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FIBER TENACITY/YARN STRENGTH RELATIONSHIP Yarn strength can be measured by several methods. One of the most popular procedures in some parts of the world, including the United States, is the skein strength test. This is a fairly rapid yet simple way of screening a relatively long length of yarn (120 yards). This test provides data on yarn number (count) and strength which are combined to give a count-strength-product (CSP). Disadvantages of the test lie in the susceptibility to personal error, such as the insertion of twist into the skein, the insensitivity to the presence of weak places in the yarn and, in many cases, the lack of information on the elongation of the yarn.

Single yarn tensile testing, which overcame some of these disadvantages, became popular with the introduction of automatic instruments that reduce testing time and eliminate human error in handling individual lengths of yarn. For example, the Uster automatic yarn strength tester provides data on the mean breaking load and elongation as well as their distributions. More recently, the introduction of the Uster Tensorapid instrument has enabled assessment of the work to break a yarn as well as the production of breaking load/elongation curve. (See *Textile Topics* Vol. XI, No. 11, July 1983.)

The relationship between fiber tenacity and count-strength-product has been documented frequently, since the latter is a much-used expression of yarn strength. The data given in Table I on the next page provide some indication of the relationship which exists between fiber tenacity measurements and two measures of single yarn strength, i.e. mean tenacity (g/tex) and mean breaking load (g). For comparison, statistics derived between count-strength-product and fiber tenacity are also included.

As expected, the correlation coefficients between fiber strength and single yarn strength are very high. The correlations between fiber tenacity and yarn tenacity are marginally better than those between fiber tenacity and mean breaking load in the finer counts. Comparison of residual coefficients of variation, which are measures of the errors of the measurement, shows that the least values are obtained with yarn tenacity, implying that the relationship between fiber and yarn tenacities may be more precise. The high correlation coefficients between fiber tenacity and either single yarn strength assessments or CSP suggest that the different measurements of yarn strength should also be highly correlated. This is confirmed by the data presented in Table II.

We trust this information will be of interest to *Textile Topics* recipients, particularly those who have inquired about our use of the count-strength-product. Fiber and yarn tests were conducted by the Textile Research Center's materials evaluation laboratory, under the direction of Mrs. Reva E. Whitt. Statistical analyses were performed by John B. Price, head of TRC's open-end spinning research.

COTTON RESEARCH REPORT NEARS COMPLETION In December 1981 the Textile Research Center began a study designed to determine the relationships between cotton fiber properties, ring and rotor-spun yarn properties, and yarn dyeability. Thirty-six cottons, grown primarily in Texas, were thoroughly tested by high volume instrument systems and the more frequently encountered "individual" instruments such as the Pressley, Stelometer, and Digital Fibrograph. Testing was performed on bale, batt (chute feed) and finisher drawing sliver samples. From each cotton, four rotor-spun yarns and three ring-spun yarns were produced, all of which were fully tested. Yarn packages from each cotton were dyed and measurements of color were made. The cottons were also used to evaluate new instruments acquired by the Textile Research Center, such as the Spinlab 800 Series high volume system and a new Shirley Fineness/Maturity Tester. (These acquisitions were reported in earlier issues of *Textile Topics*.)

Attempts were made to characterize the thirty-six cottons in terms of low-twist, rotor-spinning performance. Fabrics knitted from suitable yarns were dyed with two representatives of three classes of dyestuffs at each of four concentrations. Additionally, dust studies were performed on each cotton to determine the quantity of material which accumulates in the rotor groove when spinning under standard conditions.

Although some minor parts of the program are still being conducted, the greater portion has been completed and is currently being prepared for publication. Because considerable effort has been expended to ensure that the data have been exhaustively analyzed, the sponsor of the study, the Natural Fiber and Food Protein Commission of Texas, feels the report may be of interest to many factions of the textile industry and has consented to its release. The Textile Research Center will publish the report. Before printing, however, it would be beneficial to have some indication of the number of copies to be produced. Consequently, the Center would appreciate a response from those readers of *Textile Topics* who would be interested in receiving the report. A nominal sum will have to be charged to cover printing and mailing costs, and this will be dependent upon volume. It should be pointed out that the Textile Research Center is a non-profit organization and that the charges will only partially compensate total cost.

