LAMB PRODUCTION FROM BOOROOLA X COLLINSVILLE EWES

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SUMMARY

Booroola Merino, Border Leicester and Collinsville Merino rams were joined in three successive years to Collinsville ewes and ewe progeny from all three groups were subsequently joined with Dorset Horn rams at Leeton Agricultural Research Station. When data were analysed for performance at up to five joinings and lambings, there were significant differences among the ewe groups in ovulation rate, and lambing and weaning percentages. The performance of the Booroola cross, Border Leicester cross and purebred Collinsville groups was 1.88, 1.46 and 1.24 for ovulation rate, 159, 147 and 113 for the percentage of lambs born per ewe joined, and 112, 129 and 83 for lambs weaned per ewe joined. Lamb growth and survival to weaning was highest for lambs from Border Leicester cross ewes. While average survival and growth was lower than for lambs from purebred Collinsville ewes, lambs from Booroola cross ewes were superior if adjustment was made for type of birth effects or if the performance of single or twin born lambs was compared.

INTRODUCTION

The high reproductive potential of the Booroola Merino (Piper and Bindon 1983) can be exploited by crossing into commercial Merino flocks to improve lambing percentages and hence the dual-purpose properties of the breed. This possibility has been examined in a study in which first-cross Booroola x Collinsville Merino ewes have been compared with both purebred Collinsvilles and with first-cross Border Leicester-Merinos, the most widely-used dam for lamb production. This paper will present information on the ewe reproductive characteristics of all three groups and on the survival and growth of their lambs sired by Dorset Horn rams. Preliminary results of the study were reported by Piper et al. (1979) and McGuirk et al. (1982).

MATERIALS AND METHODS

Design and management

In three Years (1974, 1975 and 1976) Booroola Merino rams were group-mated with Collinsville Merino ewes at CSIRO Falkiner Memorial Field Station, Deniliquin. Similar groups of Collinsville ewes were joined with either Collinsville or Border Leicester rams. The Booroola rams came from the CSIRO flock at Armidale, and the origin of all other stock was described in more detail by McGuirk et al. (1982). Five new rams were used each year in each mating group. Joining took place in autumn and lasted for approximately six weeks. Each group of rams was joined with approximately 80 ewes and the ewes were re-randomised into joining flocks each year.

The ewe flocks were lambed without supervision in separate lambing paddocks, and while the sire breed of all lambs was known, their dams' identity was not. At marking the lambs were tagged according to sire breed and the ewes and lambs from the three lambing groups were run together until weaning. After weaning the ewe lambs were transferred to Leeton Agricultural Research Stat-ion.

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At Leeton the ewe progeny were run together as one flock and were first joined at 1½ years of age. This paper covers the joinings and lambings from 1976 to 1980 inclusive of all three drops of ewes. Each year the flocks were syndicate joined with two per cent of Dorset Horn rams. The ewes were lambed under paddock conditions and all progeny were identified with their dams and tagged at or soon after birth. The ewes were introduced into the lambing paddocks at weekly intervals, based on the expected date of lambing. The different ewe breed groups lambed separately in paddocks of approximately two hectares, and the unlambed ewes were 'drifted' on three times each week. When the lambs were 3-4 days of age the ewes and lambs from all breed groups were pooled and thereafter run as one flock. Ewes having difficulty lambing were assisted but no other special management practices were adopted. No attempt was made to foster lambs. Lambs were marked when between 1 and 3 weeks of age and weaned at approximately 3-4 months of age.

Observations

The ewes were run with harnessed, vasectomised rams and were checked regularly for the occurrence of oestrus. Prior to each of a ewes first four joinings, ovulation rates were assessed by laparoscopy approximately two weeks prior to the introduction of rams. The ewes were weighed at the same time. The number of lambs born to and weaned by each ewe was recorded and lambs were weighed at birth and at weaning.

Statistical analyses

All data were examined by least squares analysis. For the data on oestrous activity the model fitted included the effects of sire breed, year of birth and their interaction. The same model was used to examine ovulation rate and reproductive performance at each of the first three joinings. In addition all ovulation and reproduction records were included in overall analyses in which the effects of ewe age and its interaction with sire breed of ewe were also included. In the overall analyses we have ignored the complication that ewes are represented up to five times, and these repeat observations are not independent. Weaning weights were adjusted by linear extrapolation to an average age of 120 days. In examining data on lamb survival and growth, we estimated the effect of the breed of sire of the dam, the sex, birth type and year of birth of the lamb, age of ewe and the interactions of breed of sire of the ewe with all other effects.

RESULTS

There were significant breed differences in the proportion of ewes showing oestrus between weaning and twelve months of age, and in the average number of detected oestrous periods, although the breed of sire x year interaction was also signficiant ($P<0.05$). Average percentages of ewes showing oestrus were 4.2, 8.7 and 64.5 per cent respectively for the purebred Collinsvilles, Booroola x Collinsvilles and Border Leicester x Collinsvilles, with corresponding average numbers of detected oestrous cycles per cycling ewe of 1.37, 2.31 and 1.90 (both $P<.05$).

