REDUCING FIBRE DIAMETER VARIATION AND COARSE EDGE IN DOHNE MERINOS - PRELIMINARY RESULTS

GJ Delport* and AF Botha

SA Fleece Testing Centre, Middelburg CP, 5900 South Africa and CSIR TEXTECH, Port Elizabeth, South Africa

SUMMARY

Data of 1321 Dohne Merino progeny were used to derive breeding objectives. Heritability estimates for fibre diameter traits were low and the genetic correlation between mean fibre diameter and coarse edge was high (0.854). No detrimental effect of excluding these traits from the breeding objective was found. Restricting clean fleece weight needs more consideration.

INTRODUCTION

Recently there has been a trend towards the investigation of including fibre diameter variation traits in breeding plans for woolled sheep. This trend stems form (1) renewed interest in the effect of these traits on the processing performance of wool and (2) the value of advertising rams by means of fibre diameter variation traits. The purpose of this study was to investigate the inclusion of fibre diameter variation traits in the National Woolled Sheep Improvement Scheme in South Africa.

MATERIAL AND METHODS

The Dohne Merino was chosen for this investigation on account of it being a dual purpose breed developed from a cross between the German Merino and Merino (McMaster, 1994). Evidence by Jackson and co-workers (personal communication) suggests an increased possibility of estimating the value of fibre diameter variation traits for breed improvement.

Wool samples of 1321 Dohne Merino progeny from seven studs were analysed by a Fibre Distribution Analyser (FDA). Traits measured included hogget body weight (BW), clean fleece weight (CFW), mean fibre diameter (MFD), coefficient of variation of fibre diameter (CV) and the incidence of coarse edge (CE = percentage of fibres measuring more than 30 micron). All FDA results were based on 8000 readings of mini core samples.

Henderson's method III (Harvey,1987) was used for parameter estimation since only sire identity was known. After analysis of variance and testing all two way interactions, the following operational model was fitted to the data:

$$y_{ijkl} = \mu + f_i + s_j + x_k + fx_{ik} + e_{ijkl}$$

Where:

y_{ijkl} = an observation on the l'th individual,
μ = overall mean,
f_i = the effect of the i'th flock (i = 1..7),

s_j = the effect of the j'th sire within the i'th flock,
x_k = the effect of the k'th sex(k = 1..2),
fx_{ik} = the effect of the interaction between flock and sex,
e_{ijkl} = random error.

By utilizing standard procedures (Poggenpoel, 1985), two breeding objectives were derived as detailed in Table 1.

Table 1 Two alternative breeding objectives without and with inclusion of fibre diameter variation traits (BO1 and BO2).

Traits in breeding objective	Relative economic value (R/sheep lifetime) BO1	BO2	Market Price (Rand) BO2
Body weight	4.902	4.902	8.36/kg
Clean Fleece weight	46.710	46.710	10.38/kg
Mean Fibre diameter	-13.725	-13.725	-1.22/μ
CV Fibre diameter	-	-0.010	-0.001
Coarse edge	-	-0.010	-0.001

Since no clear evidence exists to enable estimation of economic weights for fibre diameter variability (Whiteley, 1987; Rogan, 1988), these traits were included in the second breeding objective on the basis of the lowest possible relative economic value (Table 1). Selection response were evaluated by using the SELIND programme (Cunningham & Mahon, 1977).

The market niche of the Dohne Merino breed is generally regarded as intermediate between other breeds with emphasis on mutton production and the Merino. Therefore a selection index with a restriction on clean fleece weight for each breeding objective was included.

RESULTS

A general description of the data used for parameter estimation is provided in Table 2. The averages and variation is typical for Dohne Merinos at an average test age of 12 months. The high coefficient of variation in coarse edge is indicative of a positive skew distribution.

Results in Table 3 indicate relative low heritability estimates for CV and CE and a high genetic correlation between CE and MFD. In comparison, higher heritabilities and lower genetic correlation estimates were reported for Australian studies (Piper & Lax, 1989; Howe *et al.* 1991).

Results of the evaluation of selection criteria as summarised in Table 4 indicate a slight increase in overall genetic gain by including CV and CE in the breeding objective. Restricting CFW will lead to a substantial decrease in overall gain.

Table 2 Overall means and coefficient of variation of production traits for Dohne Merinos.

Trait	Mean	Coef of variation %
Body weight (kg)	45.97	17.63
Clean fleece weight (kg)	3.58	24.79
Mean fibre diameter (μ)	20.78	8.16
CV fibre diameter (%)	20.13	11.61
CE fibre diameter (%)	2.57	71.30

Genetic and phenotypic parameters are presented in Table 3.

Table 3 Genetic (r_g below) and phenotypic parameters (r_p above the diagonal) for South African Dohne Merinos.

	TRAIT				
	BW	CFW	MFD	CV	CE
BW	0.352 (0.088)	0.292	0.188	-0.204	0.007
CFW	0.150 (0.203)	0.293 (0.080)	0.097	-0.100	0.049
MFD	0.359 (0.179)	0.168 (0.203)	0.366 (0.089)	-0.222	0.649
CV	-0.401 (0.212)	-0.435 (0.213)	-0.378 (0.212)	0.248 (0.074)	0.336
CE	-0.024 (0.212)	0.002 (0.220)	0.854 (0.075)	0.032 (0.223)	0.271 (0.077)

Standard errors in parenthesis
K-value = 19.64

DISCUSSION

Fibre diameter variation traits have an effect on yarn properties and especially prickliness. Lamb (1989) states the importance of CV as approximately 20 percent of that of MFD. Results of this study indicate a small contribution of CE to overall gain (6.57% for OB2) compared to MFD in OB1 (11.31%). The indirect response in CE when selecting for MFD (99%) suggests that the current breeding objective (OB1) amply provides for improvement of CE by only selecting for lower MFD.

Table 4 Evaluation of two breeding objectives for South African Dohne Merinos.

TRAIT	OBJECTIVE 1				OBJECTIVE 2			
	Unrestricted		Restricted		Unrestricted		Restricted	
	b-val	Val Va	b-val	Val Va	b-Val	Val Va	b-val	Val Va
BW	0.305	14.20	0.362	40.97	0.268	9.02	0.343	29.12
CFW	2.923	21.90	-0.019	0.03	2.955	19.09	0.008	0.00
MFD	-0.811	11.31	-0.940	29.16	-0.319	0.53	-0.306	0.84
CV	-	-	-	-	-0.082	0.12	0.196	1.28
CE	-	-			-0.635	2.98	-0.715	6.57
r_{IH}	0.249		0.190		0.267		0.205	
s_I	2.362		1.805		2.532		1.943	

Val Va = Percent reduction in rate of overall genetic gain if that trait is omitted.
r_{IH} = Correlation between index and breeding objective.
s_I = Genetic gain obtained by one standard deviation of selection on the index.

Variable responses to selection on the basis of OB2 may occur on account of relative large standard errors of genetic covariances. This objective however provides the basis for selection on fibre variation traits.Restricting clean fleece weight, implies a more serious reduction in overall gain and these objectives need careful consideration.

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