PARAMETER ESTIMATES FOR FLEECE AND SKIN COMPONENTS OF WOOL PRODUCTION IN MERINO SHEEP

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INTRODUCTION

Design of selection programmes for Merino sheep involves estimation of heritabilities and genetic and phenotypic correlations for production and reproduction traits of direct economic benefit. Little consideration is given to the possible effects which these programmes may have on component traits, particularly skin and fleece traits related to the major determinants of wool production. Information of this nature appears not to be readily available for the Merino. Estimates based on data collected from a multiple-bloodline experiment conducted at Trangie Research Centre are presented for five fleece and skin traits. Preliminary analyses of these data by Rogan (1982) and Mortimer et al. (1985) have demonstrated considerable variation between strains and bloodlines within strains in production and reproduction traits.

MATERIALS AND METHODS

Data were collected on hogget ewes born at Trangie between 1975 and 1981. These animals were from flocks, representative of fifteen Merino bloodlines, previously described by Atkins (1979). The component traits considered were crimps per 2.5 centimetres (CR), total follicle density (N), ratio of secondary to primary follicles (RA), wax percentage (W) and suint percentage (S). Observations were available on 2550 hogget ewes for CR,W and S and 2166 hogget ewes for N and RA, which were progeny of 231 and 325 sires respectively.

Prior to estimation of heritability and genetic and phenotypic correlations by paternal half sib correlation, the data were adjusted for significant fixed effects using regression coefficients obtained from least squares analyses of variance. Estimates of genetic and phenotypic correlations were similarly obtained between each of the component traits and greasy fleece weight (GFW), yield (Y), clean fleece weight (CFW), fibre diameter (FD), body weight (BWT) and staple length (SL). Parameters were estimated on a within-flock basis.

RESULTS AND DISCUSSION

Parameter estimates and their standard errors for the component traits are presented in Table 1. CR, W and S were highly heritable with estimates of about 0.4. Whilst heritability of CR was in agreement with earlier estimates (Brown and Turner 1968; Gregory 1982a), the estimates for W and S were larger than those obtained by James et al. (1984). N (0.20) and RA (0.21) were moderately heritable, these estimates being lower than earlier ones of Gregory (1982a) and Jackson et al. (1975). Phenotypic correlations were generally close to zero, except that between N and RA which had a high positive value. The genetic correlation between these two traits was higher at 0.72. W had low positive genetic correlations with N, RA and S. CR and RA were slightly negatively correlated.

Phenotypic and genetic correlations between the major production traits and the component traits are presented in Table 2. In most cases, the phenotypic correlation was not a reliable indicator of the size of the genetic correlation. Genetic and phenotypic correlations between CR and GFW, Y and CFW were low and negative. GFW had a low positive genetic correlation with W, whilst CFW was negatively correlated with both W and S. The genetic correlation between Y and W was strongly negative and larger than that between Y and S. FD had moderately negative genetic correlations with CR and RA, whereas that with N was strongly negative. Moderately negative genetic correlations existed between BWT and the two follicle traits. For most pairs of traits, correlations were within the range of available estimates (Brown and Turner 1968; Gregory 1982b; Jackson et al. 1975).

CONCLUSION

The present estimates provide an useful understanding of the degree of genetic determination of some component traits of wool production and of the genetic and phenotypic associations between these traits and the major production traits. Although heritabilities of crimp frequency and wax and suint percentages are high, the component traits are of greater interest as correlated traits in selection programmes involving fleece weight, body weight and fibre diameter. Selection for either greasy or clean fleece weight would not alter greatly the component traits. Selection for greasy fleece weight would slightly increase wax percentage whilst selection for clean fleece weight would reduce wax and suint percentages. However, the relatively large negative association of fibre diameter and body weight with both follicle ratio and follicle density would require consideration. Selection pressure applied to either fibre diameter or body weight would cause changes in these follicle traits.

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