

FACTORS AFFECTING BIRTH WEIGHT OF CALVES
IN NORTH SUDAN DAIRY CATTLE

By
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SUMMARY

An investigation was carried out on the University of Khartoum dairy herd to study the birth weight of calves and some factors affecting it. The herd consisted of indigenous North of Sudan dairy cattle. There were 421 calves in all: 243 males and 178 females.

The average birth weight was 53.2 lbs. 48.9 lbs. and 51.4 lbs. for male female and total calves respectively. The difference between the sexes was significant.

The average birth weight of all calves tended to increase with each successive calving of the dam up to the 7th. (except the 5th) and then to decrease. The effect was insignificant. Month and season of calving had no effect on the birth weight of calves.

The influence of the sire on birth weight was significant.

There was a positive correlation between the length of gestation period and birth weight of calves. The coefficient was significant for females and all calves but not so for males.

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INTRODUCTION

Since the birth weight of calves is of considerable importance in breeding, growth and development of animals, the factors affecting it have been studied by many workers in different parts of the world. Tyler, Chapman and Dickerson (1947) and Venge (1948 — cited by Halldor Palsson, 1955) found that calves of first calvers are lighter than those from mature cows. Anantakrishnan and Lazarus (1953) found that number of gestation had some influence on the birth weight in Red Sindhi, Gir and crossbred calves. Singh and Dutt (1961) found that birth weights in Sahiwal calves tended to increase with the age of the dams up to approximately 7 years old, after which there was no further effect. There is a general agreement that calves are on the average heavier than females; (McLaughlin, 1955; Singh and Desai, 1959; Singh and Dutt, 1961).

Knapp, Lambard and Black (1940), Tyler et al (1947), Braude and Walker (1949), Anantakrishnan and Lazarus (1953) showed that month of calving had no influence on birth weight.

Knapp and Nordskog (1946) and Anantakrishnan and Lazarus (1953) found that the sire of the calves influenced their birth weights.

A positive correlation between the gestation period and birth weight of calves was observed by Jafar et al (1950), Ragab & Asker (1951) and Anantakrishnan & Lazarus (1953). While Singh & Dutt (1961) observed a little or no association.

Since, apart from the average of weight of calves at birth in the Kenana breed (McLaughlin, 1955) and in Southern Darfour cattle (Muktar, 1961) there appears to be no information available on this subject in indigenous cattle in the Sudan, the work described in this paper was undertaken in order to assess the birth weight and to study the factors which influence it.

MATERIAL AND METHODS

This investigation was carried on the University of Khartoum dairy herd, the description and management of which was reported by Boyns (1947) and Danasoury & Bayoumi (1962). Over a period of 13 years (1944 - 1956) calves were weighed shortly after birth, before having any milk. The birth weights of 243 male and 178 female calves were recorded during that period. Only the normal calvings and calves were considered and all abnormal cases or doubtful records were discarded.

Statistical analysis followed the methods recommended by Snedecor (1956).

RESULTS

(1) *Effect of age of dam and sex of calf on birth weight :*

Birth weights were tabulated according to number of gestation and sex of calf. The number of calves and the mean of the birth weight for male and female calves in each lactation are presented in Table 1. The averages were 53.2 lbs., 48.9 lbs. and 51.4 lbs. for male, female and total calves respectively. Males ranged from 38 lbs. to 78 lbs. and females from 34 lbs. to 69 lbs. The general trend was for the average birth weight of all calves to increase with each successive calving of the dam up to the 7th. (except the 5th) and then to decrease. Analysis of variance (Table 2) showed that both the number of pregnancies through which the dam had passed and the sex of the calf had a highly significant influence on the birth weight of calves.

TABLE 1.—The Effect of Age of Dam in Lactations and Sex of Calf on the Birth Weight. (lbs.).

| No. of gestation | No. of calves | | | Average birth weight | | |
|------------------|---------------|---------|-------|----------------------|---------|-------|
| | Males | Females | Total | Males | Females | Total |
| 1 | 61 | 38 | 99 | 50.6 | 46.4 | 49.0 |
| 2 | 29 | 45 | 74 | 51.9 | 49.3 | 50.3 |
| 3 | 29 | 21 | 50 | 52.4 | 51.7 | 52.1 |
| 4 | 24 | 23 | 47 | 56.3 | 48.7 | 52.6 |
| 5 | 22 | 13 | 35 | 53.2 | 47.2 | 50.1 |
| 6 | 14 | 4 | 18 | 58.4 | 54.8 | 57.6 |
| 7 | 14 | 10 | 24 | 57.3 | 49.4 | 53.8 |
| 8 | 15 | 8 | 23 | 54.0 | 48.0 | 51.9 |
| 9 | 12 | 10 | 22 | 51.3 | 52.5 | 51.8 |
| 10 & more | 23 | 6 | 29 | 54.0 | 48.0 | 52.9 |
| Total & average | 243 | 178 | 421 | 53.2 | 48.9 | 51.4 |

