

Towards a reliable test for predicting wool contamination and impacts on processing

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Introduction

Although greasy wool lots are well specified presale by the Australian Wool Testing Authority Ltd (AWTA), a weakness exists because of the absence of an accepted test for dark and medullated fibres (DMF). Dark fibres can limit the flexibility of end-use of wool for white or pale coloured products while highly medullated fibres can be objectionable in darker dyed products. Where contaminants are widely dispersed through the lot (e.g. in Merino ewe wool after rearing of Damara crossbred lambs), bale core samples can be used to detect high levels of the contaminant fibres.

Australian Wool Innovation Ltd (AWI) recognised this limitation in technology and initiated projects to develop and refine testing for DMF in greasy and processed wool lots. This AWI project (TD015) involves assessment of a 'rapid' DMF test, involving immersion of wool in benzyl alcohol, and determines the relationships between DMF measurements on raw

Merino core sample wool, contaminated by contacts with Damara crossbred lambs, and the worsted processed top and noil products.

Trial design

The SARDI wools comprise fleeces from 10 groups of Merino sheep in a project undertaken at Minnipa Agricultural Centre in 1999. Briefly, the groups involved either Merino ewes mated to Merino or Damara (fat tail) rams, after rearing of Damara crossbred lambs with shearing of ewes at weaning or 3.5 months after weaning, and Merino lambs run with Damara crossbred lambs for 7 months. The prepared batches were core sampled in a mini-scale press and then sent to CSIRO-TFT (Geelong) for worsted processing. Samples of core wool, top and noil were measured for DMF by AWTA using the AWI/CSIRO/AWTA benzyl alcohol test and the results compared.

Summary

- The SARDI-produced Merino wools from a Damara crossbreeding study have proven to be a useful resource for studying processing impacts on the contaminant fibres. Selection and management of the Merino sheep was successful in controlling potentially confounding influences.
- The benzyl alcohol test on core wool explained well the variation present in the top and noil. It has also been found to produce results for dark fibre in top that compare well with other existing methods but offers advantages of reduced labour or instrumentation costs.

Outcomes

Figures 1 and 2 show the relationship between dark fibre in the scoured core sample and the top or noil, respectively. The core sample test explained well the variation in dark fibre found in the top and the noil ($R^2=0.97$ and 0.87).

It is important to note that the dark fibre test reports contamination as a mixture of units (i.e. number of contaminant fibres per unit weight of wool bulk). Consequently, care is required in the interpretation of contamination content of samples that have different fibre lengths. For example, if a lot of wool containing 10 dark fibres per 10 g undergoes a process that breaks every fibre in the lot, there would then be 20 dark fibres per 10 g — the reported contamination would have doubled, yet the actual amount of contamination would not have changed.

The dependence of the DMF tests on fibre length means that it is not possible to directly apportion contamination reported in greasy wool to either top or noil product based on these results. The raw wool has undergone sampling and preparation

which causes fibre breakage prior to testing, and fibre breakage during processing and length-based separation of the noil during combing ensure that there will be significant differences in the fibre length in the raw wool, top and noil of a lot. While direct quantification is not possible, it is relevant to investigate relationships between these different stages of processing of wool from both experimental and commercial lots. The level of dark fibre detected in top was about half (0.49-fold) that of the level detected in the core sample. Dark fibre levels detected in noil were 4.2-fold the level detected in the core sample.

The Damara crossbred lambs were mainly coloured so white medullated fibre represented a minority of the contaminant fibre burden. Figures 3 and 4 show the relationship between levels of medullated fibre in core sample and top or noil products, respectively. The levels of medullated fibre detected in top were close to half (0.43-fold) that detected in the core sample; a similar result to that found for dark fibre. Medullated fibre levels detected in the noil were 2.9-fold of the level

detected in the core sample. It appears that the benzyl alcohol test is distinguishing reasonably well the white medullated fibres of Damara crossbred lambs (that are likely to be objectionable and restrict flexibility of end-use for dark dyed applications) from the lesser medullation that is inherent in Merino wool.

