EFFECTS OF SHORT-TERM DIFFERENTIAL FEEDING IN THE AUTUMN ON LIVEWEIGHT GAINS AND WOOL GROWTH OF EWES

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SUMMARY

In one trial, increasing herbage allowances (~1, 2.5, 4 and 7 kg DM/ewe/day) were offered to groups of 3-year-old Coopworth ewes (n = 12/group) grazing at two levels of pre-grazing herbage mass (1200 to 1500 and 2400 to 3000 kg DM/ha), while in a second trial ~1, 2.5 and 4 kg DM/ewe/day of pasture were offered to groups (n = 20/group) of light (41.4 kg) and heavy (57.2 kg) 3- and 4-year-old Coopworth ewes for 6 weeks pre-mating. Liveweight gain and wool growth increased with allowance. Ewes offered the higher pre-grazing herbage allowance showed greater gains and increased wool growth, while the heavy ewes showed reduced gains and increased wool growth. A linear relationship between wool growth and liveweight gain was unaffected by pre-grazing herbage allowance, while the intercept for heavy ewes was greater than for light ewes.

INTRODUCTION

Large areas of New Zealand can experience lengthy dry spells during the summer and early autumn when pasture availability to livestock may become limiting (Radcliffe, 1979). Reduced intake prior to mating results in falling ewe liveweights and lowered lambing performance (Coop, 1966) as well as lowered fleece weights.

The New Zealand Romney has a pronounced inherent pattern of seasonal wool growth which is more sensitive to the influence of level of feeding in the summer than the winter (Sumner, 1979). In wethers, without the stress of pregnancy and lactation, much of the between-year variability in fleece weight can be attributed to an inability of the sheep to sustain high levels of summer wool growth through into the autumn (Bigham *et al.*, 1978). Although ewes show a similar but more accentuated

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yearly pattern of wool growth than dry sheep (Sumner and Wickham, 1969), the effects of autumn feeding, when ewes are neither pregnant nor lactating, are likely to be similar for both classes of sheep.

In 1979, trials were conducted at Ruakura to examine the effects of herbage allowance, pre-grazing herbage mass and ewe liveweight on ovulation rate and wool growth in ewes. The effect of these short-term feeding regimes on wool growth parameters is reported here.

EXPERIMENTAL

Trial Design

Effect of Pasture Allowance and Pre-grazing DM/ha (Trial 1)

Increasing allowances (~1, 2.5, 4 and 7 kg DM/ewe/day) of pastures of 1200 to 1500 and 2400 to 3000 kg DM/ha pre-grazing were offered to groups of 50 mixed-age Coopworth ewes. Detailed wool data were collected from 12 three-year-old ewes in each group selected on the basis of a common pre-experimental shearing date and a similar liveweight over all groups at the start of the trial.

Effect of Pasture Allowance and Ewe Liveweight (Trial 2)

Allowances of ~1, 2.5 and 4 kg DM/ewe/day from pastures with 2000 kg DM/ha pre-grazing were offered to groups of 50 mixed-age heavy or light Coopworth ewes. Detailed wool data were collected for 20 three- and four-year-old ewes in each group selected on the basis of a common pre-experimental shearing date and a similar liveweight within each liveweight group.

Management and Feeding

Liveweight differences required for Trial 2 were induced by differential grazing of the two groups at high and low allowances from mid-December 1978.

Differential pre-mating feeding commenced in early March and continued for 6 weeks until mid-April when the rams were introduced. Full and 24-hour fasted liveweights were obtained on days 1 and 42.

Pasture Measurements

Pasture measurement techniques were similar to those of Rattray (1977), with the use of six randomly placed exclosure cages per paddock to allow for growth during the grazing period.

Wool Measurement

All ewes were shorn in December 1978 and again at the conclusion of the trials in early May 1979. Greasy fleece weight and staple length were recorded at the May shearing.

Wool samples were clipped from the midside region of each ewe on days 1 and 42. The wool patch samples were scoured and yield determined.

Mean daily wool growth before and during the feeding period was derived by proportioning greasy fleece weight from the May shearing according to the relative growth rate on the clipped patch with allowance for yield. The mean and standard deviation (SD) of fibre diameter of each clipped sample was measured with a Fibre Fineness Distribution Analyser (Lynch and Michie, 1976) counting 500 fibres.

RESULTS AND DISCUSSION

Pasture and Intake

Mean herbage allowance and assessed intake for each group in both trials are given in Table 1.

Ewe Liveweight Gain

Initial mean full and fasted liveweights for Trial 1 were 50.7 (± 5.9) kg and 48.5 (± 6.9) kg, respectively, and for Trial 2 were 60.3 (± 2.3) kg and 57.2 (± 2.3) kg for the heavy ewes and 44.2 (±2.5) kg and 41.4 (±2.5) kg for the light ewes.

Within each allowance group in Trial 1 the high pre-grazing herbage mass treatment showed greater weight gains. In Trial 2 the lighter ewes showed greater weight gains. The higher maintenance requirements of the heavier ewes might be the reason for this.

No interaction term was significant.

