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SOME TYPICAL PROPERTIES OF COTTONS GROWN IN SOUTH AFRICA FROM 1977 TO 1979

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ABSTRACT

Tables are presented for the average properties of the various classes of cottons grown in South Africa during the past three years. Fibre quality Indices (FQI's) have been calculated and the results obtained for 3,2 mm (1/8") gauge and zero-gauge tenacities related graphically. It appears that there have been a significant increase in the proportion of better quality cottons grown in South Africa over the past three years.

INTRODUCTION

Cotton fibres properties are being measured increasingly by instruments (i.e. objectively) and specifications for cotton lint are becoming orientated towards such measurements rather than subjectively assessed qualities, since the former generally give a better indication of how the cotton will perform during processing[1]. For a number of years now SAWTRI has been called upon to measure the fibre properties of a cross-section of the cotton crop grown in South Africa and in 1976 typical values were published[2,3] for the properties and their variations for the different classes and grades of cotton. Since that time, however, changes have been introduced in the cotton growing pattern in South Africa and also in the classification of the cotton. It was decided therefore to publish typical values for the various cotton classes covering the past three growing seasons. Such tables can be used as a basis of reference with respect to the "average" values for a certain class of cotton and allow a comparison to be made between the cottons grown over the past three years.

The importance and relevance of the various fibre properties are discussed in some detail in another report[4].

EXPERIMENTAL

Representative samples of cotton lint are drawn for the official Grader and from these a 500 g sub-sample has been forwarded to SAWTRI over the past few years for various fibre tests. Trash (or non-lint) content, both visible and invisible, was determined in the normal way on a Shirley Analyser. The Shirley analysed samples were then used for micronaire, fineness and maturity tests on an IIC-Shirley Fineness/Maturity tester. In most cases, both zero-gauge (Pressley) and 3,2 mm (1/8") gauge bundle tenacity tests were carried out on a

Stelometer using a sliver prepared on a miniature card. All the Stelometer results (i.e. zero- and 3,2 mm gauge) were corrected to the Pressley values by using USDA standard samples prepared in the same way. Fibre length characteristics were determined on a digital Fibrograph (330) using standard procedures.

Some 2 400 cottons were tested over the past three years and all the cottons were then classed into the various categories according to the official minimum specifications laid down for the 1979 cotton crop.

Averages were calculated for each year (see Tables I to III) as well as the overall averages for the three years, based upon the 1979 specifications throughout (see Table IV). In addition to the standard fibre properties, the FQI values were calculated from, in the one case, the zero-gauge values (Pressley) and, in the other case, the 3,2 mm gauge tenacity results (see Tables I to IV). For the 1979 season cotton crop no 3,2 mm gauge test were performed. These FQI's, but more particularly those based on the 3,2 mm bundle tenacity, can be used as a measure of the yarn strength[5-8].

Another quality index (K-value) was also calculated. This K-value provides a measure of the "quality" of the cotton with respect to yarn irregularity[9].

The quality indices were as follows:

$$FQI_o = \frac{\text{(Pressley) x (50\% Span Length) x (Maturity Ratio)}}{\text{Micronaire}}$$

where Pressley is in 1 000 psi and the 50% span length is in mm .

$$FQI_1 = \frac{\text{(3,2 mm Tenacity) x (50\% Span Length) x (Maturity Ratio)}}{\text{Micronaire}}$$

where the 3,2 mm tenacity if expressed in cN/tex and the other units are as before.

$$K = 29{,}4 \left\{ \frac{\text{Micronaire}}{\text{(50\% Span Length) x (Maturity Ratio)}} \right\}^2$$

where the 50% Span Length is in mm .

DISCUSSION AND CONCLUSIONS

The results given in Tables I and IV, particularly those given in Table IV, give an overall picture of the values to be expected for the various cotton classes and may be used as a basis of reference. As mentioned under Experimental, the FQI values, but more particularly those based upon the 3,2 mm gauge tenacity, give a measure of the quality of the cotton with respect to yarn strength, whereas the K-values indicate how the cotton will perform as far as yarn irregularity is concerned. A higher FQI value indicates a better cotton whereas a higher K-value indicates a poorer cotton, i.e. one which should produce a more irregular yarn. It should be noted, however, that these quality indices are only an approximate guide as to the expected performance of the cotton in the yarn and, furthermore, they do not give an indication of other important aspects of cotton quality, for example, waste during processing, colour, neps in carding and processing performance. These aspects are discussed elsewhere[4].

