Seasonal wool production and staple strength of Romney ewes

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ABSTRACT

Seasonal wool growth and staple strength were measured in mature, non-pregnant Romney ewes individually penned indoors or confined as a group in a yard outdoors and offered a maintenance ration of lucerne chaff.

Clean wool growth was lowest during winter (4.6 and 5.0 g/d for indoor and outdoor ewes, respectively) and greatest during summer for indoor (11.3 g/d) or spring for outdoor (11.9 g/d) ewes. Efficiency of wool growth (g wool growth/d per kg dry matter intake/d) for indoor sheep was 5.6, 8.8, 11.8, and 7.8 during winter, spring, summer and autumn, respectively. There were positive relationships between mean wool growth, staple strength and efficiency.

Keywords Wool growth; staple strength; efficiency

INTRODUCTION

A characteristic seasonal wool growth pattern has been observed in New Zealand long-woolled sheep breeds with growth up to 4 times faster during summer than during late winter (Story and Ross, 1960; Sumner and Wickham, 1969). Reduced fibre diameter during the period of low winter growth has been associated with lower staple strength and fleece tenderness (Ross, 1965).

There is little direct information, however, on inter-relationships between seasonal wool growth and measured staple strength independently of varying nutritional or physiological conditions. In the present project, wool production during 1 year and staple strength were measured in mature, non-pregnant Rommey ewes at maintenance level of nutrition.

MATERIALS AND METHODS

Two groups of Romney ewes aged 4 to 5 years with individual histories of hand-assessed fleece tenderness or soundness were offered chaffed lucerne (dry matter digestibility 69%) in individual pens indoors or as a group outdoors in a small grassed yard. Ewes were kept non-pregnant and quantities of feed offered each week were adjusted to minimise live-weight change. They were weighed once weekly before the morning feed and were shorn in late November.

Mid-side patches were harvested at monthly intervals to measure wool growth (Hawker *et al.*, 1984) and yield (clean weight × 100/greasy weight) was estimated using standard procedures (IWTO, 1976). Staple strength (N/k tex) was determined using the apparatus of Baumann (1981) and mean fibre diameter measured by projection microscope (IWTO, 1966).

RESULTS AND DISCUSSION

Mean values for feed intake, ewe live weight (wool-free) and clean wool growth each month are shown in Fig. 1. Feed intake for the indoor sheep held at constant live weight was highest during January but mean intake and live weight of the outdoor group fluctuated, probably due to seasonal grass growth. Blaxter *et al.* (1982) have also observed periodicity of intake in housed sheep with consumption highest in summer and lowest in winter.

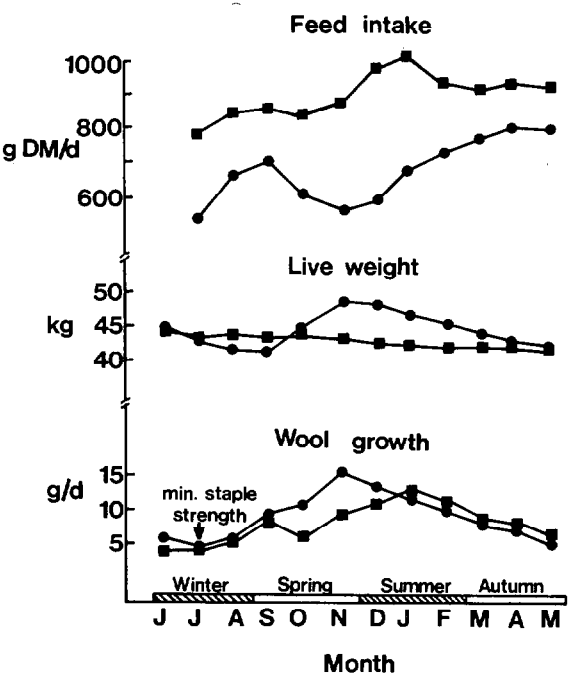

FIG. 1 Mean values each month for feed intake (chaffed lucerne), live weight (wool-free) and wool growth for indoor (□ – □) and outdoor (○ – ○) groups of ewes.

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Wool yield for both indoor and outdoor ewes was 72%, 73%, and 78%, respectively, during winter, spring and summer but during autumn was 73% for indoor and 82% for outdoor ewes. In both groups wool growth was lowest during winter but was highest during summer (January) for indoor, and late spring (November) for outdoor sheep. This seasonal pattern of wool growth followed the natural light-responsive rhythm (Ryder and Stephenson, 1968) and is consistent with observations made elsewhere in New Zealand with grazing Romney ewes (Story and Ross, 1960; Sumner and Wickham, 1969). The point of separation during tests of staple strength indicated that minimum strength occurred during the period of low wool growth in July (Fig. 1).

Efficiency of wool growth for the indoor ewes (g wool/d per kg dry matter intake/d) was 5.6, 8.8, 11.8, and 7.8 during winter, spring, summer and autumn respectively. The seasonal changes in efficiency are similar to those described by Sumner (1979) and Hawker *et al.* (1984).

Information on average clean wool growth, fibre diameter, staple strength, and efficiency for individual sheep, is given in Table 1. The wool data show slightly greater variation among indoor compared with outdoor sheep. This may either reflect the initial sampling of sheep or is possibly due to the masking of individual genetic variation among outdoor sheep caused by differences between individuals in voluntary feed intake.

The regression relationship between staple strength (Y, N/k tex) and mean wool growth (X, g/d) was markedly better for indoor than outdoor ewes. For indoor ewes it was as follows—

	RSD	r^2
$Y = 11.58X - 67.53$	6.57	0.85

The inclusion of mean fibre diameter in a multiple regression did not reduce error variance.

This regression equation indicates a positive association between staple strength and clean wool growth. For example, in this population there would be an increase in staple strength of approximately 12 N/k tex for each additional 1 g clean wool growth/d. Bigham *et al.* (1983) reported a positive genetic correlation between greasy fleece weight and staple strength.

These findings indicate that positive genetic progress in both wool growth and staple strength is possible by selection. In addition, positive correlations for indoor sheep between clean wool growth and efficiency ($r^2 = 0.88$) and staple strength and efficiency ($r^2 = 0.85$), suggest that selection for these characters may be accompanied by a correlated response in efficiency. The lack of positive relationships between wool growth and staple strength for outdoor ewes suggests that selection responses may be best using data obtained indoors with controlled individual feeding.

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TABLE 1 Staple strength history (S-sound, T-tender), staple strength (N/k tex), clean wool growth (g/d), fibre diameter (μ m), and efficiency (g wool per d/per kg dry-matter intake/d) for individual ewes.

Group	Staple strength history	Staple strength	Clean wool growth†	Fibre diameter†	Efficiency†
Indoor ewes(6)					
	S	54.3	9.8	38.5	11.0
	S	27.9	8.7	36.7	9.5
	T	23.5	8.4	37.1	10.5
	T	21.4	7.5	34.6	7.6
	T	11.4	7.1	36.5	8.0
	T	6.7	6.0	32.1	6.8
Outdoor ewes(5)					
	S	53.3	10.7	37.5	
	S	40.6	8.1	34.1	
	S	39.8	7.8	38.5	
	T	24.8	8.6	39.2	
	T	15.8	9.6	36.0	

† averaged over 1 year.

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