INFLUENCE OF SEASON OF JOINING ON THE OESTROUS, OVULATORY AND LAMBING PERFORMANCE OF MERINO EWES WITH SEASONAL LIVE WEIGHT FLUCTUATIONS CONTROLLED.

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SUMMARY

The reproductive performance of Koonoona strain South Australian strong-wool Merino ewes was assessed at eight occasions throughout a year. Mean live weight was about 49 kg at each occasion. The incidence of spontaneous and ram-stimulated oestrus and of twin ovulation fluctuated annually. Almost all ewes exhibited spontaneous oestrus during late summer and autumn but only 20-30% did in late spring. There was an equally marked, but inverse, fluctuation in stimulated oestrus. Almost all ewes were detected in oestrus within four weeks of joining. The incidence of twin ovulation was highest during summer and autumn (35-40%) and lowest during winter (10-15%). The incidence of ewes lambing and of twin births, and the wastage of either single or twin shed ova, was not significantly affected by season. The levels of oestrous and ovulatory activity observed during summer and spring were confirmed in a second experiment.

INTRODUCTION

The expression of oestrus depends on whether ewes are kept separate from rams (spontaneous oestrus) or are continuously, or suddenly, associated with them. Many anoestrous ewes previously separated from rams exhibit oestrus (stimulated oestrus) 17 to 29 days after being joined with them (Radford and Watson 1957). This stimulation may markedly reduce the anoestrous period. Oestrus occurring until day 17 reflects the level of spontaneous oestrus in the flock.

Riches and Watson (1954) observed that Peppin Merino ewes suddenly associated with rams had a shorter and more marked anoestrous period than similar ewes continuously associated with rams. Kelley and Shaw (1943) reported that Peppin and basically Koonoona strain Merino ewes exhibited similar oestrous behaviour when continuously associated with rams. Koonoona ewes may also respond to ram stimulation similarly to Peppin ewes but this point has not been shown.

Although Radford (1959) reported an effect of season (independent of seasonal changes in live weight) on the incidence of twin ovulation in Peppin Merino ewes the effect has not been widely established in Merinos. Koonoona strain Merinos have been shown to have a similar incidence of multiple ovulation in both late January and mid April (Fletcher 1971) but there has been no examination of the effect of season throughout the year.

This paper reports two experiments conducted at Turretfield Research Centre, Rosedale, South Australia to examine the effect of season of joining on the oestrous, ovulatory and lambing performance of Koonoona strain South Australian strong-wool Merino ewes with seasonal fluctuations in live weight suppressed.

MATERIALS AND METHODS

Experiment 1 was conducted between February 1970 and February 1971 using a flock of 325 three-year-old ewes. The flock was randomly allotted, after stratification on the basis of live weight, into eight groups of about 40 ewes. One group was removed from the flock for sampling about every six weeks (March 20 - Group 1, May 1, June 22, July 31, September 21, November 6, December 18, January 29 - Group 8). The mean live weight of the ewes was maintained at about 49 kg by a succession of feed regimes. The flock first grazed dryland lucerne which was...
supplemented after March 20 with meadow hay and oaten grain. On May 1 the sheep were removed from the pasture and fed entirely on hay and oats until May 13, and then hay and barley for the remainder of the experiment. The ewes were fed three times per week and weighed every two weeks. No rams were allowed near the main flock. As each group was taken from the flock it was joined in a two-ha paddock with three vasectomised rams for two weeks, and with a succession of six groups of three entire rams during a further six weeks. Oestrus was detected using Sire Sine harnesses and crayons, the colours of which were changed fortnightly. Oestrus and live weights were recorded weekly. Live weight was maintained during joining by providing supplements of hay and grain (Groups 1, 2, 3, 4, 8) or hay only (Group 7). Group 5 exceeded the target weight at joining by about 6 kg.

The ovaries of each ewe were examined by laparotomy between 23 and 33 days after her last recorded oestrus so as not to disrupt pregnancy (Cutten 1970). Each corpus luteum observed was taken as evidence of an ovulation. At lambing ewes were inspected daily and each lamb was identified with its dam and tagged.

