
THE PROCEEDINGS OF THE
NEW ZEALAND SOCIETY
OF
ANIMAL PRODUCTION
VOLUME 62 2002

GROWTH RATE AND OESTROUS BEHAVIOUR OF FRIESIAN, HEREFORD × FRIESIAN, SIMMENTAL × FRIESIAN AND ANGUS HEIFERS

D. C. DALTON,* K. E. JURY† AND D. R. H. HALL*

SUMMARY

Friesian (F × F), Hereford × Friesian (H × F) and Simmental × Friesian (S × F) heifer calves were bred and reared on 21 farms up to weaning at 4 months of age. They were then grazed together at one location, where growth and oestrous data were recorded until joining with entire bulls at 14 months of age.

The F × F heifers showed superior growth, followed by the S × F and H × F heifers. The percentage of animals exhibiting first oestrus by 14 months of age was 85, 60 and 44 for the F × F, H × F and S × F, respectively. Angus (A × A) heifers which joined the trial after single suckling to 6 months of age showed lower post-weaning growth than the other breeds.

Between breeds, there were no differences in age and weight at first oestrus of heifers which cycled, but those heifers which did not cycle were 23 kg lighter and 7 days younger than those showing oestrus.

Significant sire differences within breeds were found in the weight-for-age of their progeny, indicating potential for improvement through selection.

The pre-weaning environment exerted a highly significant effect on subsequent growth of the heifers with no compensatory growth shown by poorly reared calves.

INTRODUCTION

Despite the extensive literature demonstrating the increased productivity obtained from using crossbred females as commercial beef dams (Koger *et al.*, 1973), the practice has not been widely exploited in New Zealand. However, the recent introduction of new genotypes could cause a rapid change in this practice and could stimulate an increase in beef production, especially from the national dairy herd.

The background to this trial is presented by Everitt *et al.* (1975) while this paper reports the growth and oestrus data for female calves born in 1973.

* Whatawhata Hill Country Research Station, Hamilton.
† Ruakura Agricultural Research Centre, Hamilton.

EXPERIMENTAL

The heifer calves generated in this trial were transferred to the Tahae block of the Lands and Survey Department, administered from Te Kuiti. This block near Mangakino is rolling to hilly country with an average elevation of 450 m. The block is on light ash soils in the early stages of development and has moderately hard winters and is drought prone in summer.

The Friesian (F × F), Hereford × Friesian (H × F) and Simmental × Friesian (S × F) heifers were reared on 21 different farms and transferred to Tahae in November 1973 at 4 months of age. The total of 291 animals (96 F × F, 104 H × F, 91 S × F) were then treated similarly until mated as yearlings in October 1974.

In February, 1974, 100 single-suckled 6-month-old Angus (A × A) heifers were added to the trial from the Tahae herd. They were representative of the Tahae calf crop after the very late-born calves had been removed. No background data were available on these animals.

Liveweight was recorded at monthly intervals. Oestrous data were obtained by using Friesian vasectomized (teaser) bulls fitted with "Chin-ball" mating harnesses (Lang *et al.*, 1968). Fresh mating marks were recorded weekly with ink colour-changes every 3 weeks. Teaser bulls were rested for 4 weeks after 4 weeks' work.

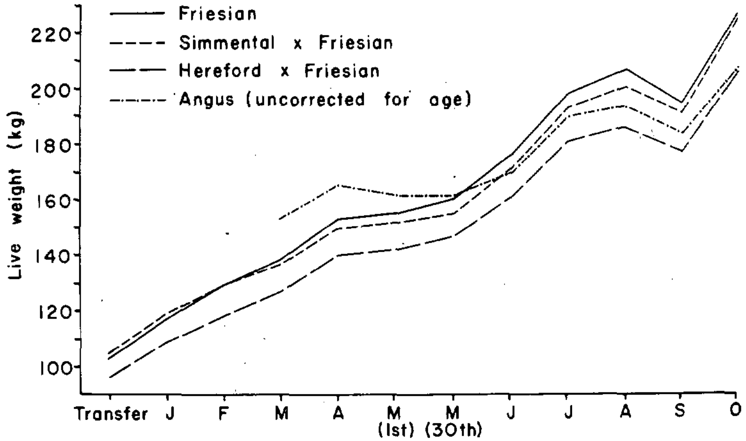

FIG. 1: *Breed mean weights adjusted for rearing farm and age effects. (Actual mean weights for Angus heifers.)*

The cattle were drenched at 6-week intervals and periodically sprayed for external parasites. The cattle were run on pasture at a rate of 2.5 per ha with a two-month period during the winter on crop at 23 per ha.

