THE EFFECTS OF RAM PERCENTAGE AND TESTIS SIZE ON LAMBING PERCENTAGE IN MERINO EWES

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SUMMARY

Mature Merino rams were mated to 6,606 ewes on two commercial properties in Western Australia to assess the effects of ram percentage (1.4 or 0.4 per 100 ewes) and ram testes size on lambing performance. More ewes were mated using 1.4 rams per 100 ewes and rams with large testes (mean testis tissue volume 181 ml) sired more lambs per 100 ewes joined, than those with small testes (75 ml).

INTRODUCTION

Gherardi *et al.* (1980) state that provided about 400 ml of total testis tissue is allocated per 100 ewes the sperm-producing capacity of Merino rams is adequate to achieve normal fertility in Western Australian flocks and that the number of rams used for flock mating can be reduced without endangering flock fertility. Allison and Davis (1976) reported little effect of reducing the number of rams to one per 100 mature ewes. In these experiments the interaction between ram numbers and volume of sperm producing testis tissue was examined on two commercial properties in the Mingenew and Esperence areas of Western Australia.

MATERIALS AND METHODS

Rams

All available mature Merino rams were screened for serving capacity using a modification of the techniques described by Blockey (1980) and Kilgour (1980). Only those rams passing the test were assessed for testis size using the orchidometer described by Fairnie et *al.* (1982).

As it has been estimated that all but 50 ml of the testis volume of mature Merino rams is sperm producing tissue (Lino, pers. comm.) the rams were allocated on the basis of testis volume so as to allow consideration of the effects of ram numbers, and the total volume of spermatogenic tissue, per 100 ewes, as follows:

"Large" testis volume (N = 26, net volume 181 ml per testis)
Group 1, 0.4 rams per 100 ewes = 145 ml of testis tissue
Group 2, 1.4 rams per 100 ewes = 507 ml of testis tissue

"Small" testis volume (N = 25, net volume 75 ml per testis)
Group 3, 0.4 rams per 100 ewes =   60 ml of testis tissue
Group 4, 1.4 rams per 100 ewes = 210 ml of testis tissue

Ewes

About 8,000 ewes were made available for joining during the period November 1980 - February 1981. The ewes were run with hormone treated Merino wethers for 14 days and then allocated to one of the four groups of rams, which were fitted with harnesses and marking raddles. Ewes with rump raddle marks were identified every four days for 16 days, when the rams were removed. Normal mating resumed after an intervening period of 14 days to enable accurate idenfication of ewes lambing from mating during the period of the experiments. Differences between groups were analysed by chi-square test.

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RESULTS

A total of 6,606 ewes were joined with rams and 4,173 ewes were identified as having been mated over the 16 days joining period. A much higher proportion of ewes were mated in the groups with 1.4 rams per 100 ewes (Table 1).

TABLE 1   Number of ewes joined (N) and the cumulative percentage mated, at either 0.4 or 1.4 rams per 100 ewes, at four day intervals during a 16 day joining period.

Rams/100 ewes	N	Days of joining			
		0-4	5-8	9-12	13-16
0.4	4278	11%	31%	41%	52%
1.4	2328	21%	49%	65%	84%

There was no significant effect of testis volume on the proportion of ewes mated.

More mated ewes lambed in the groups with 1.4 rams per 100 ewes and this trend was clear by the fourth day of joining. However, there was also a significant difference when the data were analysed in terms of testis tissue per 100 ewes (Table 2). It should be remembered when examining the data in the following tables that the testes tissue volumes specified have been calculated after allowing for 50 ml of non-spermatogenic tissue per testis.

TABLE 2   Number (and percent) ewes lambing/ewes mated at four day intervals during joining, according to the numbers of rams used and the volume of testis tissue available, per 100 ewes at the commencement of joining.

Rams /100 ewes	Testis tissue /100 ewes	Days of joining				Total* %
		o-4	5-8	9-12	13-16	
0.4	60 ml	107/264(41)	143/406(35)	64/182(35)	60/188(32)	36
0.4	145 ml	112/224(50)	148/430(34)	67/228(29)	105/304(35)	36
1.4	210 ml	108/240(45)	126/295(43)	77/185(42)	89/206(43)	43
1.4	507 ml	125/259(48)	175/354(49)	79/173(46)	103/235(44)	47

*   Pooled 0.4 v 1.4 χ^2 = 35.6 p < 0.001
    145 v 210 ml χ^2 = 11.5 p < 0.001, 210 v 507 ml χ^2 = 3.15 p < 0.1

This effect was further seen when the data were analysed from the viewpoint of the sheep breeder i.e. how many of the ewes available for joining, rather than mated ewes, lambed after a 16 day joining period.

Table 3 shows that while there was a significant effect of numbers of rams per 100 ewes, there was also an effect from the increasing amount of testis tissue available per 100 ewes.

TABLE 3   Number of ewes joined *(N)* and percent ewes lambing/ewes joined according
to the number of rams used per 100 ewes joined over a 16 day period and
the volume of testis tissue available per 100 ewes at the commencement
of joining.

Rams/100 ewes	Testis tissue/100 ewes	N	Ewes lambing/ewes joined*
	(ml)		%
0.4	60	2139	17
0.4	145	2139	20
1.4	210	1139	35
1.4	507	1189	40

*   Pooled 0.4 v 1.4 χ^2 = 287 $p < 0.001$; 60 v 145 ml χ^2 = 4.97 $p < 0.05$;
145 v 210 ml χ^2 = 87.4 $p < 0.001$; 210 v 507 ml χ^2 = 7.03 $p < 0.01$.

DISCUSSION

Salamon and Lightfoot (1970) state that to maximise the number of ewes
impregnated per ram at least 100 million sperm must be delivered to each ewe, and
Gherardi et *al.* (1980) state that as little as 400 ml of total testis tissue
(i.e.   300 ml testis tissue after allowing for non-spermatogenic tissue) can be
provided per 100 ewes without compromising flock fertility. The question posed
for these experiments was whether flock fertility was also limited by the numbers
of rams available per 100 ewes after the rams were screened for adequate serving
capacity.

Under the conditions of the experiments it is clear that more ewes were
mated when more rams were provided per 100 ewes (Table 1) and it can be concluded
that, at the rate of 0.4 rams per 100 ewes, those rams were probably unable to
mate all the ewes which were in oestrus during the 16 days of joining. However,
the proportion of ewes mated in the two groups with 1.4 rams per 100 ewes is quite
satisfactory under Western Australian conditions and this indicates that providing
rams are screened for serving capacity, this relatively low number of rams can be
used to mate a high proportion of ewes during the first 16 days of joining.

Fertility, measured in terms of ewes lambing to ewes mated, increased when
the numbers of rams per 100 ewes was increased from 0.4 to 1.4 (Table 2) but there
was no effect within these groups on ewes lambing/ewes mated related to the net
volume of testis tissue available per 100 ewes. However, small differences in
fertility did become apparent when the data were analysed in terms of ewes lambing
to ewes available at joining (Table 3) indicating that there may be an effect of
increasing testis tissue availability.

The consequences of increasing the amount of testis tissue available would
appear to be to increase the proportion of ewes lambing to the first 16 days of
joining, and this effect can be gained mainly from using more than 0.4 rams per
100 ewes. However, it is still not clear what is the minimum number of rams and
net testis tissue volume per 100 ewes needed to achieve satisfactory flock
fertility.

ACKNOWLEDGEMENT

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