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TEXTILE TOPICS

INTERNATIONAL CENTER FOR TEXTILE RESEARCH AND DEVELOPMENT
TEXAS TECH UNIVERSITY / LUBBOCK, TEXAS / U. S. A.

Volume XVII, No. 6 February 1989

EFFECTS OF AGEING ON COTTON QUALITY

We have received a number of inquiries recently about the use of cotton from the 1987 production year. Several textile companies have been concerned about the quality of the fiber after having been stored from 1987 to the present time. Mostly, the inquiries have been about the color of the cotton, as there is a general awareness that cotton will change from white to yellow over a period of time. We have never found any great change during a short period of several months or one year, but yellowness may increase noticeably when cotton is stored for several years.

It is suspected that increases in yellowness due to ageing may be caused by auto-oxidation of organic material on the surface of cotton fibers and/or the action of microorganisms. Auto-oxidation is a process that oxidizes organic materials associated with the fiber, mostly pectin and waxes. Bacterial growth contributes significantly to yellowing, depending upon the type of bacteria. Some feed on the sugar that is associated with the maturation of cotton, and it may be that the more sugar present, the greater the growth of the bacteria. If this is the case, this would lead to increasing yellowness.

Gram-negative bacteria contribute to yellowness, which is directly related to the concentration of the bacteria. This type of bacteria may also lead to temporary respiratory problems for humans who work with cotton at gins or in a textile manufacturing plant. This reaction usually is in the form of mild difficulty in breathing, a tightness of the chest, and wheezing.

Whatever the case may be, yellowness associated with cotton ageing probably is due to the presence of bacteria that feed and grow on organic matter present on the fiber, or as a result of the natural oxidation of the surface organic materials, or both.

In addition to the color change, there is some indication that cotton will lose strength over a long period of time, but we have not found any great change during a storage up to four years However, we are interested in studying the quality of cotton and any deterioration of it, regardless of what the cause may be. This subject is one we are looking at almost constantly, and our study of cotton ageing goes back a number of years.

In the latter part of 1981, a textile company expressed concern about the decrease in yarn strength at one of its plants. We were asked if this could be the result of using cotton stored for more than one year. This prompted us to undertake a program to determine specifically if there is a loss in strength as cotton ages. The study began with the acquisition of six bales of cotton similar to that used by the yarn manufacturer. These bales were tested separately, and when processing began samples from each bale were blended together. The blend was completely tested and spun into two yarns, N_e 6 and 22, on our Rieter m1/1 rotor spinning machine.

Although the cotton was produced in the fall of 1981, the program did not get underway until June 1982. This was the first opportunity we had to conduct tests on the fiber. It would have been more desirable to make the first test as soon as the cotton had been ginned, but that was not possible. We realize that the fiber had already aged six or seven months before our study began, but that likely would be a normal period of time between ginning and the use of the cotton in a textile manufacturing plant.

Reports on this study have already been made in *Textile Topics*, and we encourage our readers to refer to these. The issues containing our earlier reports are July, August and September 1984, and March 1985. We are reproducing some of the information included in those reports in this issue of *Topics*, but the results given here are a condensation of several tables of data. We will be pleased to send copies of the back issues of *Topics* to anyone not having them but wishing to read the full report.

Fiber testing results presented in Table I show that the cotton was first evaluated on an HVI system on June 11, 1982. A blend of the six bales was tested at regular intervals until May 11, 1983, and after that date testing was scheduled once each year at approximately the same time the program

TABLE I

Fiber Testing Results

Date	Strength (g/tex)	Yellowness Index
June 11, 1982	26.3	20.41
May 11, 1983	24.2	20.84
April 23, 1984	24.5	22.24
March 19, 1985	24.8	21.75

had begun. This was done until March 19, 1985 when the supply of cotton was depleted. The yellowness tests were conducted on a Macbeth 1500 Colorimeter, an instrument that accurately measures changes from white to yellow. It is generally accepted that a change in the reading of 0.5 is visible to the human eye. Certainly a change from 20 to 22 would be obvious.

A study of Table I reveals that the cotton did appear to be losing strength as the yellowness increased. The testing on June 11, 1982 showed the average of the blend to be 26.3 grams/tex, while three years later the strength was measured at 24.8 grams/tex. During the same period the yellowness increased from 20.41 to 21.75.

