Differences among and within crossbred beef cow groups in body condition and live weight

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ABSTRACT

Data on live weight (LW) and condition score (CS) were collected in a large scale breed evaluation at Goudies (Department of Lands and Survey, Rotorua). The LW data were obtained 4 times a year; the CS data on a 1 to 10 scale similar to the Ellinbank scale (10 fattest), were obtained on 7 occasions from April 1982 to February 1984. Seven breed groups, 5 2-breed crosses and 2 straightbreds (Angus and Herefords), were compared. The crosses were Hereford-Angus (HA, including its reciprocal), South Devon-Angus (Sd.A), Friesian-Angus (FA), Friesian-Hereford (FH) and Jersey-Angus (JA).

Breed differences for LW and CS were reasonably consistent between years or seasons, in spite of large year effects and significant breed x age interactions. The CS means for JA, FA and FH were 0.9, 0.5 and 0.6 units less than for Angus cows, which in turn were 0.3 and 0.7 units lower than HA and Herefords respectively. The scores of Sd.A cows were near the average of the 7 groups together, but they were heaviest, being 22 kg above the herd mean.

It is suggested on the basis of this evidence that using the same target for LW or CS for different breed crosses is unrealistic.

Within breed and age groups, the correlation between August and November CS was 0.43. The equivalent figure for LW was 0.84. For each unit increase in CS, LW rose by 25.2 kg ($r = 0.53$, range 0.42 to 0.60 on different recording occasions).

Keywords Beef cows; body condition; live weight; crossbreds.

INTRODUCTION

Differences in live weight (LW) of up to 14% have been found among beef cow breeds and crosses born, reared and managed together (Baker *et al.*, 1981). In general, breed rankings for cow LW were also consistent among age groups and locations. Because few farmers weigh cows, advice on target LW may not always be useful. One solution might be to provide information via condition scores (CS). Results have been reported on repeatability of CS within 1 breed by Nicoll (1981). This paper reports on breed differences in LW and CS of cows at 4 different times of the year, the correlations among CS at different times (within breed and age groups), and between LW and CS.

MATERIALS AND METHODS

The data on LW and CS (1 to 10 score, similar to the Ellinbank scale; 10 fattest; see Earle, 1976) were obtained from phase 3 of the Ruakura Beef Breed Evaluation (Baker and Carter, 1981). The trial was run on the Department of Lands and Survey property at Goudies, about 60 km SE of Rotorua. Phase 3 involving evaluation of breeds and crosses for maternal productivity traits, comprised straightbred Angus (A) and Hereford (H) controls plus F1 and F2 generation halfbred cows: Hereford-Angus (HA, mainly halfbreds, including the reciprocal), Friesian-Angus (FA), Friesian-Hereford (FH, including some HF of dairy herd origin), Jersey-Angus (JA, including some AJ of dairy herd origin) and South Devon-Angus (Sd.A). Pregnant cows (including pregnant rising 2-year heifers) were wintered and about 750 per year were included in the analysis. All had been born, reared and managed together, with the exception of a small number transferred in from elsewhere.

Briefly, the trial design involved all cows $\geqslant$15 months of age being joined in small single-sire mating groups. Cows were run in 2 large management groups (all breeds together) from autumn until after calving, except for the rising 2-year and sometimes the rising 3-year females which were run separately. Cows were run with breeds separate during mating for 8 weeks from late November. Calves were weaned at approximately 5 months of age.

TABLE 1 Mean live weight (kg) and condition score of cows (⩾1¼ yr) from April 1982 to February 1984. Cows were culled for age after April weights.

Month	No. of records 1982-83	No. of records 1983-84	Live wt 1982-83	Live wt 1983-84	Condition score 1982-83	Condition score 1983-84
April	981	997	454	422	6.0*	5.0
August	745	799	449	381	6.1	3.9
November excl. 1¼ yr olds	745	799	424	374	-	5.1
incl. 1¼ yr olds	997	1051	398	346	-	5.0
February incl. 1½ yr olds	997	1051	454	416	5.4	5.8

*All scores, except in April 1982, were taken by the same technician.

The equivalent of about 12 bales (*c.* 240 kg) of hay per cow were offered over the winter; on the day of calving each cow and new calf were drifted forward onto saved pasture. The winter grazing plus usual hay ration was supplemented by extra hay in the autumn/winter of 1983 but was insufficient to maintain LW in the face of severe drought. Consequences are reported later.

Culling (approximately 20%) occurred after pregnancy diagnosis in April in the following priority order: empty cows (except some 1½-year olds and any sub-fertile bull groups), first-cross cows with 4 calving opportunities and then if necessary, the oldest in-calf cows.

Both LW and CS were recorded 4 times a year, in April, August (precalving), November and February. Data are reported here from April 1982 to February 1984 inclusive (except CS in November 1982).

