# SAWTRI BULLETIN



SOUTH AFRICAN
WOOL TEXTILE RESEARCH INSTITUTE
OF THE CSIR
P.O. BOX 1124
PORT ELIZABETH

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# SAWTRI BULLETIN

*Editor: P. de W. Olivier*

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## CONTENTS




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# EDITORIAL

The arrangements for the 1980 Quinquennial International Wool Textile Research Conference in Pretoria are in full swing, and gaining momentum. It is indeed significant that the Republic of South Africa, being host to some 300 expected delegates, has once more been given the opportunity to present an image of our country which is rarely, if ever, seen abroad. It is therefore of the utmost importance that so large a number of overseas delegates be given unhindered opportunity to see for themselves, rather than rely on the media. Many papers by South African scientists will be read at the Conference so that in the magnificent Conference Centre with its ultra modern direct translation and other facilities at the CSIR in Pretoria, ideas may be fruitfully exchanged. It is in surroundings such as these and during a number of pre- and post-conference tours that people may get to know each other and the contact made at scientific level is bound to lead to technical benefits to our local textile industry.

SAWTRI is one of the best equipped and most modern research Institutes of its kind in the world. The Institute's share in the organisation of the Conference is by no means a minor one so that responsibility for establishing and maintaining good international relationships at the Conference and afterwards, also rests heavily on staff members directly and indirectly concerned with the Conference. We trust that our readers in Industry share our philosophy in this respect.

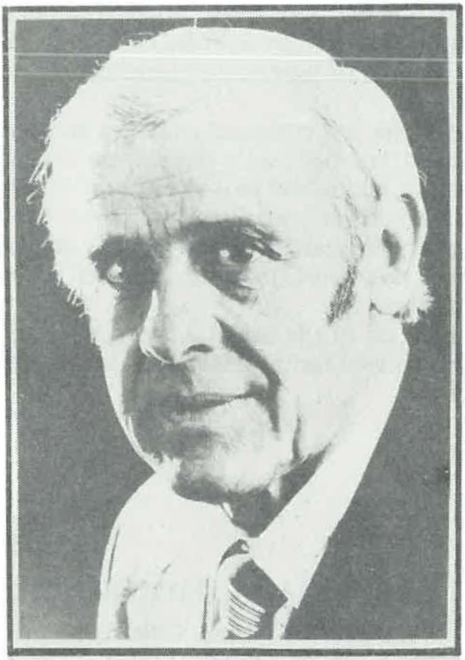
The Director and staff of the South African Wool and Textile Research Institute wish our readers well for the festive season and trust that the new year will be a prosperous one.

# OBITUARY

## Sen. Gideon J. Joubert — 30/11/1913—21/10/79

It was with deep regret and sadness that SAWTRI learnt of the recent death of Senator Gideon Joubert, Chairman of the South African Wool Board. Since becoming Chairman on June 25th, 1968, Senator Joubert had close ties with SAWTRI. The singularly purposeful pursuit of his duties earned him widespread respect and admiration, both here in South Africa, as well as abroad.

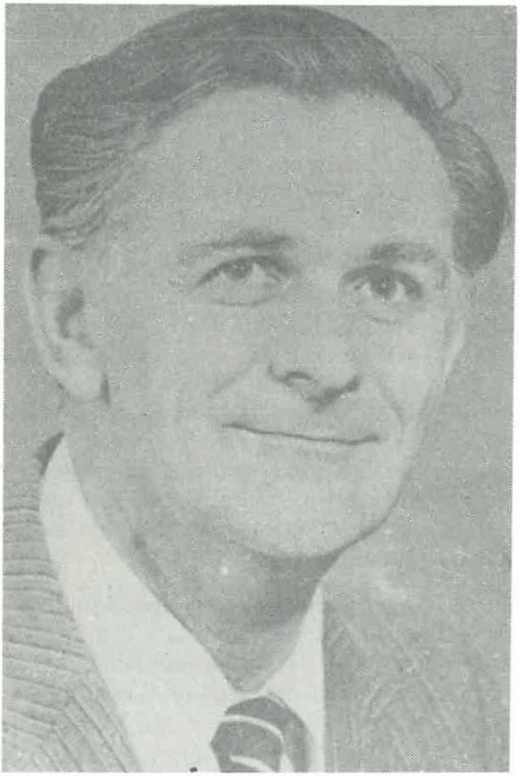
We mourn his parting and extend deep-felt condolences to the dear ones he leaves behind.



# NEW WOOL CHIEF

The South African Wool Board has announced the appointment of Mr Pieter W. van Rooyen as Chairman of the S.A. Wool Board in succession to the late Sen. G. Joubert. Prior to his appointment, Mr van Rooyen was Vice-Chairman.

SAWTRI wishes to congratulate Mr van Rooyen on his appointment and we look forward to the continuation of the excellent relationships which have always existed between the two organisations.



## INSTITUTE NEWS

### Visits abroad

Senior staff members paid visits to various organizations, attended meetings and exhibitions and held discussions in a number of countries.

The Director, Dr D. W. F. Turpie, during September, visited Australia and New Zealand. In Australia he attended a conference on the disposal of wool scouring effluents at Geelong on which occasion he read a number of papers on behalf of SAWTRI and the University of Natal. Dr Turpie's visit to the University of New South Wales included discussions with Proff. Chaiken and Ken Whiteley. He also had discussions with senior executives of the Australian Wool Corporation, the Australian Wool Testing Authority and the Commonwealth Scientific and Industrial Research Organization (CSIRO).

In New Zealand Dr Turpie discussed matters of mutual interest with Dr Stan Simpson, Director of the Wool Research Organization of New Zealand (WRONZ). He also visited Messrs Dowling and Co. in Timaru, who are manufacturers of scouring equipment.

The eighth International Textile Machinery Exhibition (ITMA) was held in Hannover, West Germany, from 2nd to 11th October, 1979. SAWTRI's Assistant Director, Dr L. Hunter, Dr N. J. J. van Rensburg and Mr G. A. Robinson attended the Exhibition. They report that ITMA '79, in the main, seemed to be content to consolidate and build on the new developments shown at the previous exhibition. The main features were: increased production speeds, automation and increased use of micro-processors, greater emphasis on energy conservation and environmental considerations such as noise and dust control. Incidentally, Messrs Petrie and McNaught's main exhibit was the Petrie-SAWTRI Rotary Gill Box.

Dr van Rensburg and Mr Robinson extended their ITMA visit to various other countries where discussions were held with leading scientists of various research organizations and with executive personnel of textile and related firms. Dr van Rensburg attended the Second World Filtration Congress in London and the International Conference on Polypropylene Fibres and Textiles at the University of York in Heslington.

Mr Robinson travelled extensively in the United Kingdom after visiting a number of SAWTRI subscribing member firms in Germany. In Yorkshire he paid visits to worsted factories. He also visited HATRA, the IWS Technical Centre at Ilkley and WIRA. Travelling to France, Mr Robinson visited the IWS in Paris and a number of factories in the Lille area. Before returning home, Mr Robinson paid quick visits to subscribing member firms in Switzerland and Italy.

**Meetings**

The SAWTRI/CCGA Steering Committee's Technical Subcommittee, including members of the Commercial Cotton Grower's Association met at SAWTRI on November 5th. The Research Steering Committee of the Mohair Board met at the Mohair Board Offices on November 21 and that of the South African Wool Board at SAWTRI on November 22.

