THE EFFECT OF AGE, SHEARING DATE AND REPRODUCTION ON SEASONAL WOOL GROWTH PATTERNS, STAPLE STRENGTH AND POSITION OF BREAK

L.G. BUTLER*, W.R. GIBSON and G.M. HEAD*

ADept of Primary Industry and Fisheries, PO Box 46, Kings Meadows, Tas. 7249
B’Scone”, PO Box 12, Perth, Tas. 7300

SUMMARY

Some management factors influencing staple strength were examined in a 3x2x2 factorial experiment with groups of 12 wethers (total 144) of each of 3 ages allocated to 1 of 2 management systems (ewe vs wether flock management) and shearing times (July vs November). An additional 12 mated ewes of each age group run with the ewe flock and July shorn provided information on the effect, confounded with gender, of reproduction. The animals were dyebanded and weighed approximately every 6 weeks. Wool growth rate was maximal in October/November and minimal about June. Older sheep had lower final liveweight and their wool was weaker (*P <0.01*). Staple strength was greater for July shorn than November shorn wethers (*P <0.01*) and for wethers run under ewe management than under wether management (*P < 0.01*). Ewe wool was not as strong as wether wool when run together, but was still in the sound range. For both final liveweight and staple strength there was an interaction between time of shearing and management system, the difference between July and November shearing being much greater in the ewe management flock than in the wether flock. This work demonstrates the potential of time of shearing and flock management to improve staple strength, and the difficulty in producing high quality wool under conditions of variable nutrition.

Keywords: staple strength, position of break, management system, reproduction, shearing date.

INTRODUCTION

Butler and Head (1992) provided evidence that staple strength of Tasmanian wools, although generally in the sound range, could be improved and that the position of break usually corresponded with wool grown in autumn-winter. Physiological and environmental stresses (Hansford 1987) increase fibre diameter variability along the wool staple and often reduce staple strength. Shearing at the point of break minimises the effect of this reduction in staple strength on processing performance (Arnold *et al.* 1984). However changing shearing time to improve this aspect of wool quality is not always an acceptable management option. This work aimed to examine the effects of some of the management factors (age, shearing date, flock husbandry and reproduction) that may influence wool growth and staple strength under Tasmanian conditions and which may be manipulated to improve staple strength.

MATERIALS AND METHODS

Five experimental groups of 36 sheep were drawn randomly from the commercial Polwarth ewe and wether flocks at “Scone”. Perth, Tasmania. They were identified by numbered ear tags and allocated back into the 2 flocks as follows. Group 1 (E/EF/JS) was drawn from a flock of about 2000 ewes (E) normally shorn in July (JS). They were returned to this ewe management flock (EF) and had no special treatment. The other 4 groups were drawn from a flock of about 2900 wethers (W) normally shorn in November: wethers of group 2 (W/EF/JS) were run with the ewe flock and July shorn; wethers of group 3 (W/EF/NS) were also run with the ewe flock but were shorn in November (NS); wethers of groups 4 (W/WF/NS) and 5 (W/WF/JS) remained with the wether management flock (WF) and were shorn in November and July respectively. Each group of 36 sheep consisted of 12 sheep of each of 3 ages (2, 3 and 4 years). Thus the 4 groups of wethers made up a 3x2x2 factorial design with 3 ages by 2 management systems (ewe vs wether management flock) by 2 shearing times (July vs November). In addition the single group of ewes could be compared with wethers to look for any effect of sex/pregnancy/lactation. Each group was monitored for 1 year from its respective shearing date (July or November). Treatment comparisons were examined by analysis of variance.

The property stocking rate overall was about 12 DSE/ha. The 2 flocks were rotationally grazed on ryegrass-clover pasture of varying quality on areas ranging from 15 to 50 ha. The wether flock was provided with supplementary pasture silage, potato chats, post-harvest potato areas (July), and oat straw at times of pasture shortage from July to September. In late September the rotation among paddocks was accelerated as the wether flock was used for rapid grazing of areas that had been sprayed with herbicide prior to cropping. The ewe flock grazed crops of oats and were fed pasture hay and oat grain during early
winter. From late July to lamb marking in October (71% lambing in both 1990 and 1991), the ewe flock was divided into sub-flocks of 100 to 300 and largely set stocked at about 10/ha for lambing in August. Lambs were weaned on 15 January 1991.

