

## **CHARACTERISTICS OF FLEECES OF FINE-WOOL MERINO WEANERS SHORN AT EITHER 9- OR 12-MONTHS OF AGE**

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### **SUMMARY**

The wool of high producing, fine-wool sheep can be discounted for over-length staple length if shorn on an annual cycle. This paper contains data on fleece characteristics (including length, strength and position of break) from the initial shearing in a project investigating different shearing intervals. Increases in both clean fleece weight and staple length indicate that wool growth between 9 and 12 months of age was proportionately greater than during the first 9 months. The mean fibre diameter of the 2 groups of fleeces (15.9 and 16.7  $\mu\text{m}$  for fleeces shorn at 9- and 12-month, respectively) reflected the higher wool growth rates. However, staple strength of the 12-month shorn group was lower than that of the 9-month group (30.5 v. 36.5 N/ktex) and the mean relative position of the break moved closer to the tip (28.5 v. 33.9 %).

*Keywords:* staple length, staple strength

### **INTRODUCTION**

In recent years, many commercial woolgrowers have moved to reduce the fibre diameter of their wool clip, and benefit from the higher premiums being paid for lower fibre diameter wools. However, many of these clips are being discounted due to their long staple, the magnitude increasing with staple length and, hence, can be substantial (e.g. 381 cent/kg clean for 110 mm v. 85 mm staple length wool of 18  $\mu\text{m}$  in 2002/3; AWI Pricemaker Statistics Report). Traditionally, fine wool flocks have had a staple length of 70-80 mm for 12 months growth. Improved flocks in different environments are producing fine wool with staple lengths in excess of 90 mm at hogget and 2-year-old shearings (12 month growth). For example, the Trangie QPLUS selection lines have shown increased staple length of medium wools selected for reduced fibre diameter compared with traditional fine wool sheep (Taylor *et al.* 2000). Similarly, reports in traditional fine wool production areas suggest concern over long staples for superfine wools (J. McLaren, *pers. comm.*).

The problem is most pronounced in young sheep, which produce finer fleeces than adults (Atkins and Mortimer 1987). Wool processors discount fine long staple length wool because they are concerned about entanglement and fibre breakages during processing. A shorter shearing interval is a means of reducing staple length of the fleece. Limited research data make it hard to estimate the effect that the interaction of different shearing times with seasonal conditions will have on other important fleece characteristics. The wool growing regions of New South Wales (NSW) vary climatically, from southern Mediterranean regions through to northern summer-dominant rainfall areas. Thus, the effects of varying shearing times and intervals on fleece value may vary on a regional basis.

A project within the Australian Sheep Industry CRC is investigating the consequences of altering shearing interval from the traditional 12 months. The project aims to evaluate the effect of varying shearing interval on wool quality and commercial returns in fine wool sheep (<20  $\mu\text{m}$ ) and subsequently develop a management strategy that takes advantage of changed shearing intervals for young sheep to optimise returns. The project is monitoring fine wool flocks on each of the northern tablelands, central tablelands and south west slopes of NSW. This report compares the fleeces shorn at 9 and 12 months of age of weaner wether sheep from the fine wool flock of the University of Sydney (Orange), located on the central tablelands of NSW, the first of the flocks for which this information is available.

### **MATERIALS AND METHODS**

#### *Sheep and their management*

The staple lengths of fleeces from the University flock average 120 mm for 12-month wool growth in hogget and adult sheep with mean greasy fleece weights of 5.0 and 5.5 kg, respectively, and mean

fibre diameters 17.4 and 19.1  $\mu\text{m}$ . At 3 months of age, 100 wether weaner sheep were selected from the 2002-drop lambs, and 50 weaners were allocated to each of 2 groups. The weaners were born in July/August, and marked in late August, with weaning occurring in early December. An anthelmintic drench was administered as indicated by regular worm counts. Both groups of wether weaners were grazed together under a cell grazing system.

The liveweight of each wether was recorded at 3-monthly intervals. The 2 groups were first shorn at 9- and 12-months of age (in April and July, respectively). At shearing, a mid-side sample was collected from each fleece and the skirted greasy fleeces were weighed, identified and individually stored until displayed individually for a commercial wool buyer to type and identify any conditional AWEX qualifiers. The mid-side samples were sent to a commercial laboratory for measurement of yield, fibre diameter and its variation, staple length and staple strength of individual fleeces. A combined measurement of vegetable matter was made on a bulked sample obtained from the individual mid-side samples. The information on staple length, staple strength, fibre diameter, adjusted percentage of middle breaks and vegetable matter was used to predict hauteur of individual fleeces using the TEAM formula (Douglas 1989).

