SKIN AND FOLLICLE CHARACTERS II. CORRELATIONS WITH OBJECTIVELY MEASURED AND SUBJECTIVELY ASSESSED WOOL CHARACTERS

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SUMMARY

Phenotypic and genetic correlations between skin and follicle characters and both objectively measured and subjectively assessed fleece characters were estimated. The strongest genetic correlations of skin and follicle characters with objectively measured fleece characters were between: fibre area and fibre diameter (0.89), standard deviation of fibre area and standard deviation of fibre diameter (0.71), standard deviation of fibre area and fibre diameter (0.69), skin quality and clean fleece weight (0.65), skin quality and staple length (0.62), follicle density and clean fleece weight (0.54), and fibre area and staple strength (0.51). The strongest genetic correlations of skin and follicle characters with subjectively assessed fleece characters were between: skin quality and condition (0.87), follicle density and crimp definition (-0.62), skin quality and visual colour (0.60), skin quality and lock (0.55), and standard deviation of fibre area and lock (0.51). From these results, the following skin and follicle characters were thought worthy of further scrutiny: follicle density, fibre area (or standard deviation of fibre area) and skin quality.
Keywords: Skin, follicles, fleece traits, correlations.

INTRODUCTION

In Part I of this paper we presented heritabilities for and correlations among a number of skin and follicle characters. Here we present phenotypic and genetic correlations with objectively measured and subjectively assessed wool characters.

MATERIALS AND METHODS

Experimental details and the statistical model fitted are given in Hill *et al.* (1997). The performance of the same experimental ram progeny was recorded at 10 and 16 months of age. The complete list of characters objectively measured or subjectively assessed on the progeny at various ages is given by Gifford *et al.* (1993). Here, the phenotypic and genetic correlations of skin and follicle characters with the following wool attributes are reported: Objectively measured Yield (YLD); Clean Fleece Weight (CFW); Fibre Diameter (FD); Standard Deviation of Fibre Diameter (FDSD); Coefficient of Variation of Fibre Diameter (FDCV); Staple Length (SL); Staple Strength (SS); and Crimp Frequency (CF); Subjectively assessed Lock (LCK); Visual Colour (VCOL); Handle (HNDL); Condition (COND); Crimp Definition (CD).

RESULTS AND DISCUSSION

Table 1 shows the phenotypic and genetic correlation estimates of skin and follicle characters with objectively measured wool attributes. With the exception of the phenotypic correlation between average fibre diameter and fibre area, all other correlations were either low or very low. The genetic correlations had standard errors ranging from 0.029 to 0.263. They were generally of greater magnitude than their phenotypic counterparts, but often not consistent between ages. For instance, the genetic correlation between follicle density and clean fleece weight was moderate at 10 months, but low at 16 months. The genetic correlations involving follicle density were in sharp contrast with those reported in other studies (Skerritt 1995, Purvis and Swan 1997). Our estimates were greater in relation to the association with clean fleece weight, but lower as far as fibre diameter, coefficient of variation of fibre diameter and staple length were concerned. The genetic correlation of fibre area with fibre diameter was very high, and the correlations of standard deviation of fibre area with fibre diameter and with the standard deviation of fibre diameter were high also. These results suggest that fibre area measured in a skin sample and fibre diameter measured in a mid-side wool sample of the same animal are to a large extent the same trait. The genetic correlations of classer assessed skin quality with clean fleece weight were moderate to high, whereas it was high with staple length at 10 months, but low at 16 months.

Table 2 shows the phenotypic and genetic correlation estimates of skin and follicle characters with classer assessed fleece attributes recorded at 10 and 16 months of age. With the exception of the correlation between skin quality and condition at 10 months, all phenotypic correlations were low to very low. Generally the genetic correlations were of greater magnitude than their phenotypic counterparts, but, with some exceptions they were mainly low and very low. Crimp definition had high and moderate (negative) genetic correlations with follicle density and total bulb area at 10 months, respectively. Handle had a moderate (negative) genetic correlation with coefficient of variation of bulb area and with standard deviation of fibre area. This latter trait was also moderately (positively) correlated with lock. Skin quality had a moderate genetic correlation with lock and visual colour at 10 months, and a high to very high correlation with wool condition.

