THE EFFECTS OF RAM PERCENTAGE AND TESTIS SIZE ON LAMBINh

K.N. BURTON*, E.J. KEOGH** and I.J. FAIRNIE*

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 identification 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**

<table>
<thead>
<tr>
<th>Rams/100 ewes</th>
<th>N</th>
<th>Days of joining</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0-4</td>
</tr>
<tr>
<td>0.4</td>
<td>4278</td>
<td>11%</td>
</tr>
<tr>
<td>1.4</td>
<td>2328</td>
<td>21%</td>
</tr>
</tbody>
</table>

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**

<table>
<thead>
<tr>
<th>Rams/100 ewes</th>
<th>Testis tissue /100 ewes</th>
<th>Days of joining</th>
<th>Total*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>0-4</td>
<td>5-8</td>
</tr>
<tr>
<td>0.4</td>
<td>60 ml</td>
<td>107/264(41)</td>
<td>143/406(35)</td>
</tr>
<tr>
<td>1.4</td>
<td>145 ml</td>
<td>112/274(50)</td>
<td>148/410(34)</td>
</tr>
<tr>
<td>1.4</td>
<td>240 ml</td>
<td>108/244(44)</td>
<td>126/354(41)</td>
</tr>
<tr>
<td>1.4</td>
<td>597 ml</td>
<td>125/259(48)</td>
<td>175/354(49)</td>
</tr>
</tbody>
</table>

* Probed 0.4 v 1.4  $\chi^2 = 35.6$  $p < 0.001$
145 v 210 ml  $\chi^2 = 11.5$  $p < 0.001$.  210 v 507 ml  $\chi^2 = 3.15$  $p < 0.1$

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.

<table>
<thead>
<tr>
<th>Rams/100 ewes</th>
<th>Testis tissue/100 ewes (ml)</th>
<th>N</th>
<th>Ewes lambing/ewes joined %</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.4</td>
<td>60</td>
<td>2139</td>
<td>17</td>
</tr>
<tr>
<td>0.4</td>
<td>145</td>
<td>2139</td>
<td>20</td>
</tr>
<tr>
<td>1.4</td>
<td>210</td>
<td>1139</td>
<td>35</td>
</tr>
<tr>
<td>1.4</td>
<td>507</td>
<td>1189</td>
<td>40</td>
</tr>
</tbody>
</table>

* Pooled $0.4 \times 1.4 \chi^2 = 207 \ p < 0.001, \ 60 \times 145 \ ml \ \chi^2 = 4.97 \ p < 0.05, \ 145 \times 210 \ ml \ \chi^2 = 87.4 \ p < 0.001, \ 210 \times 507 \ ml \ \chi^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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REFERENCES


