Fleece weight and wool characteristics of Merino ewes screened into a superfine selection flock

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ABSTRACT

The fleeces of 30,000 ewe hoggets from 12 Merino flocks were sampled and the mean fibre diameter and clean fleece weight were measured in 1987 and 1988 and the best were selected to establish a superfine joint venture (SFJV) flock of 307 breeding ewes. The breeding objective is to achieve mean fibre diameter below 17 μm in the adult fleece while maintaining fleece weight and live weight. Concomitantly, a random control flock (RC) of 101 ewes was constituted from the flocks screened. Both flocks are farmed on MAF Technology's high country station at Tara Hills, Omarama.

The screened SFJV flock has significantly lower live weight ($p<0.01$), greasy fleece weight ($p<0.05$), loose wool bulk ($p<0.001$) and mean fibre diameter by 2 μm ($p<0.001$). Staple length ($P<0.001$), staple crimp ($P<0.05$) and yield ($P<0.05$) were significantly higher for the SFJV flock compared with the RC flock. Wool returns of SFJV flock were \$81.78/hd and \$107/hd vs \$62.21/hd and \$47.00/hd for RC flock in 1988 and 1989 shearing respectively.

Keywords Merino; fibre diameter; specialty; sheep breeding; wool; characteristics; selection

INTRODUCTION

Responses to selection for fleece weight and various fleece traits in Australian Merinos has been documented (Turner, 1977; McGuirk, 1983). However, there is little information on the effect of intensive screening for fibre fineness in commercial flocks and subsequent selection responses. A superfine joint venture Merino breeding project was set up at Tara Hills High Country Research Station between MAF Technology and 10 South Island Merino breeders in 1987. The breeding objective is to breed a line with a mean fibre diameter of 17 μm or less as adults whilst maintaining fleece weight and live weight. The project also aims to promote new applications of superfine wool which has characteristics similar to cashmere. In this paper the establishment of the flocks is described. Live weights, wool production and wool characteristics for 1989 are also presented.

MATERIALS AND METHODS

Animal Selection

In 1987 the fleeces of 15,000 ewe hoggets from 12 high country Merino flocks were sampled and the mean fibre diameter and clean fleece weight were recorded. The finest 3-5% of each flock were re-tested for mean fibre diameter at 15-16 months, prior to the final selection of the top 1% of ewes with low mean fibre diameter. These 155 ewes formed the Superfine Joint Venture (SFJV) flock which was established at Tara Hills. The same screening procedure was repeated in the following year when the SFJV flock was expanded to 307 breeding ewes. Concomitantly, a random control (RC) flock of 50 ewes was constituted from the flocks screened in 1987 and then expanded to 101 ewes in the following year. Top superfine Merino sires from both New Zealand and Australia were used in the 1988 and 1989 matings.

Clip Preparation

Prior to shearing in 1988 and 1989, midside patch wool was clipped from SFJV and control flock ewes and mean fibre diameter was determined. Fleeces were classed into lines according to measured fibre diameter, tenderness, length, discolouration and visual faults.

Each fleece line was core tested and grab sampled for 'sale by sample' and lots. The fleeces of

TABLE 1 Mean liveweights, fleece weights and wool characteristics of screened superfine Merino ewes and random control Merino ewes.

Measurements	Control flock	Superfine flock	SED	Significance between means
Flock size (n)	101	307		
Liveweight (kg)	48.6	46.9	0.64	**
Greasy fleece weight (kg)	3.85	3.68	0.07	*
Clean fleece weight (kg)	2.87	2.79	0.05	NS
Yield (%)	74.93	76.12	0.46	*
Staple Length (mm)	66.45	72.89	1.08	***
Staple Strength (N/ktex)	27.84	29.13	0.83	NS
Position of break (%)	54.06	55.72	1.21	NS
Staple Crimp (per/cm)	6.07	6.45	0.09	*
Fibre diameter (μm)	19.8	17.8	0.10	***
Loose Wool bulk (cm3/g)	30.61	28.78	0.32	***
Resilience (cm3/g)	11.56	11.45	0.16	NS
Brightness (Y)	67.96	68.23	0.65	NS
Yellowness (Y-Z)	0.92	0.98	0.11	NS