TABLE II

Yarn Testing Results

Date	Yarn No. (N_e)	CSP	Tenacity (g/tex)
June 11, 1982	6	2430	13.5
	22	1970	12.6
May 11, 1983	6	2301	12.9
	22	1862	11.6
April 23, 1984	6	2376	14.0
	22	1905	12.1
March 19, 1985	6	2309	14.1
	22	1832	12.7

Table II shows the yarn strength in count-strength-product and single-strand tenacity for both the N_e 6 and 22 yarns on the same dates as the fiber testing. We would like to call attention to the tenacity values that show an increase in strength with the third testing cycle and point out that this anomalous change of direction was likely the result of the installation of a new instrument after testing was conducted in 1983. We used a table model Uster single-strand tester for the first two years, but the values recorded for 1984 and 1985 were obtained by use of a new Uster Tensorapid tester. We feel the increase in yarn tenacity is due to changing instruments rather than to any characteristic of the cotton fiber itself. We believe this is quite apparent, for the fiber tenacity and the count-strength-product of the yarn both continued to decline with age. The single-strand tenacity was the only measure to show an increase in strength, and this occurred just after the change in equipment.

Graph 1 on the facing page is reproduced from the March 1985 issue of *Textile Topics*. This shows the influence of time on fiber strength, yarn elongation as expressed in count-strength-product, and the yellowness index. This information coincides with the decline in fiber and yarn strength (CSP) shown in Tables I and II. Also, the decline in count-strength-product for both yarns is evident. The most dramatic change due to age is the increase in yellowness. As we have already indicated, not only is the increase in yellowness index obvious in this graph, but this much change can easily be distinguished by the human eye.

Fiber and yarn tests and spinning were performed by several ICTRD technicians. Yellowness measurements were made by Bobby G. Wyatt, analytical chemist at the Center.

This study was sponsored by the Natural Fibers and Food Protein Commission of Texas. We wish to thank that agency for permitting the publication of this report.

WHAT KIND OF ANIMAL IS A MO?

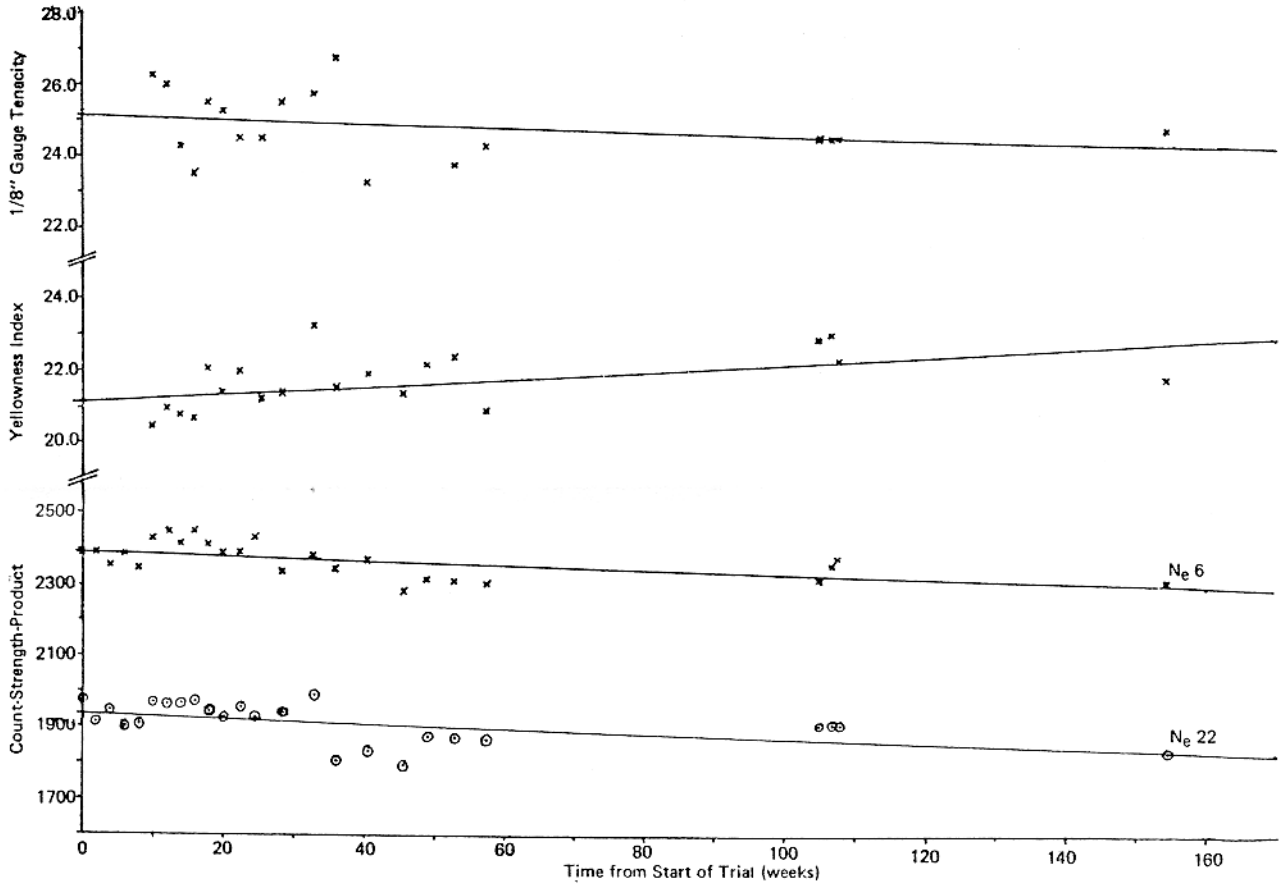
There are times when we facetiously ask new students and visitors, "What kind of an animal is a Mo?" This bit of levity comes with a discussion of mohair as an animal fiber. Mohair, of course, is the product of an angora goat. It is a high-fashion fiber used extensively in women's apparel. Approximately 90% of all U. S. mohair is produced in Texas.

