The Influence of Selection for Greasy Fleece Weight on the Components of Fleece weight in Romney Sheep

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ABSTRACT

Variation in the clean fleece weight (W) of New Zealand Romney sheep was related to variation in its four components: smooth body surface area (S), mean number of fibres (follicles) per unit area of skin (N), mean fibre cross-sectional area(A) and mean fibre length (L). The influence of the combined components, wool weight per unit area, fibre volume and total number of fibres (follicles) was considered.

The contribution of the components to differences in fleece weight between the Massey fleece weight selected and control flocks was analysed using the "percentage deviation" technique. L was the most important contributor to fleece weight differences. The components of A and N were about equally important in contributing to between flock differences in fleece weight. By contrast, the contribution of S was relatively small.

Wool weight per unit area had far more influence on fleece weight than body surface area (about 84% : 16%). Also, fibre volume made a greater contribution to between flock differences than the total fibre number.

Attempts were also made to assess the relative importance of the components of fleece weight between ewes within each flock using either simple linear regression or multiple regression (standardized partial regression coefficients) techniques. Within both the selected

and control flocks, A and S appeared relatively more important than between flocks, whereas, the L appeared to be less important, but the L seemed more important within the selected flock than within the control flock in determining the phenotypic differences in fleece weight between sheep.

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INTRODUCTION

Fleece weight is an important criterion when selecting for improved wool production. Of the various wool characteristics which determine returns to the farmer, fleece weight is probably the most important. Since it has considerable economic importance, it is desirable to know the rate at which this trait can be altered by selection and to what degree other traits show correlated changes. To this end, a selection experiment was established at Massey University in 1956 using New Zealand Romney sheep. Responses to selection for greasy fleece weight in this flock have been reported by Blair (1981) and Blair *et al.* (1985).

The purpose of the present study was to examine the changes in the components that contribute to variation in fleece weight and to produce some estimates of the relative importance of the components in the response to selection for fleece weight in Romney sheep.

The greasy fleece weight consists of the weights of the clean fleece weight and various contaminants. The clean fleece weight (W) can be considered as the product of wool production per unit area of skin and wool-growing surface area (Turner, 1958). Wool production per unit area of skin can in turn be described as a function of follicle or fibre density (N), mean fibre cross-sectional area (A) and mean fibre length

(L), which is often derived from staple length. The wool-growing surface area is influenced by both the smooth body surface area (S), a function of body weight, and the degree of skin wrinkle or fold, which is probably unimportant for Romneys.

The relationship between fleece weight and its components for Romneys can be expressed as $W = S. N. A. L. K$, where K is a constant.

This equation shows that there are several possible pathways of increasing fleece weight by changing one or more of the components. It is therefore important to know which of the components are responsible for the increase in fleece weight that results from selection. The present study examined the relative influence of each component on fleece weight of two groups of Romneys, one selected for higher fleece weight and the other (control) selected at random.