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Evaluation of genetically fine and fine x strong wool Merinos on irrigated pastures

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Introduction

The premium price paid for fine wool from 1993 to 1995 (Purvis 1995), emphasizes the importance of genetic fine wool for utilization in the apparel market. It is normally accepted that fibre diameter can be reduced genetically by 1 to 2μm in 10 years by within flock selection. This period can be shortened by mating with superfine wool rams (depending on the mean fibre diameter of the ewe flock). Conventional wisdom warns against the mating of extremes, as it is alleged to cause increased variation of fibre diameter in the offspring. Olivier *et al*. (1993) showed that mating animals with extreme fibre diameters (29 μm and 20 μm) did not increase the variance of fibre diameter above the expected mid-parent value. The purpose of this study was to investigate the effects of extreme mating and the upgrading of strong wool ewes with fine wool rams on production traits, as well as some subjectively scored traits.

Materials and Methods

During 1988 a genetic fine wool flock (F) of 520 ewes, bought from 32 breeders was established at the Cradock experimental farm. These ewes were identified on the basis of the fineness of their clips relative to the production area. The ewes were mated to 4 fine wool rams imported from Australia. Ram and ewe replacements were subsequently selected on fibre diameter, live weight and conformation from within the flock. At the same time 50 ewes (FxS) with a mean fibre diameter of 29 μm were selected from the Grootfontein Merino stud. These ewes were also mated to the same Australian rams for the first two years. They were subsequently mated to the rams used in the F strain. Ewe replacements were selected from within the strain. All animals and their progeny were managed as one flock on irrigated pastures. All progeny were shorn at approximately 6 months of age and fibre diameter (MFD-6) was recorded. At 14 to 16 months of age (two-tooth stage) all animals were shorn again. Body weight (BW), clean fleece weight (CFW), mean fibre diameter (MFD), staple length (SL), crimps per 25mm (CR), clean yield percentage (CY), coefficient of variation of MFD (CV) and the comfort factor (CF; % fibres under 30 μm) were recorded. Before shearing, the animals were also scored on a 50 point linear scale for wool quality (evenness of crimp), variation in crimps over the fleece, amount of yolk, size of staples and fullness of belly and points. They were also scored for the conformation traits, squareness of the hocks and overall conformation. The scoring system was described by Cloete *et al*. (1992). Data recorded from the 1990 to 1996 birth years (2100 records for F and 326 for FxS) were analyzed using the GLM procedure of SAS (1991). Data for CV and CF were available from 1993 to 1996. The fixed effects included in the analysis were year of birth, generation, genetic group (strain), sex and birth type.

Results and Discussion

The average two-tooth body weight was 62.9±0.18 for F progeny and 63.9±0.37 for FxS progeny. This is well above the industry average of 43 kg for ewes and 56 kg for rams in South African Merinos (Olivier *et al*., 1998). This is clearly the effect of the high level of nutrition under which these animals were kept in an attempt to maximize differences in MFD between animals. The differences in production at two-tooth age between the different generations of the two strains are presented in Table 1. In all the objectively measured traits, significant differences ($P < 0.01$) were found between the F and FxS strains in the F1 and F2 generations. The exceptions were BW and SL where differences ($P < 0.01$) were found only in the F1 generation, and CR where differences ($P < 0.01$) were found in all three generations. The fibre diameter of the F1 progeny of the FxS strain at two-tooth age was 9.0 % stronger than that of F strain contemporaries. In the F2 generation, this difference was reduced to 4.0%, while no strain difference was discernable in the F3 generation. The range in MFD (R-MFD = strongest 1% - finest 1%) was 5.0 μm in the F1 progeny of the F strain, compared to the 7.4 μm of FxS contemporaries. The R-MFD for the F2 and F3 progeny of F was 4.6 and 4.8 micron respectively compared to the 6.1 and 5.7 μm of the F2 and F3 contemporaries of the FxS strain. It seems that the within flock variation in MFD was larger in FxS animals compared to their F contemporaries. The decline in MFD was accompanied by a reduction (P < 0.01) in CFW. The F1 generation of the FxS strain produced 6.1 kg of clean wool, in comparison with 4.9 kg of the F strain. In the F3 progeny, CFW was similar for the two strains at 4.5kg per head. The CV of the FxS strain was higher (P < 0.01) than that of the F strain in the first two generations. The difference amounted to 9.7% in the F1 progeny, and to 6.3% in the F3 progeny. Corresponding strain differences were found for CF.

Table 1 The least squares means (SE) for live-weight and the objective fleece traits for the two strains of animals according to generation.

Trait recorded	Strain	Generation		
		F1	F2	F3
MFD - 6 (µm)	F	18.0 (0.07) [a]	17.8 (0.06) [a]	17.8 (0.13)
	FxS	19.0 (0.17)	18.4 (0.13)	18.0 (0.30)
MFD (µm)	F	19.9 (0.04) [a]	19.8 (0.04) [a]	19.6 (0.08)
	FxS	21.7 (0.11)	20.6 (0.08)	19.9 (0.19)
BW (kg)	F	63.0 (0.26) [a]	62.3 (0.23)	63.8 (0.49)
	FxS	64.9 (0.63)	63.2 (0.47)	62.3 (1.15)
CFW (kg)	F	4.9 (0.04) [a]	4.6 (0.03) [a]	4.5 (0.07)
	FxS	6.1 (0.09)	5.1 (0.07)	4.5 (0.16)
SL (mm)	F	108 (0.51) [a]	106 (0.45)	103 (0.96)
	FxS	111 (1.24)	108 (0.94)	109 (2.26)
CR (number)	F	13.6 (0.08) [a]	13.9 (0.07) [a]	13.9 (0.16) [a]
	FxS	10.7 (0.21)	12.7 (0.15)	12.8 (0.37)
CY (%)	F	67.6 (0.22) [a]	67.7 (0.19) [a]	68.6 (0.41)
	FxS	71.0 (0.53)	69.3 (0.40)	68.8 (0.96)
CV (%)	F	16.4 (0.14) [a]	16.0 (0.07) [a]	15.6 (0.13)
	FxS	18.0 (0.42)	17.0 (0.15)	16.4 (0.33)
CF (%)	F	98.8 (0.10) [a]	99.2 (0.05) [a]	99.4 (0.09)
	FxS	95.3 (0.30)	98.1 (0.11)	98.8 (0.23)

[a] Difference between strains is significant (P < 0.01)

No strain differences within generation could be discerned as far as wool quality was concerned. Generation F1 and F2 progeny from the F strain performed better (P < 0.01) than FxS contemporaries for variation in crimps over the fleece. Progeny from the F1 and F2 generations of the FxS strain had blockier (P < 0.01) staples than their F strain contemporaries. The belly and points score of the FxS stain was correspondingly better (P < 0.05) in the first two generations than that of F contemporaries. The conformation of F1 and F2 progeny of the F strain was inferior (P < 0.01) compared to that of progeny born in the FxS strain.

Conclusion

The results of this investigation suggested that the MFD of a strong wool breeding flock can be reduced by up to 0.5 µm per annum over the first 10 years by mating with genetic fine wool (20 µm) rams. This response is evidently too large to reflect genetic change solely. A large part of the reduction in the MFD of adult ewes was probably associated with a change in flock structure, through the replacement of original strong-wool ewes with progeny sired by fine-wool rams. Significant differences between the F and FxS strains for most of the objective production traits, and the traits scored linearly, were limited to the first two generations in this investigation.

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