VARIATION IN LAMB SURVIVAL, GROWTH AND LEANNESS OF DIVERSE CROSSBRED LAMB GENOTYPES

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SUMMARY

Variation in sire progeny groups for birth weight, skin fold thickness, lamb survival, growth and fat score of 868 lambs is reported from a larger experiment to assess variation of different lamb types in growth, carcass and meat quality traits and their importance to commercial value. The lambs were progeny of five Poll Dorset (D), three Texel (T), four Border Leicester (BL), two strong wool Merino (SM) and three medium wool Merino (MM) sires and Merino (M) and Border Leicester x Merino (BLM) dams. The sires were selected for growth and leanness and five have been used in industry central progeny tests. There was significant variation amongst sires and types for growth traits ($P<0.01$) and the dam breed x sire interaction was significant for weaning weight ($P<0.05$), postweaning weight and growth rate ($P<0.01$). There was no significant variation due to sire or sex for lamb survival.

INTRODUCTION

The Australian prime lamb breeding structure revolves around the production of second cross lambs. However this type comprises only 40% of the 16m lambs slaughtered annually. Slaughter lambs are a great diversity of genotypes, including Merino (20%), dual-purpose (10%), shortwool (15%) and longwool (10%) first cross. The industry central progeny tests (Banks et al. 1994) and other experiments (Hall et al. 1992) have demonstrated considerable diversity for growth and fatness within the limited breeds evaluated. Variation amongst sires across the range of lamb types in other important carcass characteristics and the influence of these traits on commercial carcass value is unknown. Weight and fat are now measured and specified on most lambs, but butchers (Jackson et al. 1992) and processors (Hopkins 1993) have nominated additional descriptors (eg. conformation, muscling, colour) as important determinants of carcass value. They are beginning to demand carcasses of particular specifications to meet their varying requirements for different markets. The importance and commercial value of these other descriptors of carcasses needs to be established, so that industry can incorporate cost effective measurement and description procedures. The genetic variation for these characteristics also has implications for breeding objectives and selection programs based on LAMBPLAN.

The availability of imported breeds makes their early evaluation with known genotypes desirable. In particular, the Texel is likely to produce a different carcass than traditional breeds and Texel sires should be evaluated for growth, leanness and carcass quality as well as lamb survival and skin traits.

This paper presents preliminary results for growth and other performance from a diverse range of lamb genotypes, which are part of a larger experiment to assess variation in growth, carcass and meat quality traits and their importance to commercial value.

MATERIALS AND METHODS

Data from 868 lambs were analysed which were the progeny of five Poll Dorset (D), three Texel (T), four Border Leicester (BL), two strongwool Merino (SM) and three medium wool Merino (MM) sires and Merino (M) and Border Leicester x Merino (BLM) dams. Three of the D and two of the T sires have also been used in industry central progeny tests to provide genetic links to other industry sires. Two of the D and the three T sires were mated using laparoscopic artificial insemination (AI) with thawed frozen semen in mid-February 1994. The remainder of the sires were mated in single sire groups from 11 February to 14 March 1994. Matings and lambings occurred at Cowra. Ewes were supplemented with wheat and hay from prelambing (June) until lambs were weaned (12 October 1994), due to drought conditions, which also necessitated the transfer of ewe progeny to Leeton after weaning.

Ewes lambed in separate paddocks according to sire mating group. Ewes and lambs within the AI and natural mating groups were combined after marking and each lamb sex group ran together after weaning. The lambs were tagged, weighed and skin fold thickness measured with Holtain[R] callipers within 16 hours of birth. Male lambs were made into cryptorchids with elastrator rings at marking.

Birth weight, skin fold thickness, weaning weight, fasted postweaning weight (cryptorchids, 19 December 1994, ewes, 17 January 1995), postweaning fat score, growth rate from birth to postweaning and lamb survival were analysed using REG (Gilmour 1988). The progeny of AI and natural matings were analysed separately because of the different management to weaning and the different statistical models used. For the AI progeny the model included dam breed (M, BLM), sire, sex, type of birth (linear, quadratic) and the interactions of sire with dam breed and sex. For progeny of natural matings the model included genotype (13 df, see Table 2), sex, type of birth (linear and quadratic), age and the interaction of genotype with sex. Postweaning weight was also included as a covariate for postweaning fatscore in both analyses, as was birthweight (linear and quadratic) for lamb survival.

