SAWTRI BULLETIN

SOUTH AFRICAN
WOOL AND TEXTILE RESEARCH INSTITUTE
OF THE CSIR

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SEASON'S GREETINGS

The Chief Director and Staff extend Best Wishes and Cordial Greetings for 1986 to readers of the Bulletin.

INSTITUTE NEWS

Research Papers Presented by SAWTRI Scientists at International Textile Conferences in Japan.

Pictured above is the delegation which represented the Institute at three important international textile conferences, presenting papers on the most recent research work undertaken at SAWTRI. From left to right: Dr A P B Maasdorp, Head: Chemistry; Dr N J J van Rensburg, Group Leader: Wet Processing and Textile Chemistry; Dr F A Barkhuysen, Head: Dyeing; Dr L Hunter, Director; Dr D W F Turpie, Chief Director; Mr M A Strydom, Head: Long Staple Processing; Mr G A Robinson, Group Leader: Fabric and Garment Manufacture; Mr E Gee, Head: Statistics.

woven fabrics and about 700 knitted fabrics (plain jersey, Punto-di-Roma and 1x1 rib) being produced.

The yarn and fabric properties were related to the fibre properties by multiple regression analyses and the effect of breed of sheep on the relationships so derived was established.

Emperical relationships and graphs have been used to illustrate the most important findings and trends. It was found that the behaviour and performance of a wool, in terms of yarn and fabric properties, were determined by its diameter, length and crimp characteristics regardless of breed.

The Effect of Fibre Physical Properties on Woollen Processing Performance and on Yarn and Plain Knitted Fabric Properties

J. P. van der Merwe and E. Gee

Sixty-eight lots of wool varying in mean fibre diameter, mean fibre length and resistance to compression were processed on the woollen system of manufacture into yarns of 100tex Z250, and then knitted into single jersey fabrics.

The properties of the yarns and fabrics as well as processing performance were related to the most important fibre properties by means of multiple regression analyses and some of these are illustrated in graphical form.

The Use of Skewness and Kurtosis in the Prediction of Processing Performance and Yarn and Fabrics Properties

E. Gee

The influence of CV, skewness and kurtosis of fibre diameter and length distributions on processing performance and on yarn and fabric properties was examined. About 1 000 wool yarns from 350 wool lots have been studied, as have 100 woven and 250 knitted fabrics.

Regression equations indicated that these parameters featured in the best-fit equations for spinning properties. Also, positive skewness in a diameter distribution was associated with more thin places but fewer neps in the yarns. Higher values for CV, skewness and kurtosis of fibre diameter tended to give inferior yarns, while higher values for the length properties gave better yarns. Regression analysis of knitted and woven fabric data also showed that these parameters featured in the best fit equations of the fabric properties.

II. ISF-85: SYMPOSIUM ON FIBRE SCIENCE AND TECHNOLOGY; 20 — 24th AUGUST, HAKONE

Photo-oxodative degradation of polypropylene: polycyclic aromatic hydrocarbon sensitisers

N. G. Trollip, A. P. B. Maasdorp and N. J. J. van Rensburg

This investigation reports on the extents and modes of photosensitisation/stabilisation of polypropylene by a variety of aromatic pollutants, some of which have not previously been considered as important photo-initiators. Photosensitisation by aromatic molecules (naphthalene, phenanthrene, anthracene, fluorene, pyrene and fluoranthene) is related mainly to photochemical transformation of the additives to labile products, although the induced decomposition of polymeric chromophores also appears to play a role. The singlet oxygen route is less important, while the signs of retardation at high levels of certain of the additives can be explained by triplet-triplet quenching of excited polymeric chromophores such as ketones.

Dyeing and Finishing of Textiles using Radio Frequency Energy

F. A. Barkhuysen, N. J. J. van Rensburg, E. Garner and G. Grimmer

Studies on the use of radio frequency (RF) energy for dyeing and finishing of textiles showed that cotton could be successfully bleached, various textile fibres such as wool, cotton, mohair and nylon could be successfully dyed, while synthetic fibres could be simultaneously dyed and anti-soil/stain treated, by using RF energy instead of conventional techniques.

Foam Dyeing of Cotton

G. H. J. van der Walt and N. J. J. van Rensburg

Different cotton fabrics were foam-dyed on a laboratory scale FFT machine using various reactive dyes. The dyes were applied at different wet pick-up levels (from 10% to 40%) to either one or both sides of the fabrics using the single or the dual applicator system. After the application of the dye the fabrics were batched, or steamed or baked. For purposes of comparison the reactive dyes were also applied to the fabrics by the conventional padding process.