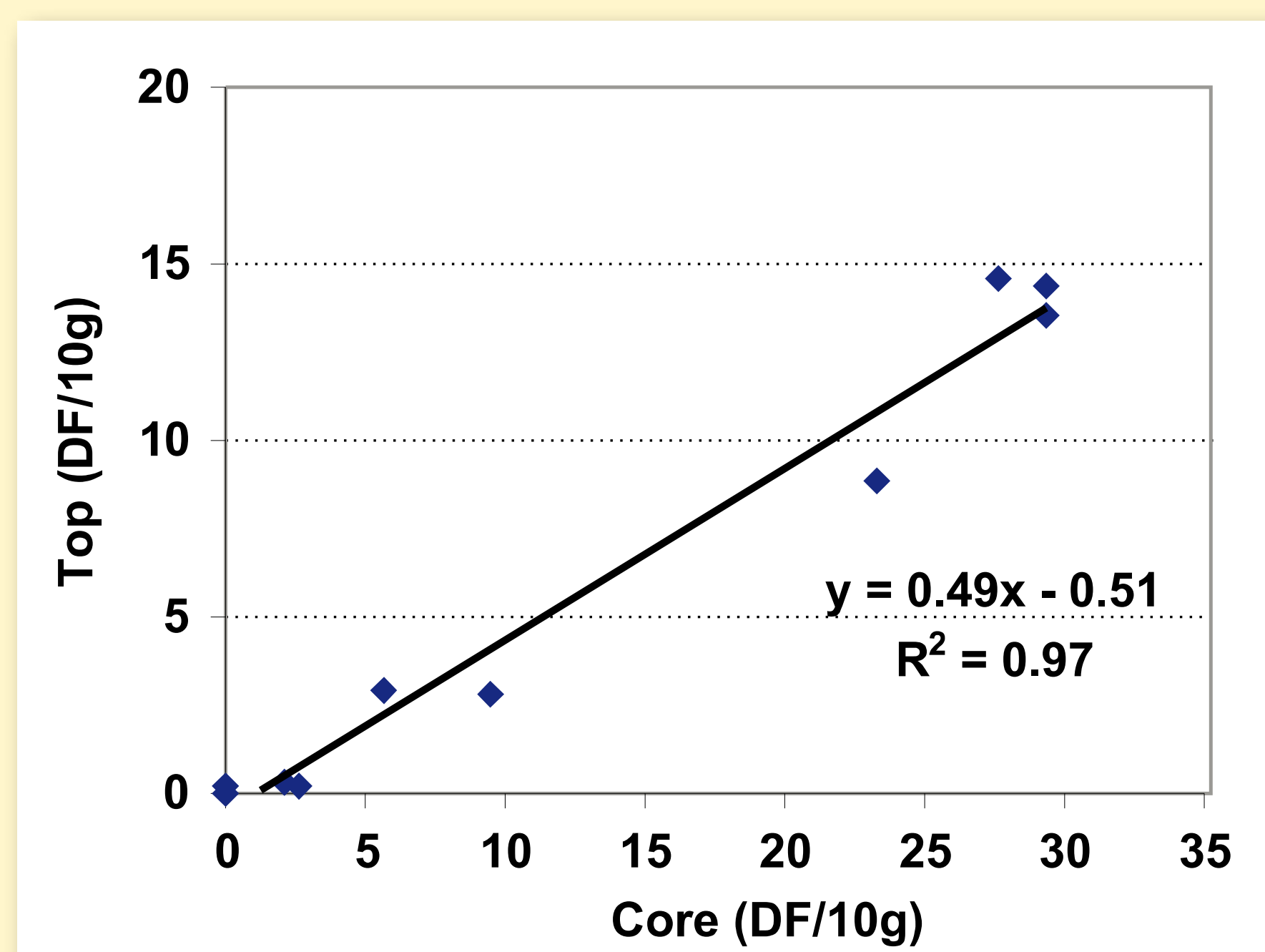


Figure 1. Relationship between dark fibre in core and top.

