A measure of clover infertility in ewes

N Davenport

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SERIOUS impairment of the breeding ability of ewes grazed for prolonged periods on growing pastures containing dominant subterranean clover has been experienced in Western Australia for many years.

The first widespread recognition of the problem coincided with the upsurge of improved pasture establishment based on the Dwalganup variety of subterranean clover in the higher rainfall sections of the wheatbelt and adjacent sheep raising areas to the west and south.

These newly-established pastures were notable for their high proportion, or dominance of, clover. Ewe flocks grazing such pastures developed high levels of infertility in a few years and lambing percentages of 20 per cent, and less were not uncommon at that time.

However, the legume also raised considerably the levels of soil nitrogen and general soil fertility. This improved soil environment favoured the growth of other species such as Wimmera ryegrass and the volunteer species, mainly barley grass, brome grasses, erodium and capeweed. Mixed pastures developed, and the reduction of the clover content minimised the further development of infertility.

This problem was described by Bennetts, Underwood and Shier* in 1946, and since then many workers have investigated the pathological, chemical, agrostological and field aspects of the problem.

Early in the investigations the W.A. Technical Committee on Sheep Infertility was established to coordinate this wide range of research.

Although understanding of the problem is still not complete, in a few years the results then achieved showed that considerable improvement could be obtained by following certain practices. The following recommendations for control were published in 1955 by Shier and Rossiter†, in collaboration with other members of the Committee:

- Avoid grazing ewes on subterranean clover-dominant pastures during the green period;
- Cull ewes which are barren for two consecutive matings;
- Promote more balanced grazing through pasture improvement and management under a ley farming system, with adequate superphosphate applications;
- Beef production as a further activity could be developed with advantage on many farms.

These practices, and particularly the development of pastures with relatively low levels of subterranean clover, diminished the incidence of infertility to such an extent that the problem appeared to have been largely overcome.

At the Avondale Research Station, where crossbred ewes (Border Leicester x Merino) are used for prime lamb production, fertility levels followed the usual pattern.

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During the pasture establishment period, with dominant clover swards, percentages of lambs marked fell to 50 per cent. but rose to around 90 per cent. and in two years over 100 per cent. when the pasture had been developed to a reasonable mixture.

However, while these percentages seemed satisfactory compared with general industry standards, field observations indicated that the intake of clover was still affecting breeding ability to some degree. Occasional dystocia was seen and the lambing season appeared more drawn out than normal. There were occasions also at this Station when, in experiments with younger ewes, lamb marking percentages of well over 100 per cent were recorded.

**Experimental details**

It was decided therefore to attempt to obtain some measure of the effect of these older pastures on ewe fertility.

An experiment was established at Avondale using 200 first cross Border Leicester x Merino ewe weaners bred at the Wongan Hills Research Station on Dwalganup sub-clover based mixed pasture.

These were sent to Avondale in February, 1960. They were run as one group until the break of the season, when they were divided at random into two groups. During the following pasture growing season, half the sheep (the “oat group”) were run on green oat crops. The other half (the “clover group”) were run on Dwalganup-based mixed pasture. This procedure was followed for the duration of the experiment which terminated in 1965, after five breeding seasons.

The oat crops were almost free of sub-clover and the only occasions when the oat group had access to green clover throughout the experiment were at the start of the seasons, before the oat crops were sufficiently developed. The oat group was run for these periods on paddocks carrying a minimum of clover.

The pastures on which the clover group was run were typical of the Station and of the Avon Valley and similar areas. They were stocked at about two sheep per acre, a rate which experience has shown is not conducive to the development of clover dominance.

During the dry grazing period each year, the flocks were run as one group. They were mated with Southdown rams at the rate of 3 per cent. in late December for the 1961 and 1962 seasons and during the first week in January, for the remaining three years.

The groups were fed grain and hay as required during the autumn—early winter period.

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<tbody>
<tr>
<td></td>
<td>No.</td>
<td>% of ewes mated</td>
<td>No.</td>
<td>% of ewes mated</td>
<td>No.</td>
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<td>99</td>
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<td>85</td>
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<td>84</td>
<td>97</td>
<td>86</td>
<td>93</td>
<td>92</td>
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<tr>
<td>Oats</td>
<td>88</td>
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<td>119</td>
<td>119</td>
<td>124</td>
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<tr>
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<td>98</td>
<td>98</td>
<td>95</td>
<td>93</td>
<td>81</td>
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<tr>
<td>Oats</td>
<td>5</td>
<td>22</td>
<td>34*</td>
<td>41</td>
<td>31</td>
</tr>
<tr>
<td>Clover</td>
<td>1</td>
<td>9</td>
<td>22</td>
<td>11</td>
<td>10</td>
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<tr>
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<td></td>
<td></td>
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<td></td>
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<tr>
<td>Oats</td>
<td>72</td>
<td>108</td>
<td>109</td>
<td>103</td>
<td>119</td>
</tr>
<tr>
<td>Clover</td>
<td>83</td>
<td>86</td>
<td>90</td>
<td>50</td>
<td>33</td>
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</table>

* Includes one set of triplets.
Experimental results

The breeding data are shown in the table.