If the samples are accepted as being numerically representative of the cotton crops, and there is no reason to suspect the contrary, then it appears that there has been a trend for the proportion of cottons in the better classes to increase over the past three years (compare Tables I to III). In addition, there appears to have been a slight improvement in the average 2,5% Span Length and Pressley values within a particular class, which is a further indication that the general quality of the cotton has improved over the past three years.

In many cases, only the zero gauge tenacity (Pressley) is measured and it would be useful if one were able to convert from zero gauge to 3,2 mm gauge tenacity and vice versa. This applies to the FQI's as well. To this end, average values have been plotted in Fig 1 and 2 and the corresponding regression curves superimposed. From Fig 1 it is clear that, in spite of the fact that average values have been used, there is still a wide scatter to the results emphasizing the fact that a significant error is possible when converting from zero gauge tenacity to 3,2 mm tenacity or vice versa, particularly for individual results. The correlation between the two sets of FQI-values, however, is better, and Fig 2 can be used as a rough guide for converting from one set of results to the other.

ACKNOWLEDGEMENTS

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TABLE IV

OVERALL AVERAGE VALUES FOR 1977 TO 1979 COTTONS (STANDARD DEVIATIONS GIVEN IN PARENTHESIS)

Class	No. of Lots tested**	2,5% Span Length (mm)	50% Span Length (mm)	Uniformity Ratio (%)	Micronaire	Maturity Ratio	Fineness (mtex)	Total Trash (%)	Bundle Tenacity			Fibre Quality Indices		
									Zero-Gauge		3,2 mm (1/8") gauge* (cN/tex)	FQI_0	FQI_1*	K
									Pressley (100 psi)	(cN/tex)				