CONCLUDING REMARKS

The conflicting results produced in comparison with other studies may reflect in part differences in methodology but also reminds us of the need to generate separate genetic and phenotypic parameter estimates for each strain of Merino sheep. Rigorously assessing the merit of indirect selection criteria in a breeding program is a complex task, beyond the scope of this paper. One must consider not only their contribution to the estimation of relevant breeding values, but also the possible timing and cost of the measurement. Of all the skin characters measured in this study skin biopsy weight, follicle density, fibre area (or its standard deviation) and skin quality are perhaps the most interesting. Given the relative simplicity of recording skin quality by a sheep classer, compared with the complexity and expense of laboratory measurements, it appears that such an assessment may be worthy of consideration in a breeding program. Note however, that in our experiment the skin quality assessment was made when the sheep had about six months of wool growth on them. The extent to which the visible wool characteristics influenced the classer's assessment of skin is unknown.

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Table 1. Phenotypic (rp), and genetic (rg) correlations between skin characters, measured at 10 months, and objectively measured fleece characters measured at 10 and 16 months

Objectively.		SKIN CHARACTERS																			
measured.		SW		DE		MBA		TBA		BSD		BCV		PC		FA		FASD		SQ	
characters.		rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg
YLD	10	-0.03	-0.29	0.08	0.37	0.04	0.11	0.10	0.34	0.02	0.07	-0.02	0.05	-0.13	-0.47	0.01	0.04	-0.06	-0.20	0.06	0.09
	16	-0.10	-0.06	-0.07	0.24	0.04	0.05	0.08	0.21	0.05	0.00	0.02	-0.04	-0.13	-0.25	0.00	0.13	-0.04	0.02	0.10	0.23
CFW	10	0.06	-0.37	0.09	0.54	0.02	0.03	0.09	0.41	-0.01	-0.14	-0.03	-0.20	-0.05	-0.31	0.066	0.02	0.06	-0.06	0.40	0.65
	16	0.04	-0.07	0.06	0.21	0.07	0.01	0.09	0.13	0.07	-0.08	0.0	-0.11	-0.10	-0.06	0.15	0.24	0.12	0.22	0.37	0.57
FD	10	0.12	0.38	-0.22	-0.37	0.25	0.41	-0.03	0.01	0.21	0.38	-0.03	-0.19	0.08	0.15	0.63	0.89	0.30	0.69	-0.01	0.07
	16	0.11	0.37	-0.21	-0.43	0.25	0.38	-0.02	-0.03	0.20	0.32	-0.03	-0.29	0.02	0.12	0.63	0.83	0.29	0.64	0.04	0.00
FDSD	10	0.12	0.37	-0.13	-0.26	0.18	0.25	-0.01	-0.04	0.23	0.36	0.07	0.11	0.02	-0.01	0.21	0.25	0.38	0.71	-0.02	0.03
	16	0.08	0.29	-0.10	-0.21	0.18	0.28	0.01	0.03	0.23	0.31	0.08	-0.06	-0.05	0.03	0.15	0.13	0.37	0.64	-0.01	-0.10
FDCV	10	0.05	0.18	0.01	-0.09	0.03	0.04	0.00	-0.06	0.12	0.19	0.10	0.26	-0.03	-0.13	-0.19	-0.26	0.23	0.39	-0.01	-0.03
	16	0.02	0.07	0.03	0.06	0.03	0.06	0.02	0.04	0.13	0.15	0.11	0.18	-0.06	-0.06	-0.26	-0.40	0.23	0.31	-0.04	-0.14
SL	10	0.01	0.19	-0.07	0.12	0.16	0.21	0.05	0.30	0.10	-0.06	-0.07	-0.46	-0.05	-0.17	0.21	0.25	0.09	0.04	0.21	0.62
	16	-0.01	0.15	-0.07	0.00	0.19	0.15	0.06	0.01	0.16	0.07	-0.02	-0.17	-0.06	-0.12	0.14	0.23	0.06	0.10	0.10	0.11
SS	10	0.05	0.27	-0.03	0.07	-0.01	-0.24	-0.03	-0.06	-0.02	-0.36	0.01	0.08	0.01	-0.12	0.10	-0.14	-0.06	-0.39	0.05	0.05
	16	0.05	0.28	-0.05	0.00	0.03	0.28	-0.01	0.23	-0.03	0.12	-0.07	-0.34	-0.01	-0.24	0.28	0.51	0.01	0.09	0.11	0.11
CF	10	-0.01	0.24	0.02	0.12	-0.09	0.02	-0.03	0.12	-0.09	0.03	-0.01	0.01	0.12	0.29	-0.13	-0.18	-0.19	-0.49	-0.09	-0.36
	16	0.02	-0.08	-0.00	-0.14	-0.08	0.25	-0.05	0.07	-0.09	0.14	-0.01	-0.29	0.17	0.44	-0.10	-0.10	-0.20	-0.35	-0.11	-0.39

