1370 EFFECT OF BLENDING EGYPTIAN AND UPLAND COTTONS ON O.E. YARN QUALITY

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The importance of cotton in the economic development is significant in both agriculture and industrial sectors in Egypt. Giza 90 Egyptian cotton variety, was chosen and blended with Sudanese Upland cotton (Acala) and also, with Greek upland cotton. Ten different combinations of blend levels including the 100 % fiber types were performed for two different yarn counts of 15 Ne and 20 Ne for constant twist multiplier 4.0.

Egyptian cotton variety is higher quality than the two upland cotton varieties especially in fiber strength, uniformity ratio and fiber elongation. The addition of different ratio of Giza 90 cotton fiber improved the mechanical properties of the Greek and Sudanese cotton yarns. If Giza 90 Egyptian cotton fibers are to be blended, the 50% Egyptian cotton/50% for both Greek and Sudanese cotton blending is suggested for use, in order to achieve optimum yarn quality properties and to reduce and control the cost.

INTRODUCTION

The importance of cotton in the economic development is significant in both agriculture and industrial sectors in Egypt. Cotton yarns are classed internationally into three categories: (1) coarse yarns: of count up to 24s. Such counts could be spun from MS and MLS cottons, to be used for manufacturing cheap fabrics, towels, upholstery fabrics, ect.; (2) Medium yarns: of count 24 up to 42s. Such count could be spun from MLS cottons, to be used for manufacturing cheap poplins, knitting fabrics, etc.; (3) Fine yarns: of count 42 up to 60s and above. Such counts could be spun from LS and ELS cottons, to be used for manufacturing high quality poplins and clothes, Abdel-Salam (1998). According to the international cotton yarn classification mentioned before, both Long Staple and Extra-Long Staple Egyptian cottons fall in the category of Extra-Fine count, i.e. that group of cottons that could be spun into yarn count of 45s and higher. Mohamed et al (2005) reported that the major problem and challenge facing the Egyptian cotton textile industry is that Egyptian cotton has two distinct markets: the international market for producing fine and extra fine yarns and the domestic market for producing mainly coarse and medium count yarn. The textile industry in Egypt, need cheaper cotton to cover the demand of the domestic market i.e. coarse and medium yarn counts. So, there is a cotton gab especially MLS cottons in this respect, the Textile industry holding company in Egypt supply Greek and Sudanese MLS cottons to close this gab to produce coarse and medium counts for local consumptions. Furthermore, the produced and exported yarn count level in the Egyptian spinning mills is around 28.5s, as much as 10-15 percent higher or lower using the Long-staple cotton varieties, Table 1 (Textile Industry cotton co.(2006) and Textile consolidation fund, 2006).

The objective of this investigation was to study the quality characteristics of yarn spun from Egyptian cotton and its blends with Upland cottons to create an optimum quality yarns, and the usefulness of blending Egyptian/Upland cottons as a potential way of reducing the costs of popular fabrics.

MATERIALS AND METHODS

The present study was carried out in Kom-Hamada, El Mahmoudia and Mit Ghamr spinning and weaving companies. Giza 90 Egyptian cotton variety, was chosen and blended with Sudanese Upland cotton (Acala) and also, with Greek upland cotton. Ten different combinations of blend levels including the 100 % fiber types were processed through carding and drawing machines. The slivers with two passages of drawing were supplied to the Schlafhorst Auotocoro 288 OE spinning using a 31-rotor diameter running at 100,000 rpm. at opening roller speed of 8200 rpm. The experiment was performed for two different yarn counts of 15 Ne and 20 Ne for constant twist multiplier 4.0.

Cotton fiber and yarn properties were determined according to ASTM method by using HVI Spectrum for raw cotton testing. Yarn strength expressed in terms of lea count strength product (lea product) was measured by using the Good-Brand Lea Tester. Single yarn properties and yarn uniformity, imperfections and hairiness were measured on Textechno Statimat Me tensile tester and Uster Tester III, respectively. Fiber and yarn properties were determined at the Cotton Technology Research Laboratories, Cotton Research Institute, Giza, Egypt.

RESULTS AND DISCUSSION

Fiber properties.

Table 2 shows the quality properties of Egyptian cotton Giza 90, Upland Greek cotton and Acala Sudanese cottons (Upland) and its blends that were used in this study. Naturally, the fiber quality of Egyptian cotton variety is higher quality than the two upland cotton varieties especially in fiber strength, uniformity ratio and fiber elongation.

