Determination of Egyptian cotton fiber properties of Giza 95 using the standard specifications of temperature and relative humidity according to different standard methods

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Abstract ■

This study was carried out at Plant Production Department, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt, during 2016/2017 season to compare three different cotton grades with four temperature levels and investigate their effect on HVI fiber properties. Three cotton grades; namely, Good to Fully Good (G/FG), , Good (G) and Fully Good Fair to Good (FGF/G) were used, belonged to one commercial Egyptian long staple cotton variety; namely, Giza 95. Four temperature degrees Celsius were used in this study; i.e., 21 OC, 23 OC, 25 OC and 27 OC. The obtained results indicated that the cotton grade, Good to Fully Good (G/FG) surpassed the other two cotton grades and gave the highest mean values of upper half mean length (U.H.M.), length uniformity index (U.I.), fiber bundle strength, fiber elongation (%), maturity index (%), micronaire reading, HVI color attributes (fiber reflectance degree (Rd %) were obtained from the highest cotton grade, Good to Fully Good (G/FG). While, the lowest mean values of short fiber index (%), yellowness degree (+b) and trash properties (trash count and trash area (%)) were attainted from the same cotton grade. The highest mean value of the fiber bundle strength (%) was reached by the cotton grade, Good to Fully Good (G/FG) of the temperature degree Celsius 27 OC. Likewise, highly significant differences among the studied temperature degrees Celsius in the fiber mechanical properties (fiber bundle strength and elongation (%) were found and insignificant effect for the HVI fiber length parameters, ; i.e., upper half mean length (U.H.M.) , length uniformity index (U.I.) and short fiber index (%).

■ Introduction

Because of the important changes that occur in textile properties as the moisture content changes, it is necessary to specify atmospheric condition in which any testing carried out. Therefore, a standard atmosphere has been agreed for testing purposes and is defined as a relative humidity of 65% and a temperature of 20°C. For practical purposes certain tolerances in these values are allowed so that for testing atmosphere the RH is 65% ± 2%, 20°C ± 2°C. In tropical region a temperature of 27°C ± 2C may be used, ASTM, 2015. Even though a testing laboratory may have a controlled atmosphere, it is not good practice to take in samples and immediately start to test them. Sufficient time should be allowed for the sample to reach equilibrium conditions before the test are made.

■ MATERIALS AND METHODS

This study was carried out at Plant Production Department, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt, during 2016/2017 season by using three cotton grades, as follows: Good to Fully Good (G/FG), Good (G) and Fully Good Fair to Good (FGF/G) from one commercial Egyptian cotton variety; namely, Giza 95 as long staple (1 1/4 -1 3/8 inch). A seed-cotton sample of 800 grams was drawn from each cotton grade, representing the original stock of the Modern Nile Cotton Company, Egypt.

1. Effect of cotton grades on fiber properties

Data tabulated in Tables (1a and 1 b) indicated that the cotton grades had a highly significant effect on the studied fibers properties.

The cotton grade Good to Fully Good (G/FG) recorded the highest mean values (28.70 mm and 83.20 %) for upper half mean length (U.H.M.L.) and length uniformity index (U.I.), respectively. While, the lowest mean values (26.38 mm and 81.75 %) for the same traits were reached from the cotton grade Good (G) and the cotton grade Good to Fully Good Fair (G/FGF), respectively, as shown in Table (1).

The mean value of the short fiber index (9.75 %) was given by the cotton grade Good (G). Meanwhile, the lowest mean value (8.55 %) for the same trait was recorded by the cotton grade Good to Fully Good (G/FG).The important physical properties of cotton fiber such as fiber length, fineness, maturity and strength vary considerably depending on the variety of cotton and lint cotton grade.

Table (1 a). Mean values of the H.V.I fiber properties of Giza 95 as affected by cotton grades(C) and temperature degrees Celsius (T) during season 2016/2017.