In general, the foam treatments produced level dyeings, except for those treatments carried out at very low wet pick-up levels (10%). A wide range of cotton reactive dyes differing in reactivity and affinity was applied successfully to cotton. In general, foam-dyeing produced slightly higher dye fixation values than conventional pad-dyeing. The fastness ratings were in general similar.

III. 3rd JAPAN-AUSTRALIA JOINT SYMPOSIUM: 5 — 7th SEPTEMBER, KYOTO

The Effect of Various Fibre, Yarn and Fabric Parameters on the Wrinkle Recovery of Wool and Mohair Fabrics

L. Hunter, S. Smuts, Williena Leeuwner and W. Frazer

This paper summarises the main findings of research on wrinkling carried out at SAWTRI and covers both published and unpublished recent work. The main emphasis is placed on the effects of mohair and wool fibre diameter, synthetic fibre type and blend level (with wool) and yarn and fabric structural variables on wrinkle recovery. The recently developed SAWTRI Wrinklemeter is briefly described and the correlations between the various measures of wrinkle and crease recovery are discussed.

Long-service Awards presented to two SAWTRI Staff Members

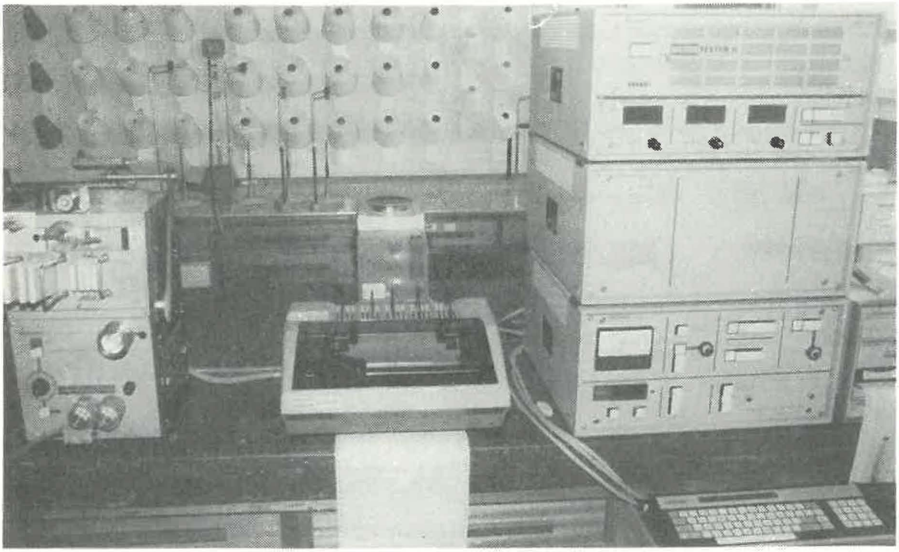
Two members of SAWTRI staff, Mr Eduard Stemmett and Mr Michael McLeod, were awarded gold watches for 25 years' service in the CSIR at a ceremony held recently at the Institute, the presentations being made by dr C F Garbers, President of the CSIR.

Eddie and Mick, as they are affectionately known by all, joined SAWTRI in May 1959 and June 1960 respectively, and enjoy the distinction of being the longest-serving members of staff in service at present. Both men were intimately involved with SAWTRI's growth and expansion over the years, both having been part of SAWTRI's pioneering days in Grahamstown when the Institute had a staff of 18, and both having had the opportunity to serve under three of the four Directors at SAWTRI. The SAWTRI Executive extend their appreciation and gratitude towards both gentlemen who have served the Institute so well in their respective capacities, and wish them a fruitful and happy further association with SAWTRI and the CSIR.

Uster Tester II

SAWTRI has recently acquired the Uster Tester II (Model B) fully automatic system for measuring the very important evenness characteristics of slivers, rovings and yarns produced from staple fibres. This highly sophisticated system greatly facilitates and expedites laboratory testing of evenness, particularly that of yarns, and represents an important addition to SAWTRI's existing range of laboratory testing equipment.

Dr D W F Turpie, Chief Director at SAWTRI and dr C F Garbers, President of the CSIR, seen together with Mr M J McLeod and Mr E Stemmett who were both presented with long-service awards by dr Garbers during his recent visit to Port Elizabeth.