In experiment 2 two groups of about 55 ewes were formed in January 1972 by stratified sampling based on age (three or four years) and live weight. One group was maintained at 45 kg (Low group) and the other at 54 kg live weight (High group) by feeding appropriate amounts of hay and grain in yards. The groups were joined with vasectomised rams beginning on February 23, 1972 for five weeks, on August 23, 1972 for six weeks and on February 16, 1973 for five weeks. Oestrous ewes were identified weekly and crayons were changed fortnightly. Ovulation was determined by endoscopy performed three to seven days after oestrus detected later than day 14 of joining, or at the end of joining if there was no oestrus.

Data were compared by chi-square ($\chi^2$) analysis. The incidence of spontaneous and stimulated oestrus was assumed to be that detected during the first and second fortnight of joining, respectively.

RESULTS AND DISCUSSION

The weekly accumulated incidence of previously undetected (fresh) oestrous ewes in each group examined in experiment 1 is shown in Fig. 1. The ovulatory, lambing and ova wastage data are shown in Table 1.

Season of joining affected the incidence of spontaneous oestrus ($\chi^2=63.0$; $P<0.001$), stimulated oestrus ($\chi^2=52.5$; $P<0.001$) and twin ovulation ($\chi^2=14.3$; $P<0.05$) but not the incidence of either ewes lambing (per ewe present at lambing) ($\chi^2=8.20$) or ewes having twin births (per ewe lambing) ($\chi^2=7.31$) or the wastage of either single ($\chi^2=6.22$) or twin shed ova ($\chi^2=8.61$).

The incidence (%) of spontaneous and stimulated oestrus and of twin ovulating ewes in experiment 2, and in groups joined at comparable seasons in experiment 1, is shown in Table 2.

There was a lower incidence of spontaneous oestrus among Low ewes during August 1972 than during both February joinings combined ($P<0.01$) or either February 1972 ($P<0.01$) or 1973 ($P<0.05$) alone; corresponding differences in the High group were not significant. There were more twin ovulating ewes in the High group during March 1977 and 1973 combined ($P<0.05$) and March 1972 alone ($P<0.05$) than during September 1972. In the Low group the incidence during March 1973 was greater than during September 1972 ($P<0.05$).

There was clearly an annual cycle in the incidence of spontaneous oestrus, with the highest incidence in autumn and the lowest in late spring. There was
Fig. 1. The accumulated incidence (%) of fresh oestrous ewes during successive weekly intervals from the day of joining, for each group in experiment 1. Spontaneous oestrus shown ■ Stimulated oestrus shown □

TABLE 1 The ovulatory and lambing performance of ewes in each group in experiment 1, together with the wastage of single and twin shed ova among those ewes with both ovulation and lambing data

<table>
<thead>
<tr>
<th>Group</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ewes with ovulation data</td>
<td>42</td>
<td>41</td>
<td>40</td>
<td>40</td>
<td>36</td>
<td>40</td>
<td>39</td>
<td>36</td>
</tr>
<tr>
<td>Twin ovulating ewes (%)</td>
<td>29.3</td>
<td>36.6</td>
<td>10.0</td>
<td>17.5</td>
<td>27.8</td>
<td>25.0</td>
<td>41.0</td>
<td>31.3</td>
</tr>
<tr>
<td>Ewes with lambing data</td>
<td>40</td>
<td>40</td>
<td>39</td>
<td>39</td>
<td>36</td>
<td>37</td>
<td>37</td>
<td>38</td>
</tr>
<tr>
<td>Ewes lambing (%)</td>
<td>70.0</td>
<td>80.0</td>
<td>64.1</td>
<td>62.2</td>
<td>74.4</td>
<td>63.9</td>
<td>78.4</td>
<td>57.9</td>
</tr>
<tr>
<td>Twin births (%)</td>
<td>10.7</td>
<td>15.6</td>
<td>4.0</td>
<td>4.3</td>
<td>6.9</td>
<td>17.4</td>
<td>8.1</td>
<td>22.7</td>
</tr>
<tr>
<td>Lambs born (%)</td>
<td>77.5</td>
<td>92.5</td>
<td>66.7</td>
<td>64.9</td>
<td>79.5</td>
<td>75.0</td>
<td>86.5</td>
<td>71.1</td>
</tr>
<tr>
<td>Twin ova&lt;sup&gt;b&lt;/sup&gt;</td>
<td>12/22</td>
<td>12/30</td>
<td>5/8</td>
<td>8/12</td>
<td>11/20</td>
<td>5/16</td>
<td>14/30</td>
<td>15/24</td>
</tr>
</tbody>
</table>

<sup>a</sup> - one ewe anovular.  <sup>b</sup> - ova not represented by a lamb/ova shed.