At about 6 week intervals, sheep were weighed and dyebands applied to estimate periodic wool growth. At shearing the dyebands were clipped, midside fleece samples were taken for staple measurements (length, strength, position of break (POB)), and fleece weights (excluding bellies) and liveweights recorded.

**RESULTS**

There were significant age differences for staple strength, final liveweight and liveweight change over the 12 months prior to shearing ($P < 0.01$). Generally, the older sheep had lower staple strength and liveweight. The treatment effects were generally similar across ages (no interaction effects).

<table>
<thead>
<tr>
<th>Group description</th>
<th>Final livewt (kg)</th>
<th>Livewt change$^A$ (kg)</th>
<th>GFW (kg)</th>
<th>Staple length (mm)</th>
<th>Staple strength (N/ktx)</th>
<th>Tip (%)</th>
<th>Middle (%)</th>
<th>Base (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (E/EF/JS)</td>
<td>42.8</td>
<td>6.9</td>
<td>3.4</td>
<td>104</td>
<td>36</td>
<td>47</td>
<td>37</td>
<td>16</td>
</tr>
<tr>
<td>2 (W/EF/JS)</td>
<td>48.9</td>
<td>10.7</td>
<td>3.4</td>
<td>113</td>
<td>43</td>
<td>27</td>
<td>47</td>
<td>25</td>
</tr>
<tr>
<td>3 (W/EF/NS)</td>
<td>56.5</td>
<td>11.9</td>
<td>3.4</td>
<td>114</td>
<td>27</td>
<td>0</td>
<td>68</td>
<td>31</td>
</tr>
<tr>
<td>4 (W/EF/JS)</td>
<td>48.4</td>
<td>8.7</td>
<td>3.6</td>
<td>107</td>
<td>21</td>
<td>0</td>
<td>2</td>
<td>98</td>
</tr>
<tr>
<td>5 (W/EF/JS)</td>
<td>46.7</td>
<td>8.2</td>
<td>3.4</td>
<td>104</td>
<td>30</td>
<td>80</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>5% LSD (1 vs 2)</td>
<td>2.04</td>
<td>1.4</td>
<td>0.26</td>
<td>5.4</td>
<td>3.9</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5% LSD (2 vs 3)</td>
<td>2.42</td>
<td>1.8</td>
<td>0.26</td>
<td>5.1</td>
<td>3.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

$^A$Over the 12 month period prior to shearing.

Therefore, for simplicity, the data in Table 1 for liveweight, fleece weight and staple measurements are pooled over ages. Wethers run with the ewe flock gained more weight. They also grew more wool than the ewes and their wool was longer and stronger ($P < 0.05$). The greasy fleece weight was greater for wethers run in the ewe flock than in the wether flock and for July shorn than November shorn animals ($P < 0.01$). Wool grown by the wethers run in the ewe flock was longer and stronger than that grown by those in the wether flock. July shorn fleeces were stronger than November shorn fleeces ($P < 0.01$). There was an interaction between time of shearing and management system for both final liveweight and staple strength ($P < 0.01$ and $P < 0.05$ respectively), the difference between July and November shearing being much greater in the ewe management flock than in the wether flock. Wool growth rates (Figure 1) were highest in late spring and lowest in autumn/early winter. The correlation coefficients of final liveweight and liveweight change with staple strength were -0.11 and -0.18 respectively ($P < 0.05$).

