REPRODUCTION RATE AND WOOL PRODUCTION OF TWO STRAINS OF AUSTRALIAN MERINO AND THEIR CROSSES WITH THE BOOROOLO MERINO

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SUMMARY

High fecundity strain Booroola Merino (B) rams were mated with Collinsville (C) ewes or with Medium Non-Peppin (MNP) ewes at separate locations in N.S.W. In each location, ewes were also mated with rams of their own strain. Wool production, reproduction rate and several component traits were measured in the straightbred (C or MNP) and Booroola Cross (BX) offspring. Increases in fertility and fecundity offset lower lamb survival rates, to give increased weaning percentages for the BX ewes. Wool production of BX ewes was lower than that of C ewes and similar to that of MNP ewes. Wool quality was unaffected by crossing with the Booroola.

INTRODUCTION

It is generally accepted that increases in reproduction rate will be accompanied by increases in both biological and economic efficiency in the majority of farm livestock species (Dickerson, 1970). However, the amount of the efficiency increase will depend on the relationship between reproduction rate and other productivity traits and will therefore vary for different species and production systems (McGuirk, 1976).

In sheep, reproduction rate has been successfully increased by within-breed selection (Clarke, 1972; Turner, 1978), but the rate of increase is unlikely to exceed 2% per year even if lifetime reproduction records are available. Data from breed crossing experiments (Nitter, 1978) indicate that substantial reproduction rate increases may be obtained by utilizing systematic crossbreeding schemes, but the drop in wool quality would be unacceptable to most Merino wool growers

This paper reports some preliminary results from several experiments where reproduction rate in Merinos is being raised by crossing with the highly fecund Booroola Merino.

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MATERIALS AND METHODS

Mating Design, Location and Management

In 1974, 1975 and 1976, Booroola Merino (B) rams were mated with Collinsville Merino (C) ewes at Deniliquin or with Medium Non-Peppin Merino (MNP) ewes at Armidale, N.S.W. Each year in each location, ewes were also mated with rams of their own strain. Details of the mating design for these joinings, which all occurred in the autumn, are given in Table 1.

TABLE 1: MATING DESIGN FOR PRODUCTION OF BOOROOLA CROSSES FROM BASE MNP OR C EWES

Rams		*Ewes*		*Type of*	
Strain	*New Rams/ Year*	*Strain*	*Number/ Year*	*Joining*	*Location*
B	5	C	90	Syndicate	Deniliquin, NSW
B	5	MNP	100	Single sire	Armidale, NSW
C	5	C	90	Syndicate	Deniliquin, NSW
MNP	5	MNP	100	Single sire	Armidale, NSW

At Armidale, daughter ewes (B × MNP or MNP) were single-sire joined each year from 1976 with five new B × MNP rams, while those born at Deniliquin (B × C or C) were moved after weaning to Leeton, N.S.W., and syndicate-mated from 1976 with 2% of Dorset Horn rams. At each location both groups of progeny have been run together from lamb marking and were only separated for breif periods each year at mating (autumn) and lambing. All ewes were first joined when approximately 18 months of age.

Observations

Collinsville Group

Lambs were shorn and weighed at weaning in February (approximately 4 to 5 months), and thereafter weighed each month until mating. At their two-tooth shearing (approximately 15 to 16 months), individual fleece weights were recorded and mid-side wool samples taken for measurement of percentage yield and fibre diameter. Ewes were run with harnessed teasers from weaning and were regularly checked for the occurrence of oestrus. Ovulation rate of each ewe was assessed each year by laparoscopy approximately 2 weeks prior to mating, and litter size by twice daily observation of lambing ewes.

MNP Group

Lambs were weighed at birth and shorn and weighed at weaning in January (approximately 3 to 4 months). All subsequent observations were as described for the Collinsville group, except that body weights were measured much less frequently and the second shearing was earlier at about 1 year of age.

Statistical

The data presented are preliminary results from two large experiments that have several more years to run. They have not been subjected to rigorous statistical analysis and are presented as simple unweighted averages of relevant subclass means. No statements regarding the significance of differences are made, but the main features of the results are nevertheless clear.

RESULTS

Body Weights

Mean body weights at weaning and at 1 year (MNP crosses) or 15 to 16 months (C crosses) are given in Table 2. There were no differences between straightbred and crossbred ewes at either age.