RESULTS

GROWTH

Breed mean weights, adjusted for rearing farm and age effects for the F × F, H × F and S × F animals are summarized in the growth curves of Fig. 1. Actual mean weights of the Angus (A × A) heifers are also shown.

Differences between sires within breeds, and differences between breeds were statistically significant ($P < 0.001$) for each recorded weight between transfer and October. This largely reflected the lower weight of the H × F heifers.

Mean weight gains over selected periods are presented in Table 1.

TABLE 1: MEAN VALUES FOR LIVE-WEIGHT GAIN (kg/day) FOR BREEDS

	Breed			*Significance*		*Breed*
Period	*F × F*	*H × F*	*S × F*	*Breed*	*Sires within Breeds*	*A × A*
Transfer-March	0.37	0.32	0.33	*	†	
March-May	0.26	0.24	0.22	*	**	0.10
May-August	0.55	0.49	0.55	***	n.s.	0.39
August-October	0.38	0.36	0.42	**	†	0.25
Transfer-October	0.39	0.34	0.38	***	**	
Birth-October	0.45	0.40	0.44	***	***	

Breed differences were evident in each period and the H × F was consistently the slowest growing dairy-based breed. The A × A heifers were lowest in overall growth rate in each period, and by October their average weight had dropped from the highest at the time they joined the trial to be similar to the H × F by October (Fig. 1).

SIRE DIFFERENCES

Within breeds, sire differences were evident for all weights ($P < 0.001$), and for some weight-gains (Table 1). Clearly, the

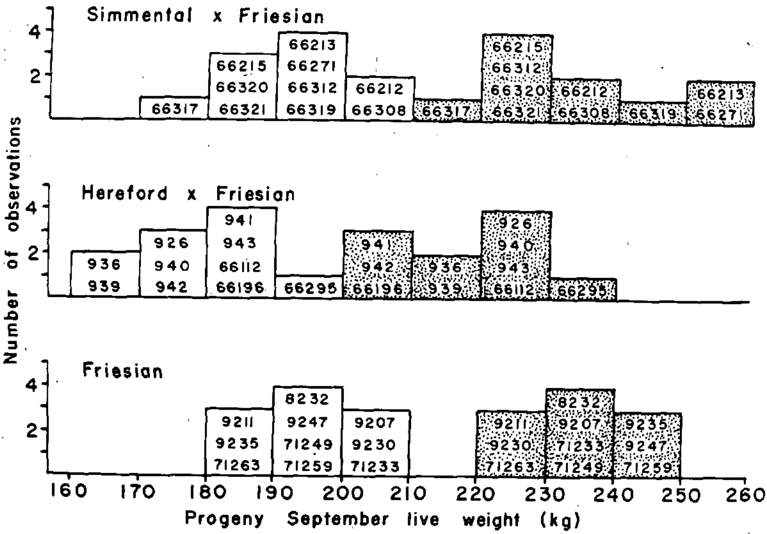

FIG. 2: *Range in liveweights (13 months of age) for heifer and steer progeny of sires of each breed.*

relatively low numbers of progeny per sire limited the accuracy of the progeny test from these data. However, the range in the mean age-corrected weights at 13 months of age shown in Fig. 2 shows the wide scope there is for selection within breeds.

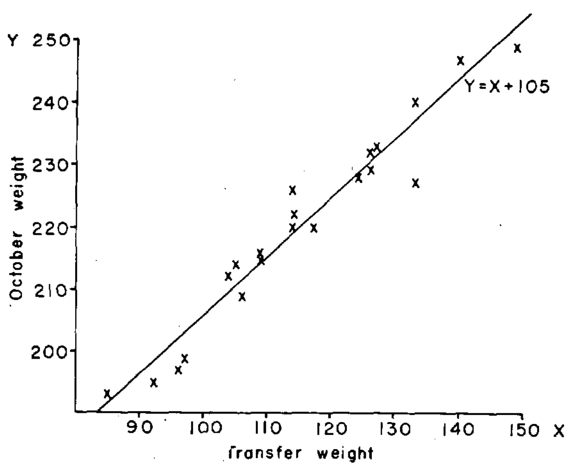

FIG. 3: *Regression of October liveweight (14 months of age) on transfer liveweight (4 months of age) for each rearing farm.*

The individual sire reference numbers presented in Fig. 2 show the consistency of sire ranking for each sex of progeny. When the steer and heifer data were combined, the correlation between sire means, within breeds, was a low value of $r = 0.45$.

