SAWTRI BULLETIN

SOUTH AFRICAN
WOOL AND TEXTILE RESEARCH INSTITUTE
OF THE CSIR

P.O. BOX 1124
PORT ELIZABETH

Vol. 17 DECEMBER 1983 No. 4

ERRATUM

p.17,THIRD LINE from bottom:read "average" for "courage".

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SOUTH AFRICAN
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SEASON'S GREETINGS

Through the Bulletin, SAWTRI has established valued contacts and links over the years with persons and organisations in almost 50 countries. To our many friends in many lands the Chief Director and Staff extend best wishes and cordial greetings for 1984.

INSTITUTE NEWS

Change of Telex Number

Readers are requested to note than on Jan. 1st 1984, the Institute will have a new telex number: 243203.

Research Programme for 1984/85

SAWTRI's Research Advisory Committee (RAC) met at the Institute on November 2nd to discuss proposals for the 1984/85 research programme. These proposals had been discussed previously at various meetings of the relevant working groups and steering committees. The research programme was approved with minor changes.

Production Advisory Committee Meetings

The Chief Director, Dr D W F Turpie, the Director, Dr L Hunter and the Institute Liaison Officer, Mr N J Vogt represented SAWTRI at meetings of the advisory committees for Wool, Cotton and Mohair Production, respectively.

VISITS ABROAD BY SAWTRI STAFF MEMBERS

International Textile Machine Exhibition (ITMA)

The four-yearly International Textile Machine Exhibition (ITMA) held in Milan, Italy, this year during October, covers all aspects of textile machinery and is regarded as the most important event of its kind in the world. The exhibition provides a complete overview of all the new developments in the field of textile manufacture. Because of the wide diversity of disciplines and the enormous number of exhibitions, four SAWTRI staff members were needed to cover the exhibition.

Mr J Cizek, Head of Machine Development and Innovation, covered all aspects of processing on the woollen, worsted and short staple systems, from fibre to yarn.

Dr F Barkhuysen, Head of Dyeing, visited ITMA and covered developments in wet processing including scouring, effluent treatment, dyeing and finishing.

Mr G A Robinson, Group Leader, Fabric and Garment Manufacture, covered developments in weaving, knitting, yarn preparation and winding and Mr E Weideman, Head of Industrial Enquiries, concentrated on developments in quality control and testing, including fibre, yarn and fabric physical and chemical testing as well as on-line monitoring of production and quality.

The Chief Director also attended ITMA to view the introduction of SAWTRI's joint development with the Cognetex division of SAVIO on the SAWTRI Autocreel, after which he chaired the SAWTRI-Cerimates steering committee meeting on the development of the SAWTRI Comb.

Other Staff Movements Overseas

Dr Barkhuysen's overseas visit also took him to a textile mill in Biella, Italy, which processes mohair. In Basle, Switzerland, he visited Messrs Ciba-Geigy and Sandoz. He then proceeded to Greifensee, Zürich, to visit the Mettler Company. In West Germany he called on BASF in Ludwigshafen, the Deutsches Wollforschungsinstitut in Aachen and the Textilforschungszentrum in Krefeld.

Mr G A Robinson's overseas visit included, apart from ITMA, visits to Italian textile firms, notably Messrs Zegna, Cerruti and Piana. In Switzerland, he visited Messrs Ruti and Uster machinery manufacturers as well as Messrs Mettler and Hamel. In Stuttgart, Germany, he had discussions with the Institut für Textiltechnik. In Belgium he had discussions with colleagues at the TNO Textile Research Centre in Delft. Mr Robinson also visited the IWS Technical Centre in Ilkley and the Textile Institute and Umist in Manchester.

En route from Port Elizabeth to Europe, Mr E Weideman attended an exhibition of scientific instruments at Milner Park, Johannesburg. In the United Kingdom, he visited the IWS Technical Centre in Ilkley and the Scottish College of Textiles in Galashiels, Selkirkshire, Scotland. In Germany he visited the Deutsches Wollforschungsinstitut, Aachen and in Basle, Switzerland, he had discussions at the Ciba-Geigy works. In Zürich, he paid a visit to Messrs Eidg. Materialprüfungs- and Versuchanstalt and Testex before proceeding to ITMA in Milan.

Mr K Sanderson, newly appointed head of Short Staple Processing at SAWTRI, was sent to the United States of America to gain first-hand information on the latest developments in the fields of cotton processing and testing. He travelled to Houston, Texas where he visited the Textile Research Centre of the Texas Technical University, the Agricultural Experimental Station of the Texas A and M University, the South Plains Ginning Research Laboratory and the Plains Cotton Growers. In New Orleans he visited the

The Textile Research Centre Texas Tech. University, Lubbock, Texas, USA, which Mr K. Sanderson, Head of Short Staple Processing at SAWTRI included in his tour of the Cotton Producing area of the United States, recently.

Southern Regional Research Laboratories of the United States Department of Agriculture. In Mississippi he was received by the US Cotton Ginning laboratory, Stoneville, and Northrup King Company, Leland. In Knoxville and Charlotte, Mr Sanderson visited Spinlab and the Quality Research Station of the United States Department of Agriculture, respectively. He rounded off his United States tour with a visit to the Cotton Incorporated Research Centre in Raleigh. From the United States, Mr Sanderson went to Manchester in the United Kingdom, to visit the Shirley Institute, Shirley Developments Limited and the International Institute for Cotton. He also visited the University of Manchester and the Textile Institute as well as the University of Leeds.