The Uster Tester II (Model B)

IN MEMORIAM

Mr Manuel Masele suddenly passed away on the 27th September at the youthful age of 41. Manuel joined SAWTRI on the 1st July 1975 as an assistant technician in the Long Staple Processing Department where he was partly responsible for the operation and maintenance of various carding and combing machines. His experience and knowledge in this field made him a valuable member of staff, and he will be remembered for his friendliness and diligent approach to his work. Manuel will be sadly missed by his colleagues and friends at the Institute.

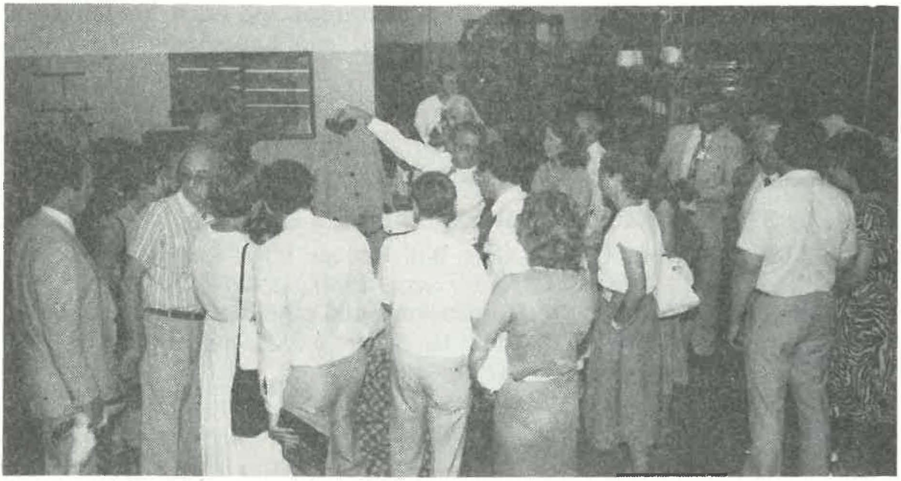
Research Programme for 1986/87:

Steering Committee meetings of the Mohair Board, 13th November, and the Wool Board and Cotton Board, 20th November, were held followed by a meeting of SAWTRI's Research Advisory Committee on the 21st November whereby the 1986/87 research programme was finalised.

Visitors Received at SAWTRI

Twenty-five wool and mohair farmers, some accompanied by their wives, visited the Institute on the 30th October. This delegation, all from the Middelburg (Cape) District Farmers' Association, was presented with a slide

Mr G H J van der Walt, Head: Finishing Department at SAWTRI, explains a technical point about dyeing to wool and mohair farmers from Middelburg, Cape.



Mr G A Robinson, Group leader: Fabric and Garment Manufacture, pointing out a feature of a garment manufactured at SAWTRI to a British delegation.

show on SAWTRI's various activities, followed by a guided tour through the various processing departments.

A trade mission comprising 14 members of the British Federation accompanied by their wives visited the Institute on the 20th November while on a study tour of the South African wool industry.

Staff News

After having completed a course in 'Advanced Medical Care' presented by the Red Cross, Mr Winston Moss followed that up with a fourth and final course to become qualified as an 'Emergency Medical Assistant', which is the highest non-degree medical qualification to be obtained in S.A. at present in the field of trauma and first aid.

SAWTRI PUBLICATIONS

Since the previous edition of the Bulletin, the following papers were published by SAWTRI:

Technical Reports

No. 572 Turpie, D. W. F. and Cizek, J., Further Studies Involving the SAWTRI Length/Strength Tester (November 1985).

No. 573 Hunter, L., Changes in the Dimensional and other Properties of Knitted Cotton Vests due to Wear and Laundering (November 1985).

SAWTRI Special Publications

WOL 72 Trollip, N. G., A Review of the Effect of Impurities on the Photostability of Polypropylene (October 1985).

Papers by SAWTRI Authors Appearing in other Journals

Turpie, D.W.F., Fewer Double Cuts Will Reduce Fibre Losses in Worsted Processing. *Golden Fleece,* **15**(4), 12 (1985).

Hunter, L., Changes in the Dimensional and other Properties of Knitted Cotton Vests due to Wear and Laundering. *Knitting Technique,* **7**, 241 (1985).

AN INTRODUCTORY STUDY ON THE EFFECT OF WARP WAXING ON THE WEAVABILITY OF WOOL WORSTED YARNS

by

J. F. McMAHON

ABSTRACT

A limited study was carried out to determine the effect of warp waxing of two all-wool worsted yarns on weavability. Four wax products were selected. The results show that significant reductions in breakage rate for both singles and two-ply warps can be achieved by waxing. This was particularly so for the two-ply warps.