RESULTS

Least squares means for growth of the first and second cross progeny of the two D and three T sires used in the AI matings are shown in Table 1. Second cross lambs were significantly heavier at weaning and postweaning and had higher growth rate from birth ($P<0.01$) than first cross lambs, although there was no difference in birth weight. First cross lambs had greater skin fold thickness at birth than second cross lambs ($P<0.01$). There was significant variation among sires for birth weight ($P<0.05$), weaning and postweaning weights, growth rate and fat score ($P<0.01$). Cryptorchid lambs were heavier than ewe lambs at weaning ($P<0.01$), although there was no difference at birth in weight or skin fold thickness. The difference between the sexes postweaning could reflect both sex and management effects which were confounded. There was a significant dam breed x sire interaction for weaning weight ($P<0.05$), postweaning weight and growth rate ($P<0.01$), due to the relatively better performance of D1 and D2 sired progeny from BLM dams than M dams. The sire x sex interaction was significant for postweaning weight, growth rate and fat score ($P<0.05$), due to relatively better performance of D1 and D2 for ewes than cryptorchids and a relatively higher fat score for T3 ewe progeny than cryptorchids.

Least squares means for traits for the lambs from the natural mating groups are shown in Table 2. There was significant variation amongst genotypes of lambs for all traits ($P<0.01$). Cryptorchids were heavier than ewes at weaning ($P<0.01$) and birth ($P<0.05$), but had lower skin fold thickness at birth ($P<0.05$). Postweaning sex effects were confounded with management differences. The interaction between genotype and sex was not significant for any trait.

For lamb survival there was no significant variation due to sire or sex. However type of birth and the linear and quadratic effects of birthweight were highly significant (P<0.01) for lamb survival amongst

Table 1. Growth of lamb progeny groups of Texel (T) and Poll Dorset (D) sires and Border Leicester x Merino (BLM) and Merino dams (M)

Genotype	Lambs (n)	Birth weight (kg)	Skin fold thickness (mm)	Weaning weight (kg)	Postwean weight (kg)	Postwean fat score (at 35.1 kg)	Growth b-pw (g/d)
T1 x BLM	37	4.9 • 0.1	3.1 • 0.1	30.4 • 0.8	38.2 • 0.9	2.3 • 0.1	197 • 5
T2 x BLM	47	5.3 • 0.1	3.2 • 0.1	29.8 • 0.8	39.3 • 0.9	2.7 • 0.1	202 • 5
T3 x BLM	50	5.2 • 0.1	3.2 • 0.1	30.6 • 0.8	40.2 • 0.8	2.7 • 0.1	207 • 5
D1 x BLM	46	5.0 • 0.1	3.2 • 0.1	32.8 • 0.7	43.1 • 0.8	2.6 • 0.1	223 • 5
D2 x BLM	46	5.2 • 0.1	3.1 • 0.1	30.7 • 0.7	42.1 • 0.8	2.5 • 0.1	217 • 5
2nd Cross		5.1 • 0.1	3.1 • 0.1	30.9 • 0.5	40.6 • 0.5	2.5 • 0.1	209 • 3
T1 x M	63	4.9 • 0.1	3.5 • 0.1	28.7 • 0.6	37.8 • 0.7	2.3 • 0.1	196 • 4
T2 x M	56	4.9 • 0.1	3.4 • 0.1	24.9 • 0.7	34.6 • 0.8	2.6 • 0.1	176 • 4
T3 x M	44	5.0 • 0.1	3.3 • 0.1	28.8 • 0.7	38.9 • 0.8	2.7 • 0.1	202 • 5
D1 x M	61	4.6 • 0.1	3.5 • 0.1	28.3 • 0.6	38.6 • 0.7	2.4 • 0.1	201 • 4
D2 x M	63	5.0 • 0.1	3.5 • 0.1	27.4 • 0.6	38.4 • 0.7	2.5 • 0.1	198 • 4
1st Cross		4.9 • 0.1	3.4 • 0.1	27.6 • 0.4	37.7 • 0.5	2.5 • 0.1	194 • 3
Ewe		4.9 • 0.1	3.3 • 0.1	28.2 • 0.5	36.8 • 0.5	2.8 • 0.1	174 • 3
Crypt		5.1 • 0.1	3.3 • 0.1	30.3 • 0.5	41.4 • 0.5	2.2 • 0.1	230 • 3

lambs from the AI and natural matings. Least squares means for percentage lamb survival for single, twin and triplet born lambs were 89±3, 80±2 and 72±3 respectively for the AI group and 92±5, 75±3 and 57±6 respectively for the natural mated group.