Mr de Wet Olivier, Head of Publications and Information at SAWTRI addressed the Annual General Meeting of the Glenconnor Farmers' Association on November 7th, giving an outline of SAWTRI's work, mainly on mohair.

Mr J. de Wit, Vice-President of the CSIR, responsible for SAWTRI, chaired a meeting of the SAWTRI Research Advisory Committee at SAWTRI on 23rd November. During the past few months the Director attended meetings of the Mohair Production Committee and, together with Mr M. A. Strydom attended a meeting of the 1980 Wool Conference Organising Committee at SAWTRI on November 12th. He also attended meetings of the Advisory Committees on Wool and Mohair production and the Wool Textile Advisory Committee of the South African Wool Board.

**TECHNICAL SUBCOMMITTEE OF THE CCGA/SAWTRI STEERING COMMITTEE**

**L to R: W. D. C. Reed, President CCGA, N. J. Vogt, CSIR Regional Liaison Officer, Dr N. J. J. van Rensburg, SAWTRI, Dr L. Hunter, SAWTRI, Dr D. W. F. Turpie, Director, SAWTRI, D. E. B. Shepherd, General Manager, CPC, K. W. Sanderson, Chief Executive, CCGA, N. G. Russell-Smith, Technical Manager CPC, A. Davies, Vice-President, CCGA**

**THE WOOL TEXTILE ADVISORY COMMITTEE OF THE SOUTH AFRICAN WOOL BOARD**

**STANDING: L to R: Mr J. Bekker, Mr C. Stewart, Mr J. Moolman, Mr J. P. van Wyk**
**SEATED: L to R: Dr L. Hunter (SAWTRI), Mr S. J. van Wyk, Dr D. W. F. Turpie (SAWTRI), Mr P. W. van Rooyen, Dr Ken Baird (IWS), Mr Joe Strydom**

## Visitors to SAWTRI

Since the previous edition of the Bulletin, the Institute received the following visitors:

Mr J de Wit, Vice-President of the CSIR;
Dr G. Garbers, Vice-President of the CSIR;
Mr P. B. Thorne, General Manager, Karina Textiles, Zimbabwe-Rhodesia;
Mr G. J. Robertson from Messrs Jaques Segard, Timber Research, CSIR;
Dr Tannock, Chemistry Research Institute, Salisbury, Zimbabwe-Rhodesia;
Prof. C. E. Terill, U.S. Department of Agriculture, Washington D.C.;
Dr Ken Baird, Director of Research and Development, I.W.S., Ilkley;
Dr L. Benisek, I.W.S., Ilkley;
Prof. James S. Basset, University of Texas;
Mr J. Feiglen, General Manager of Australian Wool Industries Ltd, Ashdod, Israel;
Mr R. J. Meeks, Managing Director, Wellington Industries;
Mr J. S. M. Venter, Head, Pulp and Paper Division, National Institute for Timber Research, CSIR.

## PUBLICATIONS BY SAWTRI AUTHORS

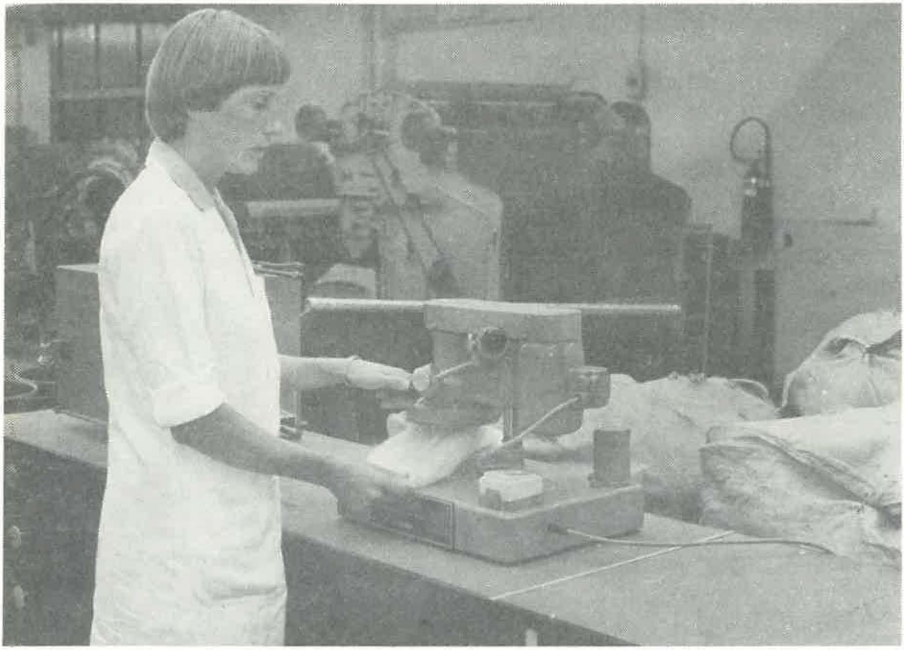
**Technical Reports**

No. 451 : Maskrey, J. W. and Currie, D. J., The SAWTRI Sliver Density Monitor, Mark 3 (November, 1979).

No. 452 : Robinson, G. A., Cawood, M. P. and Dobson, D. A., Cockling in Fully Fashioned Knitwear, Part V: The Effect of Shrink-Resist and Anti-Cockle Treatments (October, 1979).

No. 453 : Mozes, T. E. and Turpie, D. W. F., Treatment of Wool Scouring Liquors, Part XII: Microfiltration using Long Tubular Cartridges (October, 1979).

No. 454 : Robinson, G. A. and Turpie, D. W. F., Interport Differences in Processing Performance of Similar Wools, Part III: Yarn and Fabric Properties of a 1/12 Month's 60/64s (October, 1979).



**Sample felting machine to be used to study the felting qualities of different S.A. Wools**

## BOOK REVIEW

MANAGEMENT OF TEXTILE PRODUCTION *by A. Ormerod,* Newnes-Butterworth, (1979).

Alan Ormerod, besides being exceedingly wellknown in South Africa, has an international reputation as a highly successful and exceedingly practical exponent of the art of textile management. He has written very practical yet academically sound articles. This latest volume, which incorporates many of these, surpasses all previous publications.

Senior textile management should regard this as essential reading as in many respects this work could well become a major source of reference. Perhaps the most important section is that which deals with the appraisal of capital investment projects in textiles. Another chapter on the measurement of business performance using ratio analysis and the application of standard costing whilst not being entirely new, is clear and lucid. The illustration of principles by reference to data derived from the accountancy records of textile companies is novel. Other chapters deal with the nature of textile raw materials, operational research and the practical application of statistical methods to textile production. Above all, however, the author must be congratulated for attempting to destroy the belief, so often held by technologists, that textile excellence is synonymous with financial success.

Throughout the book the author's own forthright style of management is clearly evident. This is a book by a man who has practised what he is preaching. Undoubtedly it will be of great benefit to textile production managers, as well as advanced students.

(J.D.S.)

