The effect of early nutrition and hogget oestrus on subsequent reproduction

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ABSTRACT

Two experiments investigated the relationship between growth rate, hogget oestrus and subsequent reproduction. In Experiment 1 there were increases in the proportion of two-tooth ewes ovulating multiples due to high plane rearing from late December to mid July or the presence of hogget oestrus, after the correction for two-tooth pre-mating live weight. None of the four-tooth lambing differences due to rearing or hogget oestrus was significant after correction for two-tooth pre-mating live weight. There were no significant differences due to any factor at the six-tooth lambing.

In Experiment 2 there was an increase in the proportion of two-tooth ewes twinning due to the presence of hogget oestrus after correction for two-tooth pre-mating weight. There were significant effects of hogget oestrus on four-tooth twinning rates, before but not after, correction for two-tooth pre-mating live weight. There were no significant effects on twinning at the six-tooth lambing.

INTRODUCTION

Two previous papers (Moore *et al.*, 1978; Moore and Smeaton, 1980) have reported the relationship between growth rate, hogget oestrus and two-tooth reproduction for the N.Z. Romney. In the present paper the reproductive information for the same ewes is extended to the four-tooth and six-tooth lambings, which are presented both uncorrected and corrected for differences in two-tooth pre-mating live weight. Re-analyses of the two-tooth data using logit methods are also presented.

MATERIALS AND METHODS

Details of Experiment 1 are given in Moore *et al.* (1978) and Experiment 2 in Moore and Smeaton (1980).

In Experiment 1 a high nutrition group (H) was grown at 77 g/d from late December to mid July (early nutrition), while a low nutrition group (L) was grown at 13 g/d. Half of the H group (designated HH) was then grown to a two-tooth pre-mating weight of 50 kg (late nutrition), the other half (HL) to 41 kg. The corresponding weights for the L groups were LH 47 kg and LL 37 kg.

In Experiment 2 an HH group was grown at 90 g/d from December to late March (Period 1) and at 55 g/d from late March to mid July (Period 2). The corresponding growth rates for an HL group were 91 and 17, LH_1 13 and 96, and LH_2 12 and 88 g/d. The two-tooth pre-mating live weights were not significantly different (46, 45, 45 and 44 kg, respectively).

Both experiments were analysed by logit models where the dependent variables were ln (p/1-p) where p is either the proportion of: ewes ovulating (EO/EJ), ewes ovulating multiples (EOM/EO), ewes lambing (EL/EJ), ewes lambing multiples (ELM/EL), ewes weaning a lamb (EW/EJ) or ewes weaning a multiple (EWM/EW). The independent variables were rearing treatments, hogget oestrus, birth rank, dam year born, weaning weight and two-tooth pre-mating weight. The last variate was considered both between and within treatments.

RESULTS

Experiment 1, Two-Tooth Ewes

The uncorrected two-tooth data (Tables 3 and 4 in Moore *et al.*, 1978) showed significant positive effects of high nutrition, both early and late on EOM/EO and ELM/EL. Ewes that showed oestrus as hoggets had greater EOM/EO and ELM/EL proportions than those that did not.

Two-tooth pre-mating live weight, both within and between treatments, had a significant effect on EO/EJ, EOM/EO, EL/EJ, EW/EJ and EWM/EW. After adjusting for pre-mating live weight there still remained a significant treatment and hogget oestrus effect on EOM/EO (both $P<0.05$) (Table 1).

TABLE 1 Experiment 1. Effects of nutritional treatment and hogget oestrus on EOM/EO * at the average two-tooth pre-mating weight (44 kg)

Treatment	EOM/EO (p)	ln (p/(1-p))	Hogget oestrus	EOM/EO (p)	ln (p/(1-p))
HH	0.33	−0.71	Present	0.22	−1.26
HL	0.16	−1.62	Absent	0.09	−2.29
LH	0.13	−1.91			
LL	0.05	-2.86		SED	0.35
	SED	0.60			

*Ewes ovulating multiples/ewes ovulating

Experiment 1, Four-tooth and Six-tooth Ewes

The four-tooth and six-tooth reproductive data uncorrected for two-tooth pre-mating live weight are given in Table 2. There were hogget oestrus effects on four-tooth ELM/EL ($P<0.1$) and EWM/EW ($P<0.05$). Those ewes which showed oestrus as hoggets were 2 kg heavier at the four-tooth pre-mating weight than those that did not show oestrus, but there was no difference at the six-tooth mating. There was a difference between treatments at the former weight but not at the latter.

There were significant effects of two-tooth pre-mating live weight on four-tooth ELM/EL and EWM/EW. The effect of treatment or hogget oestrus was not significant after correction for two-tooth pre-mating live weight. There were no effects of two-tooth pre-mating live weight, treatment or hogget oestrus on six-tooth reproduction.

Experiment 2, Two-tooth Ewes

In contrast to Experiment 1, the uncorrected two-tooth data (Moore and Smeaton, 1980) showed no significant differences between treatments in two-tooth pre-mating live weight, however those hoggets that showed oestrus were 4 kg heavier at the two-tooth mating. Treatment and hogget oestrus significantly affects ELM/EL (Moore and Smeaton, 1980).

There were significant effects of hogget oestrus on ELM/EL after adjustment to the mean for pre-mating live weight (45 kg) by the logit model. The corrected values for ELM/EL for those that did and did not show hogget oestrus were 2.3% and 0.9% respectively. Two-tooth pre-mating live weight had a significant effect on EO/EJ, EOM/EO, EL/EJ, ELM/EL and EWM/EW.