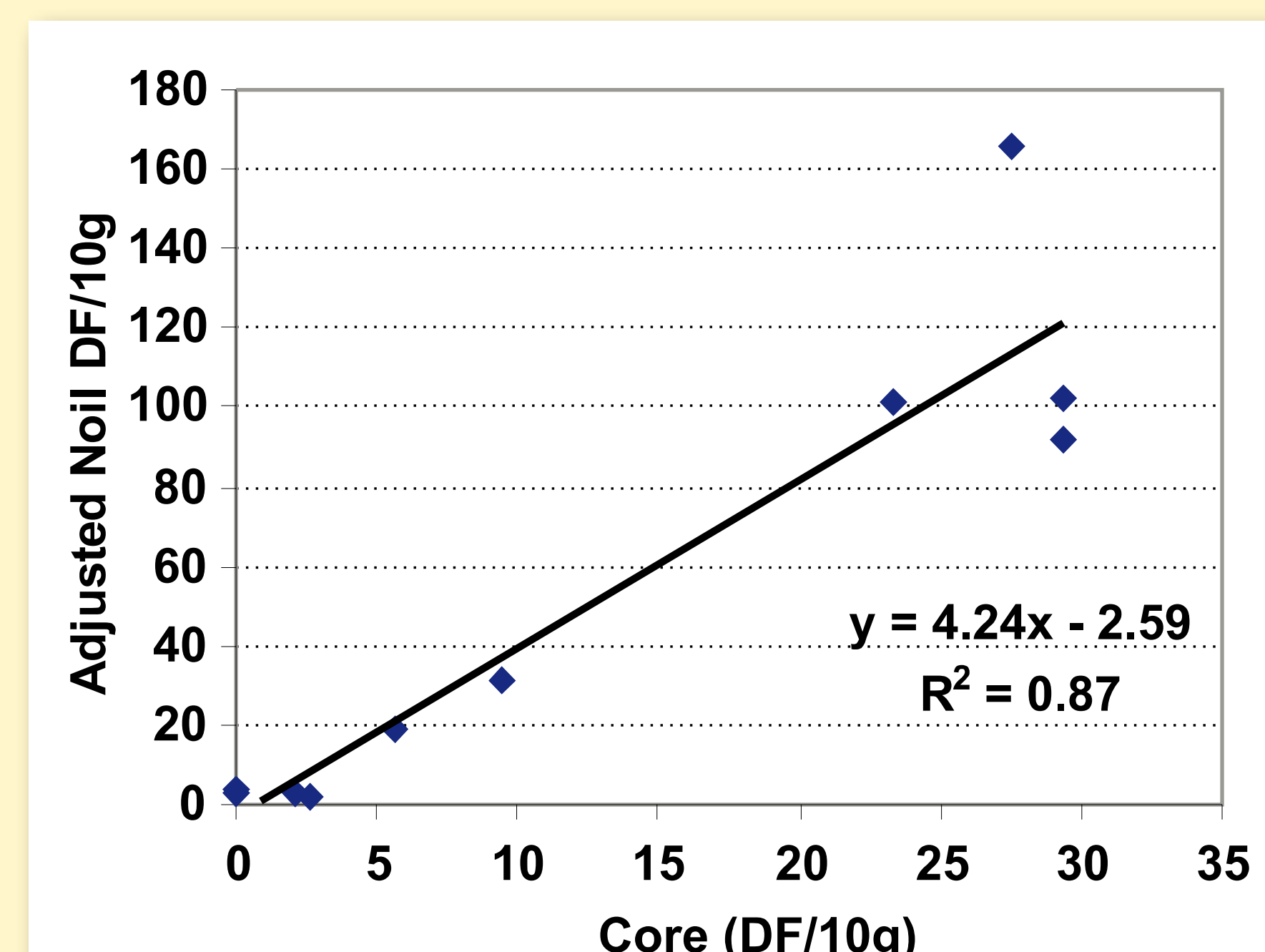


Figure 2. Relationship between dark fibre in core and noil.

