THE RELATIVE IMPORTANCE OF HEREDITY AND ENVIRONMENT IN MUTTON SCORE AND FLEECE CHARACTERISTICS IN AUSTRALIAN MERINO SHEEP

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INTRODUCTION

The Australian Merino is primarily a wool producing sheep. Investigations into the factors affecting mutton production in this breed seems desirable, however, in case the development of the artificial fibres lowers the relative importance of wool, and because the Merino is a maintenance breed in the stratification of the Australian sheep industry (Nichols 1945).

Taneja (1955 a, b, c) studied the characteristics desired for selection for improving the mutton qualities in this breed. The heritabilities of and the genetic correlations amongst these characteristics have also been reported (Taneja 1958 a, b). In order to improve both mutton and wool qualities in this breed, the knowledge of genetic and phenotypic parameters is essential. Morley (1951, 1956) reported the heritabilities of, and the genetic correlations amongst the fleece characteristics in Australian Merino sheep. However, no study has been made to estimate the genetic correlations of each of the fleece characteristics with mutton type. Besides this, knowledge on the relative importance of heredity and environment in mutton type and fleece characteristics is also lacking. This study was, therefore, undertaken to complete this deficiency.

MATERIALS AND MANAGEMENT

The flock of Peppin Merino sheep in which the observed animals were born has been previously described in detail (Taneja 1955 a). In the present study, however, only one group of data (Group 'W') has been used. The flock consists of seven 'selection groups'. Four of these 'selection groups' contain lambs born to sheep selected for or against clean fleece weight and number of crimps per inch. The selection groups of the experimental flock are as below:—

<table>
<thead>
<tr>
<th>Selection groups</th>
<th>No. of ewe lambs</th>
<th>No. of sires</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nucleus</td>
<td>69</td>
<td>6</td>
</tr>
<tr>
<td>Progeny testing</td>
<td>107</td>
<td>15</td>
</tr>
<tr>
<td>Random</td>
<td>23</td>
<td>7</td>
</tr>
<tr>
<td>Minus crimp per inch</td>
<td>17</td>
<td>4</td>
</tr>
<tr>
<td>Plus crimp per inch</td>
<td>18</td>
<td>5</td>
</tr>
<tr>
<td>Minus clean fleece weight</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>Plus clean fleece weight</td>
<td>16</td>
<td>5</td>
</tr>
</tbody>
</table>

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The measured animals comprised 269 ewe lambs born in autumn 1952. The number of sires used was 47.

A detailed account of the prevailing environmental conditions has been given by Morley (1951). It is a closely controlled and recorded experimental flock maintained under the local pastoral conditions at Trangie, New South Wales.

**Methods**

(a) **Characters Observed**

(i) **Mutton score**

Scores for mutton type were based on the shape of hind quarters of the living animals, viewed from the rear. Sheep with 'good fill' in the hind quarters giving an impression of an inverted U were scored high and those with 'poor fill' looking more or less like an inverted V were scored low (Taneja 1955 b, 1958 a, b). As the range of variation in mutton type as judged by this method was found to be limited, only three grades (2, 1 and 0) in the descending order of merit were used. The assessments were made 2 or 3 days after crutching. Each sheep was graded once by four observers each recording his score independently. The score used in the final assessment analysis was the sum of the scores of the four observers. The repeatability of observers for scoring sheep for mutton type was estimated to be 0·64 (Taneja 1955 b).

(ii) **Staple length**

The staple length was taken as the length from the base of the staple to the dense part of the tip. If the staple had a marked kink, this was removed by a lateral pressure, but the staple was not subjected to any longitudinal tension at the time of measurement. Measurements to the nearest half-centimeter were made on three staples from a mid-side sample, and the mean of these is reported as the staple length (Morley 1951, Turner et al. 1953).

(iii) **Clean fleece weight**

Clean fleece weight as used in this study has been defined as the weight of the clean scoured wool fibres of about 16% moisture content grown by the sheep. It was estimated as the product of greasy fleece weight and the yield.

Greasy fleece weight is the weight of the wool fleece immediately after shearing, while the yield is the percentage of scoured wool conditioned in an atmosphere of temperature range 60-70° F and relative humidity 60-71%. The method is described in detail by Morley (1951) and Turner et al. (1953).

(iv) **Number of crimps per inch**

This was measured in the bottom inch of staple growth. The number of crimps was measured by matching the peaks of the crimps against the teeth in the edge of a polygonal plate. Each inch-long side of the plate is cut with a different number of teeth to the inch (Turner et al. 1953).