Table 2. Phenotypic and genetic correlations between skin characters measured at 10 months and classer assessed fleece characters measured at 10 and 16 months

Classer		SKIN CHARACTERS																			
Assessed		SW		DE		MBA		TBA		BSD		BCV		PC		FA		FASD		SQ	
characters		rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg	rp	rg
LCK	10	0.06	0.17	0.01	0.06	0.04	0.02	0.03	0.05	0.05	0.12	0.02	0.22	-0.04	-0.24	0.04	0.22	0.14	0.51	0.24	0.55
	16	0.05	0.11	-0.01	0.13	0.10	-0.13	0.05	0.00	0.12	-0.04	0.03	0.11	-0.04	-0.22	0.09	0.07	0.22	0.51	0.18	0.38
VCOL	10	-0.00	0.21	-0.04	0.07	0.00	0.26	-0.03	-0.08	0.01	-0.27	-0.02	-0.09	0.07	0.03	0.06	0.22	0.02	0.19	0.34	0.60
	16	-0.07	0.12	0.05	0.38	-0.01	-0.10	0.04	0.19	0.00	-0.14	0.01	-0.10	0.03	0.04	-0.01	-0.02	-0.09	-0.04	0.13	0.32
HNDL	10	-0.07	-0.05	0.05	0.16	-0.13	-0.09	-0.03	0.10	-0.16	-0.28	-0.05	-0.41	0.03	-0.01	-0.09	0.02	-0.21	-0.46	0.26	0.39
	16	-0.05	-0.17	0.05	0.20	-0.12	-0.08	-0.01	0.13	-0.15	-0.26	-0.05	-0.40	-0.00	-0.03	-0.09	0.02	-0.23	-0.43	0.18	0.29
COND	10	0.04	-0.04	0.05	0.05	-0.05	-0.28	0.01	-0.06	-0.08	-0.37	-0.04	-0.24	0.00	-0.05	-0.04	0.07	0.00	0.07	0.56	0.87
	16	0.00	-0.23	0.07	0.20	-0.06	-0.11	0.03	0.09	-0.10	-0.25	-0.05	-0.34	-0.03	-0.06	-0.05	0.11	-0.04	-0.03	0.37	0.69
CD	10	0.06	0.30	-0.07	-0.62	0.00	-0.13	-0.06	-0.45	0.03	-0.15	0.04	-0.10	0.03	0.11	0.05	-0.04	0.05	-0.00	-0.06	-0.16
	16	0.10	0.49	-0.08	-0.36	0.03	0.17	-0.05	-0.10	0.04	0.08	0.01	-0.24	0.05	0.18	0.07	0.07	0.09	0.15	-0.09	-0.02