GENETIC EVALUATION OF AMERICAN SUFFOLKS THROUGH PROGENY TESTING

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SUMMARY

A progeny test was conducted in Western Australia in conjunction with the national central progeny test (CPT) program to evaluate 14 American Suffolk and 2 Australian rams as prime lamb sires, 4 of these rams having been evaluated previously in the national CPT program. The American Suffolks produced lambs that were heavier and had leaner carcases than lambs from the Australian sires. However, the relative eye muscle area of lambs sired by the American Suffolks were smaller than those of lambs from Australian sires. This probably reflects the slower maturity of the American Suffolks. These attributes and the superiority of particular American Suffolk sires over a number of the Australian sires tested indicate that, the American Suffolks will be useful to help the Australian prime lamb industry produce larger and leaner lambs.

Keywords: prime lambs, American Suffolks, progeny test.

INTRODUCTION

All levels of the Australian prime lamb industry are making major changes in an effort to increase consumption of lamb and ensure the long-term viability of the industry. Central to these changes is the production of larger and leaner lambs to supply more convenient and interesting cuts of lean meat to the consumer. The national LAMBPLAN central progeny test (CPT) program (Banks ***et al***. 1993) within the Meat Research Corporation's prime lamb program identifies sires that produce fast growing, heavy, lean lambs and promotes their use in industry. The work reported here used a similar design to the national CPT program to evaluate sires under Western Australian conditions, and included sires already evaluated in the national program.

The American Suffolk is one of the largest sheep breeds in the world and sires most of the lambs marketed as heavyweight lamb in the United States of America. The animals were introduced into Australia by the Advanced Performance Suffolks syndicate on the premise that the Australian prime lamb industry would, at some time, need to produce larger and leaner lambs. The animals were released in February 1992 after 8 years in quarantine where the numbers were multiplied by embryo transfer programs. The expectation that the American Suffolks would be superior to the majority of Australian sires to produce heavyweight, lean lambs was examined by progeny testing in this study.

MATERIALS AND METHODS

The site for the progeny test in Western Australia (WA) was a property at Beverley in the south west of WA. At this site, mature Corriedale ewes (800) and mature Merino ewes (300) were mated by artificial insemination (AI) with frozen-thawed semen from 16 sires over 4 days in February 1992. The 16 sires comprised 14 American Suffolks (100 to 37.5% American Suffolk genotype) and 2 Australian sires (1 Suffolk and 1 Poll Dorset). The 2 Australian sires had been used in the 1991 national CPT program and 2 of the 14 American Suffolk sires were used at the Glen Innes site in the 1992 national program. These 4 sires provided the genetic links between the WA progeny test and the national program.

The ewes were inseminated by laparoscopy (Killeen and Caffery 1982) following oestrus synchronisation with Ovakron™ intravaginal sponges and an injection of 400 IU of PMSG on day 12 at sponge withdrawal. Ewes of each breed were randomly allocated to 1 of the 16 sires and inseminated with about 20 million live sperm 51 to 57 hours after sponge withdrawal and then ear tagged for identification to their sire group.

The ewes were scanned by real-time ultrasonography (Fowler and Wilkins 1982) 86 to 90 days after AI and all ewes that were not pregnant to the AI program were removed. The pregnant ewes were run as one mob until they were placed in separate paddocks for lambing in their sire groups (138 to 142 days after AI). During lambing the ewes were inspected daily between 0800 and 1700 hours and all lambs were ear tagged for identification, weighed and had their birth-type and sex recorded within 24 hours of birth.

The ewes lambed over 10 days and at the end of lambing the ewes and lambs were combined and run as 1 mob until the lambs were slaughtered. The lambs were not tail docked, the male lambs were left entire and the lambs were not weaned prior to slaughter. The female lambs (208) were slaughtered at an average age of 107 days and the male lambs (245) were slaughtered at an average age of 129 days. After slaughter, each carcase was measured to determine hot carcase weight (kg), fat depth over the 12th rib at 110 mm from the carcase midline (GR, mm) and the area of the eye muscle between the 12th and 13th rib (EMA, cm^2). The number of lambs measured for each sire at the WA site ranged from 14 to 54.

The protocol for the WA progeny test was similar to that used at the national CPT sites, with the following differences:

1. male progeny in WA were entire, not cryptorchidised,
2. the ewes in WA were Merino and Corriedale, rather than Border Leicester x Merino or Merino,
3. the WA progeny were slaughtered at lighter carcase weights (overall average 17.5 vs 19.9 kg) and at correspondingly lower GR fat depths (overall average 8.8 vs 11.0 mm).

The data for all CPT sites (in 1991, 1992 and the WA test) were analysed using Best Linear Unbiased Prediction procedures (Henderson 1973) with site-year, sex, dam breed, birth and rearing type fitted as fixed effects and days of age within site as a covariate to calculate Estimated Breeding Values (EBVs) for carcase weight at constant age. The same fixed effects were fitted with carcase weight within site-year as a covariate to produce EBVs for GR and EMA at constant carcase weight. The model for Terminal Sire Index (TSI) was the same as for carcase weight, but with carcase GR within site-year as a second covariate to produce EBVs for carcase weight at constant age and GR. This EBV was then converted to an index with a standard deviation of 10 units and a mean of 100. TSI is an overall measure of genetic merit for production of commercial lambs since it describes a sire's genes for fast-growing lambs that are heavy at 12 mm GR (the approximate mean of the fat range over which weight:fat price grids pay the highest price for lambs). Thus, a sire with a high TSI will breed fast-growing lambs with heavy, lean carcases.