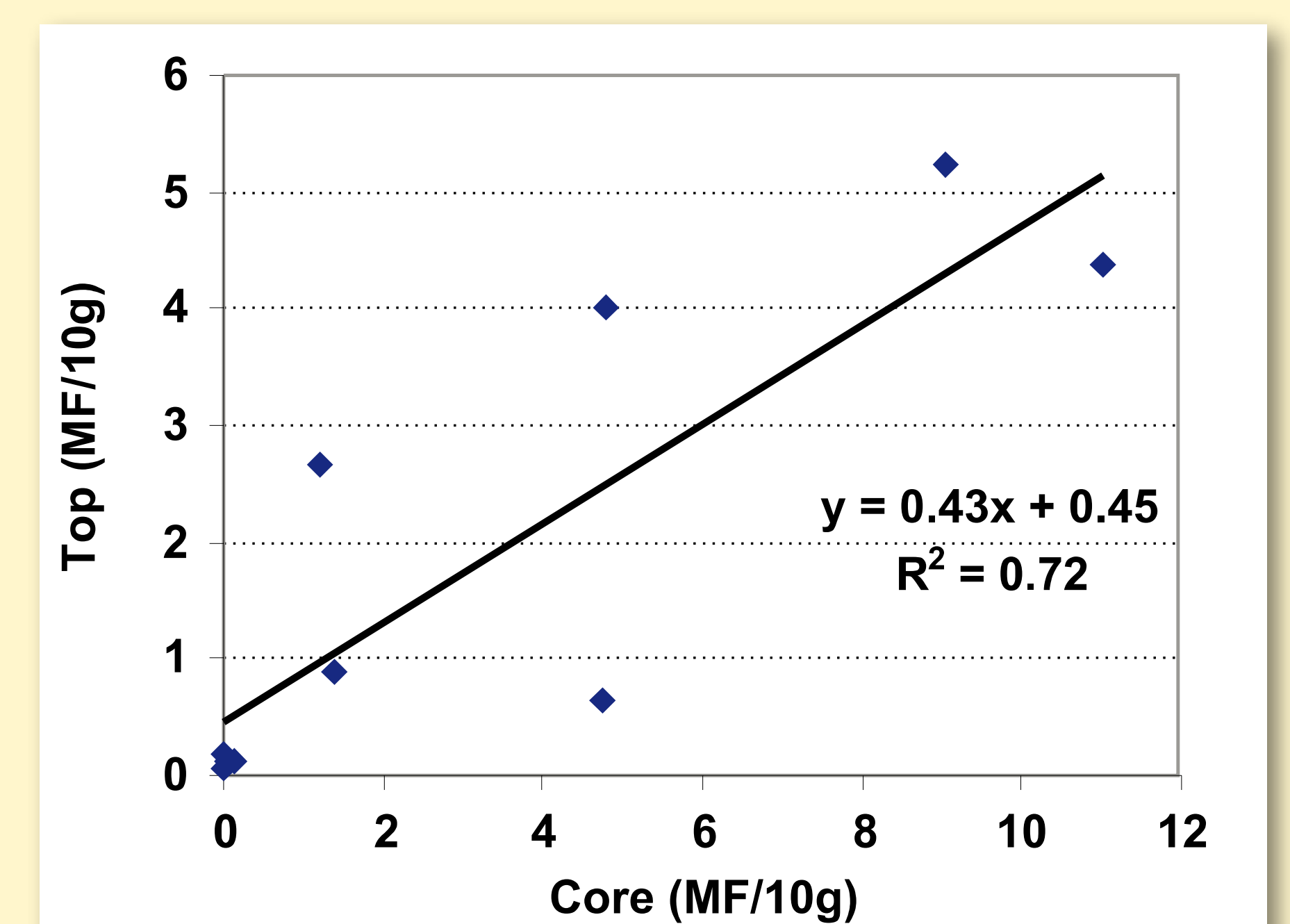


Figure 3. Relationship of medullated fibre in core and top.

