Some genetic and environmental factors affecting birth weight of Butana subtype and Friesian X Kenana crosses at Atbara and Nisheishiba Research Centres.

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SUMMARY

The data set consisted of birth weight records of 3091 Butana and Friesian X Kenana (F X K) crossbred calves born during the years 1960 to 199() at Atbara and Nisheishiba Research Stations.

Dam lactation number, interaction of year X season of birth, breed of calf and sex of calf all had highly significant ($P < 0.001$) effect on birth weight. The interaction of breed X sex was significant ($P < 0.05$). Fifth-parity dams gave the heaviest calves at birth (27.63 kg).

The 75% Friesian X Kenana calves were the heaviest among all the four types studied (29.63 kg). However, no significant difference was found between birth weight of 50% F X 50% K. F. crossbreds (26.31 kg) and pure Butana subtype (25.81). heritability of birth weight of Butana subtype was 0.20 ± 0.06.

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INTRODUCTION

Butana and Kenana subtypes are considered as the major milk producers in the Sudan. They are also utilized for their meat and for other social uses as well. Birth weight an economically important production trait is mostly influenced by additive and non additive gene action (Hafez and Dyer, 1969). The authors also reported that birth weight determines the future performance of individuals engaged in a prevailing environment. The objectives of this paper is to determine the effect of dam lactation number, interaction of year X season of calving, breed of calf, sex of calf and interaction of breed X sex of calf on birth weight as well as to estimate heritability of such an important trait.

MATERIAL AND METHODS

Source of Data

The data were taken from Atbara and Nisheishiba Research Centres. The calf record used in the analysis consisted of calf identification number (ID), calf date of birth, calf sex, calf breed, calf sire ID, calf birth weight and dam lactation number. The total number of records consisted of 3091 calves of which 2202 were Butana, 468 were 50% F:50 Kfi, 160 were 50% F: 50 K-f2 and 261 were 75% F:25% K calves. These calves were born during the years 1960 to 1990 inclusive.

Statistical Analysis

The mathematical model used to analyse these data included the effect of dam lactation number, interaction of year X season of birth, breed of calf, sex of calf and interaction of breed X sex of calf. This model was fitted using the least squares methodology as described by. Steel and Torrie (1980). In addition Duncan's Multiple Range Test was used for mean separation. A subset of the data comprising of 1822 Butana calves sired by 15 bulls having at least 12 offsprings was used to estimate heritablility of birth weight. The model usc,J for this purpose included the above factors and a random sire of calf effect. The heritability was estimated using minimum Norm Quadratic Unbiased Estimator (MINQUE) procedure with five rounds of iteration (Kennedy, 1977).

RESULTS

The average birth weight of both Butana and Friesian X Kenana was 26.33 ± 4.13 kg with a coefficient of variation of 15.7%. The result of the analysis of variance showed a highly significant effect *(P* < 0.00I) of the model used. The coefficient of determination was 17%. The effect of dam lactation number, interaction of year X season of birth. The breed X sex interaction was significant at *P*< 0.05.

The results of Duncan's Multiple Range Test for the effect of dam lactation number and breed of calf are shown in Table (1). Birth weight increased with dam lactation number up to the fifth lactation (27.35 kg) after which a gradual decline was noticed. The

Table 1: Effect of Dam lactation and breed of calf on birth weight of Butana and Friesian x Kenana (F x K).

Lactation number	Number of calves	Mean irth weight (kg)
1	711	24.57c
2	593	26.16b
3	474	27.04a
4	358	27.05a
5	271	27.35a
6	201	26.99a
7	283	27.09
S. E.		0.21***
Breed		
75% F x 25% K	261	29.63a
50% F x 50% K-f2	160	28.07b
50% F x 50% K-fl	468	26.31c
Butana	2202	25.81c
S. E.		0.21***

1 Means followed by different letters are significantly different
*** P = 0.001
f1 = First final generation born from 100% Fx 100% K
f2 = Second final generation born from 50% Fx50%K.

75% F : 25% K calves had the heaviest weight (29.63 kg) followed by the 50% F:50% K-f2 (28.07 kg), then the 50% F-K- Fl (26.31 kg) and finally the Butana subtype (25.81 kg). Male calves were heavier (26.92 kg) at birth than females (25.74 kg). However,

breed X sex interaction (Table 2) was also significant *(P*< 0.05). The heritability of birth weight of Butana subtype was 0.20 ± 0.06 with a sire and an error variance of 0.65 and 12.21, respectively.

Table 2: Breed x Sex of calf interaction on birth weight of Butana and Friesian x Kenana calves.

Breed	Sex	Number of calves	Meant S.D. (kg)
75%F:25%K	Male	132	29.52 ± 5.84
	Female	139	29.73 ± 6.07
50%F:50%Kf2	Male	80	29.27 ± 6.36
	Female	80	26.88 ± 6.05
50%F:50%Kf1	Male	224	27.08 ± 4.85
	Female	244	25.61 ± 4.59
Butana	Male	1119	26.44 ± 3.91
	Female		25.18 ± 3.68

Average S. E = 0.34*
* *P*<= 0.03

DISCUSSION

The increase of birth weight with increase in lactation number up to the fifth lactation found in the study reported herein agrees well with the findings of Khalafallah and Khalifa (1985) who reported a gradual increase of calf birth weight with dam age. The effect of lactation number and age of dam on calf birth weight is directly related to increase in maternal size. Hafez and Dyer

(1969) reported that faster prenatal growth were directly associated with large maternal size. Hafez and Dyer (1969) also reported that the maternal environment changed with parity as well as the degree of development and vascularity. In addition the authors also reported that calves born from aged dams were often small due to the excessive internal fat which might prevent full expansion of the pregnant uterus.

The significant effect of year x season interaction on birth weight reflects the effect of ecology and environment. Similar findings were reported by Khalafallah and Khalifa (1985) and Saeed *et al.* (1987). The results concerning the breed effect show that there was increase in calf birth weight with increase in percent of Friesian blood from 28.07 kg for the 50% F:50%K-f2 to 29.63 kg for the 75% F : 25% K crossbreds. The birth weight of the 50% F:50% K-f 1 was smaller (26.31 kg) than that of the f2 crossbreds (28.07 kg) due to maternal abilities of the 50% dams. The superiority of male calves over female calves is well documented in the literature. Khalafallah and Khalifa (1985) for example found that males were significantly heavier at birth than females. This difference in birth '‘›eigbt is attributed to differences in sex hormones (Hafez and Dyer, 1969).

A closer look at the breed X sex interaction (Table 2) reveals that the superiority of the males is not true for all the four subtypes studied. In fact for the 75% F:25% K crossbred, the female calves were slightly, but not significantly heavier than the males. A noteworthy point is that the 75% F:25% K crossbred had the smallest coefficient of variation compared to the other subtypes.

The heritability of 0.20 agrees with the values in the literature (Lasely, 1978). Furthermore, this figure suggests that selection can result in moderate improvement of birth weight.

In summary birth weight was found to be significantly affected by dam lactation number, interaction of year X season of birth, breed of calf, sex of calf and interaction of breed X sex of ' calf. Crossbreeding had resulted in great improvement of this economically important trait. In addition selection can result in moderate improvement of birth weight.

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