Visitors

Among visitors received at SAWTRI since the previous edition of the "Bulletin", were Mr Jim Weatherford, Managing Director of Lummus International Sales Corporation, in Columbus, Georgia, USA; Mr P Ambler, Director of William Root Ltd in Leeds; Prof A de Lange and Dr E Pretorius of the Faculty of Agriculture, University of the Orange Free State; Messrs R Emmett and L M Clark of Benj. R. Vickers & Sons Ltd, Leeds, U K; Mr F Marty of Siegfried Peyer Ltd, Wollerau, Switzerland; Mr T Saakata of Kanai Guyo Kogyo Ltd, Osaka, Japan; and Mr J G Coates of James Mackie and Sons, Ltd, Belfast, Northern Ireland.

The Shriley Institute, Manchester, U.K. where Mr Sanderson had discussions after his United States visit.

Mr Fouché retiring Institute Secretary, receives a farewell gift from his successor, Mr G.F. de Jager, during a farewell function at SAWTRI in honour of Mr Fouché.

STAFF MATTERS

Retirement of Secretary

Mr G Fouche, who had been secretary of SAWTRI for the past 24 years, retired on September 30th on medical advice. He has been succeeded by Mr G F de Jager, who held the position of Institute Accountant since 1965. Mr J Beer has been appointed as Institute Accountant in Mr De Jager's place.

SAWTRI PUBLICATIONS

Since the previous edition of the Bulletin, the following publications have appeared:

Technical Reports

No. 528: Strydom, M.A., *The Processing Characteristics of South African Wools; Part XXII: Blends of Sifted Locks with Average Style Bellies* (September, 1983).

No. 529: Strydom, M.A. and van der Merwe, J.P., *Studies on Pigmented Wools; Part III: A Comparison of the Worsted, Semi-worsted and Woollen Routes for Processing Karakul* (September, 1983).

No. 530: *Thierron, W. and Hunter, L., Studies on the Dref III Spinning System, Part I: An Introductory Study on the Spinning of Polyester/Cotton Yarns* (September, 1983).

No. 531: Bird, S.L. and Hunter, L., *An Introductory Study of Unsatisfactory Crotch Wear in Wool and Wool Blend Trousers* (September, 1983).

No. 532: Strydom, M.A., *The Processing Characteristics of South African Mohair, Part II: A Comparison of Summer and Winter Hair* (September, 1983).

No. 533: Strydom, M.A., *The Processing Characteristics of South African Mohair, Part III: Blends of Types Differing in Length* (September, 1983).

No. 535: Shorthouse, P.C.M. and Robinson, G.A., *The Use of RWCS and RWS Wool Yarns in Men's Socks* (September, 1983).

No. 536: van Rensburg, N.J.J. and Heinrich, Anita, *The Mordant Bleaching of Karakul — A New Look at an Old Process* (November, 1983).

No. 537: Strydom, M.A., *The Effects of High Density Dumping on Worsted Processing Performance. Part 1: Some Preliminary Results* (October, 1983).

No. 538: Maasdorp, A.P.B., *The Application of the Etters Diffusion Equation to the Rates of Absorption of Chromium by Dyed and Undyed Wool* (November, 1983).

No. 539: van Rensburg, N.J.J. and Barkhuysen, F.A., *The Continuous Shrinkresist Treatment of Wool Tops using Chlorine Gas in a Conventional Suction Drum Backwash* (September, 1983).

No. 540: Barella, A., Manich, A.M., Segura, A. and Hunter L., *The Effect of Fibre and Yarn Parameters on the Diameter of Mohair Yarns* (December, 1983).

No. 541: Barella, A., Manich, A.M., Segura, A., Castro, L., *The Effect of Yarn Linear Density and Twist on the Diameter and Hairiness of Ring and Rotor Cotton Yarns* (December 1983).

Papers by SAWTRI Authors Appearing in Other Journals

Barella, A*, Manich, A.M.* and Hunter, L., La Efectividad del "Shirley Hairiness Meter" en la Medicion de la Vellosidad de los Kilos de Mohair y Lana Peinada", *Ingenieria Textil,* No. 368, p.9 and No, 369, p.49 (Barcelona 1983).

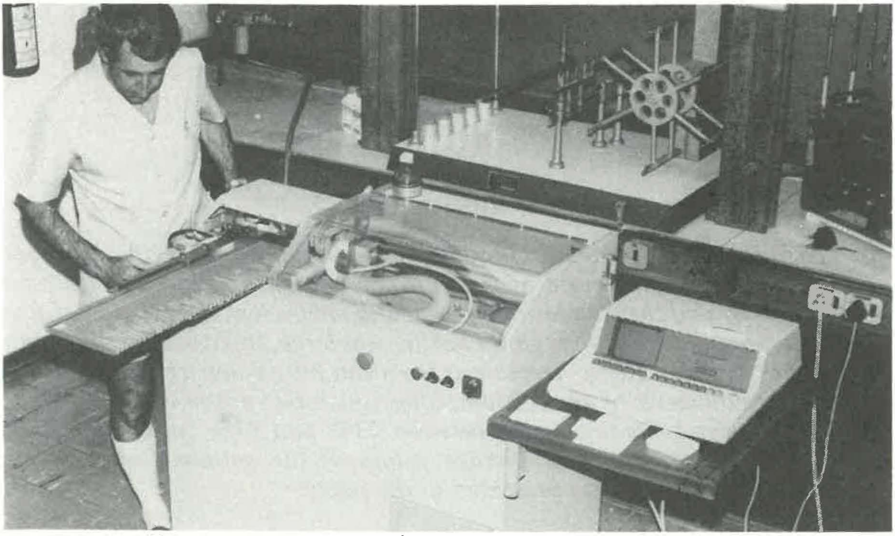
*Institute of Chemical and Textile Technology, Barcelona.