Characters / Treatments	UHML (mm)	Uniformity index (%)	Short fiber index (%)	Fiber strength (g/tex)	Fiber elongation (%)
Cotton grades (C)					
G/FG	28.70 a	83.20 a	8.55 b	34.60 a	5.75 a
G	27.71 a	81.75 b	9.75 a	31.11 c	5.01 b
FGF/G	26.38 b	81.87 b	9.72 a	32.01 b	5.49 a
Temperature degrees Celsius (T)					
21°C	27.23 a	82.44 a	9.19 a	33.08 b	5.75 a
23°C	27.37 a	81.85 a	9.57 a	30.96 c	5.66 a
25°C	27.63 a	82.23 a	9.31 a	31.84 c	4.78 b
27°C	28.16 a	82.56 a	9.29 a	34.41 a	5.48 a
Interaction					
C × T	N.S.	N.S.	N.S.	*	N.S.

Table (1 b). Mean values of the H.V.I fiber properties of Giza 95 as affected by cotton grades (C) and temperature degrees Celsius (T) during season 2016/2017.

Characters / Treatments	Maturity index (%)	Micronaire reading	Rd (%)	+ b	Trash count	Trash area (%)
Cotton grades (C)						
G/FG	86.33 a	4.14 a	70.28 a	11.85 b	40.55 c	0.36
G	84.43 b	3.19 b	67.27 b	12.41 a	60.25 b	0.78
FGF/G	83.18 c	2.80 c	65.31 c	12.37 a	77.50 a	0.93
Temperature degrees Celsius (T)						
21°C	84.33 c	3.35 bc	67.10 c	12.32 a	72.60 a	0.93
23°C	84.60 b	3.48 a	67.59 b	12.15 b	60.40 b	0.74
25°C	84.93 a	3.30 c	67.49 b	12.31 a	59.03 b	0.57
27°C	84.70 ab	3.38 b	68.29 a	12.06 b	45.70 c	0.51
Interaction						
A × B	**	**	**	N.S.	**	**

2. Interaction of cotton grades and Temperature degrees Celsius

From Tables (2 a and 2b), it could noticed that the interaction (C ×T) of the two studied factors, cotton grades (C) and temperature degrees Celsius (T) for were significant for high cases of 6 out of 11 cases, it means that each factor behaved in different way by changing the other factors. Meanwhile, the remain interactions (5 cases) were not significant, especially, for the length characters (upper half mean length (U.H.M.) , length uniformity index (U.I.) and short fiber index(%)) yarn, indicating that each factor may be acted as an independent factor.

Table (2 a): Mean values of the H.V.I fiber properties of Giza 95 as influenced by Cotton grades (C) and temperature degrees Celsius (T) interaction during season 2016/2017.

Cotton grades (C)	Temperature levels (T)	Fiber strength (g/tex)	Micronaire reading	Maturity index (%)	Rd (%)
G/FG	21°C	35.84	4.02	86.00	70.14
	23°C	32.62	4.06	85.80	70.42
	25°C	33.96	4.32	87.10	70.30
	27°C	35.98	4.15	86.40	70.26
G	21°C	32.29	3.24	84.40	66.98
	23°C	29.37	3.28	84.40	66.70
	25°C	29.48	3.01	84.50	67.55
	27°C	33.31	3.21	84.40	67.84
FGF/G	21°C	31.10	2.77	82.60	64.18
	23°C	30.90	3.09	83.60	65.64
	25°C	32.08	2.57	83.20	64.63
	27°C	33.94	2.77	83.30	66.78
L.S.D.		1.607	0.102	0.460	0.637

Table (2 b): Mean values of the H.V.I fiber properties of Giza 95 as influenced by Cotton grades (C) and Temperature degrees Celsius (T) interaction during season 2016/2017.

Cotton grades (C)	Temperature levels (T)	Trash count	Trash area (%)
G/FG	21°C	39.80	0.39
	23°C	43.50	0.38
	25°C	48.90	0.38
	27°C	30.00	0.29
G	21°C	61.70	0.84
	23°C	69.20	0.95
	25°C	60.00	0.76
	27°C	50.10	0.57
FGF/G	21°C	116.30	1.56
	23°C	68.50	0.89
	25°C	68.20	0.57
	27°C	57.00	0.69
L.S.D.		15.928	0.213

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