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Effects of shearing and herbage allowance on the intake, live weight gain and wool growth of Romney ewe hoggets in spring-summer

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ABSTRACT

Because preliminary evidence indicated that shearing Romney ewe hoggets in early October increased wool growth in spring-summer but had little effect on live-weight gain, an experiment was designed to quantify the feed intake, live-weight gain and wool growth of shorn and woolly hoggets in spring-summer.

The design was a 2 x 3 x 2 x 2 factorial, i.e. shorn *v* woolly hoggets (shorn at 4, 12 and 17 months of age *v* shorn at 4 and 17 months) x 3 herbage allowances (1.6, 3.2 or 4.8 kg total DM/hogget/d) x 2 replicates x 2 years. The 12 mobs, each comprising 15 hoggets, were shifted twice weekly for 18 weeks, with residual DM measured and intakes estimated at each shift. Live-weight gain (LWG) and wool growth were measured every 6 weeks from early October until mid February.

There were no significant differences between the shorn and woolly hoggets in residual DM (and therefore in utilisation and intake) or in LWG. The shorn hoggets grew 1 g/d more clean wool during spring-summer, i.e. a total advantage of 0.2 kg greasy. LWG and wool growth increased curvilinearly with allowance. LWG's were greatest in October-November, while wool growth was greatest in January-February.

Five shorn and 4 woolly hoggets were penned outdoors in close proximity to the grazing experiment and fed a pelleted diet *ad lib.* for the first 6 weeks after shearing in early October. Relative to the woolly hoggets the shorn hoggets ate 20% less in week 1, the same amount in week 2, and increasingly more from weeks 3 to 6 (30% difference in week 6).

The results indicate that shearing in spring does not lead to significantly higher feed intakes nor to greater LWG's, although it does result in a modest increase in wool growth.

Keywords Sheep; shearing; herbage allowance; intake; live-weight gain; wool growth.

INTRODUCTION

Shearing ewe hoggets of longwoolled breeds of sheep in spring is widely believed to promote faster live weight gains in spring-summer and therefore result in heavier 2-tooths. Shorn hoggets are also believed to grow more wool than woolly hoggets. There are however few relevant data to substantiate (or refute) either claim.

In 3 preliminary experiments at Invermay, Romney ewe hoggets shorn in early October grew 0.3 to 0.5 kg more clean wool during spring-summer than did woolly hoggets. The hoggets had been shorn as lambs in late January and were shorn again as 2-tooths in the following late January. The shorn and woolly hoggets were run together in these experiments. The spring-shorn hoggets had 1.0 to 1.4 kg higher mean live weights (fleece-free) at 17 months of age than the woolly hoggets.

To have grown considerably more wool without gaining extra live weight was attributed to shearing greatly increasing maintenance requirements, resulting in the shorn hoggets having substantially higher feed intakes than the woolly hoggets. If spring shearing markedly increases the herbage allowances needed by hoggets then it would be logical to leave shearing until the summer and allocate more pasture in early spring to the lactating ewes whose requirements are then at a peak.

In 2 years (1982-83 and 1983-84), shorn and woolly Romney ewe hoggets were offered low, medium or high herbage allowances for three 6-week periods from early October until mid-February. Intakes, live-weight gains and wool growth were measured.

MATERIALS AND METHODS

Animals and Experimental Design — Grazing Experiment

All hoggets were shorn as lambs in early February and as 2-tooths in mid-February of the following year. The animals began the experimental period as 12 month old hoggets and ended it as 17 month old 2-tooths. For simplicity the term hogget is used throughout. On 5 October half the hoggets were shorn (SHORN) and half were crutched (WOOLLY), and each half allocated to low, medium or high herbage allowance treatments. There were 2 replicates and 15 hoggets in each of the 12 mobs.

The mobs were shifted to new breaks in a new paddock twice weekly. The location of the mobs within the paddocks was re-randomised at each shift. In each year the mobs were rotated around 7 to 8 paddocks of an average size of 1 ha. After each experimental grazing the paddocks were grazed to a common residual by other sheep.

Pen-Feeding Experiment

In year 2, 5 shorn and 4 woolly hoggets were penned individually in wire cages outdoors close to the grazing experiment. For the first 6 weeks after shearing in early October these hoggets were fed *ad lib.* a high quality pelleted diet (11 MJME/kg DM).

