Effects of season and pasture allowance on the wool growth of Romney ewes

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ABSTRACT

Wool growth responses of Romney ewes to increasing pasture allowance in the autumn (pre-joining), early winter (mid pregnancy) and spring (lactation) were examined. Live weight gain and wool growth increased curvilinearly with allowance. Wool growth responses were greater in autumn than winter, with spring intermediate. The maximum difference in clean fleece weight between extremes of pasture allowance was 0.41 to 0.12 kg for autumn, 0.12 kg for winter and 0.15 kg for spring. Changes in live-weight gain were associated with greater changes in wool growth in autumn than in winter or spring.

INTRODUCTION

The marked seasonal pattern of wool growth exhibited by the Romney and other long-woolled breeds of sheep in New Zealand has been widely demonstrated. At Invermay wool growth rates in the summer are up to 5 times those in the late winter (H. Hawker, unpublished). Within seasons there is a linear relationship between the intake of a particular diet and wool growth (Allden, 1979). With long-woolled breeds of sheep there is a pronounced interaction between season and the responsiveness of wool growth to feed intake (Sumner, 1979). At Woodlands Research Station, Southland, the production responses of Romney ewes to increasing pasture allowances at different times of the year were examined. This paper describes some seasonal effects on wool growth responses to pasture allowance.

MATERIAL AND METHODS

Management of Ewes

(a) Autumn

1979: Allowances of 2, 4, 6, 8 or 10 kg DM/ewe/d were offered to groups of 50 ewes (2½ years old) from March 15 until May 31. The initial mean live weight (24 hour fast, no adjustment for fleece) was 53 kg.

1980: Allowances of 1, 2, 4, 6, or 8 kg DM/ewe/d were offered to groups of 50 mixed-age heavy ewes (initial live weight 57 kg) from March 11 until May 22. Allowances of 1, 2 or 4 kg DM/ewe/d were offered to groups of light ewes (initial live weight 52 kg) which were drawn from the same flock as the heavy ewes but had been fed a lower allowance for the previous month.

(b) Winter

Allowances of 0.7, 1.2, 1.7 or 2.2 kg DM/ewe/d were offered in 1978 to groups of 70 ewes (2 years old, initial live weight 47 kg) from June 13 until July 25, and in 1979 to groups of 50, ewes 25 of which were 2 years old (initial live weight 48 kg) and 25, 6 years old (initial live weight 57 kg), from May 23 until July 5.

(c) Spring 1978 and 1979

From September 14 or 26 until December 4 or 6, allowances of 2, 4, 6, 8, or 10 kg DM/ewe/d were offered to groups of 21 to 25 mixed age ewes which had given birth to and were rearing single lambs (S ewes: initial live weight 50 and 55 kg). Groups of 15 to 18 ewes rearing twin lambs were offered 4, 6, 8 or 10 kg DM/ewe/d (T ewes: initial live weight 52 kg).

Measurements

The mean herbage mass before grazing was 3400, 2100 and 2600 kg DM/ewe/ha in the autumn, winter and spring, respectively. Live-weight gain was recorded for all ewes. Wool growth measurements were made on 20 to 30 ewes per allowance treatment in the autumn, 25 to 30 ewes per age x allowance sub-group in the winter and 10 to 15 S or T ewes per allowance in the spring. Clean dry wool growth was estimated by partitioning clean fleece weight (oven dry) according to the relative weights of wool clipped from mid-side patches. The responses of live-weight gain (LWG) and wool growth (WG) to pasture allowance and the associations between WG and LWG were examined by regression analyses on the means for each mob. Composite regression analyses were carried out accounting for the principal category effects within each experiment [i.e., *Autumn*—1979, 1980 Heavy, 1980 Light; *Winter*—1978, 1979 2-year, 1979 6-year; *Spring*—1978, or 1979, S or T, early (weeks 1 to 7) or

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late (weeks 8 to 13) lactation]. The summary relationships shown in Figs. 1 and 2 are of the form

$$y = a - \frac{b}{x}$$

where *maximum potential* (a > o) refers to the level achieved on an infinite allowance, and where *differential response* (b > o) is defined as the change in response from 1 kg DM/ewe/d to an infinite allowance.

RESULTS AND DISCUSSION

The curvilinear rates of response of LWG to increasing pasture allowance were similar for the different categories within each season. The relationships for the autumn and winter were similar (Fig. 1). However, the displacement of the LWG/allowance curve for the lactating ewes reflects their much higher feed requirements.