AO	454	29,9 (0,9)	13,6 (0,7)	45,5	4,0 (0,3)	0,94 (0,06)	157 (11)	3,2 (1,1)	94 (3)	47,5 (2,1)	28 (1)	306 (30)	88 (8)	2,9 (0,5)
AOM	49	29,5 (0,5)	13,2 (0,6)	44,5	3,4 (0,1)	0,87 (0,05)	138 (6)	3,2 (0,8)	93 (2)	47 (1,6)	27,5 (1,8)	318 (19)	92 (7)	2,6 (0,3)
A1	179	28,2 (0,2)	13,0 (0,5)	46	4,0 (0,3)	0,92 (0,07)	161 (11)	2,8 (1,2)	93 (3)	47 (1,7)	26,5 (1,7)	280 (21)	78 (7)	3,3 (0,4)
A1M	15	28,1 (0,2)	12,8 (0,5)	45,5	3,4 (0,1)	0,85 (0,06)	142 (6)	3,0 (1,2)	92 (2)	46,5 (1,4)	26,5 (1,5)	296 (20)	83 (6)	2,9 (0,3)
A1L	287	28,8 (0,7)	13,2 (0,6)	46	3,8 (0,4)	0,90 (0,07)	155 (16)	3,2 (1,1)	87 (1)	43,5 (1,4)	26,5 (1,6)	271 (28)	81 (8)	3,1 (0,5)
A2	186	27,4 (0,3)	12,7 (0,5)	46,5	4,2 (0,3)	0,92 (0,07)	171 (14)	2,6 (1,0)	89 (3)	45 (2,2)	25,5 (1,4)	251 (21)	71 (7)	3,8 (0,6)
A2M	87	27,4 (0,3)	12,5 (0,4)	45,5	3,7 (0,1)	0,87 (0,05)	151 (7)	2,8 (1,1)	90 (2)	45 (2,0)	25 (1,6)	270 (22)	75 (8)	3,3 (0,5)
A2L	300	27,9 (0,8)	13,0 (0,7)	46,5	4,0 (0,4)	0,90 (0,06)	163 (15)	3,2 (1,1)	82 (2)	41,5 (1,7)	25 (1,5)	243 (23)	73 (8)	3,5 (0,6)
A3	170	27,9 (0,8)	13,0 (0,5)	46,5	4,2 (0,3)	0,90 (0,06)	176 (10)	3,0 (1,1)	75 (1)	37,5 (1,2)	23,5 (1,4)	208 (16)	64 (6)	3,9 (0,5)
A3M	44	27,7 (0,6)	12,5 (0,4)	45	3,6 (0,1)	0,86 (0,05)	151 (9)	3,1 (0,7)	75 (2)	38 (1,2)	23,5 (1,4)	224 (20)	68 (8)	3,4 (0,6)
B1	177	26,6 (0,2)	12,3 (0,5)	46	4,0 (0,4)	0,90 (0,07)	167 (17)	2,7 (1,2)	86 (4)	43 (2,5)	23,5 (4,8)	237 (24)	67 (7)	4,0 (0,6)
B2	86	26,6 (0,2)	12,4 (0,6)	46,5	4,1 (0,4)	0,89 (0,06)	174 (17)	3,2 (1,3)	75 (1)	37,5 (1,3)	19 (8,7)	201 (17)	60 (6)	4,2 (0,6)
BSG	249	27,1 (1,5)	12,2 (0,8)	45	3,2 (0,5)	0,81 (0,07)	136 (21)	3,5 (1,1)	81 (6)	40,5 (3,6)	24 (2,2)	259 (55)	73 (16)	3,2 (1,0)
C1	66	25,9 (0,2)	12,1 (0,4)	46,5	4,1 (0,5)	0,89 (0,08)	170 (19)	2,6 (0,9)	85 (4)	42,5 (2,4)	24 (3,8)	227 (24)	65 (7)	4,2 (0,7)
C2	63	25,8 (0,2)	12,1 (0,6)	47	4,1 (0,4)	0,88 (0,07)	171 (17)	2,9 (1,5)	75 (2)	38 (1,3)	20,5 (7,0)	198 (19)	60 (7)	4,4 (0,8)