Pasture Measurements

Pre-grazing herbage mass was determined by a double sampling technique using a weighted discmeter (50 sites/paddock) and quadrat cutting (6 sites/paddock). For the latter, the herbage from a $0.1 m^2$ quadrat was cut to ground level with a shearing handpiece and collected. At 6 equivalent sites exclosure cages were pegged over the site. The herbage from the cut quadrats was washed and oven dried at 100°C for 20 hours. The paddock was fenced with electrified netting into breaks of the appropriate size to give nominal allowances of 1.5, 3.0 or 4.5 kg total DM/hogget/d.

After the hoggets were shifted to a new paddock, 3 random quadrats were cut per plot (residual dry matter), and the exclosure cages were removed and a quadrat cut at each. "True" herbage mass was estimated from the mean of the pre-grazing and exclosure cage estimates, after allowing for herbage growth. "True" herbage allowances were re-calculated (mean values were 1.6, 3.2 and 4.8 kg DM/hogget/d) and were combined with estimates of residual DM to estimate herbage utilisation and intake.

Botanical composition prior to grazing was assessed by dissecting a subsample of bulked clippings from 20 to 30 sites within each paddock. An equivalent subsample was used to determine *in vitro* digestibility.

Animal Measurements

Fleece-free fasted live-weight gains were estimated from live weights recorded at the start of each experimental period and 6, 12 and 18 weeks later. Initial mean live weights were 35.0 kg in year 1 and 33.4 kg in year 2. Wool growth rates were estimated by partitioning clean dry fleece weight according to the weights of clean dry wool harvested from midside patches every 6 weeks. The wool growth rates were adjusted to account for the weights of oddments, crutchings, etc. not included in the fleece weights. The mean fibre diameter of the midside patch samples was determined by liquid scintillation spectrometry (Andrews and Hawker, 1982).

Statistical Analysis

The wool growth and fibre diameter data were adjusted for pre-experimental differences between treatments — these and other data were subjected to analyses of variance, covariance or regression, as appropriate.

RESULTS

Mean herbage mass was 3600 and 3000 kg DM/ha in years 1 and 2 respectively. Botanical composition was similar in years 1 and 2 being 84% grass, 11% clover and 1% dead material. Mean *in vitro* digestibilities were also similar in years 1 and 2 (79% OMD or 69% DOM).

There were curvilinear relationships with allowance for residual DM, utilisation and intake — these were consistent across the periods of measurement (Table 1). There were however no significant differences between the shorn and woolly hoggets in any measurement period and no interactions between shearing treatment and herbage allowance.

TABLE 1 Effects of herbage allowance on the residual dry matter (kg DM/ha), utilisation (%) and intake (kg DM/hogget/d) of shorn and woolly hoggets.

Shearing treatment	Herbage allowance Low	Med	High
Residual dry matter (SED = 49)			
Shorn	1380	2110	2440
Woolly	1430	2110	2390
Utilisation (SED = 1.5)			
Shorn	57	36	24
Woolly	56	35	27
Intake (SED = 0.05)			
Shorn	0.9	1.1	1.2
Woolly	0.9	1.1	1.3

On average there was no significant difference between the shorn and woolly hoggets in live-weight gain (LWG), but there was an interaction with measurement period (Table 2). The shorn hoggets had 15 and 8 (SED 3) g/d greater LWG's in October-November and January-February respectively, while the woolly hoggets had 20 (SED 3) g/d greater LWG's in November-December.

Herbage allowance had a pronounced effect on LWG in all measurement periods, but there was a significant interaction between allowance and period (Table 2). Mean LWG's declined from 136 g/d in October-November to 52 g/d in January-February, but the decline was much greater on the high than on

TABLE 2 Live-weight gain (LWG) (g/d), wool growth (g/d) and fibre diameter (μm) of shorn (S) and woolly (W) hoggets offered low, medium or high herbage allowance in spring-summer.

