Merino Crossbreeding and Objectionable Sheep Fibres: the Problem and Potential Solution

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Summary

The presence of trace amounts of pigmented, or white kemp, fibre in otherwise white wool restricts the flexibility of end-use for the wool. Increased crossbreeding in Australia, especially the minority involving coloured or kempy breeds, has produced concerns and uncertainty about occurrence of affected wool lots. It is important for the buyer to be aware of the existence of these objectionable fibres in wool lots. AWEX has changed clip preparation standards by instigating a new bale brand qualifier ("Y" suffix) in order to reduce uncertainty in the market concerning pigmented and kemp fibre contamination. Increase in the quantities of wool appraised for the auction market as containing pigmented or kemp fibre are shown together with estimates of the penalties applying for Merino fleece wools containing pigmented fibre. Gaps remain in information concerning the range of on-farm situations where the "Y" description is warranted. Research is currently being directed at both filling these gaps in information and at the provision of a practical and reliable presale test for detection of sheep fibre contaminants that are widely dispersed through the wool lot.
Keywords: wool contamination, crossbreeding, pigmented and medullated fibre, market penalties

Background

Traditional wool producers in some areas have introduced "exotic" sheep (e.g. Awassi, Damara) to diversify their commercial enterprise to include meat production. In order to quickly build up sheep numbers, rams of these exotic sheep are being crossed with Merino ewes. Crossbreeding and running crossbred lambs with Merino ewes facilitate fibre transfer, providing a risk of contamination by objectionable pigmented or medullated fibre. Dark fibres and heavily medullated fibres (kemp) restrict the flexibility of end-use of wool in white/pastel or dyed applications, respectively. AWEX revised the Code of Practice for the preparation of Australian wool clips incorporating a "Y" suffix and included wool contamination as a significant issue in their Woolclasser Development Program (AWEX 2001). However, these diversifications of sheep enterprise have raised issues for the wool industry that are still not fully resolved.

Effects on the Wool Market

Obviously a replacement of Merino sheep by exotic (fleece shedding) breeds will reduce wool supply. South Africa is the origin of fleece shedding sheep types in Australia except for Wiltshire Horn and its derivatives. Figure 1 shows changes in flock composition and wool production of South Africa during the 1990's (AWEX 2002). Expressed as average greasy wool production per head there is a reduction from 3.9kg in 1990 to 2.9kg in 2000; apparently reflecting substantial increases in the proportion of fleece shedding breeds.

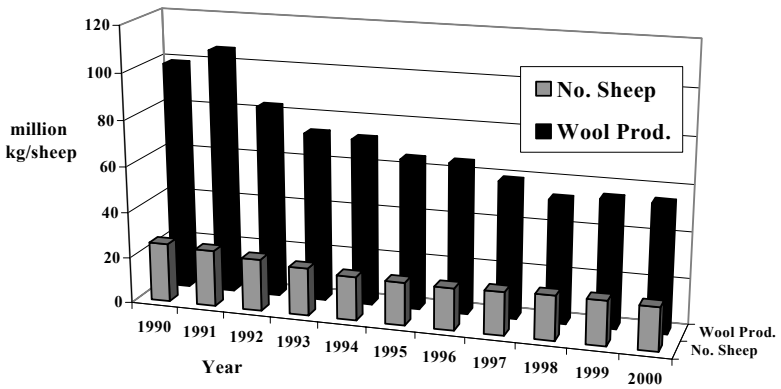

Figure 1. South African sheep population (million) and wool production (million kg greasy)

Prior to the 1990's, Australia had relatively little Merino wool (i.e. less than 0.1%) in the auction market that was black or identified as containing pigmented fibre (Dolling 1989). However, the recent increase in pigmented wool being offered at auction, as shown in Table 1, appears to involve exotic breeds and crossbreeding with Merinos. In 2001/2002 the amount of white Merino fleece and pieces wool appraised as Y1 (containing isolated pigmented fibre) was 524,712kg greasy being 0.15% of all Merino fleece and pieces wool sold at auction.

Table 1. **Percentage of auction sold wool appraised as containing pigmented or kemp fibre**

Region	Fault	1999/2000	2000/2001	2001/2002
Western	Pigment	0.60	1.07	1.00
	Kemp	0.02	0.17	0.42
Northern	Pigment	0.08	0.18	0.34
	Kemp	0.01	0.02	0.07
Southern	Pigment	0.06	0.11	0.21
	Kemp	0.02	0.02	0.03
Total	Pigment	0.19	0.33	0.41
	Kemp	0.02	0.05	0.12

In view of the small quantities of wool offered it has been difficult to determine the price penalties associated with recognition of these faults in greasy wool (Pattinson and Hanson 1993), but recent increased data presents the opportunity to better determine and monitor buyer reactions. Table 2 provides estimates (supplied from AWEX) of the clean price reductions on wool lots of Merino fleece wool sold at auction and appraised as having Y1 (isolated pigmented fibre), Y2 (pigmented fibres readily evident) and Y3 (clearly black wool or a mixture of black and white wool).