Rearing Farm Effects

The transfer of heifers from 21 rearing farms enabled an assessment of the residual effect of the pre-weaning environment on subsequent performance. Rearing farm effect was statistically significant at each weighing, and is seen by the regression of October weight on transfer weight for farm means in Fig. 3.

Figure 3 clearly indicates that differences due to rearing farm at transfer persisted for a year until the following October, with each group having added an average of 105 kg over the period. There was no compensatory growth shown by the lightest calves at transfer.

Oestrous Behaviour

The percentage of heifers of each breed which showed oestrus by October, together with their mean age and weight at first oestrus is presented in Table 2.

TABLE 2: PERCENTAGE OF HEIFERS SHOWING OESTRUS TOGETHER WITH THEIR MEAN AGE AND WEIGHT AT FIRST OESTRUS

Breed	% *Showing Oestrus by October*	*Mean Age (days) at First Oestrus*	*Mean Weight (kg) at First Oestrus*
F × F	85	344	187
H × F	60	365	186
S × F	44	352	193
A × A	41	—	191
S.D.		63	23

Individual weights were calculated by interpolation. There were large differences between breeds in the incidence of oestrus, with about twice the proportion of F × F heifers cycling than the S × F and A × A animals, with the H × F being intermediate.

Mean weight at first oestrus was similar for the four breeds and, while there was a wide range of ages within the dairy-bred heifers means for the three groups ranked as would be expected from the liveweight data; in particular, the H × F were oldest in mean age at first oestrus.

Table 3 compares the weight and age at the start and end of the period of joining with the teaser bulls, for the animals which showed oestrus with those that did not show oestrus. Those which showed oestrus were heavier and older in March and in October, and were on average a week older at first oestrus.

It is important to stress that there was wide variation about the mean values presented in Table 2. As an example of this, the distribution of age at first oestrus is shown for each breed in Fig. 4.

TABLE 3: DIFFERENCES IN WEIGHT (kg) AND AGE (days) BETWEEN ANIMALS WHICH SHOWED OESTRUS AND THOSE WHICH DID NOT

	Mean Values		
	Showed oestrus	*No oestrus*	*Diff.* ± *S.E.*
March wt	143	122	21*** ± 2.9
October wt	230	207	23*** ± 3.1
Transfer—March gain/day	0.35	0.32	0.03* ± 0.01
Birth day	217	224	—7.4*** ± 1.8
Age corrected March wt	141	125	16*** ± 2.6
October wt	229	209	20*** ± 3.1