*Values corrected to Pressley instrument level. To obtain values corrected to Stelometer level, multiply by 0,8

**Fewer lots were covered in the case of the 3,2 mm gauge bundle tenacity and FQI_1 tests

TABLE I

AVERAGE VALUES FOR 1977 COTTONS (STANDARD DEVIATIONS GIVEN IN PARENTHESIS)

Class	No. of Lots Tested	2,5% Span Length (mm)	50% Span Length (mm)	Uniformity Ratio (%)	Micronaire	Maturity Ratio	Fineness (mtex)	Total Trash (%)	Bundle Tenacity			Fibre Quality Indices		
									Zero-Gauge		3,2 mm (1/8") gauge* (cN/tex)	FQI_0	FQI_1*	K
									Pressley (1000 psi)	(cN/tex)				
AO	147	29,8 (0,7)	13,7 (0,6)	46	4,1 (0,3)	0,90 (0,06)	163 (12)	3,2 (0,7)	95 (4)	48 (2,0)	28,5 (1,7)	298 (25)	89 (8)	3,1 (0,5)
AOM	21	29,5 (0,4)	13,2 (0,4)	45	3,4 (0,1)	0,84 (0,04)	143 (7)	3,3 (0,7)	95 (3)	47,5 (1,6)	27,5 (1,8)	311 (18)	90 (5)	2,8 (0,3)
A1	33	28,2 (0,3)	13,0 (0,5)	46	3,8 (0,2)	0,87 (0,06)	159 (10)	3,7 (1,0)	96 (4)	48 (2,0)	27 (1,7)	287 (24)	81 (7)	3,3 (0,4)
A1M	5	28,2 (0,2)	12,8 (0,3)	45,5	3,4 (0,1)	0,84 (0,03)	144 (3)	4,0 (1,2)	92 (3)	46,5 (1,7)	26 (1,3)	292 (10)	82 (6)	3,0 (0,2)
A1L	55	29,0 (0,8)	13,2 (0,6)	45,5	3,6 (0,5)	0,84 (0,06)	153 (20)	3,4 (0,9)	88 (3)	44,5 (1,6)	27 (2,2)	278 (32)	83 (9)	3,1 (0,7)
A2	45	27,3 (0,3)	12,8 (0,5)	47	4,1 (0,3)	0,86 (0,07)	180 (19)	2,9 (0,9)	90 (4)	45,5 (2,2)	25 (1,4)	245 (25)	68 (8)	4,1 (0,7)
A2M	35	27,3 (0,2)	12,5 (0,3)	46	3,7 (0,1)	0,87 (0,06)	154 (10)	3,3 (1,2)	91 (4)	45,5 (2,1)	25 (1,2)	270 (22)	74 (7)	3,4 (0,6)
A2L	66	27,7 (0,7)	12,7 (0,6)	46	3,8 (0,4)	0,85 (0,06)	162 (19)	3,3 (1,0)	84 (4)	42,5 (2,3)	25 (1,8)	244 (30)	73 (9)	3,7 (0,8)
A3	22	27,5 (0,6)	12,9 (0,7)	47	4,3 (0,3)	0,87 (0,05)	186 (13)	3,1 (0,8)	76 (2)	38 (1,3)	24 (1,1)	199 (17)	63 (5)	4,4 (0,7)
A3M	12	27,6 (0,6)	12,4 (0,5)	45	3,6 (0,1)	0,85 (0,06)	154 (10)	3,1 (0,8)	76 (2)	38,5 (1,2)	24 (2,3)	224 (20)	70 (11)	3,5 (0,7)
B1	66	26,6 (0,2)	12,4 (0,6)	46,5	3,9 (0,4)	0,87 (0,07)	169 (20)	3,2 (1,0)	86 (4)	43 (2,5)	24 (1,6)	236 (27)	66 (7)	4,0 (0,8)
B2	31	26,6 (0,2)	12,2 (0,6)	46	4,0 (0,4)	0,85 (0,05)	175 (19)	3,3 (0,9)	75 (2)	38 (1,2)	23 (1,3)	196 (18)	59 (6)	4,5 (0,8)
BSG	81	26,8 (1,7)	12,1 (0,9)	45	3,3 (0,6)	0,81 (0,07)	145 (23)	3,5 (0,9)	80 (7)	40 (4,0)	23,5 (2,3)	244 (60)	71 (18)	3,5 (1,1)
C1	32	25,8 (0,2)	12,2 (0,5)	47,5	4,1 (0,4)	0,86 (0,05)	179 (19)	3,1 (0,8)	84 (4)	42 (2,3)	24,5 (1,9)	215 (22)	63 (6)	4,6 (0,7)
C2	29	25,8 (0,2)	11,9 (0,6)	46	4,0 (0,4)	0,86 (0,07)	170 (19)	2,9 (0,8)	75 (2)	37,5 (1,4)	22,5 (2,0)	196 (20)	58 (7)	4,5 (1,0)

*Values corrected to Pressley instrument level. To obtain values corrected to Stelometer level, multiply by 0,8

TABLE II

AVERAGE VALUES FOR 1978 COTTONS (STANDARD DEVIATIONS GIVEN IN PARENTHESIS)