Table 2. Reductions in the auction wool price (cents/kg clean) of pigmented Merino fleece wools

Fault scale	Fibre	Reduction in clean price and number of affected lots (brackets)		
	Diameter	1999/2000	2000/2001	2001/2002
Y1	17.1 - 20.0µm		-143 (6)	- 67 (71)
	20.1 - 23.0µm	- 92 (1)	- 66 (62)	- 92 (151)
	23.1 - 26.0µm		- 57 (11)	- 128 (26)
Y2	17.1 - 20.0µm			- 288 (1)
	20.1 - 23.0µm	- 163 (9)	- 172 (7)	- 210 (4)
	23.1 - 26.0µm		- 176 (2)	
Y3	17.1 - 20.0µm	- 508 (2)	- 576 (2)	- 359 (19)
	20.1 - 23.0µm	-185 (6)	- 190 (19)	- 281 (13)
	23.1 - 26.0µm			- 199 (1)
Average clean price (c/kg)	17.1 - 20.0µm	1052	1261	1029
	20.1 - 23.0µm	466	580	786
	23.1 - 26.0 um	406	514	765

Based on the average clean prices for the periods 2000/2001 and 2001/2002, the discounts when averaged across fibre diameters are 11% for Y1 (both years); 31% and 27% for Y2; and 34% and 35% for Y3; respectively. The apparent increase in penalty with increased fibre diameter for Y1 in 2001/2002 is opposite to expectation since fine wool products would be more sensitive to dark fibre contamination in fabric. One would not expect processors to knowingly use wool at risk of dark fibre and white kemp for sensitive end-uses. However, there are varying levels of tolerance to these faults (Foulds *et al.* 1984; Hatcher 2002) and for certain blends and processing treatments (e.g. recombing) an acceptable dilution or fault removal may be achieved.

Isolated white kemp in greasy Merino wool is more difficult than pigmented fibre to identify. Little Merino fleece wool appraised as containing kemp appears in the auction database even though entirely white fleece shedding breeds (e.g. White Dorper) and some other traditional breeds may contribute important amounts of kemp fibre in Merino crossbreeding situations. In 2001/2002 only 16,724kg of greasy Merino fleece wool was appraised as being P1 (contains isolated kemp fibre) and for the 4 lots able to be used in the price analysis the discount was 67c/kg clean.

While the total amount of auction-declared or branded, and AWEX-appraised, black, kempy or contaminated white wool is relatively small it is uncertain how much of the total shorn wool and woolled skin production is actually affected. Wool lots that are predominantly coloured or kempy can easily be recognised from buyer inspections of the raw wool, but it is the hidden isolated fibre, sporadic clump or larger portion, that can easily escape recognition. These faults usually arise from transfer of fibre or inclusion of the crossbred wool with Merino wool but could also persist as an inherited fault (Fleet 1996) should crossbreds be retained and mated to Merino rams. Therefore, buyers rely on farm practices and bale descriptions or other market segregation to avoid these objectionable dark or kempy fibres where required. Unexpected surprises in processing (such as rejection of the batch or claims on the supplier) must then be allowed for by discounting prices on raw wool. It seems likely that without rigorous attention to identification of contaminated wool, expansion of coloured and kempy breeds involving crossbreeding with Merinos, will bring a reduction in confidence among wool buyers in wool descriptions that have traditionally been assessed as low risk of such objectionable fibre. This affects the relative competition of Australian wool with other wool suppliers, who are improving in these respects (e.g. Mendoza and Maggiolo 1999), and alternative fibres in general. Australian Merino wool has traditionally been valued for its relative low risk of dark fibre (e.g. Cardellino 1978) with this reputation previously considered to be worth 10% of gross value (Pattinson and Hanson 1993).

