

OBJECTIVE MEASUREMENT OF CASHMERE AND MOHAIR

H.W. Hopkins

Australian Wool Testing Authority Ltd
Cnr Byron and Military Roads, Goldford, NSW 2161

BACKGROUND

Australian Wool Testing Authority Ltd

The AWTA was originally established by the Commonwealth Government, under the provisions of the Australian Wool Testing Authority Act 1957. In 1963, in accordance with the Wool Industry Act 1962, AWTA was reconstituted as a body corporate responsible to the Australian Wool Board, which subsequently merged with the Australian Wool Commission to form the Australian Wool Corporation, with effect from 1973.

In April 1981, the Commonwealth Government announced that AWTA would be sold to the private sector. After twelve months of negotiations, the wool industry interests, which had controlled the AWTA as a statutory body, joined together to form a public Company Limited by Guarantee and without shareholding, to take over all current assets and liabilities of AWTA on a "going concern" basis.

The AWTA Ltd took over the operations of the statutory Authority on the 1st July 1982. The Authority, whether it be statutory or a Limited Company, has been, and remains, committed to three primary objectives, namely:

- to maintain a national and international reputation for technical expertise, commercial independence and professional integrity;
- to provide accurate, impartial and efficient sampling, testing, data processing and certification services, as required by the wool, other fibre and textile industries, at a minimum cost; and
- to maximise net income to Australian primary industries - in particular, the wool industry - by encouraging the optimum application of objective measurement by growers, brokers, buyers, processors and manufacturers, both within Australia and overseas.

The objectives have obviously been centred around the wool industry. However, they apply equally to the cashmere & mohair industries.

The Authority is the largest independent wool testing organisation in the world and in 1984/85 tested approximately 98% of the Australian wool clip for yield, vegetable fault content and fibre diameter. In addition, approximately 100,000 fleece samples were tested for animal selection and sale purposes.

AWTA Ltd and Cashmere Testing

The Authority became involved in cashmere testing in June 1980 when it was approached by the NSW Cashmere Goat Breeders Society to test fleece samples for mean fibre diameter, for breed registration. Testing, by Projection Microscope, of these samples was undertaken by our Textile Testing Division. To minimise the preparation cost to the grower, the Society was encouraged to submit either combed or dehaired Cashmere samples. The NSW Cashmere Goat Breeders Society was the Authority's only client until July 1982.

In July 1982 it became obvious to the Authority that goat fibres were becoming an increasingly important part of the Australian agricultural scene and as such the Authority commenced investigations into dehairing cashmere.

In wool testing the Shirley Analyser is used to remove vegetable matter contamination and to place the fibres in a silver form in preparation for diameter measurement by the Airflow method. With changes to existing methods and equipment, it was found that Down and Guard Hair could be separated. The Authority's research confirmed the work of Couchman (1984). The Authority was now able to offer the services of determining both mean fibre diameter (by projection microscope) and yield (the amount of down as a percentage of guard hair) by Shirley Analyser. Testing equipment was moved from the Authority's Textile Testing Division to AWTA Ltd, Sydney, operators were trained in the techniques of dehairing & diameter measurement and the services were extensively promoted.

The initial test methods were particularly labour intensive. In addition, in the case of projection microscope, measurement was subject to operator bias.

In line with the Authority's stated objective of providing an efficient cashmere testing (lower cost) service, AWTA Ltd set out examining alternative methods to determine both yield and diameter measurement.

Fibre Fineness Distribution Analyser (FFDA)

In the early 1970's it was thought, within the wool industry, that diameter distribution and standard deviation were of considerable importance to the textile processor. It should be noted that the standard Airflow technique does not give a measure of either distribution or deviation. The CSIRO set about developing new machinery capable of rapidly producing these results. This development project led to the production of the FFDA.

The main features of the FFDA are:

Speed: A detailed analysis of 1000 accepted results can be completed in minutes. With the projection microscope, 600 snippets could take up to 1 hour to measure.

Accuracy: Average fibre diameter can be estimated with an accuracy comparable to the standard airflow procedure. As the analysis is based on at least 1000 measurements per test specimen, distribution parameters are determined with greater precision than with the conventional projection microscope method.

Results: The FFDA computes mean, standard deviation, co-efficient of variation and a frequency histogram of the distribution in 1 micron intervals.

The basic principal of operation is for fibre snippets in a liquid medium intersect a low powered laser beam. Snippets that fully intersect the beam are accepted. The intersection of the laser and snippet causes a shadow to be formed. The pulse height created as the shadow of the snippet falls on a detector is a measure of the fibre diameter.

In order to ascertain if the FFDA was suitable for cashmere diameter measurement, an extensive research trial was undertaken. This involved the measurement of 134 commercial tests, by both the FFDA and the projection microscope methods. The samples were also tested in the undehaired (raw) state. A three-way analysis was conducted. The average results for each group were:

Treatment	Mean Fibre Diameter	Mean Standard Deviation
Projection Microscope	16.97	3.27
FFDA (dehaired)	16.68	3.92
FFDA (raw)	16.77	5.02

The difference between treatments were statistically non-significant.

The trial clearly indicated that the FFDA could be used to determine the diameter of both dehaired and raw cashmere.