TABLE 2.—Analysis of Variance : Effect of Age Dam in Lactations and Sex of Calf on Birth Weight.

| Source of variance | Degrees of freedom. | Sum of saures | Mean saure | Variance ratio. |
|--------------------|---------------------|---------------|------------|-----------------|
| Total | 420 | 21435 | | |
| Between lactations | 9 | 1658 | 184 | 4.20** |
| Between sex | 1 | 1818 | 1818 | 41.32** |
| Error | 410 | 17959 | 44 | |

** Highly significant.

Calves from dams of known age in years at parturition were classified according to the age of the mother and are presented in Table 3 which shows that the averages increased with the age of the mother up to 6 years and then became uneven. The difference was highly significant both when taking all ages (Table 4) and up to 6 years of age.

TABLE 3.—Average Birth Weights of Calves in Relation to Age of Dams in Years

| Age of dam. | No. of calves | Average birth weight |
|--------------|---------------|----------------------|
| 3 | 20 | 45.9 |
| 4 | 49 | 47.5 |
| 5 | 45 | 51.4 |
| 6 | 37 | 52.7 |
| 7 | 28 | 50.2 |
| 8 | 14 | 52.9 |
| 9 | 12 | 50.7 |
| 10 | 11 | 49.1 |
| 11 | 6 | 58.3 |
| 12 | 5 | 57.0 |
| 13 | 7 | 54.4 |
| 14 | 5 | 55.4 |
| Total | 239 | |

TABLE 4.—Analysis of Variance for the Effect of age for the Dam in Years on Birth Weight of Calves (all ages).

| Source of variance | Degrees of freedom. | Sum of squares | Mean square | Variance ratio. |
|--------------------|---------------------|----------------|-------------|-----------------|
| Total | 238 | 12837 | | |
| Between ages ... | 11 | 1879 | 171 | 3.56** |
| Within ages ... | 227 | 10958 | 48 | |

(2) *Effect of month of calving on birth weight:*

The mean of the birth weight of calves born in each month of the year, the range of weight and number of calves are presented in Table 5. The average birth weight of calves born during the summer months (April - September

** Highly significant.

and winter months (October-March) were 51.31 pounds and 51.33 pounds respectively. Statistical analysis in Table 6 showed that month of calving had no significant effect on birth weight. Furthermore, analysis of variance showed that there was no difference between the summer and winter calves.

TABLE 5.—Mean Birth Weights of Calves
According to Month of Calving.

| Month of calving | No. of cases. | Mean birth weight | Range (lbs.) |
|------------------|---------------|-------------------|--------------|
| Jan. | 40 | 52.10 | 37 — 60 |
| Feb. | 42 | 50.74 | 39 — 78 |
| Mar. | 41 | 50.85 | 38 — 64 |
| Apr. | 30 | 50.13 | 35 — 64 |
| May | 29 | 49.28 | 34 — 72 |
| Jun. | 27 | 53.30 | 46 — 62 |
| Jul. | 40 | 50.15 | 38 — 69 |
| Aug. | 41 | 53.37 | 36 — 66 |
| Sep. | 22 | 51.45 | 40 — 69 |
| Oct. | 40 | 51.63 | 34 — 65 |
| Nov. | 22 | 50.91 | 39 — 70 |
| Dec. | 32 | 51.66 | 38 — 68 |

TABLE 7.—Effect of Weight on Birth Weight of Calves.

| Sire | No. of cases. | Mean birth weight (lbs.) | Range (lbs.) |
|------|---------------|--------------------------|--------------|
| 1 | 105 | 52.18 | 39 — 78 |
| 2 | 60 | 51.23 | 41 — 72 |
| 3 | 53 | 49.40 | 35 — 69 |
| 4 | 23 | 53.48 | 43 — 64 |
| 5 | 13 | 48.92 | 40 — 75 |
| 6 | 8 | 51.13 | 40 — 60 |
| 7 | 3 | 49.67 | 44 — 53 |
| 8 | 35 | 52.23 | 34 — 68 |
| 9 | 3 | 39.33 | 37 — 43 |
| 10 | 3 | 63.00 | 57 — 70 |
| 11 | 4 | 51.50 | 43 — 59 |
| 12 | 35 | 52.17 | 34 — 66 |

(3) *Effect of sire on birth weight:*

The sires that had more than two of springs of known birth weight were used in this study. Twelve sires and 345 calves were available. Each sire with the number of its progeny, their mean birth weight and the range of birth weights are presented in Table 7. Analysis of variance showed that the influence of the sire of the calf was highly significant (Table 8).