It is believed that the study may be of use to a wide variety of people involved with cotton. To the seed breeder, the results should promote an understanding of the interrelationship between fiber properties. To manufacturers, the report can be used to identify those properties which are important to processing. Marketing firms may also benefit from the identification of those properties which are believed to truly contribute to determining yarn strength and spinning performance. The identification of relationships between color measurements and fiber properties should be of interest to dyers.

We will appreciate an indication of your interest in obtaining a copy of this report. We ask that this be done by writing to the Textile Research Center at the address shown on the back page of *Textile Topics*.

VISITORS Visitors to the Textile Research Center during May included George Blomquist, Parkdale Mills, Lexington, NC; Robert P. Hinn, Harvest Queen Mill & Elevator Company, Plainview, TX; Robert Rolston, American Sheep Producer's Council, Denver, CO; Nick Greer and Neal Bessler, Atlantic Richfield Corporation, Dallas, TX; Dennis McClintic, Deere & Company, Moline, IL; Irwin J. Gusman and Ronald L. Depoe, J. P. Stevens & Co., Inc., New York, NY; Gray Sullivan, J. P. Stevens & Co., Inc., Cheraw, SC; Mark Perrings, Da Gama Textiles, King Williams Town, Republic of South Africa; Andrew Thomson, C.S.I.R.O., Belmont, Victoria, Australia; and C. H. Kim, Namsun Textile Co., Ltd., Seoul, Korea.

TABLE I

CORRELATION DATA FOR FIBER TENACITY AND ROTOR-SPUN YARN STRENGTH MEASUREMENTS

(Stelometer Measurement - 36 Cottons)

Rotor-Spun Yarn Number (N_e)	Statistic	Single Yarn		Skein
		Tenacity (g/tex)	Mean Breaking Load (g)	CSP
N_e 6	r	0.9444	0.9451	0.9311
	r^2	0.8918	0.8931	0.8670
	Residual Standard Deviation	0.37	37.7	82.0
	Residual CV%	2.8	2.9	3.5
N_e 10	r	0.9307	0.9446	0.9405
	r^2	0.8661	0.9017	0.8845
	Residual Standard Deviation	0.43	24.0	83.1
	Residual CV%	3.3	3.1	3.7
N_e 16	r	0.9333	0.9105	0.9140
	r^2	0.8710	0.8290	0.8354
	Residual Standard Deviation	0.46	20.2	104.4
	Residual CV%	3.6	4.3	5.0
N_e 22	r	0.9194	0.9099	0.9176
	r^2	0.8452	0.8280	0.8420
	Residual Standard Deviation	0.52	16.2	103.2
	Residual CV%	4.2	4.8	5.3

TABLE II

REGRESSION EQUATIONS FOR CSP USING SINGLE YARN STRENGTH PARAMETERS

(Sample Size: 36 Rotor-Spun Yarns)

Independent Variable	Yarn Number (N_e)	Regression Equation	Correlation Coefficient (r)	Coefficient of Determination (r^2)	Residual Standard Deviation	Residual CV%
Mean Tenacity	6	$C = -247.2 + 198.7\ t$	0.9843	0.9688	39.7	1.7
	10	$C = -398.1 + 203.7\ t$	0.9787	0.9578	50.2	2.2
	16	$C = -396.8 + 196.6\ t$	0.9771	0.9548	54.7	2.6
	22	$C = -452.7 + 194.3\ t$	0.9831	0.9664	47.6	2.5
Mean Breaking Load	6	$C = -121.3 + 1.89\ s$	0.9702	0.9412	54.5	2.3
	10	$C = -156.0 + 3.10\ s$	0.9733	0.9472	56.2	2.5
	16	$C = -324.3 + 5.16\ s$	0.9770	0.9544	54.9	2.6
	22	$C = -267.8 + 6.53\ s$	0.9810	0.9624	50.4	2.6