*Statistical analyses*

Differences between the shearing groups in mean washed yield, fibre diameter and its variation, staple strength, point of break and the proportion of tip, mid-staple and base of staple breaks were evaluated using the student's t-test (Snedecor and Cochran 1967). The mean clean fleece weight, staple length and predicted hauteur of fleeces shorn at 12-months of age were similarly compared with 4/3 of the mean of the fleeces shorn at 9-months of age.

**RESULTS**

The seasonal conditions were very dry, resulting in very little feed over spring, summer and early in the following autumn. Some late autumn rain saw an increase in herbage mass, before a decline with the colder temperatures of winter. Liveweight gain from October to April ranged from 4 to 7 kg. The average liveweight gain from April to July increased to an overall gain of 9.1 kg.

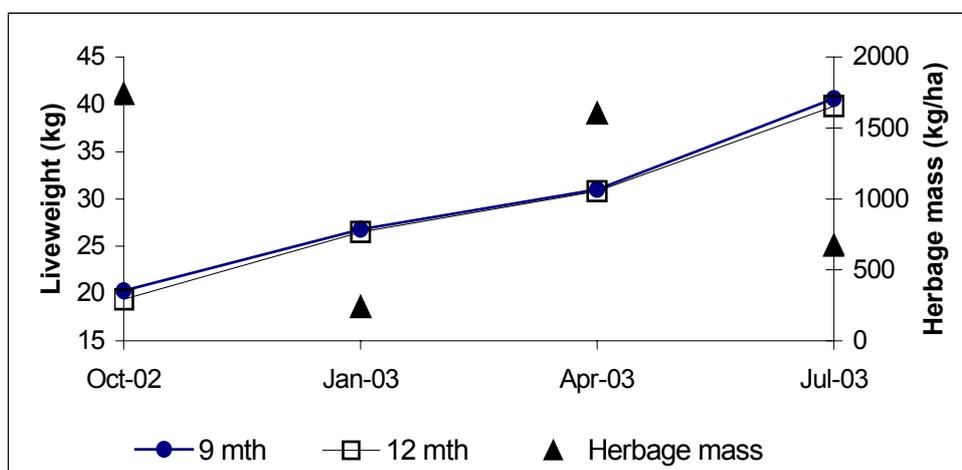


Figure 1. Average liveweights of the 2 groups of sheep, plotted with available herbage mass.

Table 1. Clean fleece weight, staple length and predicted hauteur of fleeces shorn at 9 and 12 months of age in a flock of fine-wool Merino weaner wethers.

	9 Month		12 Month		Actual diff	Expected diff	
	Mean	s.d.	Mean	s.d.			
Clean fleece wt (kg)	1.54	0.23	2.40	0.33	0.87	0.51	**
Staple length (mm)	81.0	8.3	115.2	9.3	34.2	27.0	**
Hauteur (mm)	59.5	13.5	76.3	8.20	16.8	19.8	ns

<sup>ns</sup>not significant, <sup>\*\*</sup>P<0.01

Differences in clean fleece weight and staple length indicate that wool growth between 9 and 12 months of age was proportionately greater than growth during the first 9 months. The increases in the 12-month fleeces were much greater than would be expected had the increase merely reflected the

longer growing period. The clean fleece weight of weaners shorn at 12 months of age was 55% heavier than the 1.54 kg of fleeces shorn at 9 months (Table 1). This trend was also evident in the staple length, with the 12-month fleeces being 42% longer than the 9-month fleeces (Table 1).

The proportionately higher growth rates between 9 and 12 months increased the fibre diameter of the whole fleece from 15.9  $\mu\text{m}$  to 16.7  $\mu\text{m}$  (Table 2). There was also a small difference in clean yield, with the fleeces from the 12-month fleeces being 2.3% higher. The vegetable matter (seed) in the fleeces of both the 9- and 12-month fleeces was low (0.3 and 0.2%, respectively).