# LARGE SCALE SPINNING AND WEAVING TRIAL ON ACALA SJ141/OR3 COTTON

*by J. D. SPENCER and H. TAYLOR*

## ABSTRACT

*Fibre, yarn and fabric properties of Acala SJ141/OR3 were evaluated. The characteristic high strength observed previously was evident at all stages of processing. Spinning and weaving performance also was entirely satisfactory. This cultivar Acala SJ141/OR3 has now been registered and the first commercially produced lint should be available in the 1980 crop.*

## INTRODUCTION

The Department of Agricultural Technical Services is investigating the possibility of replacing Acala SJ1 by Acala SJ141. This new cultivar has better resistance to certain diseases, notably to "rooidood" (redleaf disease). Veldsman[1] and Spencer and Taylor[2, 3] have reported fully on the fibre, yarn and fabric properties of Acala SJ141 and have found that it processed extremely well.

At the request of and in collaboration with the Department of Agricultural Technical Services a further large scale spinning and weaving trial was undertaken as the Department wanted confirmation of previous results before applying for registration of Acala SJ141.

## EXPERIMENTAL

The Department supplied the raw material namely Acala SJ141/OR3. This had already been blended at the gin.

A sample of lint was drawn from the bales and tested for trash content, micronaire, fineness, maturity, bundle tenacity, span length and uniformity ratio as previously outlined[2]. These results together with those obtained previously[3] are recorded in Table I.

The material was processed in exactly the same manner as on a previous occasion[3] and the results are compared in Table II.

In Table III the yarn properties obtained previously are compared with the current work, whilst Table IV, besides comparing the results on the current fabric with those of last year, compares both sets of fabric results made from Acala SJ141 with those on the same fabric produced from Deltapine 826.

The yarn was steamed in an autoclave for two periods of 10 minutes each at 110°C under a vacuum of 660 mm Hg . After conditioning the yarn was electronically cleared by means of an Uster Classimat with clearing levels set at B4, C3 and D2.

## TABLE I

## FIBRE PROPERTIES

| | Lint from 1979 crop | Lint from 1978 crop |
|---|---|---|
| Trash % (Shirley Analyser) | — | — |
| Visible | 1,68 | 2,56 |
| Invisible | 0,86 | 0,64 |
| Total | 2,54 | 3,20 |
| Maturity Ratio | 0,99 | 0,92 |
| Fineness (mtex) | 167 | 162 |
| **Fibrograph** | | |
| 2,5% Span length (mm) | 30,72 | 28,26 |
| 50,0% Span length (mm) | 14,34 | 12,96 |
| Uniformity ratio | 47 | 46 |
| Micronaire | 4,32 | 4,02 |
| Bundle Tenacity | — | — |
| Zero gauge (cN/tex) | 51,0 | 45,3 |
| Pressley (1000 lb/psi) | 105 | 91 |
| 3,2 mm gauge (cN/tex) | 30,0 | 28,3 |
| Extension (%) | 5,9 | 5,5 |

A warp, made on a Hergeth sample warper was made to the following specification, and then woven into standard sheeting (SABS Spec.338—1971 Cotton Sheeting):

Total ends 4480 (24 ends each side for selvedge)
Reed — 2/32 dents/inch
Reed width — 178 cm
Weave — plain
Picks/cm — 26,0

The warp was sized to the following recipe:
3 kg ®Solvitose XI
6 *l* ®Bevaloid 6381 (50%) and made up to 60 *l* at 96°C to give a 10% mix.

## TABLE II

## PROCESSING DETAILS

| | | Lint from 1979 crop | Lint from 1978 crop |
|---|---|---|---|
| Blowroom | Waste % | 1,6 | 1,84 |
| Card | Waste %<br>Sliver Mass (ktex)<br>CV (%) | 2,6<br>3,64<br>1,9 | 2,90<br>4,36<br>1,3 |
| Drawframe —<br>1st Passage | Doublings<br>Sliver Mass (ktex)<br>CV (%) | 6<br>3,65<br>3,25 | 6<br>4,25<br>3,5 |
| 2nd Passage | Doublings<br>Sliver Mass (ktex)<br>CV (%) | 6<br>4,04<br>3,5 | 6<br>4,16<br>3,9 |
| Speedframe | Sliver Mass (tex)<br>CV (%) | 424<br>6,0 | 440<br>7,0 |

The material wove very well indeed in both trials. In 1978 the weavability factor was 0,155 and in 1979 was 0,51 end breaks per 1 000 ends/100 000 picks woven under the revised "weavability factor" grading both rate as "very good". The physical properties of the desized, winch scoured and bleached fabrics produced from Acala SJ141/OR3 in both 1978 and 1979 to exactly the same specification are compared in Table IV and as in previous years the results for Deltapine are included as a basis for reference.

## DISCUSSION AND CONCLUSIONS

The fibre from the 1979 crop has a higher micronaire, is more mature and slightly coarser than that of 1978. The 1979 crop fibre too is stronger, longer and because of the higher uniformity ratio appears to contain less short fibre. In short, whilst the 1978 sample was classed as A1 this year's was classed as A0.

## TABLE III

## YARN PROPERTIES

| PROPERTY | Lint from 1979 crop | | | Lint from 1978 crop | | |
|---|---|---|---|---|---|---|
| Linear Density. Nominal (tex) | 30 | 24 | 15 | 30 | 24 | 15 |
| Actual | 30,4 | 26,4 | 14,6 | 29,1 | 24,3 | 14,6 |
| CV (%) | 2,6 | 8,5 | 3,8 | 0,7 | 2,1 | 2,3 |
| Twist (turns/m) | 699 | 766 | 988 | 699 | 766 | 988 |
| Breaking Strength (cN) | 554 | 435 | 244 | 492 | 401 | 223 |
| Tenacity (cN/tex) | 18,2 | 16,5 | 16,7 | 17,0 | 16,5 | 15,3 |
| CV (%) | 6,6 | 14,5 | 11,0 | 7,5 | 9,1 | 10,0 |
| Extension (%) | 7,5 | 7,6 | 6,3 | 7,0 | 6,8 | 6,2 |
| Irregularity CV (%) | 14,2 | 15,1 | 19,2 | 15,7 | 15,5 | 19,8 |
| Thin Places/1 000 m | 3 | 3 | 138 | 7 | 8 | 201 |
| Thick Places/1 000 m | 31 | 52 | 431 | 90 | 112 | 525 |
| Neps/1 000 m | 130 | 187 | 554 | 125 | 153 | 618 |
| End breaks/1 000 spindle hours | 12 | 4 | 13 | 16 | 13 | 16 |
| CSP (Ne × lbf) | 2690 | 2355 | 2434 | 2407 | 2456 | 2445 |
| Classimat results (faults/100 000 m) | — | — | — | | — | — |
| Number of objectionable faults (B4 + C3 + D2) | 30 | 18 | 19 | 10 | 14 | 18 |
| Total number of faults (A1 + B1 + C1 + D1) | 548 | 886 | 2115 | 410 | 801 | 4101 |