Ewe mortality

An important feature of the results is the high ewe mortality of the clover group which, up to the end of the lambing period in 1965, had lost 39 ewes or 39 per cent. of the original group. This was more than double the 17 deaths (18 per cent.) of the oat group. The latter loss is at the yearly rate of 3 to 4 per cent. and is within the normal range for ewes on non-potent grazing.

Post-mortems were not carried out, hence data on the cause of death is incomplete but it is of interest that whereas there were eight deaths in the oat group during the mating-lambing periods, there were 26 in the clover group and of these at least eight died when lambing and a number of cases were seen of difficult lambing or dystocia. As far as is known, none died during lambing in the oat group.

Comparison of the cumulative yearly losses as at the start of mating between the two groups is shown in Graph 1.

Ewes lambed

The disparity between the groups in the percentage of ewes which lambed of those mated each year was very marked, and this is clearly shown in Graph 2.

In the oat group there was a gradual drop from 3 per cent. in the second year to 11 per cent. in the final year. Only 83 per cent. lambed in the first year compared with 97 in the clover group but as these groups were mated together, this difference in the first year appears to have been due to chance. The loss in fertility of the clover group was serious and in the final year only 46 per cent. of ewes mated produced lambs, although 97 per cent. lambed at the first lambing.

Slower lambing on clover

Of those ewes which lambed in each group, the following table shows the percentage lambed in the first two weeks of the lambing period.

After the first year, in which results could have been influenced by the ewes with their first lamb, there was an increasing and finally an appreciable reduction in the percentage of ewes which lambed in the first two weeks.

Lambs born

As was to be expected, the percentage of lambs born each year in the oat group increased progressively as the ewes became...

<table>
<thead>
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<th>Per cent ewes lambed in first two weeks to total ewes lambed</th>
</tr>
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<tbody>
<tr>
<td>-------</td>
</tr>
<tr>
<td>Oat...</td>
</tr>
<tr>
<td>Clover</td>
</tr>
<tr>
<td>Difference</td>
</tr>
</tbody>
</table>
older. This was due to increased twinning rates which each year more than offset the effect of the lower percentage of ewes which lambed. Total lambs born reached 140 per cent. in the fourth year.

In the clover group, governed by the percentage of ewes which lambed, lambing percentages progressively declined until the low figure of 56 per cent. was recorded in the final year. Gains from twinning did not compensate for the increasing numbers of infertile ewes in this group.

Trends in lambing percentages are shown in Graph 3.

It is known that the better the condition of the ewe at mating, the higher her fertility.

As the groups each year were run as one flock when pastures were dry, it seemed unlikely that there would be any effective difference between them at mating in early January. However, to check this possibility, both groups were weighed at the start of mating for the final year 1965. Both groups were in good condition; the average weight of the oat group was 155 lb. and of the clover group 157 lb. There was thus no practical difference between them and it is reasonable to assume that differences in lambing percentages between the groups were not influenced by body condition.

**Twinning**

The clover group recorded a much lower rate of twinning than the oat group in all five years. The results are illustrated in Graph 4. Twinning reached its peak in the oat group in 1964 but the peak occurred a year earlier and at a much lower level in the clover group, falling rapidly in the last two years.

**Lamb losses to marking**

Percentage lamb losses to marking varied widely between groups and between seasons, as is shown thus—

<table>
<thead>
<tr>
<th>Year</th>
<th>Oat group</th>
<th>Clover group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961</td>
<td>18</td>
<td>15</td>
</tr>
<tr>
<td>1962</td>
<td>9</td>
<td>5</td>
</tr>
<tr>
<td>1963</td>
<td>11</td>
<td>3</td>
</tr>
<tr>
<td>1964</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>1965</td>
<td>4</td>
<td>15</td>
</tr>
</tbody>
</table>

These losses are not unduly high. High losses of lambs from ewes with their first lamb are not unusual, and occurred in this experiment.

Mortality was higher in the oat group for the first three years but the reverse occurred for the last two seasons.

Observations at birth, causes of death and other relevant information were not sufficient to indicate reasons for the differences between the groups and particularly whether the higher mortalities in the
clover group in 1964 and 1965 was possibly due, in part, to green clover intake by the ewes. However, it has been common experience that appreciable lamb losses can occur in flocks which have grazed dominant clover pastures.

Discussion

This experiment was carried out with old mixed pastures based on the Dwallganup variety of subterranean clover. This variety ranks among the worst of those in common use in potential for developing infertility in breeding ewes.

While similar measurement has not been made with other varieties, it is reasonable to assume that even with other common varieties of lower oestrogenic potency, fertility would be reduced.