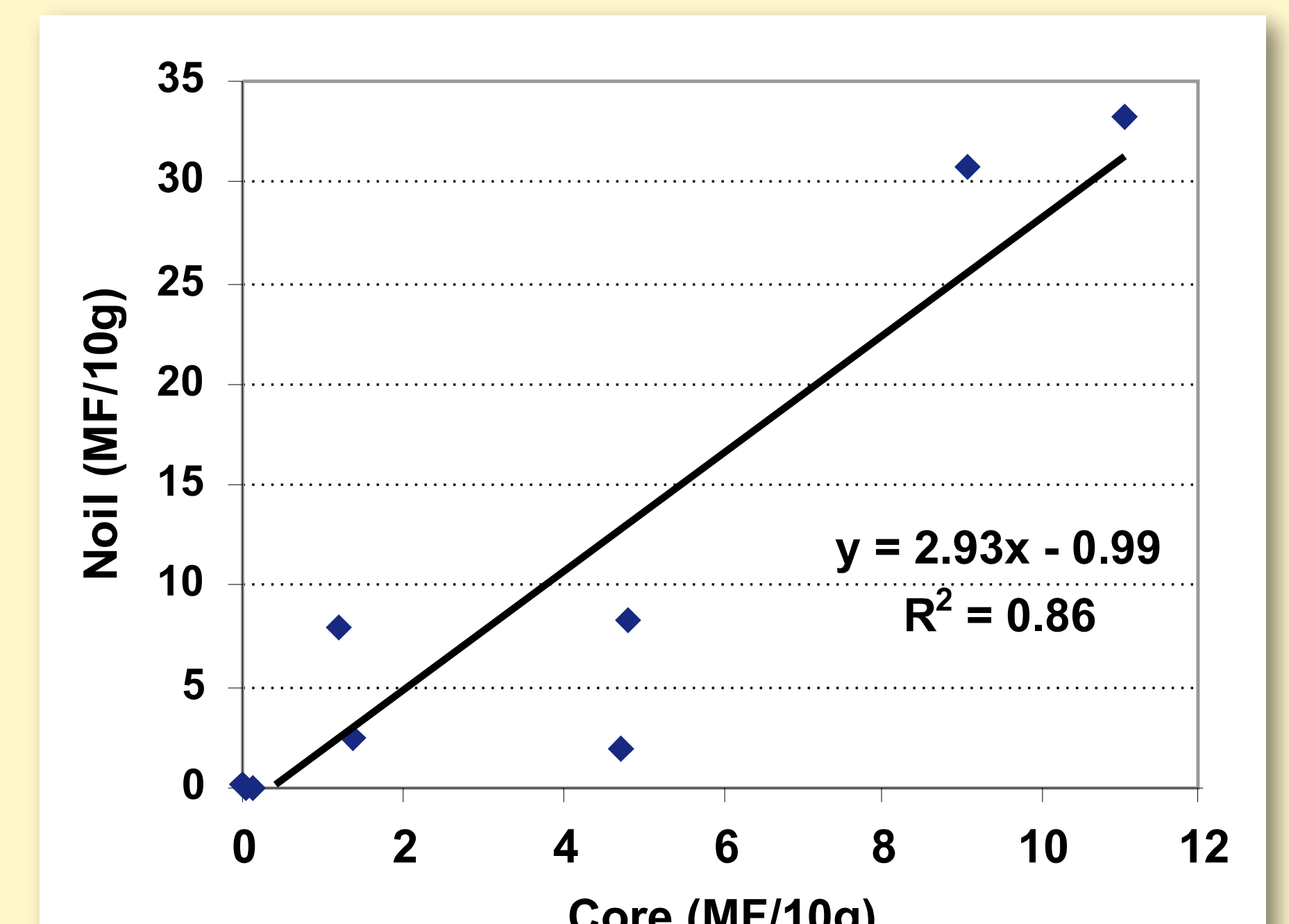


Figure 4. Relationship of medullated fibre in core and noil.

Further reading

Balasingam, A. and Mahar, T.J. (2005). Determination of the contaminant threshold level for medullated fibres in Merino wool. IWTO, T&S Committee, Biella, Report CTF01, viewed 2007, <www.awta.com.au/Publications/Research_Papers/Wool_Con>

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Fleet, M.R., Fish, V.E., Alaya-ay A.R. and Mahar, T.J. (2006b). Dark and medullated fibre contamination in Merino fleece Damara crossbred lambs: Top and noil products. International Wool Textile Organisation, Technical and Standards Committee Xi'an Meeting, Report CTF 1. pp 1-9, viewed 2007, <[www.awta.com.au/Publications/Research_Papers/Wool_Contamination](http://www.awta.com.au/Publications/Research_Papers/Wool_Contamination.htm)>

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