

**FIBRE LENGTH PARAMETERS AS MEASURED
BY FIBROGRAPH, HVI AND AFIS IN SOME
EGYPTIAN AND
AMERICAN COTTON CULTIVARS**

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Abstract

Eight of each of Egyptian and American cotton cultivars were measured by Fibrograph, HVI and AFIS in the laboratories of the SRRC, ARS, New Orleans, Louisiana, USA. Fibre length measurements; i.e., 2.5 % SL, 50 % SL, UR %, UHML, ML, UI %, UQL, and SFC % proved to be significantly affected by cotton cultivars. Egyptian cotton was of higher fibre length measurements as compared with American cotton, the difference between the means in this respect was 0.29 inch (28.15 %). Within the Egyptian cotton cultivars, the ELS Egyptian cotton cultivar Giza 45 showed the longest fibres (1.41 inch) and Dendera showed the shortest ones (1.22 inch) . Whereas in the American cotton cultivars Stoneville 213 exhibited the longest fibres (1.12 inch) and AMS showed the shortest ones (0.85 inch). Egyptian cotton cultivars were of lower mean of short fibre content whether measured by weight (w) or by number (n) than American ones.

The measurement of fibre length parameters under study measured by Fibrograph, HVI and AFIS did not show any tendency to be higher or lower for different cotton cultivars or types, while the relationship between these measurements were highly significant. In Egyptian cotton cultivars., the HVI- ML was generally longer than AFIS- ML(w) by 0.01 inch, whereas in American cotton cultivars., generally no differences in this respect.

The 2.5 % measured by Fibrograph was shorter than the HVI- UHM and AFIS- UQL (w) and longer than AFIS- UQL (n). The HVI-ML was generally longer than AFIS- ML (n). The differences between these measurements varied from cotton cultivar to another.

Introduction

Comparing the measurements of fibre length that obtain from the different instruments and techniques provides good

and important information about the accuracy of each and the magnitude of the differences between these measurements in Egyptian and American cotton cultivars. (Nawar, 1975) noticed that fibre length was significantly affected by cultivars in his study on eight of Egyptian cotton cultivars. (Bragg and Shofner, 1993) stated that correlations between length measurements measured by AFIS and the conventional measurements by Suter- Webb remain reasonably high at ($r^2 = 0.96$). (Thibodeaux *et al.*, 1993) found that AFIS length results were at least consistent with the Fibrograph results. (Jones *et al.*, 1994) cleared that technological advances have allowed the AFIS L and D measurements to accurately correlate with the weight based Suter- Webb Array method. In comparison between Fibrograph and HVI length measurements, (Palmer *et al.*, 1994) found that Fibrograph and HVI ranked six studied cotton cultivars similarly according to their measurements of Upper Half Mean Length and Mean Length. However HVI length measurements were consistently about one thirty- second of an inch shorter than Fibrograph measurements.

Materials And Methods

Samples of cotton fibres were obtained from the field experiments of the Egyptian cotton cultivars (*Gossypium barbadense* L.) namely; Giza 45, Giza 76, Giza 77, Giza 70, Giza 75, Giza 81, Giza 80 and Dendera grown in Giza, Egypt, during the two successive seasons of 1990 and 1991 after mixing the two seasons to be compared to the American cotton cultivars (*Gossypium hirsutum* L.) namely; Stoneville 825, Stoneville 213, Acala SJ5, Deltapine 61, Western Storm Proof, an AMS standard (cultivar unknown), Lengupa, and Lankart grown in Southern Regional Research Center, USDA, ARS, New Orleans, Louisiana, USA .

Three instruments were used for determining fibre length parameters as follows:-

- 1- Fibrograph was used to determine the fibre length at 2.5% and 50% Span lengths and fibre length uniformity ratio.
- 2- High Volume Instruments (HVI), Spinlab HVI 900 was used to determine Mean Length (ML), Upper Half Mean Length (UHML) and Uniformity Index (UHML / ML).
- 3- Advanced Fibre Information System (AFIS) was used to determine the mean length (L), upper quartile length (UQL) and short fibre content (SFC). The length measurements are expressed both as by weight (w) and by number(n).

