THE GENETICS OF THE WENSLEYDALE BREED OF SHEEP

II. COLOUR, FERTILITY, AND INTENSITY OF SELECTION

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INTRODUCTION

Lush has recently pointed out that before applying the fundamental facts concerning the inheritance of productivity in farm livestock, measurements are needed of the magnitude of the forces involved. He is of opinion that “neglect to measure and integrate properly these variables is the major cause for the mistakes and unsound proposals that are sometimes made, even by those whose knowledge of biological fundamentals is not seriously deficient”. He directs attention to two simple facts, the significance of which has not always been appreciated. “The first is that natural fertility and longevity set serious limits to the intensity of the selection which may be practised.” “The second...is that such intensity is weakened (much more than is generally realised) by the inclusion of more and more items in the ideal; that is, by considering many different characteristics in making the selections.” Lush goes on to say that here lies, he thinks, the only general basis of real antagonism between breeding for production and breeding for “fancy points”, namely, that “each additional point considered must necessarily weaken the selection which might otherwise have been practised”.

On reading Lush’s paper it occurred to me that it might be worth while to examine with reference to intensity of selection certain flock records which some dozen years ago were very kindly placed at my disposal for another purpose by Mr G. Goland Robinson. These records cover the whole of a quarter of a century, from 1897 to 1922, from the founding of the flock to the dispersal sale, when Mr Robinson was in charge of the Wensleydale flock of Lord Henry Bentinck at Underley Farm near Kirkby Lonsdale. The examination of these records some years ago was the first part of an investigation of colour inheritance in the Wensleydale breed. This flock is a good one in which to investigate intensity of selection because every care was taken of the sheep, and it was more important to utilise good ewes to the full than to keep depre-
ciation on female breeding sheep at a minimum. The ages up to which all ewes were retained whose ages of entering the flock were recorded are shown in Table I.

The Wensleydale breed is for two reasons a good one for the study of the intensity of selection. On the one hand, the breed is outstandingly fertile. On the other hand, the accepted colour standards being what they are, a big proportion of the lambs born, not merely the blacks, but an appreciable percentage of the whites, have on this account alone no chance of being chosen for breeding. Colour inheritance, therefore, as well as fertility, bears on intensity of selection.

I. COLOUR INHERITANCE

(1) Wool colour types and their genetic relationship

The Wensleydale wool colour types are white, black, and silver-grey. Black and silver-grey are sometimes conveniently grouped together as not-white or coloured. In coloured lambs the white fibres with tips intact always have "black", i.e. sepia, apical ends, though the pigment may be confined to the extreme tip and be visible only under the microscope. The percentages of white fibres to be stated were ascertained from counts at the basal end of the staple made at the age of about 3 months. Black lambs have always been found to possess a small sprinkling of white fibres, the darkest wool specimen having about a half of 1 per cent. Six per cent. is a frequent figure for black lambs. Lambs classed as silver-grey have from about 25 to 85 per cent. of white fibres on the main area of the fleece, with the extremities darker.

Earlier papers gave an analysis of the Underley records, with other facts and figures contributed by breeders, and the results of breeding experiments. White was concluded to be a simple dominant to coloured. It was suggested that silver-grey and black may differ by a single main factor, and that white, silver-grey, and black, in the order named, may form an epistatic series. When it is not necessary to distinguish between black and silver-grey, it is sometimes simplest to speak of white on the one hand and black on the other.

(2) White versus coloured

As published before, in matings between white rams and coloured ewes in which coloured lambs appeared in the progeny of every ram, less than half the lambs have been coloured. Additional matings make the totals:

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<thead>
<tr>
<th>White</th>
<th>Coloured</th>
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<tr>
<td>75</td>
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