The data were analysed by least squares (Harvey, 1977), fitting fixed effects for age of cow, breed, age x breed interaction, a linear regression for calving day, and with/without current pregnancy or lactation status. For November and February data, the calving day and pregnancy/lactation status referred to the previous calving and current lactation, and for April and August data, to the current pregnancy and future calving date.

TABLE 2 Effect of breed or cross and age (years) on cow live weight (kg) and condition score in August and February, expressed relative to the herd mean.

	No. of records** Aug 1983	No. of records** Feb 1984	Live wt Aug 1983	Live wt Feb 1984	Condition score Aug 1983	Condition score Feb 1984
Cow breed or cross						
Angus	82	111	−4	−6	0.1	0.2
Hereford	52	64	−14	0	0.8	0.9
HA	152	231	−2	−8	0.5	0.5
Sd.A	65	90	21	22	0.0	0.0
JA	115	136	−26	−50	−0.7	−0.8
FA	92	112	17	16	−0.4	−0.2
FH	79	102	1	0	−0.5	−0.3
Average s.e. of breed constants			5.9	6.0	0.14	0.10
Cow age						
2*	143	231	−66†	−74	0.31†	0.41
3	116	141	−5†	−43	0.06†	−0.32
4	98	112	4	11	−0.52	−0.25
⩾5	280	362	67	105	0.15	0.17
Average s.e. of age constants			3.4	3.5	0.083	0.058
Residual s.d.			39.7	47.8	0.97	0.80

* at 23 months in August, 17 months in February
** excludes 2 other breed crosses, which were part of Table 1, but not yet represented over all age groups
† Run as separate age groups over the winter of 1983.

RESULTS

Means of LW and CS are shown in Table 1. Beginning about February 1983 a severe drought occurred, and large herd responses in LW were apparent. Seasonal means of CS, although of interest, could be subject to error because the system is subjective. Breed effects *within* any 1 scoring day, relative to the herd mean, are presented for an August and February recording in Table 2. Breed effects were consistent for LW and CS at all other recordings across season and year (although not presented here).

The Sd.A cross was heavier than average but had only average CS. Herefords were of average LW but had greatest CS. Angus cows were similar to Herefords in weight but had 0.7 units lower CS. The HA cross showed intermediate CS, relative to the two parent breeds, and similar LW (average s.e. of breed mean difference for LW = 8.4 kg). The dairy crossbreds had a CS consistently lower at all times of year than the straightbred controls.

Breed x age interactions for LW were significant on the majority of occasions.

The correlations *among* breed means for CS obtained in different seasons were high, e.g. 0.93 for scores in August *v* November 1983, and 0.89 for scores in August 1983 *v* February 1984. *Within*

breeds and age groups, the correlation between CS in August and November 1983 was 0.43, and between LW at the same times 0.84. For the regression of LW on CS, analysed within breeds and age groups, the linear coefficient averaged 25.2 kg/unit, r = 0.53 (range 0.42 to 0.60, for all recording dates over the 2 year period).

DISCUSSION

Breed mean differences in LW and CS were reasonably consistent from one recording date to another, in spite of the interactions. Differences between HF and FH cows, and between AJ and JA cows were large (dairy origin cows, HF and AJ, being lighter), presumably induced originally by artificial rearing compared with single-suckling on beef dams. Differences in LW or CS in April between empty and pregnant cows were small, e.g. empty cows 0.20 lower than pregnant cows (P = 0.05) for CS in April 1982, probably because the empty cows included very thin and very fat cows.

The breed x age interactions are difficult to interpret. It is unlikely that culling contributed to these interactions. Cow sire effects no doubt contributed, but the main factor was probably the different breed maturing rates.

Usually Herefords have been found to be heavier than Angus (Baker *et al.*, 1981). Relative to all the breed-crosses, it was the Angus that appeared heavier than normal. Restricting the data to comparisons of Angus and Hereford straightbreds with F1 HA and AH cows only (i.e. no F2s), indicated averages of 4.2% and 1.3% heterosis for LW and CS respectively.

From the residual s.d. for CS of 0.8 to 1.0 score units, there was a range of about 4 to 5 units for the majority of cows between the fattest and leanest, within an age group and breed. This indicates the difficulty of running all cattle together, even of 1 age group, if targets are set. The results suggest that to set a single target LW or CS across breeds would be unwise because breeds had different optimum LW and CS.

The high correlations among LW or CS showed that these measures were repeatable, both within and among breeds, a fact well known for LW, although not for CS. Nicoll (1981) found a correlation of 0.69 within breeds, for CS recorded at different times. Strictly, the CS values should be reserved for within group comparisons, except if used with a reference standard, e.g. a set of photographs. Wright and Russel (1984), studying the association between CS and body fat in the carcass of British beef cows, found a close relationship. The correlation between LW and CS within breeds is also potentially useful. The scoring system could be used (a) by farmers, and (b) by those wishing to present management advice to farmers. One of the uses of CS could be in explaining the difference expected between dairy-cross and traditional beef cows when run together. Targets for different breeds should not be the same, and CS can be used for targets against a reference standard.

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