* P<0.05, ** P<0.01, *** P<0.001, NS: Not Significant

TABLE 2 Correlation of fleece weights and wool characteristics

	Clean fleece (CFW)	Fibre diameter (FD)	Staple Crimp (SC)	Staple Length (SL)	Bulk	Resilience (Res)
GFW	0.95***	0.32***	-0.31***	0.41***	-0.12*	-0.05 NS
CFW		0.35***	-0.35***	0.41***	-0.13*	-0.02 NS
FD			-0.18***	0.14***	0.08 NS	0.07 NS
SC				-0.15***	0.37***	0.11*
SL					-0.06 NS	0.03 NS
Bulk						0.80***

* P<0.05, ** P<0.01, *** P<0.001, NS: Not Significant

experimental flocks were sold at auction and approximate returns per head were partitioned and then compared with the random control flock.

Wool Measurement

Fleeces from the 1988 shearing were analysed for fleece weight, yield and fibre diameter for classification purposes, while fleeces from the 1989 shearing were analysed for greasy fleece weight, clean fleece weight, yield, mean fibre diameter, colour, loose wool bulk, resilience, staple strength, position of break, staple length and crimp.

Mean fibre diameter was determined by the airflow method (IWTO). Staple strength and position of break were measured on five staples per fleece sample using staple breaker (Agritest Ltd, Australia), while staple length and staple crimp were measured on the same five staples. Tristimulus scoured wool colour in brightness (Y), yellowness (Y-Z) (Bigham *et al.*, 1984), loose wool bulk and resilience (WRONZ Bulkometer)

were also measured on conditioned wool (65 ± 2% r.h. and 20 ± 2°C).

A linear model that contained selection flock and age of ewe, and the interaction between these factors was fitted (by least squares) to the data.

RESULTS AND DISCUSSION

Live weights, fleece weights and wool characteristics are summarised in Table 1. The screened SFJV flock had significantly lower live weight (P<0.01), greasy fleece weight (P<0.05) and loose wool bulk (P<0.001) compared with the RC flock. Staple length (P<0.001), staple crimp (P<0.05) and yield (P<0.05) were significantly higher for the SFJV flock compared with the RC flock. The SFJV flock had a lower average fibre diameter by 2 μm (P<0.001). No significant differences were measured for clean fleece weight, staple strength, position of break, resilience, brightness (Y) and yellowness (Y-Z).

The phenotypic correlations between fleece weight and wool characteristics are presented in Table 2. Greasy fleece weight and clean fleece weight were highly correlated (P<0.001) and fleece weight was positively correlated with fibre diameter and staple length, but negatively correlated with staple crimp, bulk and resilience. Staple crimp was negatively correlated with staple length and positively correlated with bulk and resilience.

The initial screened SFJV flock in 1988 had an average fibre diameter of 17.9 μm and the RC control flock 19.6 μm. The wool sale results indicate that in 1988 the SFJV flock clean fleeces weighed 180 g/hd less than the RC flock. Wool returns in 1988 were $81.78/hd for SFJV flock (n=146 fleeces) vs $62.21/hd for the RC flock (n=50 fleeces), - an advantage of $19.57/hd for the SFJV flock. In the expanded flock in 1989 the overall fibre diameter of SFJV was maintained, and the difference from the RC flock was 2 μm. Clean fleece weight in the SFJV flock was only 80g/hd less than the control flock. Although Merino wool prices declined at the 1989/1990 wool sale, the per head return was $107 (n=306) which was a $60 above the RC flock (n=101).

In future the superfine Merino breeding project at the Tara Hills High Country Research Station will enable the measurement of the selection response for low fibre diameter, subsequent genetic gains and the effect on other correlated characteristics. In conjunction with the main breeding project, a progeny test scheme for superfine Merino sires and comparative superfine wool processing trial are being initiated.

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