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# REPRODUCTIVE PERFORMANCE OF EWES MATED ON LUCERNE

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## SUMMARY

The reproductive performance of ewes mated on either lucerne or ryegrass-clover pastures was compared in 1975 and 1976. Phyto-oestrogens (coumestans) were present in lucerne but not ryegrass-clover pastures. In all experiments ewes flushed and mated on lucerne produced fewer lambs than ewes mated on grass, the difference varying between 16.4 and 37.8%. Reduced twinning (13.7 to 32.3%) accounted for most of this difference. Barrenness and mean lambing dates were similar for both treatments.

Ovulation rates as determined by either laparoscopy or slaughter were 12 to 24% lower in ewes mated on lucerne than on ryegrass-clover pastures in 1976. Embryonic mortality was not significantly increased by the pasture treatments. It was concluded that the effect on lambing performance of mating ewes on lucerne containing coumestans is due to a depression in ovulation rate.

## INTRODUCTION

Reproductive disorders have been reported in sheep mated on lucerne (Coop and Clark, 1960). Conception was delayed and twinning reduced by approximately 10% relative to ewes mated on grass pastures. Although the agent in lucerne responsible for these effects was not identified, it was suggested to be due to the presence of oestrogens. Coumestans have since been identified as the oestrogenic compounds in lucerne and other *Medicago* species (Guggolz *et al.*, 1961; Francis and Millington, 1965; Kelly and Lindsay, 1975).

Ingestion of feed containing large amounts of coumestans (c. 1000 ppm) can inhibit oestrus and ovulation in ewes (Kelly *et al.*, 1976). Coumestan levels in lucerne vary from 0 to 200 ppm (Hanson *et al.*, 1965) hence ingestion of lucerne at mating is not likely to have as profound an effect on ewe fertility as reported by Kelly *et al.* (1976). This paper presents the results of five experiments conducted in 1975 and 1976 to test the effect of

grazing lucerne about the time of mating on the reproductive performance of ewes.

## EXPERIMENTAL

### 1975 EXPERIMENTS

Two experiments were conducted, the first at Winchmore Irrigation Research Station using mixed-aged Romney ewes, and the second at a commercial property near Mt Somers (30 km from the research station) using mixed-aged Coopworth ewes. On both properties, ewes were divided at random into two groups in late March. One group grazed lucerne pastures for 21 days immediately prior to commencement of mating (flushing) and during the 51-day mating period, while the other grazed ryegrass-white clover pastures throughout. Mating commenced in the third week of April. After mating, both groups were combined and grazed on grass pastures. Individual mating and lambing performances of ewes were recorded.

In both experiments ewes were dosed with 5 mg of selenium 3 weeks prior to the commencement of mating and salt was available *ad libitum*. Liveweights were recorded at 3-weekly intervals during flushing and mating.

Samples of lucerne and grass were collected from both properties during flushing and mating and analysed for phyto-oestrogens.

### 1976 EXPERIMENTS

The 1975 experiments were repeated at Winchmore and Mt Somers. A further 284 six-year-old Romney ewes at Winchmore were flushed and mated on lucerne or grass pastures as outlined for the other experiments, and then slaughtered as they returned to service or on day 40 after mating commenced to record ovulation rates and embryonic mortality. In the Mt Somers flocks ovulation rates were recorded by laparoscopy (Kelly and Allison, 1976) 14 days after the commencement of mating.

TABLE 1: COUMESTAN CONTENT OF LUCERNE (ppm of DM)

	1975		1976	
	Coumestrol	4' Methoxy-coumestrol	Coumestrol	4' Methoxy-coumestrol
Winchmore	145 (129-157)	120 (67-154)	99 (82-128)	60 (41-96)
Mt Somers	65 (51- 86)	56 (33- 91)	63 (26-104)	38 (9-83)

TABLE 2: MATING PERFORMANCE OF EWES GRAZED ON EITHER LUCERNE OR GRASS PASTURES

<i>Property and Pasture Treatment</i>	<i>No. of Ewes</i>	<i>Liveweight at Commencement of Mating (kg)</i>	<i>% Ewes Mated in Cycle 1</i>	<i>% Ewes Mated in Cycle 1 that Conceived</i>
1975				
Winchmore:				
Lucerne	153	52	96.7	80.4
Grass	156	51	100.0	88.5
Mt Somers:				
Lucerne	294	60	97.6	89.2
Grass	245	61	98.3	86.7
1976				
Winchmore:				
Lucerne	131	61	97.7	89.1
Grass	124	62	99.2	90.2
Mt Somers:				
Lucerne	136	62	94.9	87.6
Grass	134	64	99.3	94.7

There were no significant differences between pasture treatments.