SAWTRI Information Pamphlet

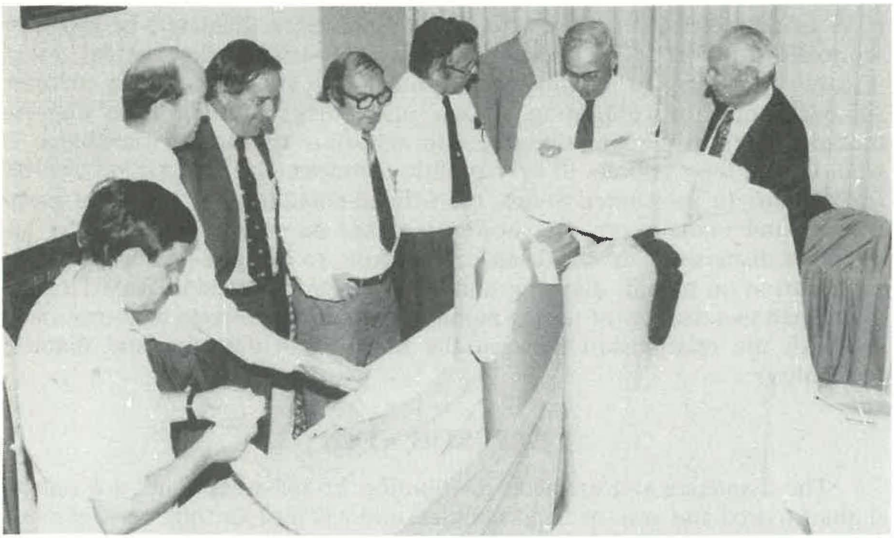
No. 2: Sanderson, K.W. and Taylor, H.: *Spinning Trials Indicate Local Breeding Advances in Cotton* (September 1983).

SAWTRI Special Publication

A.P.B. Maasdorp, *A. Review of the Chrome Mordant dyeing of Wool with Special Reference to the Afterchrome Process,* **WOL 61** (November 1983).



The SAWTRI Staple Length/Strength Tester, recently installed in the Gideon Joubert Technical Centre of the South African Wool Board in Port Elizabeth, for evaluation.



SAWTRI Fabrics on display being examined by, from L to R: Mr M.A. Strydom, Head of Long Staple Processing at SAWTRI: Dr L. Hunter, SAWTRI's Director; Dr D.W.F. Turpie, Chief Director of SAWTRI: Mr Arthur Nilsen, General Manager of Veldspun in Uitenhage; Mr G.A. Robinson, Group Leader of Fabric Development and Garment Manufacture at SAWTRI: Mr P. Raiden Marketing Manager of Veldspun and Mr N.J. Vogt, SAWTRI's Liaison Officer.

THE COEFFICIENT OF VARIATION OF FIBRE DIAMETER OF COMMERCIAL RAW AND SCOURED MOHAIR AND MOHAIR TOPS

by L Hunter, A Braun and E Gee

ABSTRACT

The diameters of some 1 232 samples of mohair (raw, scoured and tops) were measured by projection microscope and the relationship between mean fibre diameter and the standard deviation and coefficient of variation of fibre diameter investigated. Although the scatter was large, there was a tendency for the CV of fibre diameter to decrease as the mean fibre diameter increased up to a mean fibre diameter of about 35μm, after which the reverse tended to occur. CV of diameter generally varied between 23% and 32%, with the average being 27%. Histograms and average values of the various fibre diameter distribution parameters are presented in the paper.

INTRODUCTION

Often the question arises as to what is a typical coefficient of variation (CV) of diameter for mohair of a given mean fibre diameter, be it in raw, scoured or top form. This question can arise in routine quality control, during research projects, in commercial transactions and even when selecting standard tops for calibrating airflow instruments used in fibre diameter measurements. Although published information of this nature is available for wool tops[1-4], there appears to be very little corresponding information available for mohair. In the United States, the official standards for grades of greasy mohair and mohair tops are, however, based on mean fibre diameter and diameter dispersion[5]. It was decided, therefore, to compile and collate all the information on mohair diameter and its variation obtained at SAWTRI over more than two decades of testing mohair for local and foreign concerns and to establish the relationship between the mean fibre diameter and diameter variability.

EXPERIMENTAL

The diameters and diameter distribution of 852 samples of raw scoured mohair (cored and grab or hand samples) and 380 mohair tops were measured on a projection microscope using a method based upon the IWTO Method (8-1966) for wool as a basis. Six slides were prepared from each sample and at least two operators read a minimum of 300 fibres per slide, medullated fibres being included.

