SEASONAL WOOL GROWTH AND THE STAPLE STRENGTH OF WOOL FROM NINE TASMANIAN FLOCKS

L. G. BUTLER and G. M. HEAD

Dept of Primary Industry, PO Box 180, Kings Meadows, Tas. 7249.

SUMMARY

Wool growth rates and liveweight were monitored on about 20 animals per flock in nine Tasmanian flocks. Position of break in the staple generally occurred during the period of lowest fleece growth in autumn and winter while the peak growth rate was in spring. The pattern of liveweight change was similar to that for wool growth rate. Staple strength was generally in the sound range (>30 N/ktex) but always less than the strength for maximum processing performance (60 N/ktex). Significant differences ($P<0.05$) exist between flocks in liveweight, greasy fleece weight, staple strength and length. Therefore there appears to be potential for improving the strength of 'sound' wool in Tasmania, leading to better processing performance.

Keywords: seasonal wool growth, staple strength, liveweight change.

INTRODUCTION

Wool production, fibre growth rate and fibre diameter vary throughout the year due to combinations of many factors (Birrell 198 1) including the inherent wool growth rhythm due to photoperiod (Hutchinson 1976), seasonal management and feed supply, changes in physiological status such as pregnancy and lactation, occurrence of disease and parasite infections.

Staple strength appears to be related mainly to seasonal variation in average fibre diameter along the staple, diameter generally being least at the point of break. However, Hansford and Kennedy (1988) suggest that it is the rate of change of fibre diameter along the staple that determines staple strength while Ritchie and Ralph (1990) concluded that most of the variation in staple strength can be explained by the coefficient of variation in fibre diameter within a sample irrespective of fibre diameter. Shearing date largely determines the position of break (Bigham *et al.* 1983).

There is little information on seasonal wool growth for the common sheep breeds in the Tasmanian environment or on the management factors influencing staple strength. When sheep were taken from improved pastures to bush country (D.S. Thompson unpublished) the nutritional stress reduced the fibre diameter of super-fine Merinos by 2-3 µm compared with a reduction of 10-14 µm in Corriedales. In Elliottdales in Tasmania, spring/summer wool growth was about twice that of winter growth (Reid and Sides 1984).

The current work aimed to provide information on seasonal wool growth and liveweight patterns in Tasmania and relate these to staple strength and position of break.

MATERIALS AND METHODS

A sample of about 20 animals from 9 flocks (mostly Polwarth hoggets 12-15 months of age at commencement; see Table 1) from various regions of Tasmania were identified with eartags and monitored for live weight and periodic wool growth for one 12 month fleece growth period during 1986/87. Flock 1, split into 2 treatment groups, was monitored for an additional year. Flock 9 ewes were from 4 treatments in a large grazing experiment.

Dyebands were applied to the mid-back approximately every 2 months after shearing. The sheep were weighed at each dyebanding. At shearing, the dyebands were removed, the fleece weighed and a midside sample taken for objective testing of staple length and strength. Fleece weights could not be obtained for 2 of the flocks.

Seasonal wool growth was calculated as the percentage of the staple length grown per day during each measurement period. Seasonal liveweight patterns were assessed as the percentage change from each previous live weight record. The production data were analysed by ANOVA (Statgraphics) and a smooth curve fitted to the seasonal data by resistant smoothing (Minitab).

RESULTS

Mean greasy fleece weights and liveweights (averaged over all periods) for each flock are summarised in Table 1, together with staple length and strength. There were significant differences between flocks for staple length and strength ($P<0.05$). Average seasonal wool growth and live weight changes are illustrated in Fig. 1. The number of flocks (N) from which each average is derived is given together with the position of break for each flock. Vertical bars represent standard errors of the means (the relative sizes are due to differences in scale of the 2 curves). Peak wool production occurred in spring with the trough in autumn and winter. The break generally occurred during this trough. The seasonal live weight pattern was similar to that for wool.

Table 1. Flock, animal and wool growth characteristics in Merinos (Mer), Polwarths (Pol), Comebacks (Cbk), and Border Leicesters (BL)

Superscripts which differ within columns denote significant differences (P<0.05)

Flock details	Average liveweight (kg)	Greasy fleece weight (kg)	Staple length (mm)	Staple strength (N/ktex)
1. Mer wether				
Year 1	39de	–	86a	44def
	39de		90ab	45efg
Year 2	42f	3.6b	97bc	43def
	48h	4.6d	92ab	43de
2. Pol wether hoggets	38cd	3.9bc	128ij	36bc
3. Cbk ewe hoggets	37c	3.9bc	123hi	43cef
4. Pol ewe hoggets	32b		100cd	46efg
5. BL cross ewe hoggets	50h	3.9bc	132j	18a
6. Pol ewe hoggets	43g	4.8d	104de	48fgh
7. Pol ewe hoggets	28a	3.9bc	109ef	35b
8. Pol ewe hoggets	36c	3.9bc	104de	51ghi
9. Pol adult ewe hoggets	55i	4.1c	117gh	53hi
	54i	4.1c	113fg	50fghi
	55i	4.1c	114fg	56i
	41ef	3.0a	95bc	37bcd
l.s.d. (P<9,95)	2.1	0.34		