Class	No. of Lots Tested	2,5% Span Length (mm)	50% Span Length (mm)	Uniformity Ratio (%)	Micronaire	Maturity Ratio	Fineness (mtex)	Total Trash (%)	Bundle Tenacity			Fibre Quality Indices		
									Zero-Gauge		3,2 mm ($^1/_8$") gauge* (cN/tex)	FQI_o	FQI_1*	K
									Pressley (1000 psi)	(cN/tex)				
AO	108	29,3 (0,5)	13,5 (0,5)	46	3,9 (0,2)	0,92 (0,06)	157 (12)	2,9 (0,6)	94 (3)	46,5 (1,5)	27,5 (1,4)	298 (23)	87 (8)	2,9 (0,5)
AOM	23	29,4 (0,5)	13,2 (0,6)	45	3,4 (0,1)	0,90 (0,03)	136 (5)	3,2 (0,8)	94 (3)	46,5 (1,5)	27,5 (1,8)	322 (17)	94 (9)	2,5 (0,2)
A1	73	28,2 (0,2)	13,1 (0,5)	46,5	3,9 (0,3)	0,89 (0,05)	163 (12)	2,8 (0,9)	92 (2)	46 (1,3)	26,5 (1,6)	273 (19)	77 (7)	3,4 (0,5)
A1M	7	28,0 (0,2)	12,8 (0,6)	45,5	3,4 (0,1)	0,83 (0,04)	147 (6)	2,6 (0,8)	93 (2)	46,5 (1,3)	27 (1,5)	285 (11)	83 (7)	3,1 (0,2)
A1L	156	28,6 (0,7)	13,2 (0,6)	46	3,8 (0,4)	0,90 (0,05)	156 (16)	3,3 (1,1)	87 (2)	43,5 (1,1)	26 (1,3)	270 (25)	80 (8)	3,1 (0,5)
A2	66	27,4 (0,3)	12,9 (0,5)	47	4,1 (0,2)	0,90 (0,04)	167 (12)	2,8 (1,1)	89 (3)	44 (1,9)	25,5 (1,4)	252 (17)	73 (5)	3,7 (0,5)
A2M	43	27,4 (0,3)	12,6 (0,4)	46	3,6 (0,1)	0,86 (0,05)	152 (7)	2,6 (0,9)	90 (3)	44,5 (1,9)	25,5 (1,8)	268 (21)	76 (8)	3,3 (0,4)
A2L	184	27,8 (0,6)	13,1 (0,6)	47	4,0 (0,4)	0,90 (0,05)	164 (16)	3,1 (1,1)	82 (2)	41 (1,2)	25 (1,4)	242 (18)	73 (7)	3,4 (0,5)
A3	130	27,8 (0,7)	13,1 (0,5)	47	4,2 (0,2)	0,89 (0,06)	176 (10)	3,0 (1,0)	75 (2)	37,5 (1,2)	23,5 (1,4)	209 (15)	64 (6)	3,8 (0,5)
A3M	32	27,7 (0,6)	12,5 (0,4)	45	3,6 (0,1)	0,86 (0,05)	151 (10)	3,1 (0,6)	75 (2)	37,5 (1,1)	23,0 (0,8)	225 (20)	68 (6)	3,4 (0,5)
B1	73	26,6 (0,2)	12,5 (0,4)	47	4,0 (0,4)	0,88 (0,05)	165 (14)	2,3 (0,9)	85 (3)	42,5 (1,9)	25 (1,5)	236 (18)	69 (6)	3,8 (0,5)
B2	55	26,6 (0,2)	12,5 (0,6)	47	4,2 (0,4)	0,91 (0,06)	174 (16)	3,2 (1,5)	75 (2)	37,5 (1,3)	23 (1,8)	204 (15)	61 (6)	4,1 (0,5)
BSG	136	27,0 (1,1)	12,2 (0,6)	45	3,2 (0,5)	0,81 (0,06)	136 (20)	3,5 (1,2)	82 (6)	40,5 (3,4)	24 (2,1)	256 (44)	74 (14)	3,1 (0,8)
C1	19	25,9 (0,3)	12,0 (0,4)	46	3,7 (0,3)	0,87 (0,04)	153 (13)	2,2 (1,0)	84 (3)	41,7 (1,9)	24,5 (1,5)	238 (19)	70 (6)	3,6 (0,4)
C2	34	25,8 (0,2)	12,2 (0,5)	47,5	4,2 (0,4)	0,90 (0,07)	172 (17)	2,9 (1,9)	76 (2)	37,8 (1,3)	23,1 (1,3)	200 (18)	61 (6)	4,3 (0,6)

*Values corrected to Pressley instrument level. To obtain values corrected to Stelometer level, multiply by 0,8

TABLE III

AVERAGE VALUES FOR 1979 COTTONS (STANDARD DEVIATIONS GIVEN IN PARENTHESIS)