Limited Breed Information

Apart from certain extreme breed types, there is little known about the extent of contamination occurring when Merinos are continuously exposed in crossbreeding situations. Statistical farm surveys reveal a substantial swing in the ewe matings to non-Merino rams, apparently to better exploit high prices in the meat carcass or live sheep trade markets (Hooper and Connell 2001). In South Australia and Western Australia the proportion of the mainly Merino ewe flock that was mated to non-Merino rams has nearly doubled between 1990 and 2000 and in total accounted for 47% and 28%, respectively, of all intended matings in 1999/2000 (ABS 2000; N. Gibson - personal communication). The AWEX Code of Practice for the preparation of Australian wool clips applies a pigmented and medullated fibre risk level for each of 33 breeds or breed types, ranging from 1-low risk (Merino types) to 5 high (exotic) risk (e.g. Damara). Woolclassers are required to identify Merino wool at risk of being contaminated with pigmented or medullated fibres and are given mandatory instruction to apply the “Y” suffix to wool from Merino ewes that have reared crossbred lambs from breeds in the highest risk category (e.g. Damara). Lambs shed short fibres from the head and legs and longer fibres from "hairy" birthcoats and when these fibres are pigmented or have pronounced medulla there is a contamination risk. In this regard Merino lambs usually present little risk.

Current Research

Research has been undertaken in relation to Damara crossbreeding effects. It was shown that Merino ewe fleeces were contaminated with objectionable pigmented and medullated fibres after rearing Damara crossbred lambs. Delaying shearing until well after weaning only partly reduced this contaminant fibre burden (Fleet *et al.* 2001, 2002). These results are similar to those found when Merino ewes rear Awassi crossbred lambs (Hatcher *et al.* 2000). The wool from Merino lambs run together with Damara crossbred lambs also became heavily contaminated with objectionable sheep fibres (Fleet and Bennie 2002). The transferred Damara crossbred fibres, in general, had higher fibre diameters (average 68μm), variable lengths (longest class averaged 34mm after carding), pronounced medulla and had tapered fibre bases typical of shed fibres from the hairy birthcoats (Fleet *et al.* 2001). In addition to adapting clip preparation standards to allow the identification of contaminated Merino wool (AWEX 2001) there has been attention directed at possibilities for a presale test. Research has shown that isolated pigmented or white kemp fibre that is transferred during lamb rearing in certain Merino crossbreeding situations is dispersed widely through the exposed wool and can, therefore, be reliably sampled from the presale core sample. However, the methods of measurement applied (based on CSIRO Dark Fibre Detector) are labour intensive and involve subjective variations (Fleet *et al.* 2001, 2002) and are not considered suitable for routine presale testing.

Proposed Research and Development

The proportion of Merino wool from self-replacing flocks has declined and it may be important for buyers to be aware of the relative contamination impacts from certain other "traditional" breeds as well as "exotic" types.

Unfortunately, for most crossbreeding situations, there is no substantiating information to assess the extent of risk involved. Woolclassers are left with uncertainty about when is it appropriate to apply the "Y" suffix with other breeds (not classified “exotic”) which produce Merino crossbred lambs that are partly coloured or have kempy fibre. This uncertainly can result in either over or under-description penalising either the wool producer or the wool processor. The SARDI proposed research projects aimed at filling these gaps in information.

SARDI has also proposed research to examine the persistence and impact of Damara crossbred fibre in worsted and woollen processing to yarn. From a processor perspective it is considered that such contaminated wool would not knowingly be used for an end-products expected to be free of dark or kempy fibre based on the proposal (Hatcher *et al.* 1999) that worsted processing could correct the problem through the removal of short fibre. Furthermore, the by-product of worsted combing (noils) is then processed by the woollen industry that is especially sensitive to dark or kemp fibre for the finer wool applications. Although worsted combing and recombing does remove short fibre, some of this fault remains, the longer contaminant fibres are likely to persist and, for some worsted end-uses, the number of faults tolerated is very small (Foulds *et al.* 1984).

Another option that can improve buyer confidence and processing predictions is presale testing. However, at present, there is no practical and reliable option available to measure objectionable sheep fibres in core sample material. The need to resolve this deficiency of technology is emphasised by the recent invitation by Australian Wool Innovation Ltd. (www.woolinnovation.com.au) for research proposals to develop a presale test for pigmented and medullated fibre. Should such a technique become available then testing could be used in the following potential applications:

- Producers who are involved in crossbreeding with coloured or kempy types and who believe their management has minimised contamination;
- Producers who have not been involved in such crossbreeding and believe their wool so measured will attract the attention of buyers and a market advantage;
- Surveillance of wool description/standards for market protection purposes; and
- Buyers who post-sale test to become more confident about the contents of raw wool whether or not the lots are described/declared at risk.

The extent to which such a test is adopted for each of these applications will depend on the test cost and the confidence (reflected by compensation or request) in the result shown by the buyers. Clearly, there are substantial discounts on identified contaminated wool so there could be demand for the test even if test costs were high. Concerns about market protection could also provide the incentive for random monitoring of description/standards despite a potentially high testing cost.

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