interval and lactation periods were considered. The data used comprised 558 lactations from 188 cows.

The statistical techniques used were according to Snedecor's (1956) recommendations.

RESULTS AND DISCUSSION

Service period :

The average service period was found to be 129 ± 73 days (Table I) which is very close to that reported by Sikka (1931) for the Sahiwal breed (125 days). It is definitely lower than the averages reported for Red Sendhi cows (Venkayya & Anantakrishnan, 1958), Jersey cattle in Jamaica (Edwards, 1932) and Sahiwal cows (Malik, Sindhu and Singh, 1960) and were 156, 196 and 194 days respectively.

Table I also indicates that there is a very noticeable variation in the length of service period among the different lactations, which started with a definite drop from the first to second and third lactations. This does not agree with Venkayya and Anantakrishnan (1958) who found that from second to sixth calving, the service period was very steady in length and without much fluctuations although the fall from the first to the second was still there. Ragab, Asker and Hilmy (1956) in both cattle and buffaloes found that the length of the service period fell definitely from first to the second lactation but showed a tendency

to rise afterwards. The fall in length of the service period from first to second lactation may be due to the fact that the first calf heifers require more services before conception than older cows.

Statistical analysis (Table 2) revealed no significant effect of age in lactations on the length of the service period which agrees with the findings of Venkaya and Anantakrishnan (1958).

Frequency distribution of the length of 558 lactation periods is presented in table 3. The data was grouped into groups of 30 days each. It could be observed that 60.8% of the cases had a service period of 4 months or less. This percentage is relatively higher than the 46.0% reported by Venkaya and Anantakrishnan (1958) for Red Sindhi cows for the same period.

Calving interval :

The average calving interval in the herd under study was 416 ± 73 days (Table 1). McLaughlin (1955) found the average calving interval in a Kenana herd to be 408 days, while Alim (1960) studying 103 Kenana cattle found it to be 395 days. The calving interval for the Sahiwal breed was reported by Kartha (1934) to be 450 - 501 days although Sikka (1931) has stated other value for the same breed (401 days). In this respect Sundaresan, Eldridge and Atkeson (1954) found that the calving interval for Jersey \times Red Sindhi crosses was 420 days.

Table 1 shows that there was some variation in the calving interval with respect to lactations. The general trend was that the calving interval started high in the first lactation, dropped in second and third, and then rose, but after the fourth lactation the variation showed no definite trend.

TABLE 1.—Average Service Period, Lactation Period, Calving Interval and Milk Yield According to Lactations.

Lactation	No. of cases	Service period (days)	Lactation period (days)	Calving interval (days)	Milk yield (gals.)
1	131	134	315	421	359
2	92	122	308	409	406
3	84	117	308	403	439
4	62	139	321	426	482
5	49	126	324	414	509
6	42	113	312	400	490
7	36	142	330	431	495
8	25	143	339	430	569
9	15	137	324	426	488
10 & more	22	131	323	419	482
Total and average ± S.D.	558	129 73	317 63	416 73	442 140

TABLE 2.—Analysis of Variance for the Effect of Age in Lactations on the Length of the Service Period.

Service period	Degree of freedom	Sum of squares	Mean square	Variance ratio
Total	557	2995256		
Between lactations	9	50785	5643	1.050
Within lactations	548	2944471	5373	

TABLE 3.—Frequency Distribution of Length
of Service Period and Corresponding Milk Yield.

Length of service period days	Average milk yield in gallon	No. of cases	Distribution %
30 days or less	420	7	1.3
31 — 60	397	29	5.2
61 — 90	412	171	30.6
91 — 120	437	132	23.7
121 — 150	456	69	12.4
151 — 180	472	51	9.1
181 — 210	491	28	5.0
211 — 240	457	21	3.8
241 — 270	498	16	2.9
271 — 300	544	10	1.8
301 — 330	512	12	2.2
331 — 360	395	4	0.7
361 & over	499	8	1.4
Total & average ...	442	558	100

The effect of the service period on calving interval was studied and the results in Table 4 show very strong relationship between them, both in each lactation and in all lactations together. All the correlation and regression coefficients were highly significant. This result should be expected as the variation in the gestation period is so limited. Moreover, this indicates that a shorter service period will shorten the calving interval and consequently the maximum production will be reached at a later lactation and as a result of this, the cows may show a longer productive life.