## TABLE IV

## PHYSICAL PROPERTIES OF FABRICS PRODUCED FROM ACALA SJ141/OR3 AND DELTAPINE 826

| Properties | Fabric produced from Acala SJ141 1979 Lint | Fabric produced from Acala SJ141 1978 Lint | Fabric produced from Deltapine 826 1977 Lint |
|---|---|---|---|
| Fabric mass ($g/m^2$) | 157 | 153 | 148 |
| Breaking Strength Warp (N) | 539 | 523 | 451 |
| CV (%) | 11,6 | 1,0 | 7,7 |
| Weft (N) | 587 | 566 | 445 |
| CV (%) | 8,7 | 6,2 | 6,7 |
| Mean — Warp and Weft (N) | 563 | 544 | 448 |
| Breaking Extension | | | |
| Warp (%) | 18,8 | 17,3 | 23,1 |
| CV (%) | 5,7 | 2,0 | |
| Weft (%) | 15,9 | 14,3 | 23,2 |
| CV (%) | 4,6 | 4,4 | |
| Bursting Strength ($kN/m^2$) | 1161 | 1233 | 1118 |
| Martindale Abrasion Test (% mass loss after 10 000 cycles) | 2,35 | 2,41 | 4,4 |
| Tear Strength Mean — Warp and Weft (N) | 17,0 | 10,0 | 9,6 |

These characteristics are reflected in the yarn properties, where the tenacity recorded is above the average for S.A. yarns (14,2), the irregularity (CV%) is better than the average expected for this linear density (less short fibre). The neppiness too is well below the average expected (higher maturity). The yarn produced was good, strong and level, spun well and wove as well as last year's. All the fabric properties recorded except the bursting strength reflect the better fibre and yarn properties. These improved results are possibly due to better climatic conditions during growing and harvesting. They confirm, however, last year's findings that this is an excellent cultivar. When this is introduced commercially it will continue the upward trend already becoming very evident in the S.A. cotton crop because of the introduction of improved cultivars.

## ACKNOWLEDGEMENTS

The authors wish to thank the staff of the Departments of Cotton Processing, Weaving and Knitting, Dyeing and Finishing and Textile Physics for their assistance during the course of this investigation and to the Division of Crops and Pastures, Department of Agricultural Technical Services for permission to publish this report.

## THE USE OF PROPRIETARY NAMES

Solvitose XI is the registered proprietary name of Messrs W. A. Scholten-Chemische Fabrieken, N.V. Nederland.

Bevaloid 6381 is the registered proprietary name of Messrs Bevaloid S.A. Ltd.

The fact that this equipment and substances with proprietary names have been mentioned in this report does not in any way imply that SAWTRI recommends them or that there are not substitutes which may be of equal value or even better.

## REFERENCES

1. Veldsman, D. P., Some Observations on the Processing Performance of Acala SJ141, *SAWTRI Bulletin,* **12** (1) 29 (March, 1978).
2. Spencer, J. D. and Taylor, H., Processing of Five Lots of Acala SJ141 from the Lower Orange River, *SAWTRI Bulletin,* **12** (3) 27 (September, 1978).
3. Spencer, J. D. and Taylor, H., Spinning and Weaving Trials on a Blend of Acala SJ141 Cotton grown in the Lower Orange River area. *SAWTRI Bulletin,* **12** (4) 35 (December, 1978).

# OBJECTIVE MEASUREMENT OF THE 1978 IMPORTED MOHAIR CLIP MARKETED BY THE S.A. MOHAIR BOARD

*by E. GEE*

## ABSTRACT

*The imported mohair clip, forming about 10% of the mohair sold in South Africa, has been objectively measured. Typical values for clean yield, vegetable matter content, staple length, fibre diameter and kemp content have been obtained.*

## INTRODUCTION

Greasy mohair sold through the S.A. Mohair Board which was not grown in the Republic of South Africa is called Imported Mohair and comes mainly from Lesotho. It forms about 10% of the annual trade, weighs about 0,6 million kg and is contained in about 4 000 bales. The types into which the clip is classified and the approximate quantities are given in Table I.

**TABLE I**
**TYPICAL COMPOSITION OF THE IMPORTED MOHAIR CLIP**

| Description | Type | Quantity (%) |
|---|---|---|
| Kids — long or short | BKL, BKS | 0,5 |
| Fine Adults — long, medium or short | BFM 1,2,3 | 2,5 |
| Average Adults — long or short | BML, BMS | 34 |
| Strong Adults — long or short | BSL, BSS | 4 |
| Stained | BSTN | 14 |
| Seedy | BSDY | 15 |
| Crossbred | BCM | 15 |
| Lox | BLOX | 4 |
| Grey | BGREY | 11 |

About 90% of the clip is contained in six types while the Kids, Fine Adults, Strong Adults and Lox types together form the remaining 10%. The clip is built up from the mohair supplied to traders and growers' associations by individual farmers, many of whose contributions are far less than one bale. Classing of these parcels into bales by the trader or association is necessarily subjective. This project was undertaken to obtain typical values, and variations, for the properties of the various types and supplements information previously reported for South African Mohair[1,2].

## EXPERIMENTAL

It was decided that the objectively measured properties of interest at this stage were:

1. Clean yield and vegetable content
2. Staple length
3. Fineness
4. Kemp content

Accordingly, it was decided to take samples from several catalogues from the 1978 season, to sample the various types in rough proportion to their quantities (in the case of Kids, a relatively larger portion was sampled to obtain a sample representative of the clip) and to select larger lots, where possible. The lots chosen were also representative of the many traders and growers' associations. As coring was inadvisable and as variation between bales were not of interest at this stage, all the bales in a lot were hand sampled and pooled. The sampling was as random as possible in the circumstances, being taken vîa slits in the bales instead of fully opening and dispersing a bale. A 500 g sample was made from equal portions of each bale in the lot, each portion comprising many small samples from each "fleece".

The following table (Table II) shows the number of lots and bales sampled from each catalogue.

Clean yield and vegetable content were measured as prescribed in IWTO-28-75(E) and expressed as IWTO Clean Wool Content (= wool base x 1,1972) and Vegetable Matter Base. Duplicate tests were made.

Staple length was measured in the unstretched and stretched state. A difference of about 5 mm was found. Unstretched values are given in Table III. A point of note here is that the mohair staples were generally very tapered, tending to give a false indication of fibre length.

Measurement of kemp content by the usual methods of counting either under a microscope or in a liquid of certain refractive index was considered to be too precise at this stage. Instead a routine to separate the kemp from the mohair fibres was devised using a Shirley Analyser. Trials showed that three passages of a scoured sample (about 20 g), including the non-kemp fibres which dropped into the reject can, were sufficient to fully open even the most felted of samples and to separate the kemp with reasonable efficiency. Although the opened sample still contained some kemp fibres it was considered that these were balanced by the few unmedulated fibres which fell into the reject can. From a knowledge of the initial and final sample mass and the vegetable matter present, the percentage of kemp by mass was estimated. Two test samples were again used.

The fineness of the opened sample, after removal of kemp, was determined by the Airflow method described in IWTO-28-75(E). The fibres of the test sample were cut into short lengths to simulate a cored sample.