A, B…J Type of Blend. Gr.: Greek

Mechanical properties

The lea count strength product, tenacity and elongation of Giza 90 and its blends with Greek and Sudanese cottons are given in Tables 3 and 4. Statistical significant difference among the lea count strength product and tenacity values of all blended yarns in both 15 Ne and 20 Ne yarns was noted with regard to variation analysis. Giza 90 cotton variety recorded the highest and superior quality of both lea count strength product and yarn tenacity (cN/Tex), while as, Greek and Sudanese cottons showed the lowest and sufficient quality. In both yarn counts, the addition of different ratio of Giza 90 cotton fiber improved the mechanical properties of the Greek and Sudanese cotton yarn strength and elongation.

According to the Uster statistical (2001) at 25% level and the data obtained before, if Giza 90 Egyptian cotton fibers was blended, the 50% Egyptian cotton and 50% for both Greek and Sudanese cotton blending is suggested for use, in order to achieve optimum single yarn strength and elongation.

Coarse and medium yarns produced from Egyptian cotton is not economical due to high cost of raw material used such cases. Regarding to the data mentioned above, the spinning industry in Egypt should be blend high and low quality cottons to reduce and control the

cost, as well as to meet functional use requirements, Also orientated to use Egyptian cotton LS as well as, ELS cotton lint for the production of fine count yarn and high quality garments for export.

Unevenness and imperfections properties

Unevenness is the most important parameter that affects yarn quality. Yarn unevenness is a periodical and short-term variation in yarn thickness along the yarn. The yarn unevenness and hairiness values for 15Ne and 20Ne are given in Tables 5 and 6.

As a result of variation analysis, it was achieved that the unevenness C.V.% values of 100% cotton as well as Giza 90 and 100% Greek and Sudanese cottons yarns of 15Ne and 20Ne is lowest than other and its blend. Regarding to different ratio of blend between Egyptian cotton variety and Upland cottons in yarn unevenness, the short fibers had a negative effect on the yarn unevenness values. In fact, the fiber data of both Upland cotton types had lower uniformity fiber index than both 100% pure cotton. Thus, the decrease in unevenness of the 15s and 20s blended yarns with regard to a ratio increase in Upland in Egyptian cotton in the blend can be emphasize this parameter.

In the 15s and 20s yarns, the highest hairiness values were obtained from yarns produced from 100% Egyptian cotton fibers. In the case of Upland cottons and its blend with Egyptian cotton, the lowest hairiness values were recorded in both 15s and 20s yarns.

According to the Uster statistical at 25% level and the data obtained before, if Giza 90 Egyptian cotton fibers are to be blended, 50% Egyptian cotton/50% for both Greek and Sudanese blending are suggested for use, in order to achieve optimum yarn evenness.

Regarding to the imperfection properties i.e. thin (-50%) and thick (+50%) places and the number of neps (+280%), the data was acceptable in both yarn counts and all the 100% cottons and its blended yarns. The results were blew the 5% of Uster statistics level, which could be neglected.

Coarse and medium yarns produced from Egyptian cotton is not economical due to high cost of raw material used such cases. Regarding to the data mentioned above, the spinning industry in Egypt could be blend high and low quality cottons to reduce and control the cost, as well as to meet functional use requirements, also orientated to use Egyptian cotton LS as well as, ELS cotton lint for the production of fine count yarn and high quality garments for export.

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Table 1. Development of exported cotton yarn count-wise from 1993: 2005

Count-wise	Average from 1993 - 1995			Average from 2003 - 2005		
	Ton	Count average	%	Ton	Count average	%
Less than 20s	15678	16.8	21.9	9855	15.2	28.2
21s – 30s	32048	28.8	44.9	9533	29	27.2
31s – 40s	15492	37.1	21.8	5475	37.7	15.6
41s – 50	1753	48.5	2.5	2836	48.7	8.11
Total L S cotton	**64971**	**28.8**	**91.1**	**27699**	**32.65**	**79.2**
51s – 60s	2906	59.0	4.1	2847	58.5	8.14
61s – 70s	917	66.5	1.3	535	68.9	1.53
71s – 80s	1776	77.2	2.5	2063	77	5.9
81s – 90	359	84.5	0.5	345	85	0.98
From 91s and above	402	95.5	0.56	1459	99	4.17
Total E L S cotton	**6360**	**76.5**	**8.9**	**7249**	**77.7**	**20.8**
Total exported cotton yarns	**71331**		**100**	**34948**		**100**

Table 2. Fiber quality properties of Giza 90, Greek cotton and Acala cotton and its blends.