INTRODUCTION

The aim of warp waxing is not to achieve a significant penetration of the wax into the yarn structure but to modify the surface properties of the yarn and hence the yarn/yarn and yarn/guide frictional behaviour during weaving thereby improving the weaving performance of such yarns[1–6].

Warp waxing originated in the 1930's using beeswax which, owing to its expense, was used only for high class cotton and silk warps. Cheaper products of both mineral and vegetable origin were developed but these products suffered one common disadvantage of being water insoluble, causing problems during finishing[7].

A more traditional method of waxing warps was the insertion of solid paraffin wax rods into the space created between the warp beam and the unwinding warp sheet at the loom itself. This method, however, resulted in inconsistent levels of wax add-on across the warp width and it was difficult to control the quantity of wax deposited. The method frequently caused the appearance of streaks in the warp direction, which became visible during finishing[8].

During the 1960's, synthetic waxes were used for the first time in the USA. These products offered excellent lubricity and, most important, water solubility[7].

At present, many manufacturers[1–6] offer synthetic waxes for warp waxing. They are available as ready-made preparations and, depending on the particular application, differ with regard to their pH-value, viscosity and surface tension[7].

The modern technique of applying warp waxes occurs during warping with a waxing device mounted between warping cylinder and warp beam. The waxing process is thereby carried out during beaming and the entire number of warp threads is guided over the waxing device. Since practically no thread breaks occur during this working process, the application of the wax is continuous and uniform and can be regulated by adjusting the speed of the applicator's roller.

Warp waxing has been discussed[9—13] but little work relating to wool has been documented of a quantitative nature. Stein and Heiser[14], however, have reported on the waxing of both natural and synthetic yarns and note that, in the case of wool worsted yarns, thread breakages can be reduced by about 40%.

In view of the limited amount of information available, a project was initiated at SAWTRI to investigate the effect of warp waxing on the weavability of all-wool worsted yarns.

EXPERIMENTAL

Method and Apparatus

The waxing process was carried out using a lick-roller waxing device situated between the swift of the sectional warper and the warp beam. The speed of the lick roller was adjustable allowing the degree of wax add-on to be controlled. The wax add-on was verified by extraction.

Four commercial liquid waxes were applied to singles and two-ply all-wool worsted warps according to the manufacturers' recommended levels of add-on. A fifth warp of unwaxed yarn was used as a control in each case.

Materials and Parameters investigated

Two all-wool worsted yarns were used for the trials:

Two-ply: R37 tex S630/2 Z945
Singles: 37 tex Z630

The details of the four waxes are given in Table 1.

TABLE 1: WAX DETAILS

Type	Description	Add-on (%)
A	Water-soluble concentrate	1% of 1:1 diluted solution
B	Nonionic water-soluble wax	2%
C	Water-soluble wax of viscosity 0,1 — 0,2 Pa.s and pH 8,2 — 8,8	4%
D	Anionic polymeric compound	2,5%

Yarn Physical Properties

A sample of yarn was removed from each of the warps for testing. In each case, yarn tensile strength was measured on an Instron tensile tester. The yarn-to-metal friction of the yarns was measured on a SAWTRI yarn friction tester.

Weaving

The warps were woven on a Saurer 100W automatic loom running at 165 picks/min. The fabric specifications for the warps were as follows:

Linear density	
warp	: Two-ply: R37 tex S630/2 Z945, or
	: Singles: 37 tex Z630
weft	: 37 tex Z630
Total number of ends	: 4752
Ends x Picks (per cm) (loomstate)	: 28,3 x 28,3
Weave	: 2 x 2 Twill

During the weaving trials all the warp thread breakages were recorded. The weaving performance was assessed as the number of warp thread breakages/1 000 ends/100 000 picks woven. Each weaving trial averaged about 40 000 picks duration.

RESULTS AND DISCUSSION

Yarn Physical Properties

Results for breaking strength and yarn friction are given in Table 2. These show, as expected, that waxing had no significant effect on yarn breaking strength but generally produced a small decrease in yarn friction.

