

تقييم خواص الجودة لبعض أصناف القطن السوري بالطرق الحديثة وأثر تلك الخواص على صفات المنتج

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Assessment quality characteristics of some Syrian cotton varieties by modern techniques and their influence on properties of the product

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Abstract

The present research work was carried out in order to assess the quality of four Syrian cotton varieties namely: Deir-22, Aleppo 33/1, Aleppo 90, and Aleppo 118. HVI was used to investigate the characteristics of the fibers at Cotton Arbitration and Testing General Organization, Alexandria, Egypt (2010-2011). Physical and Mechanical properties of the fibers were measured for the Syrian cotton studied varieties and some other parameters were also studied as it was possible to do on the HVI. The tested fibers were spun on ring spinning system with 40's count at Cotton Research Institute , Cairo-Egypt. The produced yarns were tested for lea strength, single yarn strength and yarn elongation. The result revealed that the length of the Syrian Cotton varieties studied were ranged between 30 and 32.5 mm. in which Deir-22 fibers were the lowest and Aleppo 90 fibers were the highest in length. Values of Aleppo 118 and Aleppo 33/1 were 31.86 and 32.23 mm., respectively. Values of fiber strength (g/tex) were recorded for Aleppo 90, Deir -22, Aleppo 33/1 and Aleppo 118 as 31.3, 31.5, 36.1 and 36.5, respectively. Fiber elongation characteristic was recorded for the four Syrian cotton varieties and it was found to be the highest for Deir-22 with value of 5.8 %

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followed by 5.7% for Aleppo 33/1 and 5.2% for both of Aleppo 90 and Aleppo 118.

The best single yarn strength and yarn elongation were recorded as 17.74 g/tex and 5.77 % for Deir -22 ,while no significant differences were observed between the rest of the studied varieties. However, the lowest value of yarn elongation 4.99 was recorded for Aleppo 118. *Differences between values of lea strength for the four varieties were found non-significant.*

Key Words: Fiber Quality Characteristics, Fiber physical Properties, Cotton Yarns.

Introduction

Cotton fibers are the structural elements used to form yarns. The fiber properties, as well as their arrangement in the yarn determine the physical properties and ultimately the performance of cotton yarns. Among the various physical and mechanical fiber properties; length, fineness, maturity, strength and elongation have been generally regarded as the most important quality factors of cotton in both marketing and processing because they are associated with not only spinning performance, but also the properties of end product (Lord, 1970).

(Deussen and Neuhaus, 1988) revealed that fiber added little to the strength of coarser yarn counts but in the fine count range, fiber length became increasingly essential. (Deussen ,1992) also indicated that the longer fibers also improve spin ability to a point where lack of fiber strength can, to a certain extent, be compensated for by greater fiber length.

(Farber,1993) illustrated that the greater fiber length distribution, the more stable the spinning process. Process stability also, improve when more fibers are added to the cross-section to be twisted.

(Smith,1995) found that the micronaire is a contributing factor to yarn strength as well as a determinant of the spinning limit of the yarn.

(Abdel-Gawad *et al.*,1991) stated that fiber strength seemed to be of more importance to yarn strength in Giza 80 cultivar.

(Smith,1995) reported that yarn strength is considered to be the

most important quality factor in spinning. Fiber strength is transferred directly into yarn strength. Fiber strength is considered to be the most important fiber property in determining the strength of rotor – spun yarns and ranks second to fiber length in ring-spun yarns.

(Hamza,2007) stated that Egyptian cotton (*Gossypium barbadense*, L.) is one of the most important crops in Egypt, as it is a vital source of raw material for Egyptian textile industry and thus plays an important role in the Egyptian economy which increases the national income , for that we should study all the factors that affect cotton yield in order to maximize the yield per unit area.

(Kamal and Ragab ,1995) mentioned that there was a distinct range of variation in the mean values of short fiber index of the different varieties within the same staple length category.

(Nomeir *et al.*,1990) emphasized that the long and fine fiber cottons could be spun into stronger yarn than the coarse fiber ones. They add that Giza 45 cotton has an advantage over the other extra long staple Egyptian cottons in the potential spinning performance and quality of all the produced yarn counts.

(Shaker,1972) found that the increase yarn tensile strength was attributed to the increase in fiber strength . On the other hand,(Azab *et al.* ,1992), found that cultivars in general differed in all growth and yield characteristics where Giza 75 plants were superior in most growth and yield characteristics than Giza 69, they also differed in their fiber properties.