DISCUSSION

This work involves several Merino based breeds (mainly the Polwarth, a three-quarter Saxon Merino one quarter Lincoln stabilised cross) and a crossbred (Table 1) in a variety of Tasmanian environments and with a spread of shearing dates. To attempt a valid assessment of seasonal production, wool growth rate data and live weight change were expressed as percentages. In the case of live weight, the change was expressed as a percentage of the previous record. This is because we consider that the degree of liveweight change is likely to be involved in determining staple strength through the relationship of seasonal liveweight change with seasonal change in intake of digestible organic matter (Doney and Eadie 1967) and its effect on wool growth. It must be noted, however, that the number of assessments of seasonal production for each period are limited, particularly for the liveweight change data (Fig. 1).

Peak wool growth rate was about 25% greater (Fig. 1) than that during the trough period. This amplitude of seasonal production approximately equates with that reported for the Corriedale at high stocking rates (Birrell 1981) but is low compared with New Zealand reports such as Bigham *et al.* (1978) who found summer midside production to be 2.7 to 3.3 times winter production for various British breeds.

As would be expected in Merino based sheep, the seasonal wool growth cycle coincides with rainfall and feed availability/quality patterns. The position of break generally occurred during a period of reduced woolgrowth and following a high rate of liveweight change (Fig. 1) when the fibre diameter was presumably changing rapidly (Hansford and Kennedy 1988) and the coefficient of variation of fibre diameter was presumably high (Ritchie and Ralph 1990).

Some flock owners identified a management event which may have influenced the position of break. In particular, the position of break of the weak wool grown by the crossbred adult ewe flock coincided almost exactly with the starting date of lambing which occurred during a period of below average rainfall. Other coinciding stresses identified included the break of season and short term feed stress. When each position of break is matched with its district rainfall pattern it generally occurred during, or immediately following, a period of average or below average rainfall.

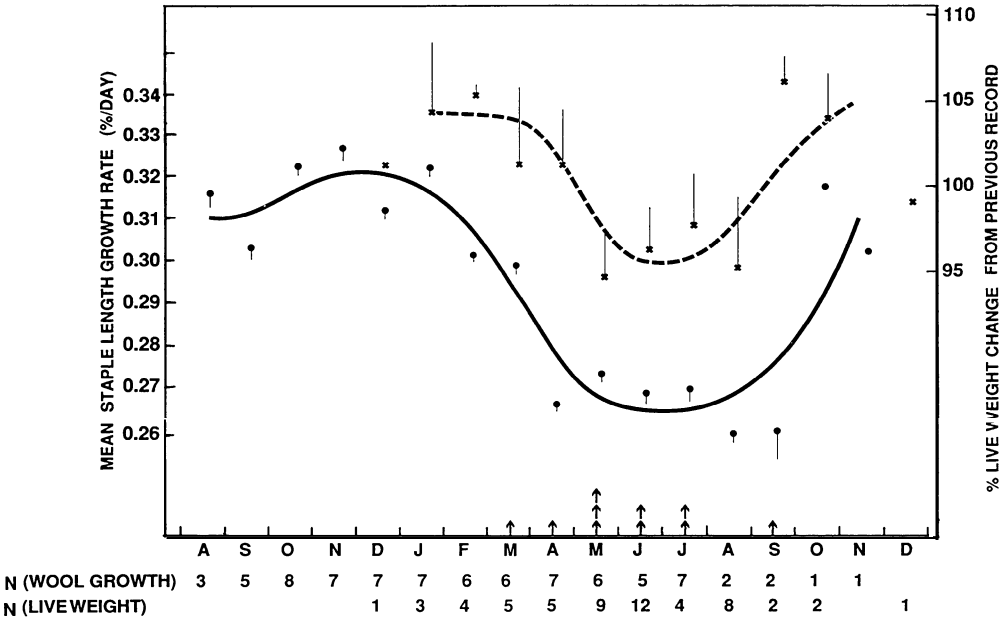

Fig. 1. Seasonal wool growth rates (●), liveweight changes (x) and time at which the staple break occurred (↑). Vertical bars represent s.e.m. and *N* is the number of flocks from which each mean was derived

Significant differences in staple length and strength were identified between flocks (Table 1), which is not surprising given the variety of breeds and environments involved. No pattern of staple strength and environment could be identified. Except for wool grown by the crossbred ewe flock, staple strength was in the 'sound' range (>30 N/ktex) for each flock, but less than the 60 N/ktex (Rottenbury *et al.* 1986) required for optimal processing performance. Within the limits of these short term observations, there appears to be potential to improve the staple strength of 'sound' wool in Tasmania. In practice, monitoring of live weight change during the trough of wool production may provide a warning of potential loss of staple strength but further research is required.

Although staple length is generally related, within flocks, to greasy fleece weight there is no evidence of such a relationship in our data. The explanation may be that these data involve between flock differences, not between animal within flock differences. Further, the within flock regressions are based on small numbers.

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