The results show that even with old pastures containing a reasonable proportion of clover, there is a definite increase in ewe mortality and impaired fertility, resulting in considerable financial loss. Over the five years the effects were progressive. From the higher ewe mortality, the increasing proportion of infertile ewes and the decreasing lambing percentage, accentuated by lower twinning rates, it is obvious that the breeding ability of the clover group had been seriously impaired through "clover disease."

This was supported later when ewes of both groups were slaughtered during comparative fertility studies involving sperm transport, fertilisation and implantation and retention of the foetus. In the course of this research, which is not yet complete, it was found that the clover group ewes had developed, to a far greater degree, abnormalities of the uterus and associated tissues, particularly a cystic condition which is typical of ewes affected with the disease. While crossbred ewes were used in this work, it is reasonable to assume that similar results would have been obtained with Merino ewes, which are also subject to the disease. However, their potential for twinning is not as high as for Border Leicester-Merino cross ewes, and lowered fertility resulting from reduced twinning would be less marked.

It should be recognised that in this experiment the results are somewhat accentuated because the two groups were not managed according to recognised practice, in that ewes were not culled following two consecutive barren years. When the results were recalculated on this basis, in the final year the oat group numbered 83 with 125 per cent. lambs born, including 31 sets of twins. The clover group numbered only 58 with 62 per cent. lambs born, including seven sets of twins. Thus, on this basis also, the difference in lambing performance is very great.

Over the period of the experiment, marking percentages of crossbred ewes of all ages at the Station ranged from 84 to 88 per cent., with 100 per cent. in 1963. When 15 per cent. is added for lamb mortality, giving an estimate for lambs born to allow comparison with the experimental results, these returns lie about midway between those of the two groups. This is not contrary to the experimental results, particularly for the latter half of the period, as the inclusion of younger sheep with a shorter history of clover intake in the Station return would result in a higher fertility than the clover group. Through grazing on potent clover pasture the Station flock would have a lower fertility than the oat group.

It is interesting to consider the results at the third lambing, when the adverse effect of the clover grazing was already considerable. The marking percentage was 91 in the clover group which, among growers, is generally considered satisfactory with crossbred ewes. However, 116 per cent. were marked in the oat group, a difference of 25 per cent. This widened to 57 and finally to 72 per cent. in the last two years.

The much higher level of twinning of the oat group is largely the reason for its greater productivity.

For prime lamb production the percentage of lambs marketed is the principal factor governing financial returns, hence the importance of ensuring that the breeding ability of the flock is not impaired.

* This work is being carried out by officers of the Sheep and Wool Branch, Wheat and Sheep Division. A preliminary report will appear in a future issue of this Journal.
Observations at the Station, over a number of years, had indicated that there could be a somewhat delayed lamb drop with ewes run on subterranean clover-based mixed pastures. This was confirmed by the experimental results. A definitely slower rate of lamb drop occurred in the first two weeks of lambing.

It is desirable that the drop should be concentrated early in the lambing period for ease in marketing in maximum drafts and to minimise the numbers which may finish at the end of the season when conditions may not be so favourable.

It is obvious that this problem of ewe infertility would be eliminated if varieties of subterranean clover could be obtained more-or-less free of oestrogenic potency and otherwise suitable for the development of pastures of high productivity.

Research into the breeding and selection of such clover strains has been conducted for some years at the Institute of Agriculture of the University of W.A. This work is a phase of the comprehensive research programme being conducted by the Department of Agriculture, C.S.I.R.O., and the Institute under the general guidance of the Technical Committee on Sheep Infertility. The stage has now been reached where promising varieties obtained by breeding and selection are under field test.

Acknowledgment

Grateful acknowledgment is made to Mr. H. G. Neil, Officer in Charge of the Sheep and Wool Branch, for criticism and suggestions during the progress of this work.

OBTAIN ADVICE ABOUT FRUIT COLOURING ROOMS, URGES CORONER

People with fruit colouring rooms should seek advice on their management from the Department of Agriculture.

This is the recommendation of City Coroner Mr. W. G. Wickens after his inquiry into a fatal explosion in a fruit colouring room at Gosnells last year.

Mr. Wickens found that the victim died from multiple injuries received when acetylene gas exploded in the fruit colouring room in the packing shed where she was working.

He found that the explosion was caused by a spark from an electric radiator in the colouring room and that the radiator had been inadvertently connected by the deceased.

In a rider to the verdict the Coroner warned:

• For future safety I would advise persons with fruit colouring rooms to seek advice from the Department of Agriculture as to the methods to be adopted in these rooms.
• Ethylene gas appears safer to use than acetylene gas.
• All electrical equipment should be in first class order.
• Radiators used for heating the room should be removed from the room before colouring gas is introduced, and bright element radiators should not be used.

Detailed advice on safe procedures for operating fruit colouring rooms can be obtained by contacting the Horticulture Division of the Department of Agriculture.
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