TABLE 2: WARP YARN PHYSICAL PROPERTIES

	Wax	Breaking Strength (cN)		Yarn Friction (cN)
		Mean	Standard Deviation	
Singles	Unwaxed	291	39	25
	A	292	37	22
	B	290	39	21
	C	288	40	22
	D	292	38	25
Two-ply	Unwaxed	300	23	25
	A	293	24	21
	B	296	24	21
	C	298	24	21
	D	299	24	25

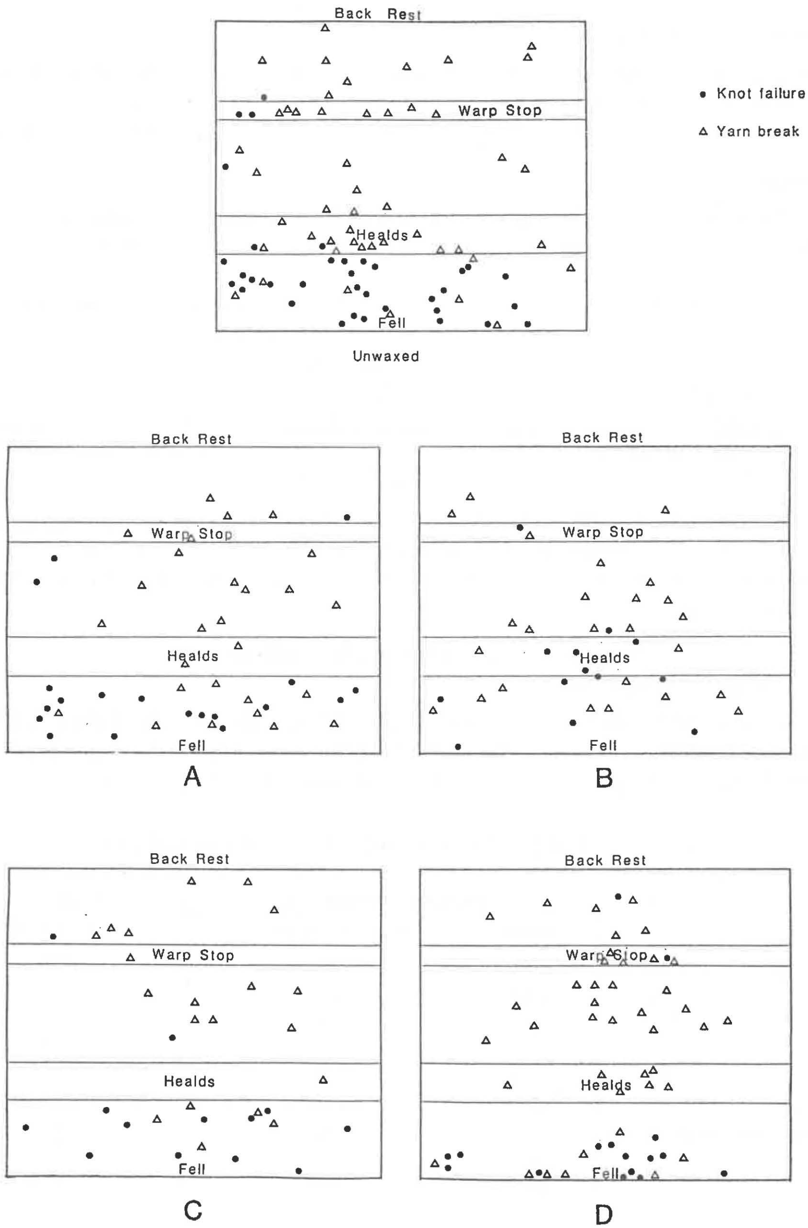


Fig. 1 — Distribution of warp breakages for unwaxed and waxed (A-D) singles all-wool worsted yarns.

Weaving:

Singles Warps:

The weavability results (Table 3) show that all four waxes caused some improvement in weavability with wax C performing the best.

TABLE 3 WEAVABILITY OF SINGLES WARPS

Wax	Weavability (Warp breaks/10^3 ends $10/^5$ picks)
Unwaxed	43,4
A	24,7
B	20,3
C	16,8
D	32,0

Considering the distribution of warp breakages (Fig. 1), the waxed warps showed a reduction in both yarn breaks and knot failures. Quite a significant decrease in knot failure in the front shed sector (from healds to cloth fell) was noted.

Visual observation during the trials showed that the waxed warps produced clearer sheds than the unwaxed warp with no clinging of ends.

Two-ply warps

The results (Table 4) show that, for the two-ply warps, three of the waxes reduced the number of warp breakages.

The distribution of warp breakages (Fig. 2) shows a similar trend to that of the singles warps in that both yarn breakages and knot failures were reduced. With the exception of wax D, the decrease in knot failure in the front shed sector is quite substantial.