Experiment 2, Four-tooth and Six-tooth Ewes

The four-tooth and six-tooth reproductive data uncorrected for two-tooth pre-mating live weight are given in Table 3. Hogget oestrus affected ELM/EL at the four-tooth ($P<0.1$), but not at the six-tooth lambing. There were no significant differences between treatment groups in four-tooth or six-tooth pre-mating live weight, those ewes which showed hogget oestrus were 2 kg heavier at both these weights.

There was a significant effect of two-tooth pre-mating live weight on four-tooth EL/EJ ($P<0.05$) and ELM/EL ($P<0.01$), and six-tooth EL/EJ ($P<0.05$) and EW/EJ ($P<0.01$).

DISCUSSION

The difference over 3 lambings between those ewes that showed hogget oestrus and those that did not in terms of total lambs born per ewe joined was 0.37 and 0.42 lambs in Experiments 1 and 2 respectively. Comparable increases due to hogget oestrus have already been shown in other N.Z. Romney

TABLE 2 Experiment 1. Four-tooth and six-tooth pre-mating weight and reproductive performance

Treatment	HH		HL		LH		LL		Hogget oestrus		No hogget oestrus	
Age	4-T	6- T	4-T	6-T	4-T	6-T	4-T	6-T	4-T	6-T	4-T	6-T
Pre-mating weight (kg)	46	49	44	48	44	48	43	48	45	48	43	48
EJ	75	59	67	50	75	59	70	55	166	135	121	88
EL/EJ%	77	90	70	80	72	88	71	85	78	86	86	86
ELM/EL%	16	26	11	25	11	19	6	26	14	27	6	20
EW/EJ%	75	83	66	72	68	85	64	78	74	79	60	82
EWM/EW%	11	22	9	19	10	20	2	21	11	22	3	19

TABLE 3 Experiment 2. Four-tooth and six-tooth pre-mating weights and reproductive performance

Treatment	HH		HL		LH_1		LH_2		Hogget oestrus		No hogget oestrus	
Age	4-T	6-T	4-T	6-T	4-T	6-T	4-T	6-T	4-T	6-T	4-T	6-T
Pre-mating weight (kg)	47	48	46	47	46	47	44	46	47	48	45	46
EJ	67	61	69	59	62	58	67	59	133	117	132	120
EL/EJ%	84	77	81	71	94	83	76	71	83	79	83	72
ELM/EL%	32	34	29	24	26	29	18	29	32	30	21	28
EW/EJ%	72	74	67	64	84	72	63	69	69	75	72	65
EWM/EW%	17	33	15	16	17	29	7	24	18	23	11	29

comparisons, e.g., Hight and Jury (1976) reported 0.56 lambs over 4 lambings and Meyer (1981) 0.23 over 3 lambings. Furthermore a positive phenotypic correlation between the number of hogget oestruses and number of lambs born over 3 lambings was found by Ch'ang and Rae (1972). The use of hogget oestrus in ewe selection is recommended (Clarke and Binnie, 1981). This method necessitates growing lambs at rates where they will show hogget oestrus, a mean weight of 30 kg on April 1 and 32 kg on May 1 should give an incidence of 80 to 90% (Moore and Smeaton, 1980).

In Experiment 1 there were hogget oestrus effects on two-tooth EOM/EO over and above two-tooth pre-mating live weight, similarly with ELM/EL in Experiment 2. Thus ewes that show hogget oestrus are potentially more fecund for 2 reasons. Firstly, they are heavier at the two-tooth mating and secondly, there is potential for a greater number of lambs born per kilogram of two-tooth ewe mated. At the four-tooth stage there were no effects of rearing treatment but the effects of hogget oestrus persisted. This could be explained solely on the grounds that the ewes that showed hogget oestrus were still heavier as four-tooths. At the six-tooth stage nearly all the differences due to two-tooth pre-mating live weight, rearing or hogget oestrus had disappeared.

In contrast to our results Drew *et al.* (1973) and Smeaton *et al.* (1982) found no effect of rearing on two-tooth reproduction over and above two-tooth pre-mating live weight. Unfortunately in neither experiment was hogget oestrus information collected. However in the former trial, the nutritional treatments were not applied until May so that the differences in the incidence of hogget oestrus between treatments may have been small. In the latter experiment the high and low nutritional treatments were maintained as such from January until November, therefore there should have been a strong positive correlation between their April weight, which would determine the incidence of hogget oestrus, and their two-tooth pre-mating weight. This may explain why the latter weight accounted for most of the variation in reproductive performance in this experiment (Smeaton *et al.*, 1982).

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REFERENCES

Ch'ang, T. S.; Rae, A. L., 1972. *Aust. J. agric. Res., 23:* 149.

Clarke, J. N.; Binnie, D. B., 1981. *Proc. Ruakura Fmrs' Conf.:* 13.

Drew, K. R.; Barry, T. W.; Duncan, S. J.; Kleim, C., 1973. *N.Z. Jl exp. Agric., 1:* 109.

Hight, G. K.; Jury, K. E., 1976. *N.Z. Jl Agric. Res., 19:* 281.

Meyer, H. H., 1981. *Proc. N.Z. Soc. Anim. Prod., 41:* 204.

Moore, R. W.; Knight, T. W.; Whyman, D., 1978. *Proc. N.Z. Soc. Anim. Prod., 38:* 90.

Moore, R. W.; Smeaton, D. C., 1980. *Proc. N.Z. Soc. Anim. Prod., 40:* 27.

Smeaton, D. C.; Webby, R. W.; Hockey, H-U. P.; Wadams, T. K., 1982. *Proc. N.Z. Soc. Anim. Prod., 42:* 37.