TABLE 3: OVULATION RATES AND EMBRYONIC MORTALITY 1976

<i>Property and Pasture Treatment</i>	<i>Ewes Mated</i>	<i>Liveweight at Commencement of Mating (kg)</i>	<i>Ovulations/ Ewe Mated</i>	<i>Embryos or Lambs/ Ewe Mated</i>	<i>Partial Embryonic<sup>1</sup> Mortality</i>
Winchmore:					
Lucerne	140	54.3 A	1.39 A	1.00 A	22.2 A
Grass	144	54.1 A	1.51 A	1.14 A	37.0 A
Mt Somers:					
Lucerne	81	62.1 A	1.53 A	1.25 A	38.1 A
Grass	65	63.8 A	1.77 B	1.49 B	29.2 A

<sup>1</sup> Ewes that have two ovulations but only one embryo or lamb.

## RESULTS AND DISCUSSION

## PHYTO-OESTROGEN CONCENTRATIONS IN THE PASTURES

The average phyto-oestrogen content of lucerne during the flushing and mating period is presented in Table 1. Generally, lucerne grown at Winchmore had higher concentrations of coumestans than lucerne grown at Mt Somers. The ryegrass-white clover pastures had no detectable phyto-oestrogens.

## LIVWEIGHTS

Differences between mean ewe liveweights for the two pasture treatments at the commencement of mating were small and non-significant (Tables 2 and 3). Liveweights changes during flushing and mating were similar for all treatments.

## MATING PERFORMANCE

In all experiments, the majority of ewes were mated in the first 17 days (cycle 1) of mating. There were no significant differences between pasture treatments in the percentage of ewes mated in the first cycle or the percentage of ewes that conceived to that mating (Table 2).

## LAMBING AND OVULATION RATES

Lambing performance data are presented in Table 4. The mean lambing date of each flock in 1975 and 1976 was similar, ranging from September 20-23.

In both 1975 and 1976 there were highly significant differences between two pasture treatments in the percentage of multiple births ( $P < 0.01$ ).

Ewes flushed and mated on lucerne had between 13.7 and 32.3% fewer multiple births than ewes flushed and mated on grass pastures. Reduced multiple births, together with the slightly, but consistently, higher proportion of barren ewes in flocks mated on lucerne, resulted in lambing percentages between 16.4 and 37.8% lower than in flocks mated on grass. These results are consistent with, although somewhat greater than, the 10 to 12% depression in lambing percentages recorded by Coop and Clark (1960).

Ovulation rate data from both slaughtered and laparoscoped ewes (Table 3) indicate that the differences in proportion of multiple births is almost entirely due to differences in ovulation

TABLE 4: LAMBING PERFORMANCE OF EWES MATED ON EITHER LUCERNE OR GRASS PASTURES

<i>Property and Pasture Treatment</i>	<i>Barren Ewes (% ewes at mating)</i>	<i>Multiple Births (% ewes lambing)</i>	<i>Lambs Born (% ewes at mating)</i>
1975			
Winchmore:			
Lucerne	7.2 A	16.9 A	109.7 A
Grass	4.5 A	30.6 B	126.1 B
Mt Somers:			
Lucerne	3.0 A	29.0 A	126.7 A
Grass	2.0 A	61.3 B	164.5 B
1976			
Winchmore:			
Lucerne	3.9 A	22.1 A	118.3 A
Grass	3.2 A	43.6 B	140.3 B
Mt Somers:			
Lucerne	6.6 A	27.9 A	122.8 A
Grass	1.5 A	51.5 B	150.7 B

Different letters indicate significant differences ( $P < 0.01$ ) between pasture treatments within each property in each year.

rates and not differences in survival of multiple embryos. In the Mt Somers flocks, there was a difference in ovulations per ewe mated of 0.24 in favour of ewes mated on grass. The difference in lambing performance of the two groups was of the same magnitude. At Winchmore, ewes grazing grass during mating had 0.12 more ovulations and 0.14 more embryos at slaughter than ewes mated on lucerne.

It can be concluded that the reduced incidence of multiple births in ewes mated on lucerne containing coumestans is primarily due to a reduction in ovulation rate. It is not possible to relate the different magnitude of effects on ovulation rate and lambing performance recorded at Winchmore and Mt Somers to differences in amount of coumestans in the lucerne. This is due to the variability in concentration of coumestans in lucerne at a particular time of sampling and between times of sampling. Nevertheless, the results indicate that lucerne containing about 100 ppm coumestans is sufficiently potent to depress the reproductive performance of ewes.

There are several possible management techniques that may overcome the effect lucerne has on the reproductive performance of ewes. These include grazing lucerne at an immature stage of growth when the concentration of coumestans is low, or spraying

lucerne with fungicides to prevent infestation with foliar pathogens since both stage of growth and fungal infections will affect the concentration of coumestans in lucerne (Hanson *et al.*, 1965). These and other management techniques to minimize the exposure of ewes to coumestans are being tested.

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