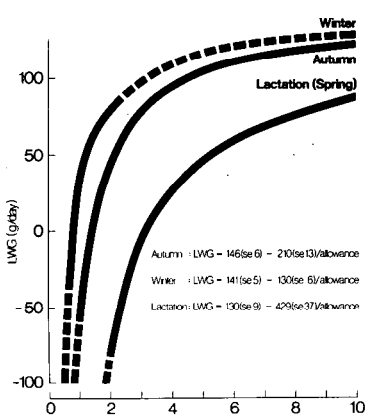

FIG. 1 Response of live-weight gain (LWG) to pasture allowance.

Wool growth increased curvilinearly with allowance in each season, with characteristic relationships shown in Fig. 2. Differences between categories were relatively small for the winter and spring, but were important for the autumn.

The maximum potential of autumn 1980 heavy ewes was 1.7 (s.e. 0.34) g/d higher than that of the light ewes. In addition, the rate of response was greater for the 1979 ewes ($P<0.001$) because relatively less wool was grown on the lower allowances than in 1980. A carryover effect of autumn allowance on wool growth in early winter was apparent in 1979 ($P<0.01$) but not in 1980. Accordingly, the differential amount of wool grown between common low and high allowances from March to December was much greater in 1979 (0.41 kg s.e. 0.08) than in 1980 (0.12 kg s.e. 0.06). The greater wool growth response to allowance in autumn 1979 may be associated with differing ewe ages (2½ years in 1979, mixed-age in 1980). Maximum wool production usually occurs at 2 to 3 years of age, with a pronounced decline thereafter (Bigham *et al.*, 1978; H. Hawker unpublished).

Both the maximum potential of wool growth and the rate of response to increasing pasture allowance were less in winter than in autumn (Fig. 2). Allowance in June-July affected wool growth in late winter ($P<0.001$) but not in spring. Between the lowest and highest allowances there was a difference of 0.12 (s.e. 0.04) kg in wool grown from June to December.

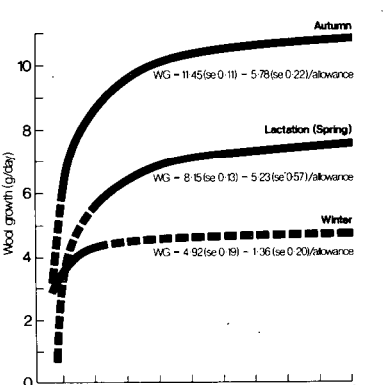

FIG. 2 Response of wool growth (WG) to pasture allowance.

During spring (lactation) the maximum potential of wool growth and its rate of response to allowance were intermediate between autumn and winter (Fig. 2). The maximum potential was 2.1 (s.e. 0.28) g/d greater in late than in early lactation, and was 0.6 (s.e. 0.23) g/d greater for ewes rearing single lambs than for ewes rearing twins. Between allowances of 2 and 10 kg DM/ewe/d there was a difference of 0.15 (s.e. 0.05) kg in wool grown during lactation.

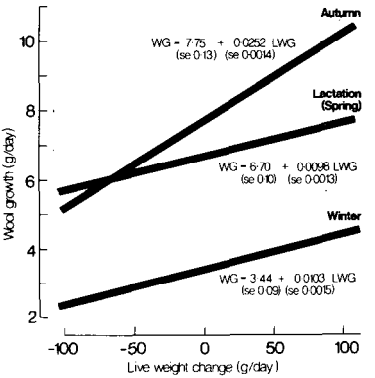

FIG. 3 Association between live-weight gain (LWG) and wool growth (WG).

The experiments described here were not designed to afford direct statistical comparisons between seasons. The results for any one season are not necessarily typical, especially in view of the variation that occurred between autumn categories. Nevertheless, the marked differences between seasons (Fig. 2) suggest the following generalisations.

Wool growth is clearly more responsive to increases in pasture allowance when its maximum potential is high (autumn) than when it is low (winter). The responsiveness in spring (lactation) is intermediate, with a higher maximum potential in late than early lactation. This pattern is consistent with the strong interaction between season and the response of wool growth to intake described by Sumner (1979).

The influence of season on the responsiveness of wool growth to allowance implies that the association between wool growth and LWG will vary between seasons in both gradient and elevation (Fig. 3). A ewe at maintenance in the autumn will grow more wool than comparable ewes in spring (lactation) or winter, while for a given change in live weight the associated change in wool growth is likely to be some 2 to 3 times as great in the autumn as in the other seasons.

Our results broadly support farm management recommendations for most times of the year. Maintenance of live weight in the winter is sensible as wool growth is slow and relatively unresponsive to better feeding. High allowances during lactation are necessary for high intakes and milk production. Similarly, ewes in the autumn should be offered high allowances to increase ovulation rates.

However the present results suggest that the responsiveness of wool growth to level of nutrition will be greatest in the summer. Management of ewes between weaning and pre-joining should therefore be considered carefully.

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