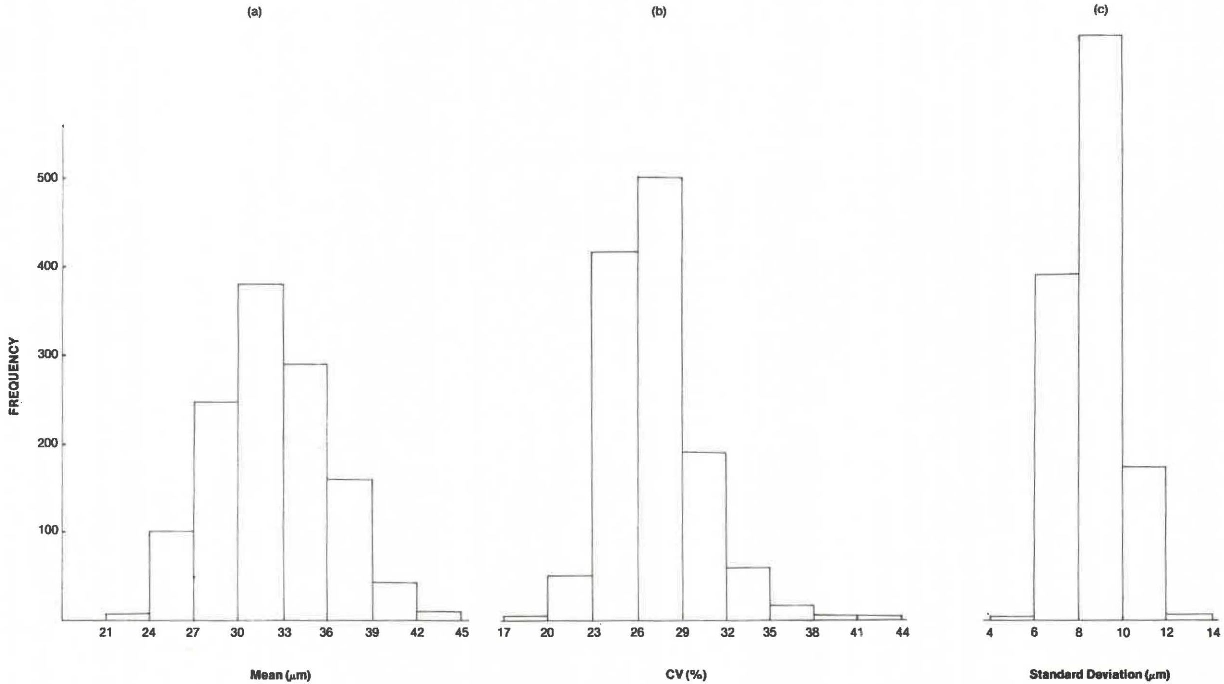


Fig. 1: Frequency Distribution Diagrams (Histograms) for Mean Fibre Diameter, CV of Fibre Diameter and Standard Deviation of Fibre Diameter (1232 results).

RESULTS AND DISCUSSION

A preliminary statistical analysis was carried out on the data which were separated into four groups, namely cored samples from raw (greasy) mohair (294), cored samples from scoured mohair (308), hand or grab samples from scoured mohair (250) and samples from tops (380). From the analysis it emerged that, for the purposes of this study, the data for all four groups could be regarded as originating from the same population and the results were therefore pooled (n = 1 232) for all subsequent analyses as reported here.

Fig 1 depicts frequency distribution histograms for the mean fibre diameter (a), CV of fibre diameter (b) and standard deviation of fibre diameter (c) for the pooled results while Table 1 summarises the results in terms of mean, range and standard deviation for each of the three parameters illustrated in the figure.

TABLE I
AVERAGES, STANDARD DEVIATIONS AND RANGES FOR THE DIFFERENT FIBRE DIAMETER PARAMETERS (n = 1 232)

Parameter	Average	Standard Deviation	Range
Mean Fibre Diameter (μm)	32,2	3,8	23,2-45,6
CV of Fibre Diameter (%)	27,0	2,9	19,7-41,0
Standard Deviation of Fibre Diameter (μm)	8,7	1,2	5,6-12,7

In Fig. 2 standard deviation has been plotted against mean fibre diameter (d), the best fit quadratic regression curve, corresponding to the equation given below, having been superimposed:

$$\text{Standard deviation } (\mu m) = -0{,}34d + 0{,}0084d^2 + 10{,}7 \quad \ldots\ldots\ldots\ldots (1)$$

n = 1 232; correlation coefficient (r) = 0,70

Similarly, in Fig. 3, CV of fibre diameter has been plotted against the mean fibre diameter with the curve corresponding to the following best fit regression equation superimposed:

$$CV (\%) = -2{,}33d + 0{,}035d^2 + 67{,}8 \quad \ldots\ldots\ldots\ldots (2)$$

n = 1 232; r = 0,34

From this relationship, the following table of "average" or "typical" CV of fibre diameter values have been derived for various mean fibre diameter values.

Although standard deviation tends to increase with increasing mean fibre diameter (equation (1) and Fig. 1) the relationship is a tenuous one and the