	5 Oct-18 Nov		19 Nov-31 Dec		1 Jan-11 Feb	
	S	W	S	W	S	W
LWG (SED = 5)						
Low	90	86	22	39	30	22
Med	156	137	78	102	55	51
High	186	163	99	117	84	71
Wool growth (SED = 0.3)						
Low	9.3	8.5	12.5	11.4	13.0	12.7
Med	10.2	9.3	15.2	13.7	16.2	14.9
High	10.1	9.4	15.7	14.2	16.8	15.4
Fibre diameter (SED = 0.8)						
Low	36.5	33.6	37.2	35.3	38.3	38.0
Med	36.3	34.6	39.1	37.3	39.8	39.5
High	36.6	35.0	39.6	38.6	40.4	39.7

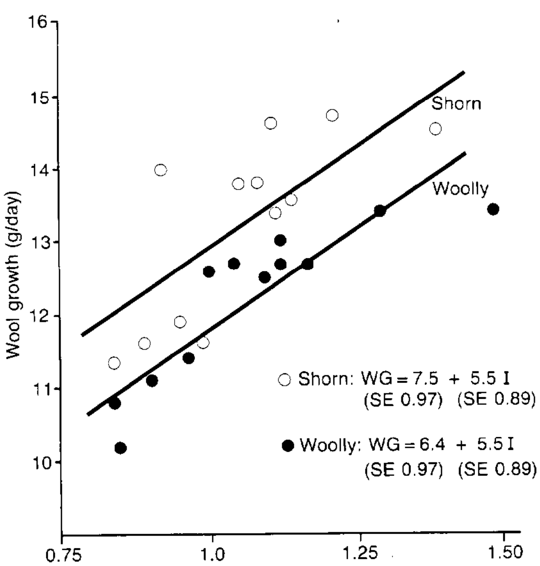


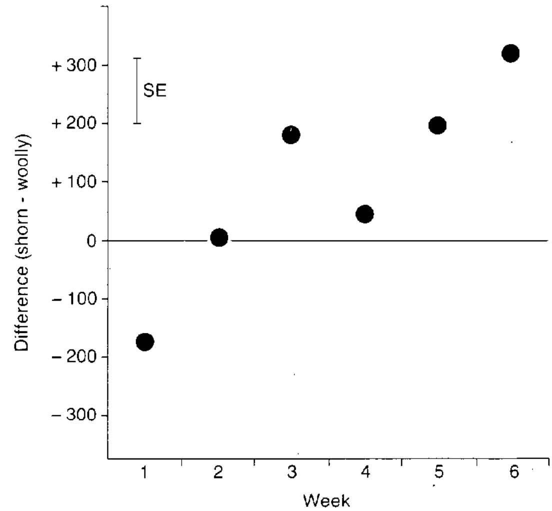
FIG. 1 Relationship between wool growth and intake for shorn and woolly hoggets.

the low allowance. There was no significant interaction between shearing treatment and herbage allowance.

Herbage allowance and shearing treatment had significant and apparently independent effects on wool growth (Table 2). The shorn hoggets grew on average 1.0 g/d (SED 0.13) more wool than the woolly hoggets and this difference was similar in each period of measurement. The relationship between wool growth and intake is shown in Figure 1. The slopes for the shorn and woolly hoggets were not significantly different but the shorn hoggets had a 1.1 g/d (SED 0.3) higher intercept.

Wool growth increased from 9.5 g/d in October-November to 14.8 g/d in January-February. This increase was greatest on the high and least on the low allowance (6.3 *v* 3.9 g/d; SED 0.2).

Fibre diameter (FD) was also significantly affected by both herbage allowance and shearing



Mean intake	783	931	1133	1230	1254	1171

FIG. 2 Intakes of pen-fed shorn and woolly hoggets (g DM/day).

treatment (Table 2), with no significant interaction between these effects. Mean FD was on average 1.3 μm SED 0.33) higher for the shorn than woolly hoggets, but the difference was greater in October-November than in January-February (2.0 *v* 0.4 μm; SED 0.5). FD increased by 3 to 5 μm between October-November and January-February.

The intakes of the pen-fed hoggets are shown in Figure 2. The shorn and woolly hoggets did not differ significantly in mean intake in the first 6 weeks after shearing but did differ significantly in the linear increase in intake with time. Relative to the woolly hoggets the shorn hoggets ate 20% less in the first week after shearing, a similar amount in week 2 and increasingly more from weeks 3 to 6, the difference being 30% in week 6.