Objectives

1-Assessment of Quality Characteristics of the following Syrian Cotton Varieties:

A-Deir-22

B- Aleppo 33/1

C-Aleppo 90

D- Aleppo 118

2-Determine the Influence of the Fiber Characteristics on the Yarns Produced out of the Studied Cotton Varieties.

Materials and Methods

Part of the present research work was carried out in Syrian Arab Republic –Ministry of Agriculture and Agrarian Reform- General Commission for Scientific Agricultural Research – Cotton Research Administration , (Cotton Bureau)- Aleppo.

Lint Percentage was carried out for the four Syrian cotton varieties namely: Dier-22, Aleppo 33/1, Aleppo 90, and Aleppo 118 at Laboratory of Cotton Research Administration – Aleppo.

Quality Assessment of the Fibers: Cotton Fibers of the four Syrian Varieties were tested for quality assessment at Laboratory of the Cotton Arbitration and Testing General Organization(CATGO) – Alexandria Egypt using HVI in which the following characteristics were

tested: Fiber length UHML(mm), Strength (g/tex), Elongation (%),

Micronaire (Mic), Maturity (Mat), Uniformity (UI), Short Fiber (%), Trash content, Trash Area (%), Moisture Content (%). Color Reflection (Rd) and Yellowness degree (+b). All the samples were tested under standard conditions.

Yarn Measurements: The yarn produced on ring spinning system with English count 40 (Ne) were tested for Lea Strength, Single Yarn Strength (tenacity g/tex) and Yarn Elongation (%) at Laboratory of Cotton Research Institute – Agriculture Research Center- Cairo- Egypt.

Statistical Analysis: The results of the research work were analysed using CRBD and the LSD between the means. Results of the fiber Characteristics of the four varieties investigated were analysed using a computer programme provided within the HVI.

Results and Discussions

Lint Percentage or Ginning lint: The four Syrian cotton varieties were tested for lint percentage in Cotton Research Administration- Aleppo (Cotton Bureau) .The results are shown in the following Table

Table (1)- Lint Percentage for four Syrian Cotton Varieties:

Varieties	Lint Percentage	Remark
1-Deir-22	41.52	a
2- Aleppo 33/1	39.75	b
3-Aleppo 90	35.65	c
4-Aleppo 118	39.85	b

It can be seen that Deir -22 cotton varieties showed the highest value of ginning percentage followed by Aleppo 33/1 and Aleppo 118 with almost the same values of lint percentage while the lowest value was recorded for Aleppo 90.

Fiber Quality Characteristics: Quality characteristics of the studied four Syrian cotton varieties were assessed using HVI, which is concerned as the most modern technique for testing cotton fibers.

Fiber Quality Characteristics of D-22 :

Table (2)- (A) and (B) shows the physical and mechanical as well as the other parameters of fibers for Deir-22 cotton variety . Each of the fiber properties was given in mean value as the average with minimum and maximum values as well as the standard deviation and CV% .

We can note that the fiber length of this variety was the lowest (30.23) comparing with the other three varieties investigated. But , on the other hand the fiber fineness(4.05) and the fiber elongation(5.8)% were the best as it will be seen hereafter.

Fiber Quality Characteristics of Aleppo 33/1:Fiber Quality Characteristics of Aleppo 33/1 cotton variety are shown in Table (3). All fiber properties, i.e, physical and mechanical and also trash content and area as well as Rd and +b were observed by HVI. However, this variety revealed the best fiber length shared with Aleppo 90 with 32.50 mm. as UHML.

Table (2)-Deir-22 Fiber Quality Characteristics.

(A)						
	Length(UHML)	UI	Strength	Elongation	Mic.	Mat
	(mm)	(%)	g/ tex	(%)		
Average	30.23	84.6	31.5	5.8	4.05	0.86
Std. Dev.	0.41	0.8	0.3	0.1	0.18	0.00
CV%	1.3	1.0	1.1	1.0	4.5	0.5
Min.	29.98	83.9	31.2	5.7	3.86	0.85
Max.	30.70	85.5	31.8	5.8	4.22	0.86
(B)						
	Mst. (%)	SF (%)	TrCnt	TrAr	Rd	+b
Average	8.0	7.9	86	0.77	76.6	8.2
Std. Dev.	0.2	0.2	0.0	0.20	0.9	0.6
CV%	2.4	2.0	0.0	1.0	1.2	7.8
Min.	7.9	7.7	69	0.60	75.8	7.8
Max.	8.2	8.0	120	1.00	77.6	8.9

Table(3)-Fiber Quality Characteristics of Aleppo 33/1

(A)