## TABLE II

## NUMBER OF LOTS AND BALES SAMPLED

| Type | No. of lots sampled from Cat. Nos | | | | | Total No. | % | Type | No. of bales sampled from Cat. Nos | | | | | Total No. | % | Composition of clip in a recent seasonby MASS % |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 21 | 23 | 24 | 25 | 26 | | | | 21 | 23 | 24 | 25 | 26 | | | |
| BML | — | — | — | 3 | 1 | 4 | 3 | BKL | — | — | — | 5 | 1 | 6 | 1 | ) 1 |
| BKS | 1 | 1 | 3 | 2 | 1 | 8 | 5 | BKS | 1 | 1 | 3 | 6 | 2 | 13 | 2 | ) |
| BFM 1 | 1 | — | — | 1 | — | 2 | 1 | BFM 1 | 1 | — | — | 1 | — | 2) | | |
| 2 | — | — | — | 1 | 1 | 1 | 1 | 2 | — | — | — | 1 | 2 | 3) | 3 | 2 |
| 3 | — | — | 3 | 3 | 1 | 7 | 4 | 3 | — | — | 4 | 7 | 1 | 12) | | |
| BML | 1 | 1 | 3 | 4 | 5 | 14 | 9 | BML | 2 | 1 | 8 | 16 | 16 | 43 | 8 | 14 |
| BMS | 1 | 2 | 8 | 4 | 3 | 18 | 11 | BMS | 2 | 2 | 32 | 15 | 14 | 65 | 12 | 20 |
| BSL | 1 | — | 1 | 1 | 2 | 5 | 3 | BSL | 2 | — | 1 | 3 | 5 | 11 | 2 | ) 4 |
| BSS | — | — | 3 | 2 | 1 | 6 | 4 | BSS | — | — | 7 | 12 | 3 | 22 | 4 | ) |
| BSTN | 1 | 2 | 8 | 6 | 5 | 22 | 14 | BSTN | 2 | 2 | 24 | 25 | 34 | 87 | 15 | 14 |
| BSDY | 1 | 1 | 7 | 7 | 6 | 22 | 14 | BSDY | 6 | 1 | 20 | 32 | 29 | 88 | 16 | 15 |
| BCM | 1 | — | 7 | 7 | 5 | 20 | 13 | BCM | 3 | — | 40 | 33 | 25 | 101 | 18 | 15 |
| BLOX | 1 | — | 2 | 4 | 2 | 9 | 6 | BLOX | 1 | — | 6 | 13 | 9 | 29 | 5 | 4 |
| BGREY | 1 | 1 | 4 | 8 | 5 | 19 | 12 | BGREY | 2 | 1 | 16 | 31 | 26 | 76 | 14 | 11 |

## TABLE III

## MEAN VALUES FOR EACH TYPE AND VARIATION (σ) BETWEEN LOTS

| Type | Staple Length (mm) | | Yield (%) | | Vegetable (%) | | Fineness (μm) | | Kemp (%) | |
|---|---|---|---|---|---|---|---|---|---|---|
| | mean | σ | Mean | σ | Mean | σ | Mean | σ | Mean | σ |
| BKL | 136 | 7 | 90,4 | 2,7 | 2,2 | 1,5 | 25,6 | 0,8 | 3,9 | 1,5 |
| BKS | 125 | 9 | 92,0 | 0,8 | 1,4 | 0,9 | 25,1 | 1,5 | 3,1 | 2,4 |
| BFM 1 | 174 | — | 90,9 | | 1,1 | | | | | |
| 2 | 158 | — | 88,4 | 2,6 | 3,0 | 1,0 | 27,6 | 1,8 | 3,3 | 1,7 |
| 3 | 131 | 8 | 91,1 | | 1,8 | | | | | |
| BML | 156 | 26 | 91,9 | 2,6 | 1,4 | 0,9 | 31,2 | 3,1 | 4,2 | 2,6 |
| BMS | 130 | 14 | 91,4 | 1,9 | 2,1 | 1,1 | 29,9 | 3,0 | 4,3 | 2,6 |
| BSL | 163 | 8 | 92,0 | 3,7 | 1,5 | 0,9 | 30,6 | 1,0 | 4,7 | 1,7 |
| BSS | 137 | 11 | 92,6 | 1,4 | 1,5 | 1,4 | 32,6 | 3,7 | 2,9 | 2,3 |
| BST | 142 | 15 | 87,1 | 4,3 | 2,3 | 1,3 | 29,5 | 2,6 | 6,6 | 3,3 |
| BSDY | 134 | 12 | 87,1 | 2,8 | 4,8 | 2,7 | 28,2 | 2,0 | 8,2 | 4,6 |
| BCM | 125 | 14 | 90,0 | 3,4 | 2,4 | 1,6 | 28,2 | 2,4 | 9,7 | 4,9 |
| BLOX | 131 | 14 | 81,3 | 5,6 | 4,1 | 2,2 | 30,4 | 2,1 | 9,0 | 5,0 |
| BGREY | 130 | 13 | 88,5 | 2,7 | 2,8 | 2,0 | 29,2 | 1,2 | 7,3 | 4,0 |

## RESULTS AND DISCUSSION

Table III gives the mean value of each measured property for each type separately and the standard deviation of the variation between lots of the same type. The range of values that can be expected, therefore, is four times the standard deviation. For example the yield for type BKL can be expected to be in the range 85,0 to 95,8 and vegetable content to be zero to 5,2.

### Staple Length

For Kids the difference in length of 11 mm between the long and short lots was not statistically significant. The long lots ranged from 122 to 150 mm while the short lots ranged from 107 to 143 mm .

The BFM 1, 2 and 3 types showed a progressive reduction in length from about 170 mm in steps of 20 mm . For the average and strong hair, long fibre exceeded the short by 26 mm, the strong being marginally longer than the average diameter lots.

The remaining five types were about equal at approximately 132 mm .

Although the figures for variation in staple length within a lot are not tabled the coefficients of variation (CV) were about 22% for the better types and about 26% for the inferior types.

### Clean Yield

The clean yield of the better types averaged 91,6% while the stained and seedy gave 87,1% and crossbreds 90%. Lox gave the lowest yield at 81,3% and greys gave 88,5%.

### Vegetable Matter

The nine samples representative of the better qualities had an average vegetable matter content of 1,8%, ranging from 0,5% to 5,0%; the stained, crossbred and greys gave about 2,5% ranging from 0,5% to 7,3%; lox gave 4,1% ranging 0,7% to 6,5% and seedy gave 4,8% ranging 0,5% to 11,1%.

### Fibre Diameter

Typical values for the various types were:

| | | |
|---|---|---|
| Kids | = | 25 μm |
| Fine Adults | = | 28 μm |
| Average Adults | = | 30,5 μm |
| Strong Adults | = | 31,5 μm |
| Stained | = | 30 μm |
| Seedy | = | 28 μm |
| Crossbred | = | 28 μm |
| Lox | = | 30 μm |
| Grey | = | 29 μm |

These averages suggest that the subjective classing on the basis of fibre diameter was reasonably good. However, the relatively large standard deviations given in Table II indicate some incorrect classings. For instance, some lots classed as strong were found to be finer than some average-classed lots and even finer than some fine lots. Although, in general, duplicate test samples gave good reproducibility indicating that the lots were uniform, on a certain number of occasions wide differences were found. For instance, two test samples of a BCM lot gave 26 μm and 30 μm, respectively. Three test samples of an ML lot gave 29,9; 34,7; 29,2 μm (the 34,7 result was confirmed by a repeat test).

It is suggested that this type of result reflects the difficulties inherent in the system where traders collect small parcels of mohair from individual farmers and have to suitably pool them with other parcels to make uniform bales and lots.