**Table 2. Fibre diameter and its variation, scoured yield, staple strength and point of break of fleeces shorn at 9 and 12 months of age in a flock of fine-wool Merino weaner wethers.**

	9 Month		12 Month		Actual Diff	
	Mean	s.d.	Mean	s.d.		
Yield (%)	73.5	3.5	75.8	2.8	2.3	**
Fibre diameter ( $\mu\text{m}$ )	15.9	0.9	16.7	0.9	0.8	**
FD CV (%)	19.6	2.1	18.5	2.0		*
Staple strength (N/ktex)	36.5	9.7	30.5	7.6	6.0	**
Point of break (%)	33.9	13.1	28.8	11.5	5.1	*
% Breaks in:						
Tip	63.5	41.5	71.6	33.8		ns
Mid	34.3	40.6	27.2	33.1		ns
Base	2.2	11.5	1.2	4.8		ns

<sup>ns</sup> not significant, \*  $P < 0.05$ , \*\*  $P < 0.01$

The 16.8 mm increase in TEAM predicted hauteur did not reflect the full increase in staple length. The additional 3 months of wool growth was associated with a 6 N/ktex reduction in staple strength, although the point of break was predominately in the tip and mid-staple in both shearing groups. There was little variation in style between the fleeces, with 100 and 96% being assessed as best topmakers within the 9- and 12-month shorn fleeces, respectively.

## DISCUSSION

The results of the shearing confirm that altering shearing interval to manipulate staple length (and clean fleece weight) can affect other important quality traits such as fibre diameter, staple strength and position of break. The magnitude of increases in both staple length and clean fleece weight between the 9- and 12-months shearings is indicative of seasonal and/or age effects over and above that expected from the longer growth period *per se*. Although yields of the 12-month fleeces were significantly higher, the size of the yield difference could only have contributed to 20% of the difference between the expected and observed increase in clean fleece weight.

Despite the earlier shearing at 9 months, some fleeces from this group were still above the optimal length, with staple length ranging from 68 to 98 mm. All fleeces from the 12-month group were above the optimal staple length. Monitoring staple length to determine an appropriate shearing time is an alternative to fixed fleece growth intervals, and to allow for seasonal variation in wool growth.

The decline in staple strength from the 9-month (36.5 N/ktex) to the 12-month (30.5 N/ktex) is likely to reflect changes in the linear density of the staple (Schlink 2000) that are associated with the increased fibre diameter of fibre growth over the last 3 months of the 12-month fleeces. Although there was a significant shift in the point of break (as a percentage of staple length), the change in the proportion of mid-breaks (from 34.3% mid breaks in the 9-month fleeces to 27.2% in the 12-month fleeces) was relatively small. The actual distance of the point of break from the staple tip did not change. The change in hauteur can be attributed solely to the increase in staple length.

Depending on the fibre diameter of adult sheep (which tend to be broader than young sheep), discounts for over-length wool may not be sufficient to justify shearing more frequently than 12-monthly. The fourth 9-monthly shearing would bring the young sheep back in line with 12-monthly shorn adults.

There are likely to be managerial problems with fitting more frequent shearing intervals into a 12-month management cycle. For example, a producer who begins a 9-month shearing cycle of weaners in June will find himself shearing in March and December of the following year, and September the

third year. Over a number of lamb drops, 4 separate shearings would be required annually. A less prescriptive strategy would be to monitor staple length growth of all age/sex groups and select shearing times by optimising expected returns based on numbers shorn, staple length and other price-sensitive traits.

The logistics of arranging traditional annual events within the wool producing enterprise such as joining, lambing, lamb marking and weaning around continually changing shearing dates may prove difficult. Other factors would need to be taken into consideration on an individual, seasonal and/or geographical basis. For example, many producers select the annual shearing date as a means of controlling vegetable matter in the fleece and/or restricting the point of break to the tip or base of the staple. Others may be reluctant to shear in summer because of the increased risk of heat stress and sunburn for sheep off shears at this time in many regions. Conflicts in priorities between enterprises within mixed farming systems would also need to be resolved. The extra income derived from avoiding penalties for overlong wool would need to more than cover the costs (including time, labour and monetary terms) of an extra shearing.

In conclusion, these results demonstrate that predicting the effects on wool production and quality traits of altering shearing interval require more than proportional extrapolation. Other factors that will impact on the fleece and require consideration in predicting the effects of altering shearing interval/time of shearing include seasonal variability and age differences in components of wool growth.

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