All fibres tests were carried out in the laboratories of the SRRC, ARS, New Orleans, Louisiana, USA., at a constant relative humidity of 65 % \pm 2 and temperature of 70 \pm 2 ° F.

Result and Discussion

Fibre Length Parameters by Fibrograph Method

Results presented in Table (1) and Figure (1) demonstrate the fibre length parameters by Fibrograph; i.e., 2.5 % SL, 50 % SL and Uniformity ratio % in eight of each of Egyptian and American cotton cultivars. It is proved that the differences among each of Egyptian and American as well as all cotton cultivars were highly significant. These results are in agreement with those obtained by (Nawar, 1975).

Comparing Egyptian and American cotton cultivars, it could be noticed that Egyptian cotton cultivars showed the highest means of fibre length parameters; i.e., 2.5 % and 50 % span lengths, being 1.32 and 0.60 inch; respectively as compared to American cotton cultivars under study, being 1.03 and 0.49 inch; respectively.

It could be concluded that the ELS Egyptian cotton cultivar Giza 45 was the longest of eight of Egyptian cotton cvs., (Hindeleh, 1980), came to the same findings.

The aforementioned results indicate that Egyptian cotton was of higher fibre length measurements as compared with American cotton, the difference between the means in this respect was 0.29 inch (28.15 %).

Fibre Length Parameters as Measured by Fibrograph, HVI and AFIS Methods

Results in (Tables 2, 3 and 4) and (Figures 2, 3 and 4) showed the fibre length parameters as measured by Fibrograph, HVI and AFIS methods.

It could be concluded that the measurement of fibre length parameters under study measured by Fibrograph, HVI and AFIS did not show any tendency to be higher or lower for different cotton cultivars or types. In contrast, (Krowicki and Thibodeaux, 1990) found that the differences between the 2.5 % SL and UQL was higher in long cotton than in short cotton. (Thibodeaux *et al.*, 1993) found that AFIS length results were at least consistent with the Fibrograph.

The differences between ML measured by each of HVI and AFIS varied from one cotton cultivar to another, as well as no trend according to length within the type of cotton. On the other hand the variation of differences in Egyptian cotton cultivars were higher than in American cotton cultivars.

Egyptian cotton cultivars were of lower mean of SFC % whether measured by weight (w) or by number (n).

Considerable differences between length measurements obtained from different instruments could be noticed such differences appeared to be affected by cotton cultivar with reference to its length. This is conformed with the findings reported by (Jones *et al.*, 1994).

Relationships Between Fibre Length Parameters by Using Fibrograph, HVI and AFIS Methods

Simple correlation coefficients between fibre length parameters by using Fibrograph, HVI and AFIS methods in Egyptian, American and all investigated cotton cultivars are shown in (Tables 5, 6 and 7).

As for Fibrograph 2.5 % SL, HVI- UHML and AFIS- UQL (w), the "r" values showed that these parameters are highly correlated. The Fibrograph 2.5 % SL showed the highest value of "r" with AFIS- UQL (w) in American cotton cultivars, being 0.994. Also, the lowest values in this respect were between Fibrograph 2.5 % SL with HVI- UHML as well as AFIS- UQL (w), in Egyptian cotton cultivars, the "r" values were 0.758 and 0.735; respectively.

As for Fibrograph 50 % SL and HVI-ML as well as AFIS- ML, in Egyptian cotton cultivars, the highest value was recorded between Fibrograph 50% SL with HVI-ML, being 0.810. Whereas, in American cotton cultivars, the highest value was recorded between Fibrograph 50% SL with AFIS-ML, being 0.807. It could be noticed that the "r" values were the highest in the sixteen cotton cultivars.

With regard to Fibrograph UR % and HVI-UI, this relation did not show significant correlation. On the other hand, Fibrograph-UR% showed highly negative correlation with AFIS-SFC (w) % in American cotton cultivars only, being - 0.881. Conversely, no relation in this respect in Egyptian cotton cultivars.

