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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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TABLE OF CONTENTS

Abstract	I
Acknowledgements	III
List of Tables	VII
List of Figures	X
CHAPTER 1 INTRODUCTION	1
CHAPTER 2 REVIEW OF LITERATURE	3
2.1 Responses to selection for fleece weight	3
2.1.1 Selection for greasy fleece weight in New Zealand Romney sheep	3
(a) Direct response in greasy fleece weight	4
(b) Correlated responses	7
(c) Physiological changes	8
2.1.2 Selection for clean fleece weight in Merino sheep	10
(a) Direct response in clean fleece weight	14
(b) Correlated responses to selection for clean fleece weight	18
(c) Physiological and biochemical consequences of selection	19
2.2 The effects of selection for fleece weight on the components of fleece weight	20
2.2.1 Wool production per unit area of skin	22
(a) Mean fibre cross-sectional area (A)	22

(b) Mean fibre length (L)	23
(c) Mean number of fibres per unit area of skin (N)	25
2.2.2 Wool growing surface area	26
(a) Skin wrinkle (R)	26
(b) Smooth body surface area (S)	28
2.3 Selection on the components of clean fleece weight	28
2.3.1 Direct responses in the components	30
2.3.2 Correlated responses in clean fleece weight	32
 CHAPTER 3 MATERIALS AND METHODS	 35
3.1 Materials	35
3.1.1 Sheep and environment	35
3.1.2 Measurements	37
3.2 Statistical methods	40
3.2.1 Derivation of the components from measured characters	40
3.2.2 Techniques for assessing the influence of each component on fleece weight	42
(a) The percentage deviation technique	42
(b) Simple linear regression of the log of each component on log fleece weight	43
(c) Standardized partial regression of fleece weight on components (multiple regression)	44

CHAPTER 4 RESULTS	46
4.1 Prediction of fibre length	46
4.2 Fitted means for characteristics and components of fleece weight	48
4.3 Contribution of the components to differences in fleece weight between selected and control flocks	52
4.4 Contribution of the components to differences in fleece weight between ewes within each flock	55
4.4.1 Correlations between the components within each flock	55
4.4.2 Contribution of the components to differences in fleece weight within each flock	57
4.5 Comparison of between and within flock contributions of the components to differences in fleece weight	60
CHAPTER 5 DISCUSSION AND CONCLUSIONS	64
5.1 Methods of predicting fibre length	64
5.2 Techniques for estimating the relative influence of each component on fleece weight	65
5.3 Comparison of the importance of components	69
5.4 Conclusions	77
REFERENCES	79

LIST OF TABLES

Table 1. Summary of selection experiments for increased fleece weight in New Zealand Romney sheep	5
Table 2. Summary of selection experiments for increased clean fleece weight (CFW) in Australian Merino sheep	12
Table 3. Annual percentage rates of improvement in flocks selected for increased clean fleece weight	15
Table 4. Summary of lines selected on the components of clean wool weight	29
Table 5. Regression coefficients of direct responses in selection criterion, expressed as percentage deviations from control on time (year) for ewes in CSIRO single-trait selection lines	31
Table 6. Mean value of each characteristic and its standard error for 49 ewes in fleece weight selected (FW) and control (C) flocks	49

Table 7. (a) Mean values of clean fleece weight and its components for ewes in fleece weight selected (FW) and control (C) flocks. The values (mean \pm SE) were based on 16 ewes with fibre length measured	50
(b) Mean values of clean fleece weight and its components for ewes in fleece weight selected (FW) and control (C) flocks. The values (mean \pm SE) were based on 49 ewes with predicted fibre length	51
Table 8. (a) Contribution of the components to differences in fleece weight expressed as percentages of the control flock means. Values were based on 16 ewes with measurement of fibre length	53
(b) Contribution of the components to differences in fleece weight expressed as percentages of the values of the control flock. Values were based on 49 ewes with predicted fibre length	54
Table 9. Correlation of the components within fleece weight selected (a) and control (b) flocks	56

- Table 10. Contribution of components (in logarithms) to differences in W between ewes within each flock as assessed by the coefficients of determination (R^2) 58
- Table 11. Proportion of the sum of within flock variation in fleece weight accounted for by each component 58
- Table 12. Standardized partial regression coefficients of the log of each component on the log of clean fleece weight 59

LIST OF FIGURES

- Fig.1. The relationship between mean staple length and mean fibre length 47
- Fig.2. Proportion of between and within flock change in clean fleece weight accounted for by each component (between flock values expressed as percentage deviations; within flock values expressed as coefficient of determination R^2 from simple linear regression) 61
- Fig.3. Proportion of between and within flock change in clean fleece weight accounted for by each component (between flock values expressed as percentage deviations; within flock values expressed as the standardized partial regression coefficients) 62
- Fig. 4 Path diagram indicating the interrelations of components and clean fleece weight (W)
 (a) within the selected flock 68
 (b) within the control flock 68

CHAPTER 1.

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 $W = S \cdot N \cdot A \cdot L \cdot K$, 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.