TABLE 6.—Analysis of Variance for the Effect of Month Calving on Birth Weight of Calves.

| Source of variance | Degrees of freedom. | Sum of squares | Mean square | Variance ratio. |
|--------------------|---------------------|----------------|-------------|-----------------|
| Total | 405 | 20082 | | |
| Between months ... | 11 | 554 | 50.4 | 1.016 |
| Within months ... | 394 | 19528 | 49.6 | |

TABLE 8.—Analysis of Variance for the Effect of Sire on Birth Weight of Calves.

| Source of variance | Degrees of freedom. | Sum of squares | Mean square | Variance ratio. |
|---------------------|---------------------|----------------|-------------|-----------------|
| Total | 344 | 17820 | | |
| Between sires ... | 11 | 1358 | 123.5 | 2.50 ** |
| Within sires | 333 | 16462 | 49.4 | |

**Highly significant.

TABLE 9.—Effect of Length of Gestation Period on Birth Weight of Calves

| Sex of calves | No. of calves | Coefficients | |
|-------------------|---------------|--------------|--------|
| | | r | b |
| Males | 203 | 0.128 | 0.172 |
| Females | 145 | 0.730* | 0.191* |
| All calves | 348 | 0.460* | 0.201* |

*Significant at 5% level.

**Significant at 1% levels.

(4) *Correlation between length of gestation period and birth weight :*

The available data concerning 203 males and 145 females were used in studying the correlation between the gestation period and birth weight and the results are presented in Table 9. There was a general tendency towards an increase in birth weight of calves as the gestation length increased. This seemed to be true as the correlation coefficients in both male and female calves were positive. However, the correlation coefficients, though statistically significant for females, were not so for males. The correlation and the regression coefficients of birth weight on length of gestation period for males and females are also presented in Table 9 and are significant.

DISCUSSION

This investigation showed that the average birth weight in Sudan dairy cattle was 51.4 lbs. ($n=421$) compared with 56.7 lbs. found by McLaughlin (1955) as being the average birth weight in the Gezira Kenana herd ($n=157$). The difference might be due to the small number of Kanana calves, environmental and/or genetic differences. In view of the very wide variation in the birth weight, the different factors that might affect this phenomenon were studied.

The sequence of calving was found to have a significant effect on birth weight of calves, those from first calvers being the lightest which agrees with the observations of many workers (Anantakrishnan and Lazurus, 1953). The age of the cow in years significantly affects the birth weight of the calf. Our results, which showed that this increased with the age of the cows up to approximately 6 years, are in agreement with that of Singh and Dutt (1961) in Sahiwal

calves. The uneven trend after the 6th. year might be mainly due to the small number of cows in each group.

The birth weight is influenced by the sex of the calf as has been reported by Littlewood (1937), Knapp et al (1940), Rhoad et al (1945), Anantakrishnan and Lazarus (1953) and Singh and Dutt (1961).

Also, the sire of the calf had a definite influence on the birth weight which confirms the findings of Knapp and Nordskog (1946) and Anantakrishnan and Lazarus (1953).

The month and the season of calving had no effect on the birth weight of calves which agrees with the observations of Anantakrishnan and Lazarus (1953).

Anantakrishnan and Lazarus (1953) quoted many workers who found that there is a correlation between the gestation period and the birth weight of calves. In the present investigation it has been found that the correlation coefficients between the gestation period and the birth weight of calves were positive and statistically significant for females and all calves but not for males. This is in general agreement with the findings of Anantakrishnan and Lazarus (1953) except in that they found the significance in males and not in females.

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الملخص

أوزان العجول عند الولادة في أبقار

شمال السودان

- ١ — يتناول هذا البحث دراسة أوزان العجول عند الولادة في ٤٢١ حيواناً^١ (٢٤٣ من الذكور ، ١٧٨ من الإناث) في قطيع من أبقار اللبن السودانية التابع لجامعة الخرطوم .
- ٢ — كان متوسط وزن العجول عند الولادة ٥٣ر٢ رطلا في الذكور ، ٤٨ر٩ رطلا في الإناث ، ٥١ر٤ رطلا في الجنسين معاً . ولقد كانت فروق الوزن بين الجنسين معنوية إحصائياً .
- ٣ — كان متوسط أوزان العجول يميل إلى الزيادة كلما زاد عدد ولادات الأم وذلك حتى الولادة السابعة (فيما عدا الخامسة) ثم أخذ في النقصان بعد ذلك ولد وجد أن لعمر الأم أثر معنوي من الناحية الإحصائية .
- ٤ — لم يكن لشهر أو موسم الولادة أثر حقيقي على وزن العجول عند الولادة .
- ٥ — كان تأثير الأب معنوياً من الناحية الإحصائية على الوزن عند الولادة .
- ٦ — كان هناك ارتباط موجب بين طول فترة الحمل ووزن العجول عند الولادة وكان عامل الارتباط حقيقياً من الناحية الإحصائية في العجلات ولم يكن كذلك في العجول الذكور .