**Kemp**

The procedure devised to give a measure of the number (by mass) of kemp fibres present in a wool sample is not an exact measure. It is, however, a fairly simple procedure and gives reasonable results as can be judged from the values in Table II. The Kids through to the Strong mohairs averaged 3—4% kemp while the seedy, crossbreds and lox were in the 8—9% region. The standard deviations of approximately 2% and 5% respectively for these two groupings indicate that the kemp content can be up to 8% for the better classes and up to about 20% for the others.

Good duplication of tests in general indicated that the method was fairly reproducible. Some results, however (for instance a negative value sometimes obtained) show that this method has its deficiencies.

## CONCLUSIONS

The subjective classification scheme in general has reflected the objectively measured properties. However, some anomalies were found, e.g. some lots classed as average fineness should have been classed as strong.

The yields were about 90%, staple lengths were in the 120 to 175 mm region and vegetable matter averaged between 1% and 5% with individual lots, particularly the seedy types, containing as much as 15% vegetable matter. Fibre diameter ranged from 25 μm for Kids to 33 μm for the strong mohairs, individual lots were found as coarse as 40 μm . The kemp content was about 4% to 9% depending on the type, again individual lots varying from 0% to 20%.

## ACKNOWLEDGEMENTS

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# A NOTE ON THE EFFECT OF REGAIN ON AIR-FLOW MEASUREMENTS OF COTTON FIBRE MICRONAIRE, FINENESS AND MATURITY

*by S. SMUTS, L. HUNTER and J. D. SPENCER*

## ABSTRACT

*The effect of regain on cotton fibre micronaire, fineness and maturity as measured on a Shirley/IIC Fineness/Maturity Tester was determined for various cottons. When the sample specimens were weighed off at the regain at which they were conditioned, both micronaire and fineness increased significantly with an increase in regain, with the maturity ratio hardly changing. The magnitude of the effect was approximately independent of micronaire or fibre fineness. The change in micronaire was almost solely due to the reduction in the actual mass of cotton present in the sample as the regain increased. The measured fibre linear densities (finenesses) were very close to those predicted from the linear density of the dry fibres and the mass of water absorbed at each relative humidity. The effects were much smaller and in the opposite direction where a constant dry mass of fibres was used, and in this case the magnitude of the effect increased as micronaire increased. Within the approximate range of 15% to 90%, relative humidity has only a small effect on micronaire and fineness.*

## INTRODUCTION

Sometimes it is more convenient or even essential, to test cotton fibre properties under ambient atmospheric conditions, in which case it becomes important to know what effect the atmospheric conditions, relative humidity in particular, have on the properties being tested. Recently SAWTRI was requested to study the effect of the regain of cotton on fibre micronaire, fineness and maturity ratio as determined on a Shirley/IIC Maturity/Fineness Tester. Although some work[1] has been carried out on the effect of regain on micronaire nothing appears to have been done on its effect on fineness and maturity as measured on air-flow type instruments.

## EXPERIMENTAL

Samples were selected to represent a wide range of cottons grown in the Republic of South Africa. The samples of cotton lint were opened on a Shirley Analyser prior to testing. Sub-samples of each cotton type were conditioned in atmospheres at 20°C having relative humidities ranging from 0% RH to 97% RH. All samples were preconditioned so that they approached equilibrium from the *dry* side in all atmospheres (i.e. they approached equilibrium on the adsorption curve). After a conditioning period of 18 hours the mass of each sample was adjusted to four grams (this being the mass required for the micronaire test). Hereafter the micronaire, fineness and maturity were rapidly determined under standard atmospheric conditions (20°C and 65% RH). The change in mass after the above procedure was never greater than 1% of the mass of the test samples. Subsequently the regain of each sample was determined.

To eliminate the effect of the changing number of cotton fibres with changing regain, present in the above experiments, the following experiment was performed on two cotton samples. Four grams of cotton were weighed out exactly at 20°C and 65% RH. These samples were then conditioned at the various relative humidities and tested in the same manner as above except that no adjustment of the mass was made. In this way the number of fibres in the samples of each cotton type was kept *constant* although the mass of the test sample obviously varied according to the conditioning atmosphere (i.e. fibre regain).

## RESULTS AND DISCUSSION

Both micronaire and fineness increased appreciably with an increase in regain (relative humidity), i.e. the fibres appeared to be coarser. The linear regressions carried out on the results showed that, for the range of micronaire covered here, the trends and magnitude of the changes were approximately the same for these samples for each of the abovementioned properties. The constants which indicate the rate of change of the measured property with changes in the regain were therefore averaged for each property for the nine samples tested and these average values were used in preparing Figures 1 and 2.

The maturity ratio showed no consistent change with regain and there does not seem to be any effect on micronaire due to a possible interaction between maturity ratio and regain.

Since the mass was kept constant irrespective of the relative humidity, the changes were due to a combination of two effects, viz. a change in fibre shape and surface area due to swelling and a change in fibre surface area due to a change in the number of fibres tested (since the dry mass of the samples, i.e. the amount of cotton fibre, decreased as the regain increased). A separate small experiment (using a *constant dry mass*) showed that as the regain increased so the micronaire reading decreased slightly (Fig. 3). The change in the micronaire with an increase in regain when the *conditioned mass* was kept constant (i.e. the number of fibres changed) was in the opposite direction to the above and much greater. The observed effects, therefore, appear to be mainly a function of the number of fibres tested (i.e. the dry mass).

These results imply that where cottons are conditioned, weighed and tested at a certain relative humidity (especially for extreme relative humidities),