The shorn and woolly hoggets had similar LWG's (140 *v* 131 g/d; SED 25) and these gains were similar to those on the highest allowance of pasture. The shorn hoggets grew more wool than their woolly counterparts both during (7.5 *v* 5.5 g/d; SED 1.2) and after (12.7 *v* 11.7 g/d; SED 1.2) the 6 weeks of pen feeding, but neither difference was significant.

DISCUSSION

There was no detectable difference between the shorn and woolly hoggets in residual dry matter (and hence in utilisation and intake) at any feeding level or in any measurement period. That the lack of difference in intake between the shorn and woolly hoggets was *bona fide* is clear from a comparison of observed treatment differences and the residual variability of measurement. There was a 30% difference in intake between the lowest and highest allowance (LSD 7%) but only a 2.5% difference in intake between the shorn and woolly hoggets (LSD 6%).

When the meteorological data from the present experiment (Table 3) are compared with those used in the simulation exercise described by Faichney *et al.* (1976) it is clear that shearing in early October should have led to an increase of 50 to 100% in average maintenance requirements for the next 6 weeks and therefore have elicited a response in intake.

TABLE 3 Meteorological data for first 6 weeks after shearing (7 October-19 November).

	Year 1	Year 2
Mean windspeed at sheep height (m/s)	2.0	1.7
Temperature:		
Mean daily max (°C)	16.6	16.8
Mean daily min. (°C)	5.7	6.4
Total rainfall (mm)	106	61

In the pen experiment there was a significant effect of shearing on the pattern of intake after shearing, with the shorn hoggets initially eating less than the woolly hoggets but then surpassing them. Such a lag between shearing in cool conditions and intake stimulation has been observed in a number of studies (e.g. Weston, 1970; Donnelly *et al.*, 1974). Our penned hoggets would have been exposed to a lower effective temperature than the grazing hoggets because the protection afforded by the pasture was absent. This protection plus the marked variation between paddocks in herbage mass, etc. may have masked any trend with time in the intake of the grazing hoggets in the first 6 weeks after shearing.

That the predicted effects of shearing on intake were not observed suggests that there are circumstances in which the simulation model of Faichney *et al.* (1976) may be inadequate. That there was little difference between the live-weight gains of the shorn and woolly hoggets supports the conclusion that shearing had little effect on maintenance requirements.

While it is difficult to precisely compare the wool production of sheep with different frequencies of shearing, the greater wool growth of the shorn hoggets was a real effect because there was a corresponding increase in mean fibre diameter. Figure 1 clearly shows that the effect on wool growth was independent of intake. This is somewhat surprising because most evidence (reviewed by Hopkins and Richards, 1979) indicates that increases in wool growth can occur only via increased intakes because exposure of the skin to cool air leads to vasoconstriction and lower wool growth. It is possible that the shorn hoggets had an increased nutrient availability in the intestines because Kennedy *et al.* (1976) have shown that cold exposure increases the rate of passage of digesta through the reticulo-rumen and hence protein digestion in the intestine.

The curvilinear effects of herbage allowance on live-weight gain, wool growth and fibre diameter are similar to those observed with hoggets in spring in experiments at Woodlands (McEwan *et al.*, 1985; Thompson *et al.*, 1985). The diminishing response in LWG with time occurs because as hoggets grow, their physiological propensity to make further gains declines and their maintenance requirements increase. Nevertheless the results show that LWG's of 100 g/d through the summer are possible if high allowances of good quality herbage are offered.

The increase in wool growth and fibre diameter from spring to late summer is consistent with the normal photoperiod determined seasonal wool growth cycle. The associated increase in the response of wool growth to herbage allowance is consistent with the season x nutrition interaction described by Hawker and Crosbie (1985).

CONCLUSIONS

Shearing in early October had no significant effect on subsequent intake or live-weight gains. Although the shorn hoggets grew about 0.2 kg more greasy wool in spring-summer, the extra production would barely cover the costs of shearing. Justification of the practice must therefore rest with management advantages (such as fewer cast sheep) which are clearly difficult to quantify.

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