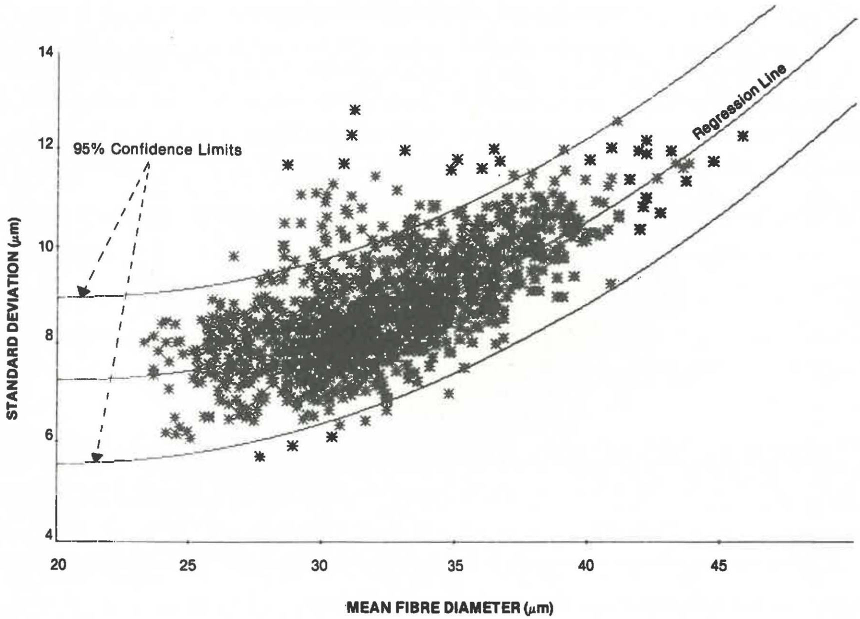


Fig. 2: Standard Deviation of Fibre Diameter VS Mean Fibre Diameter.

scatter large. For CV of fibre diameter, the relationship is even less precise since the scatter is even larger (equation (2) and Fig. 2), there being a tendency for CV to decrease as mean fibre diameter increased up to a mean fibre

TABLE II
"AVERAGE" CV OF FIBRE DIAMETER VALUES CORRESPONDING TO DIFFERENT MEAN FIBRE DIAMETERS

Mean Fibre Diameter (μm)	CV of Fibre Diameter (%)
25	30
30	27
35	26
40	27
45	29

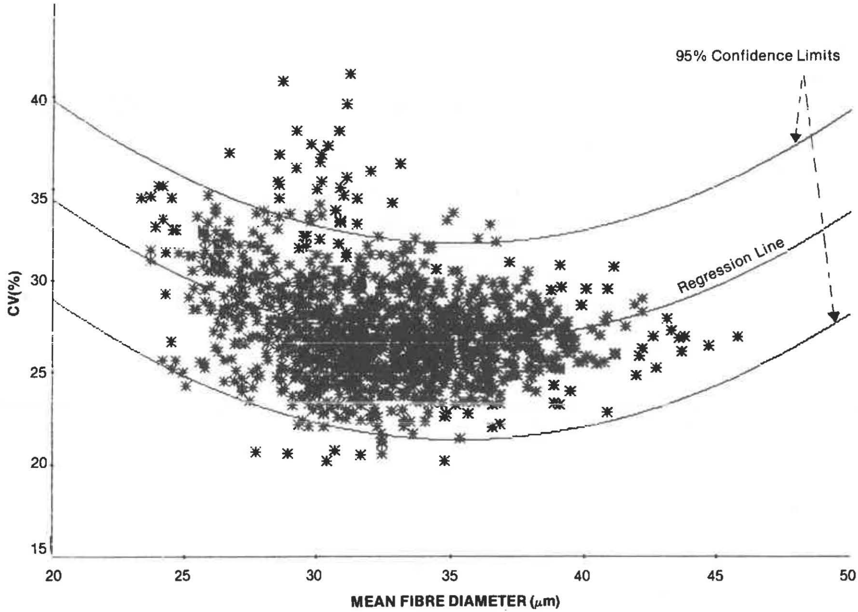


Fig. 3: CV of Fibre Diameter VS Mean Fibre Diameter.

diameter of somewhere around 35 μm, after which the reverse occurred. For most practical purposes, however, the CV of diameter can be regarded as independent of mean fibre diameter, with an average value of approximately 27%, the standard deviation of the CV being 2,9%. Some 95% of the CV values lie between approximately 23% and 32%. The average standard deviation of fibre diameter for these samples was 8,7 μm, with more than 95% of the values lying between 6 μm and 12 μm .

ACKNOWLEDGEMENTS

The authors wish to thank staff members in the Department of Industrial Enquiries for carrying out the fibre diameter measurements and Miss C Watermeyer for the statistical analysis of the data.

THE USE OF PROPRIETARY NAMES

The names of proprietary products where they appear in this report are mentioned for information only. This does not imply that SAWTRI recommends them to the exclusion of other similar products.

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2. James, J.F.P. and David, H.G., *J. Text. Inst.*, **59**, 585 (1968).
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5. USDA Grade Standards for Grease Mohair and Mohair Top, U.S. Department of Agriculture Marketing Bulletin No. 62 (1977).

A NOTE ON CHANGES IN THE FINENESS AND LENGTH DISTRIBUTION OF THE SOUTH AFRICAN MERINO WOOL CLIP

by M A Strydom and E Gee

ABSTRACT

Equations for the Pearson system of frequency curves and the Gauss (normal) curve were calculated from length and fineness distribution data of the South African merino wool clip for each season from 1967/8 to 1982/3. During this period, the average fibre diameter of the merino clip has increased by about one μm as indicated by a shift in the position of the mode, mean and median values of these distribution curves. The proportion of the clip finer than 20,0 μm has decreased from about 20% to about 5%. Over the same period no significant trends in staple length distributions could be detected. The mode of the length distribution curve is at an appraised length of 10/12 months while 50% of the clip is produced in length categories of 9/11 months and shorter.