Wool Growth

During the feeding period wool growth and mean fibre diameter were both influenced in Trial 1 by pre-grazing herbage mass and allowance, while in Trial 2 only by allowance (Table 1). There was a carryover effect of pre-treatment ewe liveweight on wool growth and mean fibre diameter as shown in the covariance analysis. Variability in fibre liameter within the fleece was unaffected by any of the imposed treatments.

TABLE 1: HERBAGE PARAMETERS, LIVEWEIGHT GAIN AND WOOL MEASUREMENTS

Treatment	Herbage Allowance (kg DM/ewe/day)	DM Disappearance (kg DM/ewe/day)	Liveweight Gain (g/day)	Wool Growth during Feeding Period (g/day)[1]	Fibre Diameter during Feeding Period Mean (μm)[1]	Fibre Diameter during Feeding Period S.D (μm)[1]	Greasy Fleece Weight (kg)	Staple Length (cm)
Trial 1:								
1200-1500	1.4	0.85	–90	8.8	**36.3**	8.1	2.03	8.3
kg DM/ha	2.8	1.28	16	**10.3**	37.7	8.2	2.18	8.2
	4.6	1.79	129	**10.9**	38.4	8.4	2.27	8.4
	6.8	1.97	120	10.7	37.5	8.5	2.16	9.0
2400-3000	1.2	0.76	45	9.2	37.4	8.4	2.10	8.4
kg DM/ha	2.5	1.38	174	**11.0**	39.0	8.5	2.24	8.9
	4.2	1.44	185	**11.6**	39.4	8.6	2.25	8.7
	6.9	2.23	224	12.9	38.8	8.9	2.47	9.0
DM/ha effect	—	—	***	***	**	n.s.	n.s.	n.s.
Allowance effect	—	—	***	***	***	n.s.	*	*
Covariate	—	—	—	***	***	***	—	—
Trial 2:								
Light ewes	1.1	0.95	–87	7.0	33.6	8.2	1.60	7.9
	2.4	1.32	67	8.6	34.6	8.3	1.74	8.2
	3.9	1.31	136	9.7	37.1	8.6	1.83	8.8
Heavy ewes	1.1	0.84	–130	9.1	36.1	9.0	2.07	8.4
	2.4	1.32	36	10.7	38.4	8.7	2.26	9.2
	3.9	1.51	57	11.7	38.9	8.9	2.41	8.9
Liveweight effect	—	—	***	n.s.	n.s.	n.s.	***	***
Allowance effect	—	—	***	***	***	n.s.	***	**
Covariate	—	—	—	***	***	***	—	—

[1] Adjusted by covariance for values of parameter at start of feeding period when testing significance.
All interaction terms not significant.

Changes in wool growth rate, induced by the improved liveweight and allowances, were large enough to affect both fleece weight and staple length when the ewes were second shorn in early May (Table 1). The fleece weight effect for the heavy ewes in Trial 2 was considerably exaggerated as, by design, they entered the trial significantly heavier than the light ewes, and it was not possible to meaningfully remove this effect.

All interaction terms were not significant.

Wool growth during the feeding period (Y) was linearly related to liveweight gain (X) ($P < 0.001$) within each pasture level and body condition treatment (Fig. 1). The slopes of the relationships did not differ between body condition and herbage mass treatments. However, the intercept for the heavy ewes was greater ($P < 0.001$) than the intercept for the light ewes. The intercepts for the two herbage mass treatments were not different and the pooled intercept for the Trial 1 ewes, which were intermediate in liveweight, was intermediate between the intercepts for the heavy and light ewes ($P < 0.01$ and $P < 0.05$, respectively). There is likely to have been a carryover effect on wool growth into the feeding period for the heavy ewes. Nevertheless,

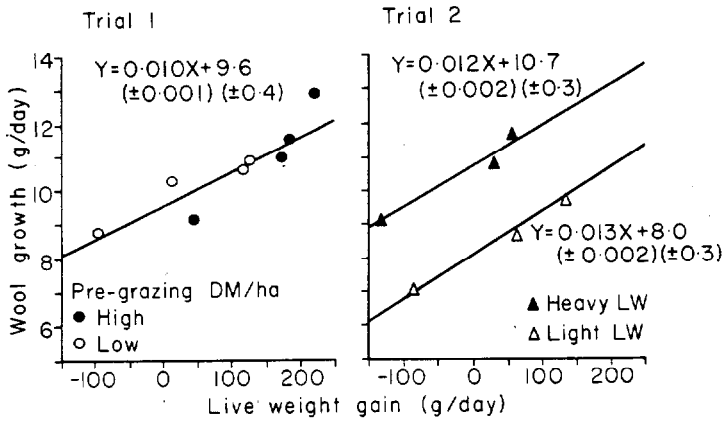

FIG. 1: *Relationship between liveweight gain and wool growth.*

the magnitude of the difference in the intercepts in the above relationships suggests that heavy ewes may utilize a relatively greater proportion of nutrients for wool growth than for body tissue accumulation compared with light ewes.

It is clear that increased wool growth can result from short-term increases in feed allowance during the autumn. Thus, in addition to the beneficial gains to be obtained with increased lambing performance through flushing (Rattray *et al.*, 1980), increased fleece weights can also be obtained which can be worth up to $1 per head at present prices. It is unlikely that a similar growth response would be obtained with short periods of increased feeding of ewes during the winter or early spring (Sumner, unpublished data).

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