Lactation period :

Table 1 shows also that the variation of the lactation periods with age showed no definite trend. The average length of the lactation period in this study was found to be 317 ± 63 days. Our figure is much higher than the 242 and 224 days reported by McLaughlin (1955) and Alim (1960) respectively for Kenana Cows. Also it is almost the same as that found by Ragab et al(1954) in Egyptian cattle.

Regarding the relationship between the service period and lactation period, Table 1 shows that both followed the same pattern. Both variants started high in the first lactation, dropped in second and third lactations, then fluctuated in a very similar way afterwards. This does not agree with the findings of Kohli and Malik (1960) who found that in Murrah buffaloes, both the service period and lactation period were maximum in the first lactation, with a regular fall in subsequent lactations. The coefficients of correlation and regression were positive and highly significant in every lactation and in all lactations. In the last lactation, the coefficients were also positive but not significant. This indicates that an increase in the service period affected the lactation period which agrees with the results of all other workers.

MILK YIELD

Effect of service period :

The influence of the service period on milk yield was also studied. It could be noticed from table 3 that the average milk yield increased as the service period increased except in the group having a service period for 7 - 8 months and in the last two groups which included a few number of cases. The high average of yield shown in the first group might be influenced to a certain extent by the small number of cases considered (7 cases only). The analysis of variance set up in Table 5 shows that the difference between these groups was statistically significant.

The correlation and regression coefficients between the service period and milk yield in each lactation and in all lactations are also presented in Table 4. The table shows that the correlation coefficients were positive in every lactation except the last one which was negative but very low. This coefficient of correlation was significant in the first, fourth, fifth and seventh lactations with the first showing the strongest relationship. when all lactations were put together the correlation coefficient was also highly significant. The regression coefficients behaved in the same way. Venkaya and Anantakrishnan (1958) reported similar results to ours but Ragab et al (1956) found no significant relationship.

The regression coefficient of milk yield on service period was 0.381 (Table 4) and highly significant. In other words, an increase in the length of the service period by one month resulted into an increase in the total milk yield by 104 lbs. Venkaya and Anantakrishnan (1958) found the increase in Red Sindhi to be 59 lbs.

Effect of calving interval :

The relationship between the length of the calving interval and milk yield was positive in all of the lactations (Table 4). It can also be seen from the table that both coefficients of correlation and regression were significant up to the seventh lactation except for the second. Taking all lactations together, both the coefficients of correlation and regression of milk yield on length of calving interval were statistically highly significant. This indicates that calving interval had a definite influence on milk yield. This agrees with other workers results (Asker, El Etriby and Bideir, 1958).

Effect of lactation period :

Table 4 shows that the lactation period has a positive effect on total milk yield in the different lactations. In the first five lactations and the seventh one, the correlation coefficients were highly significant. When all lactations were taken together the relationship was even stronger ($r = 0.899$; $b = 1.080$) and highly significant. This very highly significant correlation coefficient is in agreement with that found by Alim (1960) in Kenana cattle, Robertson (1950) in Fulani cattle and Asker et al (1958) in Egyptian cows. Such close relationship between the lactation period and milk yield may be due to environmental conditions under which the animals are kept (Asker et al, 1958) or to the wide variation in the yield from cow to cow when compared with the small variation in the daily

production (Alim 1960) or it could be attributed to both reasons.

The regression coefficient indicates that for an increase of one day in the length of the lactation period there will be an increase of 11 lbs. of milk compared to 17.5 lbs. in Kenana cattle (Alim 1960) and 8 lbs. as reported by Asker et al (1958) in Egyptian cows.

SUMMARY

The service period, calving interval and lactation period, as well as their effect on the yield of dairy cows belonging to the herd of the University of Khartoum for 1946 - 1962 were studied.

The averages for the service period, calving interval, lactation period and milk yield for the considered 558 cases were 129 ± 73 , 416 ± 73 , 317 ± 63 (in days) and 442 ± 140 gallons respectively.