DISCUSSION

The second cross lambs were 12% heavier at weaning and 8% heavier postweaning than the first cross lambs, which was similar to the advantage in other reports (Atkins and Gilmour 1981; Kleeman et al. 1984). While there was considerable variation between sires, amongst the AI group, the second cross progeny of the two D sires grew faster than the similar progeny of the three T sires, although the differences were small amongst first cross progeny. The D sires used in the AI group were selected as high performers in the central progeny test for growth, leanness, muscling and the terminal sire index. The T sires were selected to represent three different families from the frozen semen that was available at the time.

There was significant variation in growth amongst the sire progeny groups resulting from the natural matings. There was overlap amongst the D and BL first cross progeny groups. The Dorset sires had previously been selected from the one stud using LAMBPLAN EBVs for high growth and high lean (Hall et al. 1992). The BL rams were selected on a similar basis from two studs.

The two SM progeny groups had 12% higher growth than the three MM groups, which was slightly greater than the 8% advantage reported by Atkins and Gilmour (1981). Heterosis may contribute up to 1/4 of this advantage of the SM progeny (Mortimer et al. 1994).

There was no difference in postweaning fat score between the first and second cross lambs when they were compared at the same liveweight. The Merino groups tended to be leaner, but measurements on carcasses following slaughter will be more definitive. The lack of differences in lamb survival between sire groups is to be expected with the low heritability of the trait (Fogarty 1995).

Table 2. Growth of lamb progeny groups of sires of diverse genotypes

Genotype	Lambs (n)	Birth weight (kg)	Skin fold thickness (mm)	Weaning weight (kg)	Postwean weight (kg)	Postwean fat score (at 31.7 kg)	Growth b-pw (g/d)
D3 x BLM	32	5.9 • 0.1	4.5 • 0.1	29.6 • 0.8	40.5 • 1.0	2.4 • 0.1	212 • 6
D4 x BLM	36	5.5 • 0.1	3.7 • 0.1	28.8 • 0.8	37.6 • 0.9	2.4 • 0.1	196 • 6
D6 x BLM	27	5.9 • 0.1	4.0 • 0.1	29.0 • 0.9	37.7 • 1.0	2.3 • 0.1	198 • 6
D3 x M	12	5.0 • 0.2	3.5 • 0.1	25.3 • 1.3	36.2 • 1.5	2.4 • 0.2	192 • 9
D4 x M	12	5.5 • 0.2	3.9 • 0.1	24.9 • 1.2	35.8 • 1.3	2.1 • 0.1	187 • 8
BL1 x M	19	5.3 • 0.2	3.8 • 0.1	25.2 • 1.0	36.2 • 1.1	2.4 • 0.1	190 • 7
BL3 x M	26	4.9 • 0.1	4.0 • 0.1	25.8 • 0.8	36.6 • 0.9	2.3 • 0.1	194 • 6
BL4 x M	31	4.9 • 0.1	3.8 • 0.1	23.9 • 0.8	33.1 • 0.9	2.3 • 0.1	173 • 5
BL5 x M	22	4.9 • 0.1	3.6 • 0.1	24.5 • 0.9	33.0 • 1.0	2.1 • 0.1	171 • 6
SM1 x M	28	5.2 • 0.1	3.9 • 0.1	24.3 • 0.8	32.3 • 0.9	2.0 • 0.1	167 • 6
SM2 x M	30	5.2 • 0.1	3.7 • 0.1	26.1 • 0.9	33.8 • 1.0	1.9 • 0.1	177 • 6
MM3 x M	31	4.8 • 0.1	3.9 • 0.1	22.2 • 0.7	29.8 • 0.8	2.2 • 0.1	154 • 5
MM4 x M	24	4.9 ◦ 0.1	4.0 • 0.1	22.6 • 0.8	29.1 • 0.9	1.9 • 0.1	149 • 6
MM5 x M	25	4.8 • 0.1	3.7 • 0.1	23.9 • 0.8	30.3 • 0.9	2.1 • 0.1	157 • 6
Ewe		5.1 • 0.1	3.9 • 0.1	24.5 • 0.4	29.7 • 0.6	2.3 • 0.1	149 • 4
Crypt		5.3 • 0.1	3.8 • 0.1	26.3 • 0.4	39.1 • 0.8	2.1 • 0.1	210 • 5

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