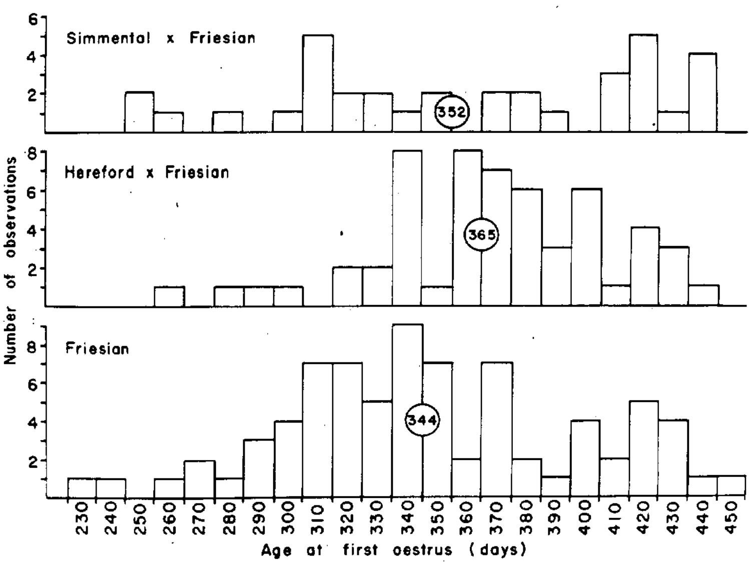

FIG. 4: *Distribution of age at first oestrus (days) of heifers of each breed.*

DISCUSSION

This trial, together with that of Everitt *et al.* (1975), confirms the growth potential of the Friesian under New Zealand pastoral conditions. It lends further support to the similar conclusion by Hight *et al.* (1973), Dalton and Everitt (1972), and the thesis of Shannon (1971). However, recent British work (Deeble, 1974), using similar crosses showed the S × F to have superior growth to the F × F and H × F under intensive feeding conditions.

Probably the most important conclusions from this trial is the marked carry-over effect of the pre-weaning environment on subsequent growth and breeding performance. This work now supplements the substantial evidence on this subject built up by Everitt *et al.* (1969), Everitt (1972, 1973), Reardon and Everitt (1972), Smith *et al.* (1973). In practice this means that the apparent widely held view by farmers that small and inevitably cheap calves will exhibit compensatory growth cannot be supported.

The sire analysis, despite the limitations caused by low numbers of progeny per group, demonstrates the wide scope for selection within breeds for weight-for-age. This was especially apparent in the Simmental sires (Fig. 2).

In reproduction, the Friesian again exhibited an earlier onset of oestrus than any of the other breeds (Table 2). The low percentage of S × F heifers showing oestrus which was lower than the H × F may reflect their later sexual maturity and could be a disadvantage of their later physical maturity.

Caution is clearly needed if the mean values for age and weight at first oestrus are used as management target weights (Table 2), because of the wide variation around these values (Fig. 4). There is a need for data to see if early oestrus and many cycles have merit in lifetime production before breeds like the S × F and A × A are criticized for these traits. By joining, all these heifers were above the minimal weight at first joining suggested by the extensive analyses of Angus and Hereford cattle by Carter and Cox (1973).

ACKNOWLEDGEMENTS

The collaboration of the New Zealand Dairy Board and the Livestock Improvement Association (Auckland) Inc. is gratefully acknowledged, along with that of all the farmers who co-operated in the trial.

Generous acknowledgement is due to the staff of the Lands and Survey Department (Te Kuiti) for the willing co-operation at all levels in carrying out this programme.

F. Paviour (1970) Ltd, is acknowledged for provision of a research grant for the purchase of equipment.

REFERENCES

Carter, A. H.; Cox, E. H., 1973: *Proc. N.Z. Soc. Anim. Prod.*, *33*: 94.
Dalton, D. C.; Everitt, G. C., 1972: *Proc. N.Z. Soc. Anim. Prod.*, *32*: 11.
Deeble, F. K., 1974: *Limousin and Simmental Test's Steering Committee. Rep. No. 6.*
Everitt, G. C., 1972: *Proc. Ruakura Fmrs' Conf. Week*: 77.
———, 1973: *Proc. Ruakura Fmrs' Conf. Week*: 55.
Everitt, G. C.; Evans, S. T. Franks, M., 1969: *Proc. N.Z. Soc. Anim. Prod.*, *29*: 147.
Everitt, G. C.; Jury, K. E.; Ward, J. D. B., 1975: *Proc. N.Z. Soc. Anim. Prod.*, *35*: 119.
Hight, G. K.; Everitt, G. C.; Jury, K. E., 1973: *N.Z. Jl agric. Res.*, *16*: 519.
Koger, M.; Cunha, T. J.; Warnick, A. C. (Eds.), 1973: *Crossbreeding Beef Cattle Series 2. Univ. of Florida Press.*
Lang, D. R.; Hight, G. K.; Uljee, A. E.; Young, J., 1968: *N.Z. Jl agric. Res.*, *11*: 955.
Reardon, T. F.; Everitt, G. C., 1972: *Proc. N.Z. Soc. Anim. Prod.*, *32*: 26.
Shannon, P., 1971: *Proc. N.Z. Soc. Anim. Prod.*, *31*: 1.
Smith, M. E.; Callow, Clare; McSweeney, B. J., 1973. *Proc. N.Z. Soc. Anim. Prod.*, *33*: 166.