Materials	Fiber length parameters UHM UR (mm) (%)		Tenacity Strength El. cN/tex (%)		Mic. Reading
A 100% G.90 / 0% Gr. cotton	30.1	83.4	35.7	7.9	4.3
B 75%G.90 / 25% Gr. cotton	28.9	82.7	33.5	7.6	4.4
C 50%G.90 / 50% Gr. cotton	28.2	82.6	32.4	7.4	4.3
D 25%G.90 / 75% Gr. cotton	28.3	82.7	30.6	6.9	4.3
E 0% Giza 90 / 100%Gr. cotton	27.8	82.3	28.7	6.4	4.3
F 100% G.90 / 0% Acala cotton	30.1	83.4	35.7	7.9	4.3
G 75%G.90 / 25% Acala cotton	28.5	81.8	34.4	7.6	4.3
H 50%G.90 / 50% Acala cotton	27.4	81.1	31.7	7.1	4.3
I 25%G.90 / 75% Acala cotton	26.8	81.1	30.2	6.5	4.2
J 0% G.90 / 100%Acala cotton	26.6	82.1	26.8	5.5	4.3

Table 3. Yarn tenacity and elongation values for Giza 90/Greek blends.

	15 Ne			**20 Ne**		
	L.C.S.P.	**Yarn tenacity (cN/Tex)**	**Yarn elongation (%)**	**L.C.S.P.**	**Yarn tenacity (cN/Tex)**	**Yarn elongation (%)**
Egyptian cotton/Upland Greek blends						
A	2100	16.56	7.9	2015	15.74	7.6
B	1965	15.24	7.6	1940	14.92	6.8
C	1875	13.94	7.1	1830	13.33	6.6
D	1800	13.10	6.8	1795	13.00	6.8
E	1660	12.65	6.7	1650	12.23	6.5
L.S.D	49.08	0.125	0.14	50	0.13	0.1
25% Uster level		13.25	7.0		13.00	6.6

Table 4. Yarn tenacity and elongation values for Giza 90/Acala blends.

	15 Ne			20 Ne		
	L.C.S.P.	**Yarn tenacity (cN/Tex)**	**Yarn elongation (%)**	**L.C.S.P.**	**Yarn tenacity (cN/Tex)**	**Yarn elongation (%)**
Egyptian cotton/Acala Sudanese blends						
F	2100	16.57	7.9	2015	15.71	7.6
G	1935	14.45	7.1	1930	14.35	6.8
H	1855	13.43	6.5	1815	13.25	6.4
I	1750	13.00	6.1	1700	12.24	6.1
J	1600	12.17	6.7	1550	11.16	6.4
L.S.D	49.08	0.125	0.14	49.08	0.125	0.14
25% Uster level		13.25			13.00	6.6

Table 5. Yarn unevenness and hairiness values for Giza 90/Greek blends.

	15 Ne		20 Ne	
	Unevenness (C.V.%)	**Hairiness**	**Unevenness (C.V.%)**	**Hairiness**
Egyptian cotton/Upland Greek blends				
A	11.21	4.7	11.90	4.5
B	12.75	4.3	13.70	4.2
C	13.19	4.5	13.70	4.4
D	13.02	4.3	14.22	4.2
E	11.78	4.4	12.42	4.3
L.S.D	0.50	0.05	0.50	0.05
25% Uster level	13.50	5.0	14.00	4.5

Table 6. Yarn unevenness and hairiness values for Giza 90/Acala blends.

	15 Ne		20 Ne	
	Unevenness (C.V.%)	**Hairiness**	**Unevenness (C.V.%)**	**Hairiness**
Egyptian cotton/Upland Greek blends				
F	11.21	4.7	11.90	4.5
G	13.21	4.6	14.88	4.4
H	15.01	5.0	14.86	4.7
I	15.60	4.7	15.72	4.7
J	11.23	5.1	12.90	4.8
L.S.D	0.50	0.05	0.50	0.05
25% Uster level	13.50	5.0	14.00	4.5