RESULTS

Table 1 shows the average EBVs for the carcase traits measured and the TSI values for the 14 American Suffolk sires and the 125 Australian sires tested to mid-1993 at the national CPT sites.

Table 1. Mean Estimated Breeding Values (EBVs) for carcase weight (CWT), fat depth at constant weight (GR_{Wt}), eye muscle area at constant weight (EMA_{Wt}) and terminal sire index (TSI) for 14 American Suffolk and 125 Australian sires

Sire	CWT (kg)	GR_{Wt} (mm)	EMA_{Wt} (cm^2)	TSI
American Suffolk	0.12	- 0.47	- 0.08	103.01
Australian	- 0.02	0.06	0.02	99.64

Since the analysis included the American Suffolk sires the average EBVs and TSI for the Australian sires are not 0.00 and 100, respectively. These results show that the average of all American Suffolk sires is better than that of the Australian sires for carcase weight and leanness, but lambs from the American Suffolks have a slightly smaller eye muscle area at constant carcase weight than the lambs from Australian sires. This superiority for carcase weight and leanness is summarised in the TSI value where the American Suffolk sires averaged 3.01 points or 0.3 standard deviations above the overall mean. Based on these results, the average genetic merit of the American Suffolk animals is equivalent to a ram placed 47 out of the 125 sires evaluated to mid-1993 in the national CPT program.

Table 2 shows the ranking of the best 3 American Suffolk sires amongst the top 15 sires from the combined analysis of the 139 sires evaluated. The sire numbers are as allocated in the national CPT results and the best 3 American Suffolk sires are placed 6th, 12th and 13th out of the 139 sires evaluated.

DISCUSSION

An important feature of this study was the use of common link sires between the national CPT sites and the WA site. This allowed for a combined genetic analysis of the WA results with the national results, and so extended the scope of the results to assess the value of the American Suffolks to the Australian prime lamb industry. It is concluded that rams with some proportion of American Suffolk genes are superior to the average Australian ram as sires of heavy, lean lambs. However some of the differences in the design between the WA and national CPT sites have implications for this conclusion.

Table 2. Estimated Breeding Values (EBVs) for carcase weight (CWT), fat depth at constant weight (GR_{Wt}), eye muscle area at constant weight (EMA_{Wt}) and terminal sire index (TSI) listed in order of TSI for the top 15 sires in the combined analysis

Sire	CWT (kg)	GR_{Wt} (mm)	EMA_{Wt} (cm^2)	TSI
116	2.40	- 0.18	0.16	120.81
282	2.28	- 0.48	0.02	120.55
106	2.50	- 0.15	0.12	120.47
253	2.10	- 0.36	- 0.52	119.75
150	2.90	0.82	0.14	118.87
289 A	1.38	- 0.92	- 0.14	117.55
159	0.90	- 1.44	0.44	115.36
163	0.64	- 1.48	0.28	114.16
132	1.58	- 0.44	- 0.16	112.86
257	1.60	0.48	- 0.02	112.80
213	2.18	0.38	- 0.08	112.34
297 A	0.70	- 1.44	- 0.26	112.17
285 A	0.24	- 1.82	- 0.42	111.83
255	1.46	0.16	0.18	111.52
280	1.06	- 0.62	1.88	111.40

A denotes an American Suffolk sire.

Adjustments were made for the site in the analysis and so it is unlikely that the use of entire males rather than cryptorchids in WA significantly affected the results. Of more importance is the difference in the average slaughter weight and fatness of the lambs between the WA and national sites. In WA, the lambs were killed at an earlier stage of maturity. This may result in genetic differences amongst the sires used in WA being underestimated compared to those used elsewhere, ie. the genetic correlations between GR in WA and elsewhere, and hence TSI in WA and elsewhere, are almost certainly less than 1. In effect this would underestimate the TSI value for the best American Suffolk sires as well as to underestimate the genetic range within the WA site compared to the national CPT sites. This shortcoming can be addressed in future WA tests by taking the lambs out to heavier weights.

The conclusions drawn from a combined analysis are stronger as the number of link sires between CPT sites increases. There were 4 link sires between the WA and the national CPT sites, but with the number of progeny per site for some sires being less than 25 (the minimum number aimed for in the national CPT program) the accuracy of the estimates of differences in true genetic merit between the WA and other sites is reduced.

The results from the combined analysis indicate that American Suffolks will be useful to breed heavy, lean lambs under Australian conditions, and that the best of the American Suffolks evaluated to date are competitive with the best Australian sires. An important observation that has been made in the course of the national CPT program is that the progeny of American Suffolks are not "finished" at the carcase weights the lambs have been slaughtered (approximately 18 kg for ewes and 20-21 kg for cryptorchids). At these carcase weights, progeny of the American Suffolks are leaner than average for their weight, and have smaller eye muscles than average for their weight, suggesting that they are still at an earlier stage of maturity. To examine this, the cryptorchid lambs in the national CPT are likely to be taken to carcase weights of around 25 kg in future.

This study demonstrates how CPT programs and the use of link sires can be used to quickly and objectively compare the genetic worth of introduced animals with those whom they may compete.

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