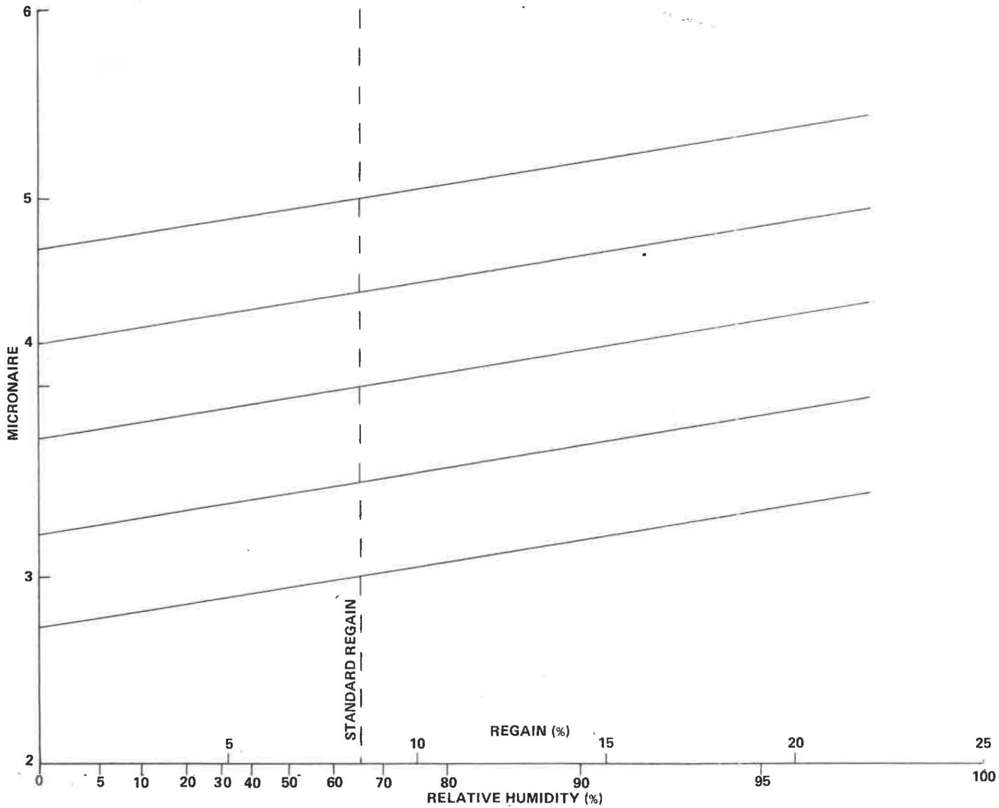


**FIGURE 1**
**The relationship between micronaire and regain for various micronaires (at 20° C)**

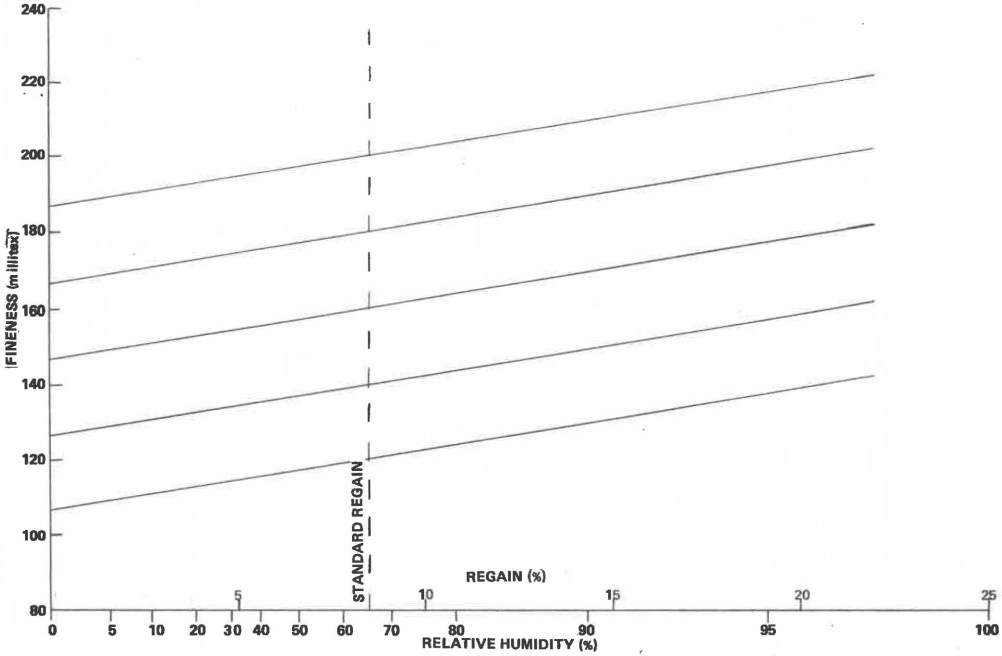


**FIGURE 2**
**The relationship between fineness and regain for various finenesses (at 20° C)**

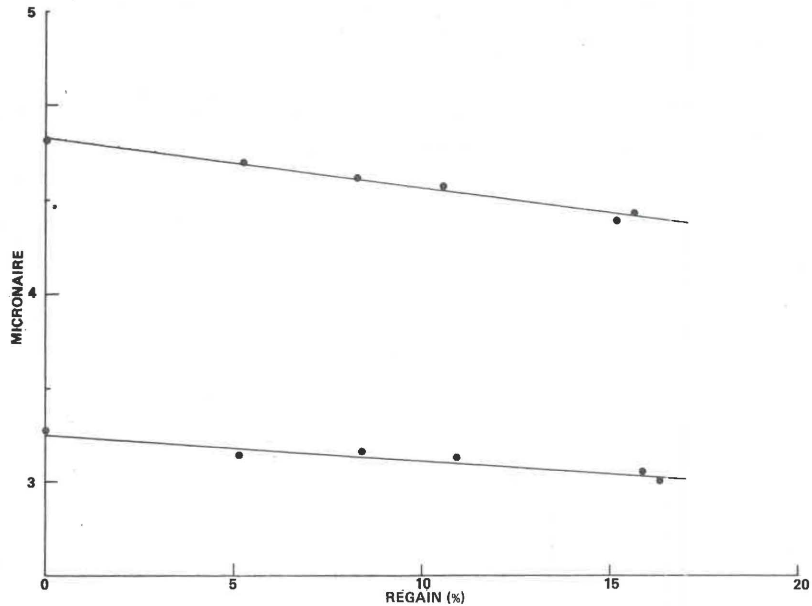


**FIGURE 3**
**The relationship between micronaire and regain for two cottons when a constant dry mass was used**

a considerable error may be introduced in the micronaire and fineness results unless a correction is made. According to the results obtained here, results so obtained may be corrected to *standard* atmospheric conditions (i.e. 8,5% regain) by applying the following equations which ignore possible small effects due to the maturity ratio. These equations are valid for regains from 0% to about 22%.

Micronaire at standard regain

= Micronaire at regain of test sample + 0,032 (8,5 — regain of test sample) .................................... (1)

Fineness at standard regain

= Fineness at regain of test sample + 1,60 (8,5 – regain of test sample) ............................................ (2)

where the fineness is in millitex.

Equation (1) estimates the micronaire at standard regain quite well, but because of the larger difference in behaviour between different samples with respect to changes in fineness which occur with changes in regain, equation (2) does not predict the fineness at standard regain very accurately. Should the relative humidity and not the regain be available then Table I, which relates *adsorption* regain to relative humidity, may be used to obtain an estimate of the regain which may then be used in the above equations.

## TABLE I

## RELATIONSHIP BETWEEN ADSORPTION MOISTURE REGAIN OF COTTON AND RELATIVE HUMIDITY

| Relative Humidity (%) | Adsorption Regain (%) |
|---|---|
| 0 | 0 |
| 10 | 2,7 |
| 20 | 3,9 |
| 30 | 4,8 |
| 40 | 5,6 |
| 50 | 6,6 |
| 60 | 7,8 |
| 70 | 9,1 |
| 80 | 10,8 |
| 90 | 14,3 |
| 95 | 19,1 |
| 100 | 25,0 |

Another consequence of these results, which could be of practical importance, is that large changes about the standard relative humidity (e.g. for the range 15% RH to 90% RH which forms the plateau of the regain vs relative humidity curve) cause relatively small deviations in the micronaire (and fineness) from that obtained at the standard relative humidity. For example, taking a 3 micronaire sample and the extreme relative humidities quoted above, the measured micronaire reading will deviate from the micronaire reading obtained at the standard relative humidity by about 6% each way.

It is assumed that within the practical temperature range the effect of temperature changes on the measured properties will be small.

## ACKNOWLEDGEMENTS

Misses S. Verrie and C. I. Watermeyer are thanked for their assistance.

