



**THE INHERITANCE AND CONTROL OF  
ISOLATED PIGMENTED WOOL FIBRES  
IN MERINO SHEEP**

by

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**ABSTRACT**  
**THE INHERITANCE AND CONTROL OF**  
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This thesis provides an account of research on the occurrence and inheritance of isolated melanin pigmented wool fibres and macroscopic pigmentation in Merino sheep. Dark fibres in greasy wool cannot be reliably measured prior to sale and can limit the flexibility of end-use and result in financial loss by wool processors. In view of this limitation of wool, Merino breeders have traditionally selected against most types of pigmentation.

Following the literature review (Chapter 1), three experiments are presented in detail. The first experiment (Chapter 2) involved a private Merino flock in which pigmented leg fibres had increased. Hogget ewes without pigmented leg fibres had a distinctly lower incidence of isolated pigmented fibres (22 vs 1136 per kg of scoured staples) relative to sheep with this macroscopic pigmentation. Leg fibre pigmentation also involved greater amounts of other pigmentation and was highly repeatable (0.9) during adult life.

The second experiment (Chapter 3) involved a Merino resource flock at the Agricultural Centre, Trangie (NSW) and provided estimates of heritabilities and correlations for pigmentation traits and some production traits (Chapter 3). Most types of pigmentation had moderate or high heritabilities and were positively correlated with each other. Exclusion of sheep with macroscopic fibre pigmentation reduced the concentration of isolated pigmented fibres in the hogget wool clip from a mean of 231 per kg to as low as 15 per kg.

Pigmented halo-hair on the birthcoat had the highest correlations ( $r_p = 0.33$  and  $r_g = 0.66 \pm 0.19$ ) with the concentration of isolated pigmented wool fibres and their heritabilities were  $0.61 \pm 0.16$  and  $0.18 \pm 0.12$ , respectively. Even though the heritabilities and genetic correlation coefficients mainly had high standard errors, being based on a sample of 24 to 42 sires, the pigmentation parameters are the first values to be generated for Merinos.

The phenotypic correlations between the hogget production characters (clean fleece weight, average fibre diameter and off-shears body weight) were low (-0.7 to 0.13). However, the genetic correlations between pigmentation and clean fleece weight or body weight were generally positive (0.1 to 0.7) while those with average fibre diameter were generally negative (-0.1 to -0.5). The importance of these genetic trends on future generations arising from industry selection practices and in other Merino resource flocks requires further clarification.

The mode of inheritance of key indicators (pigmented leg fibres and pigmented birthcoat halo-hair) of isolated pigmented wool fibres was investigated at Turretfield Research Centre, Rosedale (SA) (Chapter 4). The segregation of phenotypes (presence vs absence) for leg fibre pigmentation was consistent with simple Mendelian inheritance though penetrance of the proposed allele was not complete. The data for pigmented birthcoat halo-hairs was inconsistent with the hypothesis for simple inheritance.

Also conducted at Turretfield, were other experiments (reported briefly) that increased understanding of the occurrence of isolated pigmented wool fibres (foetal development, distribution in the fleece, change with age), changes in macroscopic pigmentation with age and the relationship between measurements of pigmented fibres in raw wool and processed tops.

This thesis confirms that the occurrence of isolated pigmented fibres in hogget Merino fleeces is associated with the presence and degree of types of remnant macroscopic fibre pigmentation. The opportunity to exploit these associations to improve wool quality in relation to dark fibre risk is examined.

## DECLARATION

This work contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and that, to the best of my knowledge and belief, contains no material previously published or written by another person, except where a due reference has been made in the text.

I give consent to this copy of my thesis, when deposited with the University Library, being available for loan and copying.

Date: 5th March 1997

Signature:

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