The relationship between the different variants was studied. The result of the statistical analysis are shown in the following table :

Variants		r	b
S.P. and L.P.	... ..	0.594 **	0.507 **
S.P. and C.I....	... ..	0.964 **	0.990 **
S.P. and M.Y.	... ..	0.199 **	0.381 **
C.I. and M.Y.	... ..	0.394 **	0.405 **
L.P. and M.Y.	... ..	0.899 **	1.080 **

S.P.	Service period	C.I.	Calving interval
L.P.	Lactation period	M.Y.	Milk yield.

This indicates that :

The service period has strongly influenced the lactation period, the calving interval as well as the total milk yield. An increase in the service period by one month resulted in an increase in the total milk yield by 104 lbs.

The calving interval was influenced by the service period and has a great influence on milk yield.

The lactation period has much great influence on the milk yield ; an increase of one day in the length of the lactation period resulted in an increase of 11 lbs. of milk.

TABLE 4.—Relationship Between Service Period, Lactation Period, Calving Interval
and Milk Yield According to Lactations.

Lactation	No. of cases	S.P. & L.P.		S.P. & C.I.		S.P. & M.Y.		C.I. & M.Y.		L.P. & M.Y.	
		r	b	r	b	r	b	r	b	r	b
1	131	0.547**	0.530**	0.890**	0.987**	0.223**	0.413**	0.242**	0.403**	0.649**	1.239**
2	92	0.411**	0.310**	0.996**	0.989**	0.088	0.497	0.081	0.138	0.474**	1.066**
3	84	0.532**	0.478**	0.978**	0.958**	0.211	0.383	0.236*	0.437**	0.547**	1.105**
4	62	0.635**	0.384**	0.997**	1.002**	0.310*	0.460*	0.302*	0.445*	0.507**	1.243**
6	42	0.673**	0.495**	0.929**	0.989**	0.106	0.219	0.661**	0.136	0.205	0.401
7	36	0.751**	0.634**	0.999**	1.010**	0.411*	0.706*	0.416*	0.705*	0.638**	1.295**
8	25	0.763**	0.619**	0.996**	1.020**	0.166*	0.283	0.177	0.293	0.167	0.348
9	15	0.826**	0.886**	0.999**	0.985**	0.269	0.453	0.273	0.466	0.299	0.468
10 & more	22	0.291	0.181	0.998**	0.995**	0.021	—0.055	0.036	0.062	0.350	0.970
All lactations	558	0.594**	0.507**	0.964**	0.990**	0.199**	0.381**	0.394**	0.505**	0.899**	1.080**

* Significant at 5% level.

** Highly significant.

S.P. = Service period

L.P. = Lactation period

C.I. = Calving interval

M.Y. = Milk yield.

TABLE 5.—Analysis of Variance : The Effect
of Service Period on Milk Yield.

Service period	Degree of freedom	Sum of squares	Mean square	Variance ratio
Total	557	2995256		
Between groups ...	12	584998	48750	11.02**
Within groups ...	545	2410258	4422	