TABLE 2 The incidence (%) of spontaneous (Spon) and stimulated (Stim) oestrus and of twin ovulation (Tov) in experiment 2, and for groups joined at comparable seasons in experiment 1

<table>
<thead>
<tr>
<th>Time of joining</th>
<th>High group&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Low group&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Time of Experiment 1</th>
<th>Experiment 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feb 1972</td>
<td>69</td>
<td>20</td>
<td>48</td>
<td>80</td>
</tr>
<tr>
<td>Feb 1973</td>
<td>63</td>
<td>24</td>
<td>42</td>
<td>73</td>
</tr>
<tr>
<td>Aug 1972</td>
<td>52</td>
<td>31</td>
<td>26</td>
<td>54</td>
</tr>
<tr>
<td>Sept 1970</td>
<td>58</td>
<td>40</td>
<td>80</td>
<td>58</td>
</tr>
</tbody>
</table>

<sup>a</sup> - oestrus, n=54; ovulation, n=50.  <sup>b</sup> - oestrus, n=56; ovulation, n=52.  
<sup>c</sup> - adjusted for live weight at joining of 55 kg.

an equally clear, but inverse, fluctuation in stimulated oestrus with the result that at each season nearly all ewes exhibited oestrus during the first four weeks
of joining. The incidences of oestrus observed during late winter/early spring in experiment 2 were very similar to those of groups joined at similar seasons in experiment 1. Except for a higher incidence in March 1970 the incidences during summer/early autumn were also consistent.

The annual pattern of combined spontaneous and stimulated oestrus of the Koonoona ewes was markedly different to that of fine-wool Merinos in New South Wales (Barrett et al. 1962) and slightly different to Peppin ewes in Queensland (Riches and Watson 1954). The fine-wool flock exhibited a longer and more complete non-breeding season with only 20 to 50% of ewes exhibiting oestrus during spring. The Peppin ewes experienced a depression in oestrous activity during spring in one of two years. These different patterns of oestrous behaviour could be due to strain of ewe, location, year or nutritional regime. However, in the circumstances of the various studies the Koonoona ewes exhibited least seasonal depression in overall oestrous activity. Thus of the ewes noted, Koonoona ewes may be the most suitable for naturally breeding at any season of the year, provided they are isolated from rams for a period before joining.

There was an annual fluctuation in the incidence of twin ovulating Koonoona ewes. During both autumn and early spring the incidence of twin ovulation at 49 kg was between that observed at 54 kg and 45 kg. After allowing for the different mean live weights at joining the incidences of twin ovulation observed in experiment 2 fit those observed in experiment 1. The annual fluctuation was more distinctly either high or low than that observed among Peppin Merinos by Radford (1959); his ewes fluctuated smoothly with a maximum during autumn and minimum during spring while the Koonoona ewes reached a maximum during summer and autumn then rapidly declined to a minimum during winter and increased gradually during spring. The amplitude of the annual fluctuation was greater for Radford’s ewes than for the Koonoona ewes, possibly as a consequence of the higher level of twin ovulation at all seasons among his Peppin ewes. The present study supports the finding of Fletcher (1971) that the incidence of twin ovulating Koonoona ewes is unaffected by season between late January and April.

Although not varying significantly the incidence of twin births and the number of lambs born per ewe present at lambing both appeared to reflect the annual fluctuation in twin ovulation, with lower levels following winter joinings.

Under grazing conditions both season and live weight affect ovulation. In the South Australian Mediterranean type climate delaying joining from spring to summer will probably first increase ovulation as the increase due to season is likely to be greater than the decrease due to any slow fall in weight. During January the opposing effects of season and weight may be about equal and from then until April ovulation is likely to fall with declining live weight.

ACKNOWLEDGEMENTS

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REFERENCES