Similar results for dehaired & raw cashmere are obtained because the FFDA rejects measurements obtained on coarse (over 56 μ) fibres. In the case of raw cashmere the majority of guard hair measurements are excluded.

AWTA Ltd, with the financial assistance of the Kinross Cashmere Company, purchased an FFDA in December 1983. The cost of equipment, approximately \$30,000, was shared between the Authority & KCC. Test results issued since early February 1984 have been tested via the FFDA.

In the two years the Authority has been promoting its full cashmere service, the growth and acceptance of testing & test result has been rapid. In 1983/4 approximately 4000 samples were tested, whilst for the first 11 months of 1984/5 approximately 8000 samples were tested. The tests are conducted on behalf of breeders and merchants. Breeders test to either improve their overall herds or to sell individual animals, whilst the merchants test parcels of fibre with a view to purchase, export & process.

AWTA Ltd and Mohair Testing

In July 1981 the Authority approached the Angora Breed Society (ABS) and expressed an interest in testing their Mohair pool for the standard measures used in the wool industry (yield, diameter and vegetable fault). As reported by Stapleton (1981), a number of trials were undertaken to determine the feasibility of conducting these standard tests. The trials conducted included:

- (a) Feasibility of core-sampling Mohair bales.
- (b) Test methods to be used in certifying Mohair.
- (c) Repeatability of test results for both yield and diameter.

In summary, it was shown that:

- (i) Bales of Mohair could be core sampled using the manual technique developed for wool. Sampling Officers used in this trial reported that Mohair was more difficult to sample than wool. This comment is still forthcoming 4 years later.
- (ii) Samples were processed using the standard methods of the International Wool Textile Organisation (IWTO) for determining test results for wool. The IWTO method allows for the determination of Woolbase (clean oven dry fibre, free from all impurities) and Vegetable Matter base (VMB) (the amount of vegetable matter contamination present). This trial clearly indicated that the standard wool tests and wool testing equipment could be used to determine Mohair base (equivalent to wool base) and VM base. The IWTO method allows for the calculation of a large number of commercial yields, however as no processing data for Mohair was available, it was decided that the only commercial yield which could be certified was the IWTO Scoured Yield with 17% Regain. Initially, mean fibre diameter was determined by the Projection Microscope method.
- (iii) Repeatability trials indicated that:
 - (a) the core sample did give a representative sample; and
 - (b) the test methods adopted were also repeatable.

The trials indicated that Mohair behaved similarly to wools of similar diameters.

Having determined that the Authority could test and certify Mohair, efforts were made to improve the test method. The projection microscope technique was extremely labour intensive and is generally accepted as not being as accurate as the standard Airflow technique. A review of literature revealed a paper by Slinger & Robie (1970) which showed that Mohair could be tested by airflow provided standard Mohair tops were used to calibrate the airflow and other minor modifications were made to the airflow equipment & method. Equipment modifications included changing:

- (a) the chamber size; and
- (b) the working pressure,

while a $5 \pm 0.0004g$ specimen weight had to be measured instead of the standard $2.5 \pm 0.004g$ used for wool.

The Authority was in possession of a series of standard Mohair tops and thus immediate calibration was possible. A further series of comparisons was made and some 20 lines were tested repeatedly using both the projection microscope and the airflow technique. This trial satisfied the Authority that results obtained by the airflow were both accurate and repeatable. From February 1982 all lots of Mohair certified by the Authority show results determined by airflow and standard IWTO yield methods. In 1984 the International Mohair Association introduced a series of round trials for laboratories regularly determining diameter of Mohair. The trials are conducted annually and satisfactory testing of round trial samples determines registration for the following year. The AWTA Ltd is registered for both Airflow and Projection Microscope measurements.

Since introducing the presale test service, all selling organisations have used the service to some extent, either as an aid to sale or classing, or both.

In addition to the standard presale service, the Authority has been actively promoting the use of objective measurement for animal selection. Regretably, the Australian market has been extremely slow to move in this area but the New Zealanders have been most positive and a large number of samples have been received for testing. It is recommended that growers/breeders interested in this area have the following tests conducted:

- Fibre Diameter (via airflow method).
- Washing Yield at 16% Regain (the submitted sample is washed & dried and the oven dry weight expressed as a percentage of the greasy sample weight plus a standard moisture content).
- Medullation Count (400 snippets are examined under the projection microscope, each snippet is categorised as Medullated, Non-Medullated and Kemp. Results are expressed as a percentage, ie. Non-Medullated = 90.00%, Medullated = 7.50%, Kemp = 2.50%).

Personal discussions with overseas processors reveals that the three most important factors about the Australian Mohair clip are:

- (1) excessive presence of Kemp and Medullated fibre;
- (2) lack of uniform classing standards; and
- (3) the limited quantity available.

If the industry is to become viable in the fibre market, efforts must be made to solve all three problems. It is our belief that selection based on objective measures will assist in two of the areas (medullation & quantity). Recent work by the Authority has shown that a reasonable estimate of medullation can be obtained by examining core samples and as such, certain pool operators have expressed an interest in having this measurement shown as a guide to buyers. The Authority welcomes this positive approach and hopes that many individual breeders follow this progressive lead.

REFERENCES

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