	Length (UHML)(mm)	UI (%)	Str. g/tex	Elo. (%)	Mic.	Mat.
Average	32.45	86.4	36.1	5.7	4.22	0.87
Std. Dev.	0.98	0.1	1.4	0.2	0.08	0.0
CV%	3.00	0.2	4.0	3.1	1.8	0.1
Min.	31.65	86.2	34.7	5.5	4.14	0.87
Max.	33.55	86.5	37.6	5.9	4.28	0.87

(B)

	Mst	SF(%)	TrCnt	TrAr(%)	Rd	+b
Average	9.0	6.3	26	0.23	82.0	8.9
Std. Dev.	0.3	0.5	0.0	0.06	0.3	0.1
CV%	3.3	8.4	0.1	0.2	0.3	1.7
Min.	8.8	5.7	19	0.19	81.8	8.8
Max.	9.3	6.7	35	0.30	82.3	9.1

Fiber quality Characteristics of Aleppo 90:

Fiber quality Characteristics of Aleppo 90 are shown in Table (4).It can be seen that although fiber length was higher, the Fiber strength recorded the lowest(31.3 g/tex) compared to other varieties.

Table(4)-Fiber Quality Characteristics of Aleppo-90

	Length UHML (mm)	UI (%)	(A)			Mat.
			Str. g/tex	Elg. (%)	Mic	
Average	32.50	87.7	31.3	5.2	4.53	0.88
Std. Dev.	0.51	0.3	0.8	0.3	0.18	0.01
CV%	1.6	0.4	2.4	5.6	4.1	0.7
Min.	31.94	87.4	30.4	4.9	4.34	0.87
Max.	32.92	88.0	31.8	5.5	4.7	0.88

(B)

	Mst.(%)	SF(%)	TrCnt.	TrAr. (%)	Rd	+b
Average	8.2	6.0	33.0	0.42	76.5	7.6
Std. Dev.	0.3	0.1	0	0.27	0.6	0.1
CV%	3.6	1.6	0.1	0.4	0.8	2.0
Min.	7.9	5.9	29	0.23	75.9	7.5
Max.	8.5	6.1	36	0.73	77.1	7.8

Fiber quality characteristics of Aleppo 118:

Fiber quality characteristics of Aleppo 118 are shown in Table (5). This variety showed the highest value of Micronaire with 5.3 (the coarser fiber) but it recorded the best fiber maturity (0.9), and also recorded the best fiber strength (36.5 g/tex).

Table(5)-Fiber Quality Characteristics of Aleppo 118

(A)

	Length uhml(mm)	UI (%)	Str. g/tex	Elg. (%)	Mic.	Mat.
Average	31.86	86.5	36.5	5.2	5.30	0.90
Std. Dev.	0.02	0.80	1.7	0.1	0.13	0.00
CV%	0.1	0.90	4.9	2.7	2.50	0.50
Min.	31.84	86.0	34.5	5.1	5.15	0.89
Max.	31.88	87.5	37.5	5.3	5.39	0.90

(B)

	Mst. (%)	SF (%)	TrCnt	TrAr(%)	Rd	+b
Average	9.3	6.4	46	0.56	74.1	9.5
Std. Dev.	0.4	0.1	0.0	0.17	0.30	0.30
CV%	4.3	2.2	0.0	0.90	0.40	3.60
Min.	8.9	6.2	43	0.38	73.7	9.10
Max.	9.6	6.5	51	0.70	74.3	9.8

Physical fiber properties:

Physical fiber properties of the four Syrian cotton varieties investigated are shown in Table (6). It can be seen that the longest fiber lengths were observed for Aleppo 90 and Aleppo 33/1 with values of 32.5 and 32.45 mm., respectively followed by Aleppo 90 then Deir -22 with values of 31.86 and 30.23, respectively.

The finer cotton variety observed for Deir 22 followed by Aleppo 33/1, Aleppo 90 and Aleppo 118 with Micronaire value of 4.05, 4.22, 4.53 and 5.30, respectively. Similar trend (in means) was observed for Fiber maturity with the best value of 0.9.

Table (6)- Physical Fiber properties.

Varieties	Length (mm)	length Uni. (%)	S. Fiber (%)	Mic.	Mat.
Deir-22	30.23	84.6	7.9	4.05	0.86
Aleppo33/1	32.45	86.4	6.3	4.22	0.87
Aleppo 90	32.50	87.8	6.0	4.53	0.88
Aleppo 118	31.86	86.5	6.4	5.30	0.90

Mechanical fiber properties:

Mechanical fiber properties of the varieties studied are shown in Table (7). It can be seen that Fiber Strength in g/tex were recorded and the highest value was recorded for Aleppo 118 as 36.5 followed by Aleppo 33/1, Deir-22 and Aleppo 90 with values of 36.1, 31.5, and 31.3, respectively.