The results of the overall analyses of ewe ovulation and reproduction records are summarised in Table 1. While differences in the proportions of ewes cycling or which lambed were small and not significant, the Booroola cross ewes were superior in ovulation rate, the number of lambs born per ewe joined and in litter size (lambs born/ewe lambing), (all $P<.05$). The Border Leicester x Collinsville ewes were superior in the percentage of lambs weaned, due to their superior ability to rear their lambs. Based on the ratios of lambs weaned to lambs born in Table 1, in which no allowance has been made for the effect of dam age or sex, survival of lambs from Booroola cross ewes was in

general superior to that from Collinsville ewes, especially for lambs of a defined birth type status (single or twins). The interaction of breed of sire of the ewe with age was not significant for any of the characters examined and the differences observed between the breed groups at each of the first three joinings were similar to those reported in Table 1.

Table 1 Summary of least squares means for reproductive performance

	Breed group of ewe			
	Collinsville	Booroola x Collinsville	Border Leicester x Collinsville	
Body weight (kg)	47.6	46.1	61.3	*
Ewes ovulating (%)	91.0	94.2	90.2	
Ovulation rate	1.24	1.88	1.46	*
Ewes lambing (%)	87.2	86.4	90.2	
Lambs born/ewe joined (%)	113.2	159.0	146.9	*
Lambs born/ewe lambing (%)	129.6	184.6	163.1	*
Lamb weaned/ewe joined (%)	82.7	111.6	129.4	*
Lamb weaned/ewe lambing (%)	94.7	130.2	143.5	*
Ratio of lambs weaned/lambs born				
(i) all lambs	75.8	75.8	88.5	*
(ii) single born lambs	80.0	85.3	91.0	
(iii) twin born lambs	63.1	79.1	87.2	*

* Difference between ewe flocks significant, P<0.05

The Booroola cross ewes were noticeably different from the other two ewe types in the distribution of ovulation rates and litter sizes. For ovulation rate, 23 per cent of ovulation records for the Booroola cross were of 3 or more eggs compared with only 1 and 2 per cent respectively for the Collinsville and Border Leicester x Collinsville groups. For litters of 3 and above, the corresponding percentages for the three groups were 19, less than one and two per cent.

Table 2 Least squares means for lamb survival and growth

	Breed group of dam			
	Collinsville	Booroola x Collinsville	Border Leicester Collinsville	
Survival to weaning				
(i) all lambs adj. for birth type	64.3	70.3	83.6	*
(ii) all lambs, no adj. for birth type	74.3	70.1	89.9	*
(iii) single lambs	77.2	83.5	92.4	*
(iv) twin lambs	66.6	73.2	87.8	*
Weaning weight (kg)				
(i) all lambs adj. for birth type	18.7	19.8	27.6	*
(ii) all lambs no adj. for birth type	23.4	20.3	29.8	*
(iii) single lambs	25.5	26.1	34.2	*
(iv) twin lambs	19.0	20.3	28.0	*

* Difference between ewe flocks significant, P<.05

, Lamb survival and growth informtion is summarised in Table 2. The Border Leicester x Collinsville ewes were superior for both traits, regardless of whether adjustments were made for birth type of the lamb. The Booroola x Collinsville ewes were superior to the purebred Collinsvilles in lamb survival and growth when litter size effects were taken into account, or when the performance of single or twin born lambs was compared.

DISCUSSION

It is clear from this evaluation that the Booroola has the potential to increase the reproduction and lamb production potential of Merino ewes. The Booroola x Collinsville ewes gave birth to 46 more lambs per 100 ewes joined, and weaned 29 more lambs than a comparable flock of purebred Collinsvilles. Total lamb production, calculated as the product of lambs weaned per ewe joined and average weaning weight unadjusted for birth type, was 18 per cent higher for the Booroola cross ewes. The poorer average survival and growth of their lambs (see Table 2 for means unadjusted for birth type) were due to the higher proportion of triplet and higher order births from the Booroola cross ewes. For single and twin born lambs, survival and growth was superior to lambs from purebred Collinsville ewes, so that on this basis, the Booroola is not a poor mother by comparison with the Collinsville Merino. The superior lamb production of the Booroola cross ewe was achieved without recourse to special management procedures to reduce losses in triplet and higher order births. Despite its superiority over purebred Collinsville ewes under these circumstances, the Booroola cross ewes were inferior to the Border Leicester cross ewe flock. Whether the difference in lamb output between Booroola and Border Leicester cross ewes can be reduced by specific nutritional and lambing management practices remains to be seen.

It should be pointed out that the Booroola rams used in this study were not selected as being known homozygotes or even heterozygotes for the putative gene for high fecundity (see Piper and Bindon 1983). Based on the criteria that an ovulation of 3 eggs is indicative that a ewe carries the gene, the ovulation rate data over 4 observations indicates that only 41 per cent of ewes were carriers. We propose to extend this evaluation to attempt to define the relative performance of a flock in which all ewes carry the gene.

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