GENETIC AND ENVIRONMENTAL INFLUENCES ON VARIABILITY OF FIBRE FINENESS IN MERINO WOOL

Influences génétiques et ambientales sur la variabilité de la finesse dans la laine mérinos

Influencias genéticas y ambientales sobre la variabilidad de la finura de la lana merina

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Although the wool trade has always been unanimous in demanding uniformity in wool quality number within sale lines, there is little critical information to support the contention that a high degree of variation in fibre diameter causes major difficulties in spinning with consequent loss of efficiency and higher costs in yarn production.

Commercial estimates of variability within sale lots have, until quite recently, been dependent on subjective assessment, based largely on crimp frequency and the general appearance of the wool. It is now known that the correlation between appearance and measured fibre fineness is very low indeed within clips of wool derived from Merino sheep bred on one property, and it follows that the effort of wool classers to produce uniformity by segregating lines for apparent fineness within clips is almost entirely wasted.

This has been established during investigations carried out as part of the Australian Objective Measurement Programme (AOMP, 1972) and in turn explains why critical trials showed no price premium for traditionally well classed lines (WHAN, 1970) because, in fact, no gain in efficiency in handling or processing was generated.

Recently, DUNLOP and MCMAHON (1973) have demonstrated that the principal source of variation in fibre diameter within a wool clip stems from variation in fibre size amongst closely adjacent fibres (Table 1).

Clearly, the diameter variation within a single clip is dominated by the variation occurring between and along individual fibres. Since the latter variation in the Australian Merino is known to be controlled by non-genetic effects such as changes in nutrition, animal health, and physiological influences such as pregnancy

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TABLE 1

Source of variation	%
Between and along fibres (staples)	74
Between sites on individual sheep	9
Between sheep within flocks	17
	100

and lactation, it has long been believed that differences in breeding policy were responsible for the major differences between adjacent fibres at skin level. Most popular accounts of sheep breeding direct owners to follow a consistent practice of building up a well bred flock by regular purchase of similar type rams from the one source, in the belief that mating like to like will achieve increased uniformity in all characteristics including, presumably, the size of individual fibres.

In 1971 and subsequent years, the opportunity occurred to check the overall variability in fleece wool from a complete New South Wales Central Tablelands Merino clip. Table 2 shows the genetic origin of the flock.

TABLE 2

Genetic origin	Quality number
Foundation ewes:	
314 M/A * Tableland ewes	60 *s* - 80 *s*
310 Cull maiden strongwool ewes	58 *s* - 64 *s*
170 M/A Peppin type ewes	60 *s* - 64/70 *s*
Rams used in experimental groups:	
40 % Haddon Rig Peppin type	60 *s* - 64 *s*
40 % Egelabra daughter stud	58 *s* - 64 *s*
20 % Collinsville daughter stud	58 *s* - 60 *s*
Progeny:	
All viable young ewes incorporated in the flock without culling or classing.	

* Mixed age.

In preparing the wool clip for sale only abnormal fleeces showing tenderness, cotting or discolouration were removed, following normal shed practice of light skirting and removal of belly wool.

A composite line consisting of all fleece wool from ewes, wethers and hoggets, amounting to about 30 bales, was core sampled and measured for fineness by the optical method so that diameter and coefficient of variation could be calculated. In 1973 in conformity with Objective Clip Preparation procedures (Australian Wool Corporation, 1973) visually strong fleeces and hogget wool were removed from the main line.

Table 3 shows the results of diameter and diameter variability measurements over the 3 years 1971-73.

TABLE 3

Year	Percentage of fleece wool in main line	Mean fineness (μm)	C. of V.
1971	97 %	21.3	22.5
1972	90 %	21.75	22.4
1973	60 %	22.3	22.3
		Commercially combed top (1971 only	
		21.1	22.9

The bulk lines, so derived, aroused considerable interest in the wool trade and were severely criticised for the apparent variability in quality number apparent on subjective assessment. In 1971, however, arrangements were made for the whole line to be combed as a trial lot (see Table 3) and the top produced was