** Highly significant.

REFERENCES

- ALIM, K.A. (1960).—Reproductive rates and milk yield of Kenana cattle in Sudan. *J. Agric. Sci.*, 55, 183 - 187.
- ASKER, A.A., EL ITRIBY, A.A. and BIDEIR, L.H. (1958).—Environmental factors affecting milk production in Egyptian cows. *Indian J. Dairy Sci.*, 11, 113 - 124.
- BAYOUMI, M.S. and DANASOURI, M.S. (1963).—Effect of lactation number and month of calving on milk production in a herd of Sudanese dairy cattle. *Indian J. Dairy Sci.* (in press).
- BOYNS, B.M. (1947).—Sudanese cattle as milk producers. *Emp. J. Exp. Agric.* 15, 27 - 41.
- DANASOURY, M.S. and BAYOUMI, M.S. (1962).—Age at First calving and its effect on first lactation period, first dry period, first calving interval and first milk yield. *Indian J. Dairy Sci.*, 15, 131 - 138.
- EDWARDS, J. (1932).—Breeding for milk production in the tropics. *J. Dairy Res.* 3, 281 - 293.
- KARTHA, K.P.R. (1934).—A note on the comparative economic efficiency of the Indian cow, the half-bred cow and the buffalo as producers of milk and butter-fat. *Agric. and Livestock in India*, 4, 605 - 623.
- KOHLI, H.C. and MALIK, D.D. (1960).—Effect of service period on total milk production and lactation length in Murrah buffaloes. *Indian J. Dairy Sci.*, 13, 105 - 111.
- MALIK, D.D., SINDHU, B.S. and SINGH, S. (1960).—Breeding season in Sahiwal cows. *Indian J. Dairy Sci.*, 13, 151 - 156.
- MCLAUGHLIN, E.A. (1955).—The cattle of the Fung : A local variant of the shorthorned Zebu, indigenous to the Northern Sudan. *Emp. J. Exp. Agric.*, 23, 188 - 201.
- RAGAB, M.T. ASKER, A.A. and HILMY, S.A. (1954). Milk yield in the Egyptian cow as affected by age, dry period and month of calving. *Indian J. Dairy Sci.*, 7, 171 - 177.
- (1956).—The relation between some fertility aspects and the milk yield in Egyptian cattle and buffaloes. *Indian J. Dairy Sci.*, 9, 53 - 60.
- ROBERTSON, A. (1950).—A preliminary report on the herd of Fulani cattle at Shika, Nigerai, conf. Imp. Livestock trop. conditions. *Edinburgh* (mimeographed).
- SIKKA, L.C. (1931).—Statistical studies of records of Indian dairy cattle. I. standardisation of lactation period milk records. *Indian J. Vet. Sci.*, 1, 63 - 98.
- SNEDECOR, G.W. (1956).—Statistical methods (5th. ed.) Ames : Iowa State College Press.
- SUNDARESAN, D. ELDRIDGE, F.E. and ATKESON, F.W. (1954).—Age at first calving used with milk yeild during first lactation to predict lifetime production of Indian cattle. *J. Dairy Sci.*, 37, 1273 - 1282.
- VENKAYA, D. ANANTAKRISHNAN, C.P. (1958).—Some factors causing Variations in milk yeild of Red Sindhi cows. *Indian J. Dairy Sci.*, 11, 1 - 10.
(Printed in 1965)

الملخص

فترة التلقيح ، الفترة بين ولادتين وفترة الحليب
وأثرها على إنتاج اللبن في مواشى اللبن السودانية

يشتمل هذا البحث على دراسة فترة التلقيح ، الفترة بين ولادتين ومدة الحليب وأثرها على إنتاج اللبن في قطيع جامعة الخرطوم المكون من حيوانات اللبن الأهلية .

متوسطات طول فترة التلقيح والفترة بين ولادتين ومدة الحليب وناتج اللبن في ٥٥٨ حالة كانت على التوالي: ١٢٩ ± ٧٣ يوما ، ٤١٦ ± ٧٣ يوما ، ٣١٧ ± ٦٣ يوما ، ٤٤٣ ± ١٤٠ جالونا .
وتتلخص نتائج دراسة العلاقة بينها دراسة احصائية في الجدول التالي :

العلاقة بين	معامل الارتباط	معامل الانحدار
طول فترة التلقيح ومدة الحليب	** ٠.٥٩٤	** ٠.٥٠٧
» » » والفترة بين ولادتين	** ٠.٩٦٤	** ٠.٩٩٠
» » » وناتج اللبن	** ٠.١٩٩	** ٠.٣٨١
» الفترة بين ولادتين وناتج اللبن	** ٠.٣٩٣	** ٠.٤٠٥
» مدة الحليب وناتج اللبن	** ٠.٨٩٩	** ١.٠٨٠

وهذا يدل على أن :

طول فترة التلقيح لها تأثير قوى على كل من مدة الحليب والفترة بين ولادتين وكذلك على ناتج اللبن .
وأن زيادة قدرها شهر في طول فترة التلقيح ينتج عنها زيادة في كمية اللبن قدرها ١٠٤ رطلا .

وأن الفترة بين ولادتين تأثرت بفترة التلقيح ولها تأثير كبير على ناتج اللبن .
وأن طول فترة الحليب لها تأثير كبير على ناتج اللبن — فزيادة يوم واحد في طولها يسبب زيادة قدرها ١١ رطلا من اللبن .