Values of Fiber Elongation were showed that the highest value was found for Deir -22 as 5.8 followed by Aleppo 33/1, Aleppo 90, and Aleppo 118 as 5.7, 5.2, and 5.2, respectively.

Percentage of short fibers of the four investigated varieties did not show a clear trend and the values were different and this agree with Kamal and Ragab(1995) which mentioned that there was a distinct range of variation in the mean values of short fiber index of the different varieties within the same staple length category.

Table(7)- Mechanical Fiber Properties and other Parameters.

Varieties	Str. g/tex	Elon. (%)	TrCnt (no.)	TrAr. (%)	Rd. refl.	+b Yel.
Deir-22	31.5	5.8	86	0.77	76.6	8.2
Aleppo 33/1	36.1	5.7	26	0.23	82.0	8.9
Aleppo 90	31.3	5.2	33	0.42	76.5	7.6
Aleppo 118	36.5	5.2	46	0.56	74.1	9.5

The differences in fiber physical and mechanical properties agree with what was found by Azab *et.al.* (1992) where they reported that cultivars in general differed in all growth and yield characters and some cultivars were superior in most growth and yield characteristics and also they differed in their fiber properties.

Yarn Mechanical Properties.

Yarn mechanical properties are shown in Table (8). **Single Yarn Strength** values were ranged between 17.74 g/tex and 15.99 g/tex for Deir 22 and Aleppo 118, respectively. While Aleppo 90 and Aleppo 33/1 recorded values were observed as 16.75 and 16.34, respectively. It can be seen that Deir-22 recorded the best single yarn strength. This may be explained by the fact that D-22's fibers were the finest one as compared with other varieties, however, this results agree with Deussen(1992); Nomeir *et.al* (1990) as regarding the effect of yarn fineness but disagree with Shaker(1972)who concluded that yarn tensile strength attributed to the increase in fiber strength.

Similar trend was observed for **yarn Elongation** with values ranged between 5.77% and 4.99 for Deir 22 and Aleppo 118 respectively. Values of 5.19 and 5.26 were recorded for Aleppo 33/1 and Aleppo 90 respectively. However, values of **Lea Strength** observed to be 2360, 2320, 2340, and 2355 for the varieties of Deir-22, Aleppo33/1, Aleppo 90 and Aleppo-118, respectively which showed a close range between 2320 and 2360.

Table(8)- Yarn Mechanical Properties.

Varieties	lea Strength count	Single Yarn Str. g/tex	Yarn Elo. (%)
Deir-22	2360	17.74	5.77
Aleppo 33/1	2320	16.34	5.19
Aleppo 90	2340	16.75	5.26
Aleppo 118	2355	15.99	4.99

Conclusion

Four Syrian cotton varieties namely: D-22, Aleppo 33/1 Aleppo 90 and Aleppo 118 were investigated for assessment fiber quality using advanced equipment i.e. HVI . The following fiber characteristics: fiber length, U%, strength, elongation, fineness , maturity, trash cont. and area Rd, +b and other parameters were assessed. The physical fiber properties showed that the best fiber length was found for Aleppo 90 and Aleppo 33/1 with values of 32.5 and 32.45 respectively. While the most fineness one was recorded for Deir-22with value of 4.05 followed by Aleppo 33/1 , Aleppo 90 . However the coarsest one was the cotton variety Aleppo 118 with a micronaire value of 5.0.

Assessment of mechanical properties revealed that the best fiber strength was recorded for Aleppo 118 with value of 36.5 g/tex with almost the same reading for Aleppo 33/1. Lower values were recorded for D-22 and Aleppo 90 with values of 31.5 and 31.3 g/tex respectively. Fiber elongation recorded to be the highest percentage with 5.8 for D-22 and 5.7 for Aleppo 33/1 while the same percentage of 5.2 for both of Aleppo 90 and Aleppo 118.

Measured yarn mechanical properties revealed that the best single yarn strength was recorded for D-22 with 17.74 g/tex while the lowest strength of yarn was recorded for Aleppo 118. This result could be due to the low value of micronaire for D-22 and also due to the higher value of fiber elongation of D-22 compared with the other cotton varieties investigated.

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