THE GENETIC RELATIONSHIP BETWEEN FAECAL CONSISTENCY, FAECAL WORM EGG COUNTS AND WOOL TRAITS IN MERINO SHEEP.

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SUMMARY

This paper reports direct and maternal genetic parameters for faecal worm egg count (WEC), scouring, fleece and body weight traits in Merino sheep in a Mediterranean environment. WEC at 3 (WEC3) and 15 months (WEC15) of age had a low heritably (0.19 and 0.15) and was genetically well correlated (0.66). Faecal consistency scores (FS) had a very low heritability at both times (0.04 and 0.09) and was genetically moderately correlated (0.39). The phenotypic relationship between WEC and FS at 3 and 15 months of age was about zero while the genetic relationship was negative and low (-0.21 to -0.25). The genetic relationship between FS15 and WEC15 was virtually zero indicating that they are genetically different traits.

Keywords: Merino, genetic parameters, parasites, scouring, wool traits.

INTRODUCTION

Faecal soiling and the development of dags is a major concern to many wool sheep breeders. This syndrome is associated with scouring and leads to increased costs due to crutching and devaluing of the affected wool. Affected sheep are more prone to blowfly strikes which could result in death if not treated timely.

Scouring is though to be due to a range of factors including green pastures and parasitism. Recent studies have shown that there appears to be a negative genetic relationship between WEC and scouring (Greeff and Karlsson, 1997). The Rylington Merino project where hoggets were selected for decreased WEC over 6 years supported this relationship as the selected line scours significantly more than the unselected control line (Karlsson *et al.*, 1995). Similar results were reported by Morris *et al.* (1997) and Larsen *et al.* (1994). This study investigates the inheritance of scouring and its relationship with WEC, body and wool traits.

MATERIAL AND METHODS

The data for this study was collected in a flock of Merino sheep from the Rylington Merino selection and control flocks. The management and selection protocol were described by Karlsson and Greeff (1997). Lambing occurred in July/August. Faecal samples and body weights were collected and recorded at weaning and at 15 month of age. At faecal sampling time, FS were recorded from 1 (hard pellets) to 5 (fluid) that was used as an indication of scouring. The animals were shorn for the first time in September at 13-14 months of age. Midside wool samples were collected and analysed for wool and fibre traits.

The pedigree file consisted of 4933 animals and the number of records collected from 1988 until 1996 and pedigree structure are shown in Table 1.

Table 1. Summary of data and pedigree structure.

Trait	Progeny with records	Number of sires	Number of dams	Records /sire
WEC at 3 months of age (WEC3)	3739	89	1694	42
WEC at 15 month of age (WEC15)	3733	89	1692	42
FS at 3 months of age (FS3)	3897	89	1706	43
FS at 15 months of age (FS15)	3537	89	1655	40
Weaning weight (WT3)	3983	89	1729	45
Hogget weight at 15 months (WT15)	3664	89	1690	41
Clean fleece weight (CFW)	3658	89	1683	41
Fibre diameter (FD)	3696	89	1683	41
Staple length (SL)	1981	52	1329	38
Staple strength	1989	52	1332	38
Coefficient of variation of FD (CVFD)	1142	36	744	31

The WEC data (eggs/gram faeces(epg)) were transformed to cube root following Woolaston and Piper (1995). Animals with zero WEC were given a value of one. FS3 and FS15 were transformed to LOG(FS + 1). Line, year-management group, age of the dam (2 to 5 years), birth status (singleton, twin or triplet) and sex of the lamb (ewe or ram) were specified as fixed effects in the model. Date of birth was included as a covariable. For fleece traits, body weight, FS and WEC measured at 15 months of age, sex and management groups were completely confounded because ewes and rams were run and managed separately from weaning. The data were analysed with an "Animal Model" with ASREML (Gilmour, 1997). The variance was partitioned into direct additive and maternal additive genetic variance, and the residual variance. The direct and maternal heritability were calculated for each trait from these components.

RESULTS AND DISCUSSION

The phenotypic and genetic correlations between traits, the heritability (direct and maternal), the mean and the total variance of each trait are indicated in Table 2. The direct heritability of FS (0.04 and 0.09) and WEC (0.19 and 0.15) at 3 and 15 months of age, were low and dams made in general no significant contribution to the total variation of these traits. The heritability of WEC15 (0.15) was much lower than that reported by Greeff *et al.* (1995) on a different and much smaller dataset. These low estimates may have been due to the scoring system used for FS and also to the low WEC and FS at 3 and 15 months of age, respectively.