INTRODUCTION

The identification of the price determining characteristics of greasy wool and the quantification of their effects on the price which it reaches at auction are of considerable importance to the stud breeder, to the commercial flock owner as well as to the marketing authorities. Several papers have recently been addressed to this question. Mckinnon *et al*[1] found that 80 – 90% of price fluctuations for Australian wools are accounted for by style, quality number, length and vegetable fault, while Pattinson[2] used multiple regression analysis to show that variations in mean fibre diameter accounted for up to 84% of observed *clean* price differences for one week's auctions during the 1981/82 season in Australia.

From data compiled by Visser[3] on price differences over a number of seasons for 12 months good topmaking South African wools in various fineness categories, it can be shown that a highly significant negative correlation exists between clean price and average fibre diameter. For the period covering the 1967/8 season to the present, the lowest correlation coefficient was calculated for the 1973/74 season ($r^2 = 0{,}805$) and the highest for the 1977/78 season ($r^2 = 0{,}997$). The magnitude of this diameter effect, as illustrated by the calculated linear regression coefficient also varied considerably, as expected, from season to season. The highest value was obtained for the 1979/80 season (–26,4c/kg clean/μm) and the lowest for the 1971/72 season (–5,1c/kg clean/μm). In an earlier paper, Visser[4] published data which can also be used to illustrate the high degree of association between diameter and price on a *greasy* basis. Using data for the 1981/82 season as a basis, the appropriate calculations show that the linear regression coefficient was −13,5c/kg greasy/μm . He found price differentials for *length* to be as much as 17,5c/kg greasy per unit trade length difference for short wools (7/9 and 6/8 months), decreasing to 3,3c/kg greasy for long wools (12 and 10/12 months). Despite this disparity, however, Cloete[5], maintains that longer wools are more profitable, and using his data it can be shown that the linear regression coefficient for the length/income relationship for the 1982/83 season decreased from an average of +31c/mm/sheep for fine wools (19 − 20 μm) to an average of +23c/mm/sheep for coarse wools (24 − 27 μm).

As far as the importance of the various greasy wool characteristics in terms of processing performance is concerned, there is a vast source of documented evidence on the overriding contribution of mean fibre diameter[6]. Length (i.e. staple length), of perhaps lesser importance, has nevertheless been afforded a high priority for objective measurement[7] since it is of considerable importance to the topmaker[8]. Research has clearly illustrated the strong association between average staple length and the average fibre length in the top[9,10]. Consequently, considerable effort is being made to develop and test measurement systems to give, amongst others, staple length data to supplement certified core-test information on fibre diameter, yield and vegetable matter[11].

In the world trade South Africa is known as a producer of merino wool, i.e. wools from as fine as 18 μm up to as coarse as 27 μm . Mean staple lengths of 30 mm to 90 mm and longer are produced in varying proportions, depending mainly on shearing practices. Concern has been expressed about the gradual shift in the proportion of the clip which can be considered as fine[12], and ram breeders have been urged to give this serious attention[13]. Several reasons for this shift have been suggested. These revolve mainly around selection patterns and breeding policies which have changed as a result of fleece mass requirements and insufficient price incentives to make fine wool production economically attractive[3]. In addition, feeding and management have improved considerably which has also served to accentuate this shift to a stronger clip.

It is logical to assume that a measure of the extent to which the clip has changed in terms of its diameter and length distribution would be of considerable interest to the industry as a whole. There are various ways of quantifying a shift in distribution statistics. For example, one such an approach would be simply to determine the position of the micron interval corresponding to the highest mass proportion of the clip from year to year, or another to draw cumulative frequency curves and to quantify the year to year shift by determining the relative position of some predetermined cut-off point on each curve. Slightly more sophisticated techniques, based upon the socalled normal and skewed distribution curves and the various parameters describing such curves are, however, also available. It was decided therefore to supplement the existing information available through the South African Wool Board's Annual Statistical Reviews by re-analysing the data in terms of certain of such distribution curves. This has been done for both mean fibre diameter and for mean staple length, since little information is available about possible trends in clip length over recent years.

STATISTICAL FRAMEWORK

Data Source

Data were extracted from the Wool Board's Annual Statistical Reviews[14] for the period 1967/68 up to and including the 1982/83 season. Up to 1973/74, the percentage breakdown for merino fleeces was given in spinning count. For the purposes of the analysis, these were translated to mean fibre diameter values using the appropriate equivalents[15]. Since 1974/75, measured fibre

TABLE 1
FINENESS AND LENGTH CLASSES AND THEIR EQUIVALENTS AS USED IN THE ANALYSIS

FINENESS		LENGTH	
Description in terms of Traditional Spinning Count	Mean Fibre Diameter Interval* (μm)	Description in terms of Appraised (Trade) Length (Months)	Average staple length (mm)**
70's and over	<18,0	Warp (13)	88
Bulk 70's	18,0 — 19,0	12	81
66/70's	19,5 — 20,5	10/12	74
64/70's		9/11	66
64's	20,5 — 21,5	8/10	59
60/60's	21,5 — 22,5	7/9	52
60's	22,5 — 23,5	6/8	45
58's	23,5 — 24,5	6	38
56's and lower	>25,0	4/6	31

*See Ref. 15

**Calculated from Turpie and Gee[9]:

$$\text{Mean Staple Length} = \frac{(\text{appraised length} - 0{,}7)}{0{,}14}$$

diameter has been used. From the same source the annual breakdown for merino fleeces, bellies and lambs in terms of appraised length classes was translated into actual lengths using a simple linear equation suggested by Turpie and Gee[9]. Details are given in Table 1. The average staple lengths calculated in this manner compared well with the NWGA classing standards, only the extreme classes exhibiting slight deviations. For example, the warp length equivalent should have been in excess of 90 mm whereas the 4/6 months lengths should have been below 30 mm . However, these were not considered large enough to have biased the statistical analysis to any appreciable degree.