Class	No. of Lots Tested	2,5% Span Length (mm)	50% Span Length (mm)	Uniformity Ratio (%)	Micronaire	Maturity Ratio	Fineness (mtex)	Total Trash (%)	Bundle Tenacity		Fibre Quality Indices	
									Zero-Gauge		FQI_o	K
									Pressley (1000 psi)	(cN/tex)		
AO	199	30,2 (1,2)	13,7 (0,8)	45,5	4,0	0,97 (0,04)	155 (9)	3,3 (1,4)	96 (4)	47,5 (2,3)	317 (34)	2,7 (0,4)
AOM	5	30,0 (0,9)	13,1 (0,8)	43,5	3,4 (0,1)	0,91 (0,03)	133 (7)	3,1 (0,8)	93 (2)	46,5 (1,4)	324 (29)	2,5 (0,5)
A1	73	28,2 (0,3)	12,9 (0,4)	45,5	4,2 (0,3)	0,97 (0,05)	162 (12)	2,5 (1,4)	94 (3)	47 (1,6)	283 (19)	3,3 (0,4)
A1M	3	28,2 (0,3)	12,8 (0,4)	45,5	3,5 (0,1)	0,93 (0,04)	134 (3)	2,4 (1,0)	96 (2)	47,5 (1,1)	329 (13)	2,5 (0,3)
A1L	74	28,9 (0,8)	13,0 (0,7)	45	4,0 (0,3)	0,95 (0,05)	157 (13)	3,0 (1,4)	87 (2)	43,5 (1,4)	269 (29)	3,1 (0,4)
A2	75	27,4 (0,3)	12,4 (0,4)	45,5	4,3 (0,3)	0,97 (0,04)	170 (13)	2,4 (0,9)	91 (4)	45,5 (2,2)	254 (20)	3,8 (0,4)
A2M	9	27,5 (0,3)	12,2 (0,4)	44,5	3,6 (0,1)	0,91 (0,04)	146 (4)	2,2 (1,0)	91 (3)	45,5 (1,9)	276 (24)	3,2 (0,4)
A2L	46	28,5 (1,1)	12,9 (0,7)	45,5	4,2 (0,4)	0,95 (0,05)	164 (14)	3,2 (1,5)	83 (3)	41,5 (2,0)	245 (23)	3,4 (0,4)
A3	18	28,7 (0,9)	12,8 (0,4)	44,5	4,4 (0,2)	0,96 (0,04)	176 (6)	3,5 (1,3)	76 (1)	38 (0,9)	212 (10)	3,8 (0,3)
B1	38	26,6 (0,2)	12,0 (0,5)	45	4,4 (0,4)	0,98 (0,05)	172 (16)	2,6 (1,5)	90 (5)	44,5 (2,8)	241 (27)	4,1 (0,6)
BSG	25	27,9 (1,8)	12,2 (0,9)	43,5	2,8 (0,7)	0,78 (0,13)	121 (20)	3,7 (0,8)	86 (6)	43 (3,4)	294 (53)	2,7 (0,8)
C1	15	25,8 (0,2)	11,9 (0,4)	46	4,5 (0,4)	1,01 (0,04)	174 (14)	2,3 (0,6)	89 (4)	44,5 (2,4)	236 (22)	4,2 (0,6)

*Values corrected to Pressley instrument level. To obtain values corrected to Stelometer level, multiply by 0,8