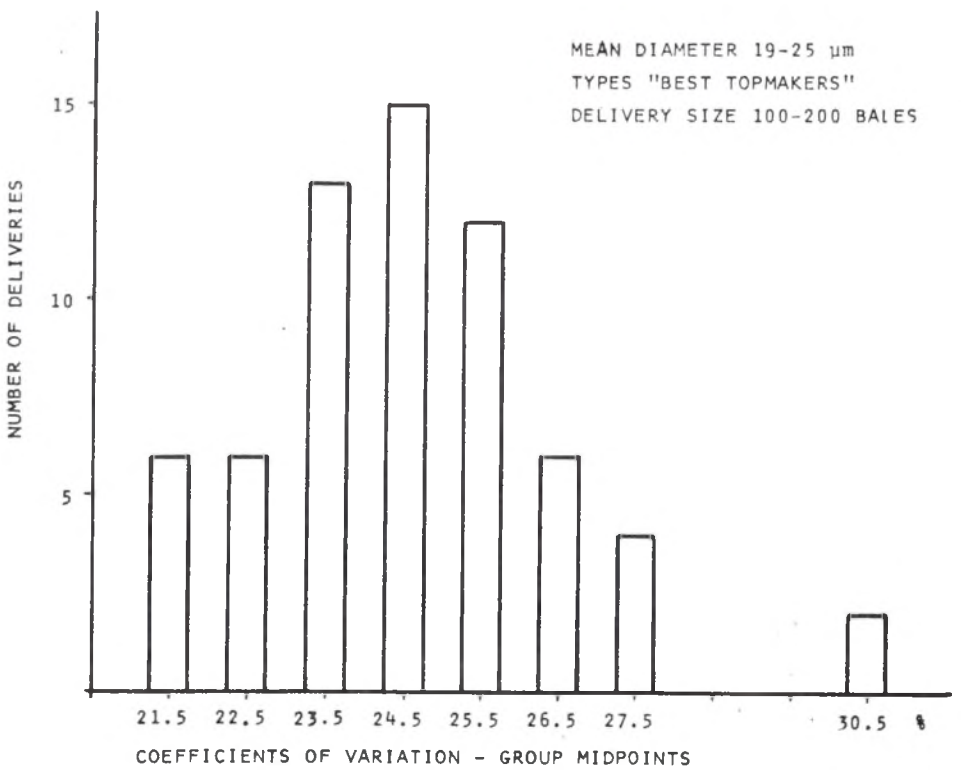

FIG. 1. Distribution of coefficients of variation in fibre diameter for 62 commercial deliveries of «Best Topmakers» australian merino fleece

commented upon favourably for uniformity of fibre fineness by a leading Bradford authority. This opinion has been confirmed by comparison with the distribution of coefficients of variation in fibre fineness found in 62 commercial deliveries (100-200 bales) of scoured Australian Merino wool of «Good Topmaking» style in the 18-25 micron range (Fig. 1). 80 per cent of these deliveries are less uniform than the clip being studied in the present report. Finally, comparison may be made with American National Standard L 14.26, 1969, which allows up to 25.1 % coefficient of variation for 22 μm wool in the scoured state.

Discussion

These results are clearly of great importance to stud breeders, commercial wool growers and to wool manufacturers. They show that the progeny of wide out-crosses within the Australian Merino breed can, without culling, produce wool which, even without classing, is sufficiently uniform in fibre diameter as a bulk line for manufacturing into high grade tops. Trade complaints concerning lack of uniformity in subjective quality number probably arise from confusion between the commercial desirability of a sorting process when the premium for fineness is substantial and labour is cheap, and the real technological requirements of the topmaker and spinner.

The results also confirm the conclusions of the AOMP investigations which showed that variability in fibre diameter in wool, not subjected to adverse environment during growth, is genetically controlled at the within staple level and is affected to a negligible degree by classing prior to sale. In this instance the measure of variability was not changed by exclusion of hogget fleeces and visually «strong» wool.

SUMMARY

Australian Merino wool grown commercially on Australian Merino stock of extremely mixed origin (3 diverse lines of foundation ewes; 3 very different strains of rams) and not subjected to culling, except for non-viable producers, when prepared for sale with the minimum of classing, produced blends of very satisfactory uniformity in fibre diameter (C. of V. 22.4 %) and a wool top which was commented on favourably for this feature. The results confirm work showing that variability in fibre diameter stems principally from inherent differences in fibre size within individual staples and not from variability over the fleece, or from animal to animal in the flock.

RESUMEN

La lana merina australiana procede comercialmente del merino de Australia, de origen extremadamente mixto (tres diversas líneas de ovejas de fundación; tres estirpes muy diferentes de carneros) y no se somete a desecho, salvo para los animales muy defectuosos, cuando se prepara para la venta con un mínimo

de claseo, produciendo vellones de uniformidad muy satisfactoria en diámetro de la fibra (coeficiente de variabilidad = 22,4 %), constituyendo un tipo de lana considerado como muy satisfactorio para esta característica. Los resultados confirman que la diferencia o variabilidad en el diámetro de la fibra depende principalmente de las diferencias a lo largo de la misma en las fibras individuales y no en el vellón, o de animal a animal en el rebaño.

RESUME

La laine mérinos australienne procède comercialement du mérinos de l'Australie, à l'origine extrêmement mixte (trois lignées diverses de brebis de fondation; trois souches très différentes de moutons), et elle ne se soumet pas à rebut, sauf pour les animaux ayant un grand nombre de défauts, quand on la prépare pour la vente avec un minimum de classement, en produisant de toisons à uniformité très satisfaisante quant au diamètre de la fibre (coefficient de variabilité = 22,4 %) et en constituant un type de laine considéré très satisfaisant quant à cette caractéristique. Les résultats indiquent que la différence ou variation du diamètre de la fibre dépend principalement des différences au long de celle-ci dans les fibres individuelles, et non dans la toison, ou bien, d'animal à animal dans le troupeau.

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