Analytical Procedure

Histograms of frequency (on a percentage basis) vs class interval for both diameter and length were constructed for each of the 16 seasons from 1967/68 to 1982/83. In each case, two curves were fitted to the data, namely the normal or Gauss distribution curve and one of the Pearson distribution curves. The approach was similar to that described by Gee[16] in a recent paper. The chi-squared test was used to assess which curve of each pair was more suitable for describing the data for a particular season. In addition, the cumulative diameter or length percentages up to each diameter or length group were calculated. Other curve parameters, such as the mean and standard deviation for the Gauss curve and the mode, median, skewness and kurtosis for the Pearson curves were also calculated. The latter two parameters provide estimates of the assymmetry and peak width for the Pearson curves in relation to the Gauss curve for a particular data set. (For the normal distribution, kurtosis = 3 and skewness = 0).

RESULTS AND DISCUSSION

Fibre Diameter

Table 2 shows that almost without exception, the chi-squared value for the particular Pearson curve which fitted the data best was lower than that for the corresponding Gauss curve, indicating that the data are more accurately described by the former. Thus, the mode and the median values may possibly be more useful than the mean value for describing shifts in the fineness of the clip. The choice of the mode (per definition, the observation in a sample which occurs the most frequently) would also be a logical one since it is easily recognisable from histograms or by cursory inspection of tabular data as published annually in the Statistical Review[14]. However, the median value (per definition, the middle observation for an odd number of observations or the courage of the two middle observations for an even number of observations in a sample) is also useful, since it defines a value for mean fibre diameter below which one half of the clip lies.

TABLE 2
SUMMARY OF MAIN PARAMETERS AND CHI-SQUARED TEST FOR GAUSS AND PEARSON CURVES FITTED TO THE DATA

Curve Parameter	1967/8	1968/69	1969/70	1970/71	1971/72	1972/73	1973/74	1975/76	1976/77	1977/78	1978/79	1979/80	1980/81	1981/82	1982/83
Type*	1	6	1	1	6	4	4	4	4	1	4	4	4	1	1
Chi-Squared (Gauss)	9	11	22	29	17	10	5	4	4	2	2	2	2	2	1
Chi-Squared (Pearson)	4	2	5	10	3	3	2	2	1	1	1	0,5	1	0,5	1
Mean ± 2σ	21,2 ±3,4	21,3 ±2,97	21,5 ±3,2	21,5 ±3,5	21,6 ±3,7	21,6 ±3,0	21,7 ±3,3	21,9 ±2,5	21,9 ±5,2	22,3 ±5,3	21,9 ±6,4	22,0 ±5,9	21,9 ±6,1	22,3 ±6,9	22,1 ±6,5
Mode (μm)	20,9	20,9	21,0	21,1	21,3	21,5	21,5	21,7	21,7	22,0	21,7	21,8	21,8	22,1	21,9
Median (μm)	21,0	21,0	21,2	21,2	21,3	21,6	21,5	21,7	21,8	22,1	21,8	21,8	21,8	22,2	22,1
Skewness	0,79	0,99	0,93	0,83	0,68	0,41	0,34	0,44	0,42	0,37	0,36	0,28	0,25	0,28	0,22
Kurtosis	3,89	4,82	3,99	3,78	3,71	3,94	3,26	3,48	3,41	3,20	3,37	3,20	3,22	2,97	2,98
Proportion of clip finer than 20 μm (%)	19	12	7,5	9,0	5,5	7,0	7,5	3,5	3,5	2,5	5,0	5,0	5,5	5,5	4,00

*See Ref. (14), pp.5—6 & 21—24

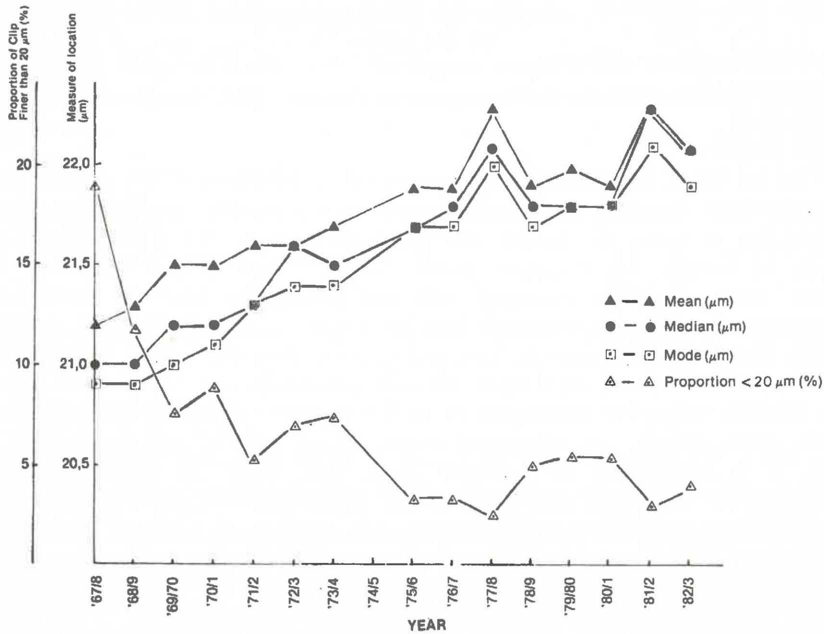

Fig. 1: Measures of Location for Fibre Diameter Distribution and Proportion of Merino Clip finer than 20,0µm (1967/8 to 1982/3).