We have recently made an interesting observation about another animal fiber, cashmere, and the demand for (and apparent shortage of) it. We have read several news articles telling that a certain segment of the apparel industry cannot obtain as much cashmere yarn as it needs for sweaters. Further, it has been found that some of the imported yarns are not 100% cashmere as they are purported to be. It seems that other fibers, such as yak and camel's hair, are being considered by some suppliers as substitutes for cashmere.

We are reminded of a similar occurence in the late 1950's when there was a shortage of vicuña,

GRAPH 1

INFLUENCE OF TIME ON SELECTED FIBER AND YARN PROPERTIES



coincidental to an effort on the part of an industrialist to gain influence in Washington by giving a vicuña coat to a White House advisor. Whether or not this was the cause, the demand for the fiber became greater than the supply. This inspired hacienda operators in the South American altiplano to crossbreed vicuña with alpaca, hoping the fineness of vicuña would be retained in the resulting fiber while increasing production. We do not recall that this ever came to anything worthwhile, nor do we remember a fiber called vipaca or alcuña.

Presently, however, there is an effort underway in Texas to crossbreed cashmere and angora goats. We are not sure at this point how well this program is going, but we do know that the resulting animal (fiber) is called cashgora.

If this is a successful venture, our attempt to determine the identity of a Mo may be doomed to failure.

VISITORS

February visitors to the International Center for Textile Research included Harvey Campbell, Harvey Campbell and Associates, Inc., Bakersfield, CA; Mark Farmer, Levi Strauss, El Paso, TX; Gregg Boggs and Dave Krupnick, Southwest Public Service Company, Amarillo, TX; Ed White and William F. Hartman, Spinlab Inc., Knoxville, TN; J. Thomas Vernon, Burckhardt America Incorporated, Greensboro, NC; Larry Schwarz, Snyder, TX; Christopher Faerber, Schlafhorst Inc., Charlotte, NC; Franco Oetterli, Reiter Corporation, Spartanburg, SC; Joe Don Long and Gerald Gonlke, ACG Textiles, Littlefield, TX; Gene Duke and S. P. Sengupta, Technical Seed Processors, Brownfield, TX; Jearl Holland, Holland Cottonseed, Big Spring, TX; Juan Espinosa, Castillo Fabrics, Inc., Burlington, NC; and Harry Cripps, Crosrol Ltd., Halifax, England.

Also, 30 students from Slaton High School, Slaton, TX; and 20 Pampa, TX 4-H Club members toured the Center during the month.