**DISCUSSION**

The outstanding feature of the data is the increase in staple strength when wethers were shorn in July (groups 2 and 5) instead of November (groups 3 and 4) regardless of whether they were subject to ewe or wether flock husbandry. This is similar to the work of Arnold and Gordon (1973) in WA who reported maximal tenderness occurring with November-December shearing and minimal tenderness for wool shorn in April-May. The increase in staple strength in this work is probably due to the July shearing being close to the winter feed deficit. Therefore there is potential for farm managers to manipulate their wool quality (in terms of staple strength) and potential returns, provided a change in shearing date is acceptable to their management program. Choice of best shearing date could readily be made by farm managers on the basis of staple measurements of wool from groups of their own sheep shorn at various potentially acceptable times, but otherwise treated identically to the rest of their flock. The present work indicates that gains of the order of 12 N/ktx might be made in this way.
Staple strength can also be improved by changes in flock husbandry. For example, in the present work, wethers run in the ewe flock (groups 2 and 3) had stronger staples than equivalent wethers run in the wether flock (groups 4 and 5). This was so regardless of whether they were shorn in July or November and was presumably due to the more favourable husbandry applied to the ewe flock. Only the wether flock was subjected to sudden changes in feed and, for example, some of these sheep showed scouring after being moved to a post-harvest potato area. Brown (1971) has suggested that such changes in feed may cause breaks in the wool. The simple option of altering shearing date, mentioned above, is not always practicable and, in this event, improvements in staple strength may require the more onerous adjustment of feed supply or other aspects of husbandry. A higher level of management skill may be required. The gains can be substantial, of the order of 10 N/ktx in the present trial. Further, such improvements would not include the partially cosmetic nature of the gains due to shifting shearing date (as discussed below).

The improvement in measured strength gained by moving shearing from November to July presumably arose because, at least in a substantial proportion of wethers, the point of weakness was now so near the tip of the staple that the weak point was clamped during the measurement, thus forcing the break to occur at some other, stronger point. This is supported by the increased proportion of mid-staple breaks recorded for the July shorn, compared with the November shorn, wethers. The improvement was most marked in the wethers run with the ewe flock rather than in those run with the wether flock (significant shearing time x management system interaction). Perhaps under wether management conditions, the weakest point occurred less consistently in the clamped extremity of the staples because the sudden changes in nutrition were occurring somewhat later than the nutritional trough under ewe management conditions.

The clear shift in position of break produced by the change of shearing time from November to July resembles the result of Arnold et al. (1984) who showed that shearing ewes just prior to lambing moved the finest point of the staple to the tip or base. This increased the measured staple strength and would be expected to improve the wool’s processing performance (Andrews 1979). However, in the absence of any genuine improvement in strength of the ends of the staples (whose weakness is masked in the measuring process), the expected improvement in hauteur of the wool top is likely to be accompanied by greater wastage due to an increase in short fibre production in the top (< 30 mm), and/or in noil. Such wastage would reduce the value per kg due to the increased hauteur.

The observation that the wool of ewes was not as strong as that of wethers run and shorn with the ewe flock (groups 1 and 2) is consistent with previous work (Corbett 1979) showing a reduction in wool growth due to pregnancy and lactation. This makes the reasonable assumption that the selected EWES were a representative sample of the whole ewe flock, comprised of ewes of a range of reproductive states,
and thus the average measurements of their fleeces were representative of the clip from the whole ewe mob. Nevertheless, even the ewes in the present trial had sound (> 30 N/ktex) wool. Thus it appears that the demands of pregnancy and lactation do not raise an insurmountable barrier to producing sound wool, even if they coincide with the season of low pasture growth as they did in this ewe flock.

There was no specific weak point identified in the wool grown by ewes (July shorn). This variable POB is consistent with Thornberry et al. (1988) who attributed it to varied responses by individual ewes to pregnancy and lactation.

The seasonal wool growth pattern (highest in late spring and lowest in autumn/early winter; Figure 1) matched the annual cycle of pasture availability and was consistent with the previous observations of commercial flocks in Tasmania (Butler and Head 1992). Treatment (age or shearing date or management flock) does not appear to affect this pattern of rate of wool growth described in terms of staple length growth (not necessarily in terms of mass).

This work confirms that time of shearing is a useful management tool for improving staple strength, but also indicates that other management strategies should be considered. Further it shows that reproduction is no barrier to producing sound ewe wool in Tasmania, at least if shearing time is suitably chosen in relation to the environmental conditions. More work is needed to elucidate the influence of reproduction and sudden change in feed.

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REFERENCES