TABLE 4: WEAVABILITY OF TWO-PLY WARPS

Wax	Weavability (Warp breaks/10^3 ends/10^5 picks)
Unwaxed	10,0
A	4,4
B	2,7
C	3,8
D	10,4

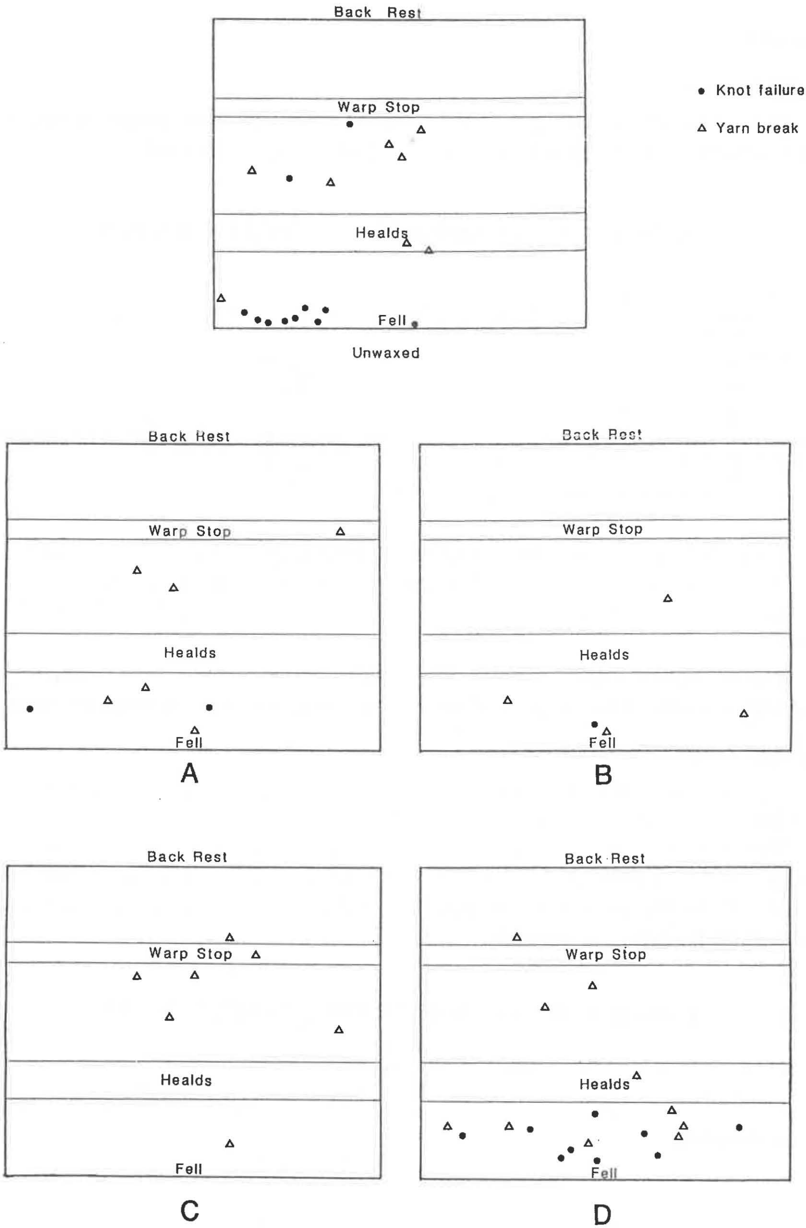


Fig. 2 — Distribution of warp breakages for unwaxed and waxed (A-D) two ply all-wool worsted yarns.

SUMMARY AND CONCLUSIONS

The waxing of all-wool worsted yarns has been investigated by applying four wax products to two-ply and singles warps and then measuring the yarn properties and weaving performance. The results show that yarn friction (SAWTRI friction tester) was generally slightly reduced by waxing while yarn breaking strength remained unaffected. Three of the waxes had a significant effect on the warp breakage rate, reducing breakages attributed to both knot failure and yarn breakage. The fourth wax product performed less satisfactorily in the case of the two-ply warps but slightly reduced the warp breakage rate for the singles yarns.

ACKNOWLEDGEMENTS

The author is indebted to Mr G A Robinson for his comments, to Messrs D Alcock and D Peters for technical assistance and to the S.A. Wool Board for permission to publish the results.

USE OF PROPRIETARY NAMES

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

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