WEC at 3 and 15 months of age were genetically well correlated (0.66) while FS was genetically moderately correlated (0.39). The phenotypic correlation between WEC and FS at 3 and 15 months of age was about zero and the genetic correlation negative and low (-0.21 to -0.25). The genetic relationship between FS15 and WEC15 was virtually zero. Except for the relationship between FS3 and FS15 (0.39) these parameters are completed different to those reported by Greeff and Karlsson (1997) estimated in an unselected Merino flock.

The heritability estimates for weaning weight (0.34) and body weight at 15 months of age (0.40) were in the range reported in the literature. Maternal heritability was 0.09 for WT3 and decrease to 0.04 at 15 months of age. The genetic parameters of the fleece and wool traits also agree well with published estimates (Mortimer, 1987; Greeff *et al.* 1995). The genetic relationship between SS and CVFD was not as strong (-0.36) as compared to other studies but higher than the -0.27 reported on 6 month wool growth in 10 months old Merino sheep in the Turretfield Research Centre's flock (Greeff *et al.* 1995). A surprise finding was the negative genetic relationship between SS and CFW (-0.14). This is the reverse of the relationship normally found between SS and CFW, but is similar to the results found on 6 month wool growth in 10 months old Merino sheep in the Turretfield flock (Greeff *op cit.*). This result should be treated with care because of the small amount of data available.

A moderately positive genetic relationship of 0.35 was found between FS15 and CFW. This indicates that selection for increased fleece weight may result in softer faeces. However, as the heritability of FS was very low this may not result in any significant change. In another study in an unselected Merino flock, Greeff and Karlsson (1997) found FS to have a heritability of about 0.38. A more refined scoring system was used in this case but these results indicate that more research is necessary on these relationships to predict the consequences of selection for increased production in wool sheep.

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Table 3. Means and phenotypic variation and the genetic parameters of worm egg count, scouring, body weight and wool traits in the Rylington Merino flock. (Direct heritabilities on the diagonal, phenotypic correlations above the diagonal and genetic correlations below the diagonal)

	WEC3 (epg)	WEC15 (epg)	FS3	FS15	WT3 (kg)	WT15 (kg)	CFW (kg)	FD (µm)	SL (mm)	SS (N/ktex)	CVFD (%)
WEC3	**0.19**	0.11	0.06	-0.06	-0.08	-0.03	-0.04	-0.01	-0.03	-0.05	0.01
WEC15	0.66	**0.15**	-0.03	0.00	-0.04	-0.04	0.02	-0.02	-0.08	-0.04	0.08
FS3	-0.21	-0.25	**0.04**	0.07	-0.01	-0.02	-0.05	-0.02	-0.01	-0.02	0.03
FS15	-0.22	0.03	0.39	**0.09**	-0.05	0.06	0.03	-0.01	-0.02	0.02	-0.01
WT3	0.11	0.14	0.27	-0.04	**0.34**	0.50	0.44	0.03	0.04	-0.01	0.05
WT15	-0.08	0.12	-0.05	0.19	0.79	**0.40**	0.48	0.17	0.17	0.03	0.09
CFW	0.01	0.06	-0.06	0.35	0.41	0.44	**0.38**	0.26	0.33	0.10	-0.01
FD	-0.17	-0.02	-0.22	-0.11	0.06	0.06	0.23	**0.43**	0.18	0.06	-0.03
SL	-0.08	-0.09	0.16	0.06	0.04	0.00	0.25	0.25	**0.40**	-0.04	-0.16
SS	0.21	0.15	0.10	0.25	-0.12	-0.12	-0.14	-0.07	-0.31	**0.26**	-0.37
CV	0.10	0.09	0.26	-0.14	0.20	-0.01	0.28	0.11	-0.06	-0.36	**0.50**
Mean	5.81	6.66	1.033	1.253	20.10	33.10	1.82	18.20	93.00	18.10	25.11
Vp	7.31	7.01	0.103	0 08	12.33	26.30	0.114	1.49	96.80	32.30	6.58
h_m	0.02	0.00	0.00	0.00	0.09	0.04	0.02	0.01	0.00	0.01	0.02