

# **SOME OBSERVATIONS ON THE BIRTH WEIGHT OF BEEF CATTLE**

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## *Summary*

Birth weights of 1908 purebred Herefords, Shorthorns, Brahmans and Africanders, and F1 and F2 generation Africander cross, Brahman cross and British cross calves, collected from 1954 to 1962, were analysed.

Heterosis in the F1 was estimated as 13% for Brahman cross, 5% for Africander cross, and 3% for British cross. The mean birth weights of the F2 Zebu cross were less than those of the F1, while in the British cross the reverse applied. In the Brahman cross, large sex differences appeared in the F1, whereas no sex difference was found in the F2 generation.

## **I. INTRODUCTION**

Crossbreeding of British bred cows and Zebu or Zebu cross bulls has increased rapidly in the beef raising areas of Northern Australia. The cross-breeding programme at the National Cattle Breeding Station, "Belmont", (Kennedy and Turner 1959) based on Africander, Brahman, Hereford and Shorthorn crosses, produces material which is comparable with many commercial undertakings.

The first generation Zebu x British (F1) have definite advantages over the British breeds. However little information is available on the merits of the second generation Zebu x British (F2).

To compare post-natal growth between F1's and F2's, the years would have to be directly comparable. Pre-natal growth is not affected by year variations and thus birth weight may be a useful indication of the true genetic potential of the cross-bred cattle.

Effects of breed type and generation upon birth weight are examined in this paper.

## **II. MATERIALS AND METHODS**

Calves representing the pure parental British breeds were born from 1954 to 1958, the F1's from 1954 to 1959 and F2's from 1957 to 1962. The analysis showed that effect of year of birth is not significant. In the F1 's, three year old heifers dropped calves 2.3 kg lighter than others and this has been corrected for in the data which are summarised in Table 1. No correction for sex has been applied because the sex effects differ in different groups; the means in Table 1 are based on data with sex ratios varying from 0.96 to 1.00.

Birth weights for pure Brahmans and Africanders were few in number and were therefore not used. Heterosis in the crossbreds has been conservatively estimated by comparison with pure British calves, which represent the parent with higher birth weight and with the same maternal effect as F1's (Ellis, Cartwright and Kruse 1965).

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TABLE 1

**Mean birth weight and coefficient of variation of breeds and crosses**

Breeds	No. of animals	Mean birth weight (kg)	Co-eff. of variation (%)
<i>Parents:</i>			
Hereford (H)	264	31.8	14.4
Shorthorn (S)	67	31.2	13.8
Mean		31.5	14.5
<i>F1:</i>			
A X (AH + AS)	402	33.3	12.3
B X (BH + BS)	302	36.3	13.8
Brit. (HS + SH)	198	32.6	11.4
<i>F2:</i>			
A X	299	30.9	12.5
B X	232	29.8	15.9
Brit.	130	33.2	13.1

## III. RESULTS AND DISCUSSION

Analysis of variance of F1 and F2 birth weights (Table 2) shows significant effects of sex, breed x generation, and breed x generation x sex.

The breed x generation interaction is illustrated in Table 4. The F1 heterosis was high (13 %) in Brahman cross, less (5%) in Africander cross, and small (3 %) in British calves. F2 Zebu crosses showed little advantage over pure British but birth weights of F2 British crosses were actually higher than F1's (Table 1).

The breed x generation x sex interaction is seen in Table 5 which shows that the sex difference was lower in F2's than F1's in all breeds but was strongly affected by generation in the Brahman cross.

TABLE 2

**Analysis of variance of birth weight**

Source of variation	Degrees of freedom	Mean square	Variance ratio(F)
†Breed (cross) (B)	2	0.85	0.06
Generation (G)	1	16.02	1.14
Sex (S)	1	17.08	18.54**
<i>Interactions:</i>			
B x G	2	14.09	15.29**
B x S	2	0.40	0.43
G x S	1	2.05	2.22
B x G x S	2	0.92	5.14*
Animals within B, G and S	1531	0.18	

† The three "breeds" are Africander cross, Brahman cross and British.

\*  $P < 0.05$ .

\*\*  $P < 0.01$ .

TABLE 3

***t* test of mean birth weights of directly comparable Zebu cross F1 and F2 generations**

	F1	F2	<i>t</i>
AX	33.4 (61)	31.5 (106)	2.70*
BX	36.2 (34)	31.0 (86)	5.28**
<i>t</i>	2.72*	—0.70	

\*  $P < 0.01$ .

\*\*  $P < 0.001$

No. of animals in parenthesis.

TABLE 4

***Percentage advantage of F1 and F2 over mean of pure bred British calves (Heterosis), and advantage of F1 over F2***

	AX	BX	British
F1 .....	5.3	13.0	3.2
F2 .....	-1.8	-5.8	5.1
F1>F2 .....	7.4	18.0	-2.0

TABLE 5

***Percentage advantage of male over female within generations (%)***

	AX	BX	Brit.	All
F1 .....	10.6	11.8	7.6	10.0
F2 .....	9.9	0.5	5.1	5.1

Analysis of a portion of the data in which year of birth and age of dam were strictly comparable in F1's and F2's led to the same conclusions as did analysis of the whole data (Table 3).

The increase in the coefficient of variation from F1 to F2 seems negligible (Table 1). The explanation for this may be that the effects of the genotype of the foetus and the maternal environment are confounded.

These results indicate that the gain in birth weight of first generation Zebu crosses is large but is rapidly lost in subsequent generations. This situation may be paralleled to some extent in other aspects of performance, and decline in heterosis must be counteracted by selection pressure.

#### IV. REFERENCES

- ELLIS, G. F. Jr., CARTWRIGHT, T. C. and KRUSE, W. E. (1965). Heterosis for birth weight in Brahman Hereford crosses. *Journal of Animal Science* **24**: 93.
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