In Fig. 1, the mean, mode and median values for fibre diameter have been plotted as a time series, and the gradual increase in the average diameter is evident. Over the period under consideration the shift has been of the order of one micron, the average value increasing from around 21,0 µm in 1967/68 to around 22,0 µm in 1982/83. It should be noted that whereas the increase appeared to be fairly gradual up to the mid-seventies period, the latter half of the period under consideration seems to have been characterised by more widely differing fluctuations from season to season.

Referring again to Table 2, parameters which estimate the degree to which the particular distribution curve is more peaked (or flat) compared with the Gauss curve, or more skew compared with the Gauss curve, have also been included. Positive values for skewness indicate that the peak of the distribution (the mode) is in the lower half of the range, with the tail to the right. For kurtosis values >3,0 the distribution is more peaked, i.e. more observations tend to be clustered around the mode than at the mean for the corresponding Gauss distribution. Values for skewness calculated in this analysis decreased from about 1,0 to about 0,2. This gradual shift to a more symmetrical distribution confirms that the clip is becoming coarser, with a correspondingly smaller "fine portion". Table 2 shows that in 1967/8 this portion was about 20%, and this has decreased to about 5% by 1982/83 (see Fig. 1). Table 2 further shows that the values for kurtosis were all in excess of 3,0, which suggests that a higher proportion of wools is normally produced at the mode position than would have been the case for the corresponding normal distribution.

Staple length

As for mean fibre diameter, the seasonal breakdown of the clip in terms of appraised lengths was analysed in terms of the appropriate curve parameters in order to identify any possible shifts in the distribution from season to season. No apparent trends emerged from this analysis and the results were therefore averaged and the histogram and the cumulative frequency curve for the averaged data have been plotted in Fig. 2. It is fairly evident that the distribution is skew to a considerable degree and consequently there is a considerable difference between the mode and the median values. The median value was calculated to be 9,8 months (about 65 mm) while the mode, quite clearly, corresponded to the 10/12 months category (about 75 mm). It is interesting to compare these data with the expected values calculated for a normal distribution. The mean value for such a distribution would have corresponded to the 8/10 months category (i.e. about 60 mm). By comparison, the average staple length of Australian merino wools was recently found to be about 84 mm[17], which clearly reflects the difference in, amongst others, shearing practices between Australia and South Africa.

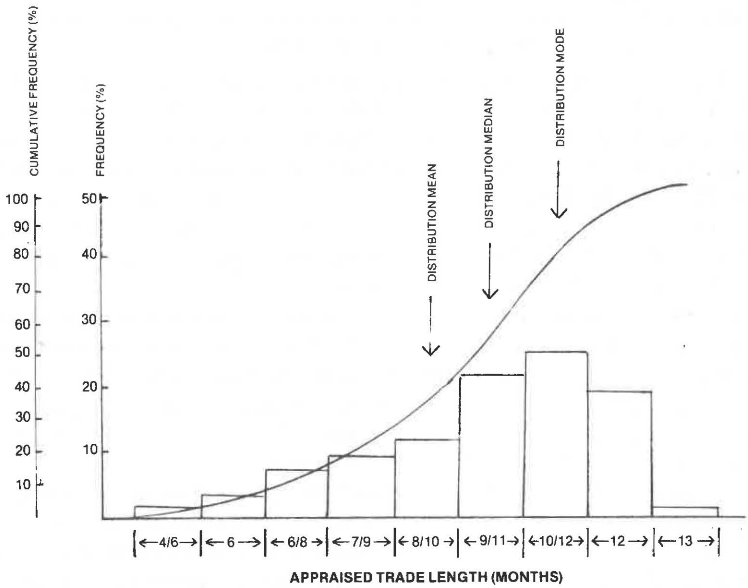

Fig. 2: Average Clip Length Distribution for Merino Fleeces, Bellies and Lambs (1967/8 to 1982/3).

SUMMARY AND CONCLUSIONS

Attempts have been made to show how distribution curves and their parameters may be used to illustrate certain trends in the South African merino clip, particularly with respect to fibre diameter.

Using data from official sources from the 1967/68 season to the present, it has been shown that non-symmetrical distribution curves based upon the Pearson system of frequency curves can be useful for describing the composition of the clip in terms of fineness and length. The class mid-point for the clip (i.e. the distribution mode) has increased from 20,9 μm in 1967/78 to 21,9 μm in 1982/83. In 1967/68, 50% of the clip was finer than 20,5 μm; in 1982/83, 50% of the clip was finer than 22,1 μm . The gradual increase in the average diameter of the merino wool clip in South Africa is further illustrated by the "fine" proportion (<20 μm) of the clip having decreased from about 20% in 1967/8 to about 5% at present.

No apparent shifts with respect to staple length distributions have occurred over the last sixteen years. On average, the distribution mode of the clip corresponds to the 10/12 months trade length category (about 75 mm), while 50% of the clip is marketed in length categories 9/11 months (about 65 mm) and shorter. Over the practical length range for merino wools (from 30 to 90 mm), the average length distribution was found to be considerably more skew than a typical distribution for diameter over the range of 19 μm to 27 μm .

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USE OF PROPRIETARY NAMES

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