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# THE USE OF DREF CORE SPUN YARN WITH A *Phormium tenax* FIBRE SHEATH AS WEFT IN CARPET BACKING FABRIC

*by J. D. SPENCER and H. TAYLOR*


## ABSTRACT

*The use of a yarn produced from a blend of Phormium tenax fibre and polypropylene staple fibre with a polypropylene core is described. Processing details, including the preparation of the Phormium tenax fibre and conversion into yarn, are described. The resultant yarn, when used as weft across a polypropylene warp, produced a promising secondary backing fabric for tufted carpeting.*


## INTRODUCTION

The production of fibre from the leaves of the *Phormium tenax* plant (New Zealand Flax) has been described previously[1]. At this stage the fibre is extremely course and harsh and can only be spun to relatively high linear densities (usually 800 tex and above) suitable for coarse fabrics such as for grain bags. Due to increased mechanisation on the farms, however, the use of grain bags is declining. SAWTRI was therefore asked to explore alternative uses for the fibre.

A method of successfully softening the fibre was devised[2, 3] by SAWTRI and the softened fibre then blended with a synthetic fibre as a carrier for carding and spinning purposes. Attempts to spin yarns of 300 tex and finer on a flyer frame, however, were unsuccessful even using 30% polypropylene staple fibre as a carrier, the yarn being too weak for practical purposes. After the recent purchase by SAWTRI of a Dref II open-end spinning machine it was decided to investigate whether these blends could be spun successfully on the Dref system and in the first instance to see whether a high tenacity yarn suitable for use in carpet backing could be produced by incorporating an appropriate core yarn during the spinning process. The necessity for introducing a synthetic core in the yarn was obvious from the commencement of the experiment because of the high tenacity required in carpet backing fabrics. This high strength is necessary for the fabric to withstand the strains applied whilst stretching the carpet during the laying operation.

## EXPERIMENTS AND RESULTS

### Softening

A quantity of *Phormium tenax* fibre (supplied in "carded" form from the farm) was softened by treatment with a solution of 0,4% (m/v) sodium hydroxide, at a liquor to fibre ratio of 40:1, at 95°C for 1 hour. The sodium hydroxide was exhausted onto the fibre after about 45 minutes giving a final pick up of 6,5% (o.m.f.). After thoroughly washing and rinsing at room temperature (3 baths) the fibres were lubricated by submerging them in an aqueous solution containing ®Bevaloid 4027 (4% on the weight of fibre), squeezed at a pressure of 11 N/cm by rubber coated rollers, passed through a fleece opener and then dried in a Fleissner dryer at 80°C.

**Carding**

The softened fibre in its oiled, dried, open state was passed through a Turner and Atherton sample card. This first passage through the card was carried out merely for further opening and levelling. The carded fibre was blended by hand with 30% polypropylene staple fibre (11 dtex, 150 mm staple) and the blend then passed through the card twice to ensure an even blend. After the final passage the material was delivered in sliver form. The polypropylene staple fibre was introduced into the blend only to create greater fibre cohesion so that the sliver could be processed satisfactorily in subsequent operations.

The carded sliver was gilled 4 times, (3 times on an NSC intersecting preparer gill box with autoleveller and finally on an NSC finisher gill box). A draft of approximately 4,5 was applied during each gilling operation, the final sliver linear density being 10 g/m .

**Spinning**

Three of the above slivers were fed into a Dref II Open End spinning machine to form the sheath around a core spun from 4 dtex 150 mm polypropylene staple fibre. The core had a linear density of 40 tex.

Previous experiments with a polypropylene *mono*filament core were unsuccessful because of the poor cohesion of the staple fibre sheath to the core. Whilst the yarn produced with the monofilament core initially appeared to be quite satisfactory subsequent processing caused the fibres to slide on the core and for the monofilament to show through or "grin". The introduction of a spun staple fibre core overcame this difficulty.

Attempts were made to produce a 275 tex yarn from the 70/30 *Phormium tenax*/polypropylene blend alone but the high strength required for carpet backing could not be achieved. The introduction of a man made fibre core seemed to be the only method of achieving the high strength and yet retaining a large percentage of *Phormium tenax* in the blend. The eventual composition of the yarn selected was 60% *Phormium tenax,* 40% Polypropylene. Yarn properties are listed in Table I.

**Weaving**

The yarn was woven as weft over a 100% polypropylene warp to produce a secondary backing fabric for tufted carpeting. Tufting was carried out commercially and the final tufted carpet tested for weight and strength.

## TABLE I

### PROPERTIES OF 60/40 *Phormium tenax* FIBRE/ POLYPROPYLENE CORE YARN

| | |
|---|---|
| Linear Density (tex) | |
| Nominal | 275 |
| Actual | 281 |
| Breaking Strength (N) | 31,2 |
| CV % | 2,8 |
| Breaking Extension (%) | 15,5 |
| CV % | 6,5 |
| Tenacity (cN/tex) | 11,1 |
| Irregularity CV % | 23,8 |
| Thin places/1 000 m | 608 |
| Thick places/1 000 m | 1 260 |
| Neps/1 000 m | 0 |

## TABLE II

### PROPERTIES OF LENO WEAVE SECONDARY BACKING FABRIC WITH 60/40 *Phormium tenax*/POLYPROPYLENE WEFT

| **Property** | | |
|---|---|---|
| Structure | Warp (ends/cm) | 8 |
| | Weft (picks/cm) | 3,5 |
| Weight | $g/m^2$ | 131,4 |
| Breaking Strength* | Warp (N) | 652 |
| | Weft (N) | 439 |

*Tests carried out on an Instron Strength Testing machine 5 cm x 15 cm strips

### Results and Discussion

Results for various physical tests are given in Table II. It can be seen that satisfactory results were obtained. No direct comparison with a similar fabric made from jute was possible as no standards for jute fabrics for strength are available. Further work would also be necessary to establish how the fabric would behave during wear. Equally as important also is how it would respond to the heat bonding process when joining carpet widths during laying.

## SUMMARY AND CONCLUSIONS

The use of *Phormium tenax* fibre as the sheath of a core yarn suitable for weft in a secondary backing fabric for tufted carpeting appears promising. Much more work is necessary however, especially in fabric testing, such as in user trials. It would also seem desirable to establish whether the amount of carrier used in carding and spinning could be reduced and so enable either more *Phormium tenax* or a heavier core to be used for the same yarn linear density. The setting up of a pilot plant to soften the fibre in larger quantities and thereby obtaining a more accurate assessment of fibre costs is essential. Once these costs are established the yarn and subsequent fabric prices can be determined. This will enable a survey of the competitive position of the fibre to be made.

## THE USE OF PROPRIETARY NAMES

®denotes registered trade mark. ®Bevaloid 4027 is the registered trade mark of Messrs Bevaloid (S.A.). The fact that products with proprietary names have been used in this report does not in any way imply that SAWTRI recommends them or that there are not substitutes which may be of equal value or even better.


## ACKNOWLEDGEMENTS

The authors gratefully acknowledge the generous help and advice of the SAWTRI staff members involved during various aspects of the work. Their sincere thanks are also due to Messrs Romatex-Extruded Fabrics and Messrs Dunlop Flooring who jointly produced the finished fabric.


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SAWTRI Bulletin : Vol. 13 No. 4

ERRATA

Page 15. last paragraph, line 1: ..... six types ... should read ... five types.

Page 17. Table II
1st Horizontal row under "TYPE": BML to read BKL.

Page 19. Under paragraph heading: "Vegetable Matter" ..... The nine samples .... should read .... The five samples.