Wool Quantity and Quality

Mean clean wool weights and fibre diameters at 1 year (MNP crosses) or 15 to 16 months (C crosses) are given in Table 3. The growth interval is different for the two groups, but the data in Table 3 have been adjusted to a standard 365-day growth period. BX ewes produced less wool and of finer average fibre diameter than C ewes but did not differ in either respect from MNP ewes.

Reproductive Performance

Mean ovulation rates of 2- to 4-year-old Merino and B × Merino ewes are given in Table 4. BX ewes had higher ovulation rates than either of the comparative groups at all ages, though the difference appears to be lower in the Collinsville crosses. Mean ovulation rate increased with age of ewe at Leeton, but this trend was not evident at Armidale.

Data on reproduction rate (lambs weaned/ewe joined) and its components, fertility (ewes lambing/ewe joined), fecundity (lambs born/ewe lambing) and survival (lambs weaned/lamb born) are summarized in Table 5.

TABLE 2: MEAN BODY WEIGHTS OF MERINO AND B × MERINO EWES (Kg)

	Collinsville Group		*MNP Group*	
	C	*B × C*	*MNP*	*B × MNP*
Number	74	94	55	58
Weaning	21.7	22.2	18.0	17.3
12 – 16 months	37.9	38.0	33.7	33.8

TABLE 3: MEAN CLEAN WOOL WEIGHTS (Kg) AND FIBRE DIAMETER (μ) OF 12- TO 16-MONTH-OLD MERINO AND B × MERINO EWES

	Collinsville Group		*MNP Group*	
	C	*B × C*	*MNP*	*B × MNP*
Number of ewes	74	94	55	58
Clean wool weight	3.7	3.3	2.2	2.2
Fibre diameter	22.8	21.1	19.2	18.9

TABLE 4: MEAN OVULATION RATE IN 2- TO 4-YEAR-OLD MERINO AND B × MERINO EWES

	Collinsville Group		*MNP Group*	
Age	*C*	*B × C*	*MNP*	*B × MNP*
2	1.15 (67)*	1.43 (91)	1.05 (75)	2.11 (79)
3	1.26 (69)	1.76 (87)	1.08 (26)	1.97 (36)
4	1.61 (36)	2.08 (36)	1.00 (4)	2.17 (12)

* (Number of ewes).

TABLE 5: MEAN REPRODUCTIVE PERFORMANCE OF 2- AND 3-YEAR-OLD MERINO AND B × MERINO EWES

Group	*Age*	*Number*	*Fertility* %	*Fecundity*	*Survival* %	*Lambs Weaned* %
C	2	72)				
		)	82	1.17	78	78
	3	37)				
B × C	2	98)				
		)	94	1.55	64	96
	3	40)				
MNP	2	51)				
		)	92	1.18	88	96
	3	17)				
B × MNP	2	56)				
		)	98	1.84	62	112
	3	20)				

There may be differences between the data sets in that when the cross is with C ewes the fertility difference appears greater and the fecundity difference less than when the cross is with MNP ewes. However, the general picture is clear, with BX ewes having increased fertility and much increased fecundity, but reduced lamb survival through increased mortality of triplet- and quad-born lambs. The overall increase in lambs weaned is about 20% in both cases.

DISCUSSION

The present results confirm previous experience with Booroola × Merino ewes regarding the observed increases in the percentage of lambs born (Robertson, 1976; Allison *et al.*, 1977) and weaned (Allison *et al.*, 1978). A 20% increase in numbers of lambs weaned might require 10 to 15 years of careful within-flock selection, and, judged solely from the standpoint of improving reproduction rate, a single cross with the Booroola should be an extremely attractive alternative.

The wool production data indicate that there may be some penalty in fleece weight if the cross is made with sheep from traditionally heavier cutting strains. By contrast with their own strain (MNP) or those tested so far in New Zealand (Allison *et al.*, 1977, 1978), the cross produces little or no change in fleece weight or quality, at least in hogget ewes.

The future direction of the work should include much more extensive evaluation of lifetime productivity of Booroola crosses in both the fine wool-producing and fat lamb industries. There should also be a concerted effort to understand the genetic basis of the Booroola phenomenon, and the results reported here and elsewhere should be a sufficient stimulus to ensure that the necessary experiments are undertaken.

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