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EFFECTS OF SEASON ON THE WOOL GROWTH RESPONSE OF ROMNEY EWES TO PASTURE ALLOWANCE

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SUMMARY

Wool growth responses of New Zealand Romney ewes to increasing pasture allowance in the autumn (pre-joining), early winter (mid-pregnancy), spring (lactation) and summer (post-weaning) were examined. Wool growth increased curvilinearly with pasture allowance in each season, the response being greater in summer and autumn than in winter, with spring intermediate. Efficiency of wool growth was ranked summer > autumn > winter > spring. The wool growth of ewes at maintenance was ranked summer > autumn > spring > winter. For a given change in live weight the associated change in wool growth was ranked summer > autumn > spring, winter.

INTRODUCTION

The marked seasonal pattern of wool growth exhibited by the New Zealand Romney and other longwoolled breeds of sheep is well documented. Story and Ross (1960) observed at Invermay that wool grows up to four times faster in summer than in late winter. Within seasons the intake of a particular diet and wool growth are linearly related (Allden 1979). With longwoolled breeds there is a pronounced interaction between season and the responsiveness of wool growth to 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 summarises the effects of season on the response of wool growth to pasture allowance.

MATERIALS AND METHODS

Management of ewes

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

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

1982: Heavy (55 kg) and light (41 kg) ewes were selected from a flock of 1750 2½ years old ewes with a common history. Groups of 40 ewes were offered pasture allowances of 1.2 or 4.0 kg DM/ewe/d from March 17 until April 27.

(ii) Winter: Pasture allowances of 0.7, 1.2, 1.7 or 2.2 kg DM/ewe/d were offered from June 13 until July 25, 1978 to groups of 70 ewes (2 years old, 47 kg).

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and from May 23 until July 5, 1979 to groups of 50 ewes, of which 25 were two years old (48 kg) and 25 six years old (57 kg).

(iii) Spring: From September 14 (1978) or 26 (1979) until December 5, pasture 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. Groups of 15 to 18 ewes rearing twin lambs were offered 4, 6, 8 or 10 kg DM/ewe/d. Initial mean live weights of the ewes were 50-55 kg.

(iv) Summer: Seven groups each of 15 mixed-age ewes were offered pasture allowances of 0.71, 0.83, 1.0, 1.25, 1.67, 2.5 or 5.0 kg DM/ewe/d from December 16 until February 24. The initial mean live weight was 55 kg in 1981/2 and 51 kg in 1982/3.

Measurements

The ryegrass/white clover pastures used had mean herbage masses before grazing of 3400, 2100, 2600 and 3800 kg DM/ha in the autumn, winter, spring and summer experiments, respectively. Intakes of pasture were estimated from DM measurements made before and after grazing. In each experiment wool growth was measured on between 10 and 30 ewes per pasture allowance treatment. 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. In the autumn and winter experiments the ewes were run as one mob after the period of differential feeding. The mid-side patches were clipped at intervals until shearing in mid December. The ewes in the spring and summer experiments were shorn in mid December and early March, respectively, with no record kept in either experiment of possible carry-over effects on wool growth after the differential feeding period.

The responses of wool growth (WG) to pasture allowance and the associations between WG and liveweight gain (LWG) were examined by regression analyses on group means. Composite regression relationships were estimated for each season. The summary relationships shown in Fig. 1 are of the form

\[ \text{WG (g/d)} = a - \frac{\beta}{\text{pasture allowance (kg DM/ewe/d)}} \]

where maximum potential \(a > 0\) refers to the WG approached on very high pasture allowances, and where the rate of response \(\beta > 0\) corresponds to the potential lift in WG in going from 1 kg/ewe/d to very high pasture allowances.

RESULTS AND DISCUSSION

Wool growth increased curvilinearly with pasture allowance in each season, with characteristic relationships shown in Fig. 1. Wool growth responses differed significantly between years in autumn but not in winter, spring or summer.

Autumn: In each experiment autumn pasture allowance significantly affected both current wool growth and subsequent wool growth in early winter. Based on the estimated relationships, the predicted effect of pasture allowance in autumn on annual clean fleece weight (carry-over effects included) varied between experiments from 0.33 (s.e. 0.10) kg to 1.09 (s.e. 0.19) kg.

Winter: Both \(\beta\) and \(a\) were lower than in the other seasons. Pasture allowance in early winter affected wool growth in late winter \((P<0.001)\) but not subsequently. The predicted effect of pasture allowance on clean fleece weight (carry-over effects included) was 0.12 (s.e. 0.04) kg. The proportion
of ewes with tender fleeces decreased as winter pasture allowance increased (P<0.001), from 80% on allowance 0.7 to 28% on allowance 2.2 kg DM/ewe/d.

Spring: During spring (lactation) $\beta$ (rate of response) was similar to that in summer and autumn, but $\eta$ (maximum potential) was substantially lower. The predicted effect of pasture allowance on wool growth during lactation was 0.37 (s.e. 0.04) kg.

Summer: In summer $\alpha$ was higher than in the other seasons. Pasture allowance had a predicted effect of 0.29 (s.e. 0.04) kg on clean wool grown during the 70 day experimental period.

The influence of season on both the responsiveness of wool growth to pasture allowance and its maximum potential suggests that the association between wool growth and liveweight gain will vary between seasons in both gradient and elevation, as shown in Fig. 2. The wool growth of ewes at maintenance was ranked summer > autumn > spring > winter, while for a given change in live weight the
associated change in wool growth was ranked summer > autumn > spring, winter. In each case the difference between summer and winter was approximately threefold.

Estimates of the efficiency of wool growth (g clean dry wool/kg apparent DM intake) were:

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer</td>
<td>12</td>
<td>8 - 17</td>
</tr>
<tr>
<td>Autumn</td>
<td>8</td>
<td>6 - 11</td>
</tr>
<tr>
<td>Winter</td>
<td>6</td>
<td>6 - 7</td>
</tr>
<tr>
<td>Spring</td>
<td>4</td>
<td>3 - 6</td>
</tr>
</tbody>
</table>

Except for the spring, these figures are consistent with the relationships in Fig. 1. In spring lactating ewes have high intakes, but nutrient partitioning favours milk production, decreasing the efficiency of wool growth. Non-lactating ewes in spring would have efficiencies comparable to the autumn figures (Corbett 1979).

These experiments were not designed to afford direct statistical comparisons between seasons and the results for each are not necessarily typical. Nevertheless, there were marked seasonal differences in:

(i) the maximum potential of wool growth and its responsiveness to increasing pasture allowance,
(ii) the association between wool growth and liveweight gain, and
(iii) the efficiency of wool growth.

The pattern observed is consistent with the strong interaction between season and the response of wool growth to intake described by Sumner (1979).

The results of the experiments described here have important implications for the year-round grazing management of longwooled ewe flocks. Two examples warrant emphasis:

(i) Feeding ewes above maintenance in winter is wasteful because wool growth is then slow and relatively unresponsive to better feeding. High winter allowances will improve staple strength but this practice is unlikely to be economic.

(ii) To maximise wool production ewe live weights should be kept as high as possible over summer-autumn. This objective is compatible with high ovulation rates.

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REFERENCES