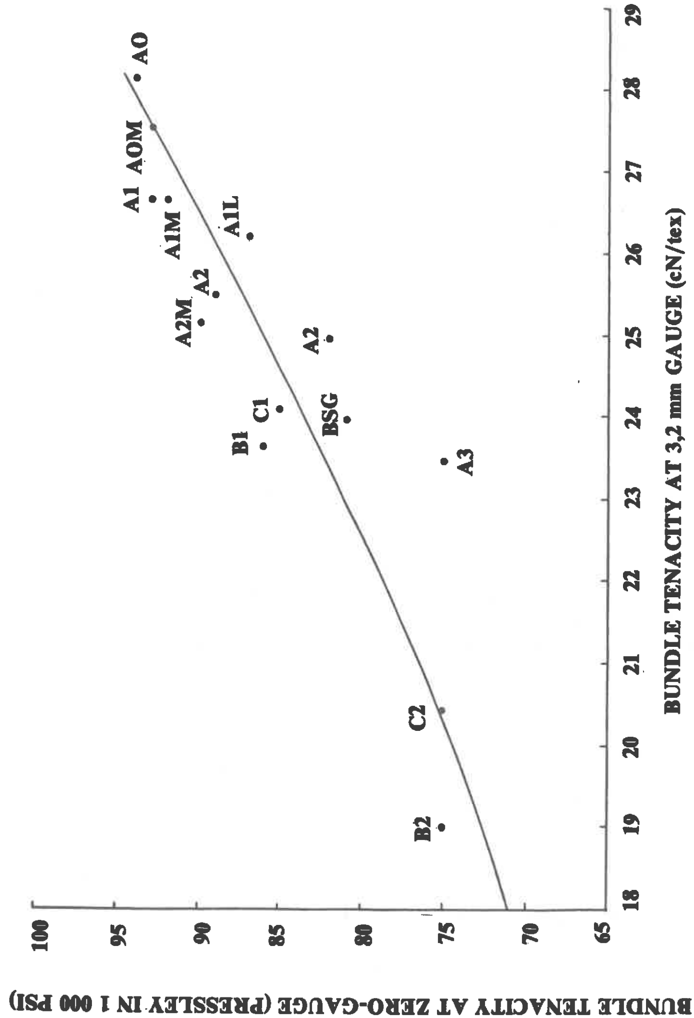

Fig 1 – Zero-Gauge tenacity vs 3,2 mm (¹/₈") gauge tenacity

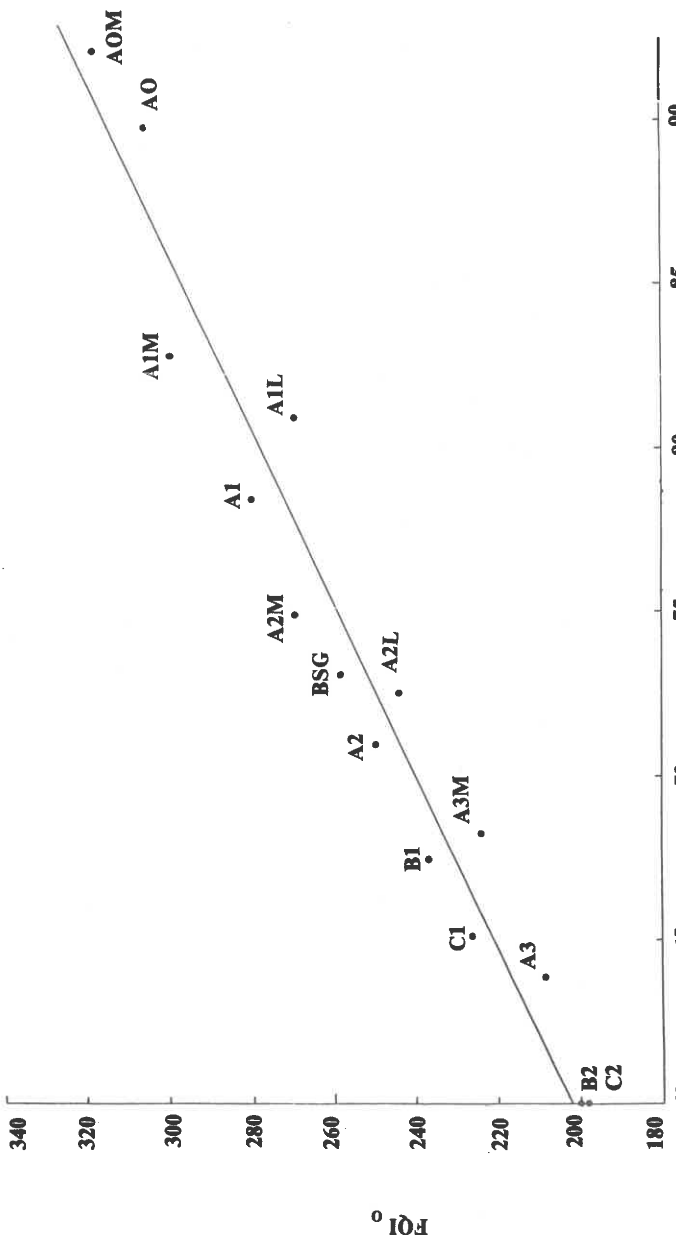

Fig 2 – FQI_o involving zero-gauge tenacity vs FQI_1 involving 3,2 mm gauge tenacity

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