Regarding the "r" values between HVI-ML and AFIS-ML (w), the "r" values were highly significant, American cotton cultivars had the highest value. On the other hand, Egyptian cotton cultivars had the highest "r" value between HVI- UHML with AFIS-UQL (w). In contrast, (Bragg and Shofner, 1993) found that correlation between length measurements measured by AFIS and the conventional measurements by Suter-Webb remain reasonably high at (r^2 0.96).

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Table 1. Mean values of fibre length parameters for Egyptian and American cotton cultivars measured by Fibrograph

Cultivars	2.5% SL(inch)	50% SL(inch)	Uniformity ratio(%)
<u>Egyptian cultivars</u>			
Giza 45	1.41	0.69	48.9
Giza 76	1.40	0.64	45.7
Giza 70	1.40	0.63	44.3
Giza 77	1.36	0.62	45.3
Giza 75	1.26	0.58	46.0
Giza 81	1.25	0.55	44.0
Giza 80	1.24	0.55	44.4
Dendera	1.22	0.53	43.4
\bar{x}	1.32**	0.60**	45.3**
L.S.D. (0.05)	0.02	0.02	0.24
<u>American cultivars</u>			
Stoneville 825	1.08	0.50	46.3
Stoneville 213	1.12	0.52	46.4
Acala SJ5	1.10	0.54	49.1
Deltapine 61	1.11	0.51	45.9
WSP	0.95	0.43	45.3
AMS	0.85	0.38	44.7
Lengupa	1.02	0.53	51.9
Lankart	1.03	0.51	49.5
\bar{x}	1.03**	0.49**	47.4**
L.S.D. (0.05)	0.02	0.02	1.73
\bar{x}	1.18**	0.54**	46.3**
L.S.D. (0.05)	0.02	0.02	1.20

** = Highly significant

Table 2. Mean values of fibre length parameters for Egyptian and American cotton cultivars measured by HVI

Cultivars	UHML (inch)	ML (inch)	Uniformity Index(%)
<u>Egyptian cultivars</u>			
Giza 45	1.38	1.21	87.7
Giza 76	1.38	1.20	84.8
Giza 70	1.41	1.22	84.5
Giza 77	1.42	1.17	86.0
Giza 75	1.26	1.07	84.9
Giza 81	1.26	1.04	82.5
Giza 80	1.26	1.04	82.2
Dendera	1.25	1.04	83.1
\bar{x}	1.33**	1.12**	84.2**
L.S.D. (0.05)	0.02	0.02	0.22
<u>American cultivars</u>			
Stoneville 825	1.11	0.92	83.2
Stoneville 213	1.14	0.97	85.0
Acala SJ5	1.15	0.95	83.1
Deltapine 61	1.14	0.95	83.6
WSP	0.98	0.78	80.2
AMS	0.94	0.73	77.1
Lengupa	1.07	0.78	82.2
Lankart	1.08	0.90	83.1
\bar{x}	1.08**	0.88**	82.1**
L.S.D. (0.05)	0.03	0.02	0.96
\bar{x}	1.20**	1.00**	83.4**
L.S.D. (0.05)	0.03	0.02	0.68

** = Highly significant.

Table 3. Mean values of fibre length parameters for Egyptian and American cotton cultivars measured by AFIS

Cultivars	ML (w) (inch)	UQL (w) (inch)	SFC (w) (%)	ML (n) (inch)	UQL (n) (inch)	SFC (n) (%)
<u>Egyptian cultivars</u>						
Giza 45	1.21	1.48	4.3	0.97	1.35	15.4
Giza 76	1.21	1.50	5.7	0.98	1.35	19.8
Giza 70	1.18	1.48	5.9	0.98	1.34	17.8
Giza 77	1.17	1.42	6.5	1.00	1.29	17.8
Giza 75	1.04	1.27	7.1	0.86	1.14	20.3
Giza 81	1.03	1.25	6.9	0.87	1.13	19.7
Giza 80	1.04	1.27	6.8	0.88	1.14	18.4
Dendera	1.01	1.24	7.7	0.83	1.10	20.5
\bar{x}	1.11**	1.36**	6.4**	0.92**	1.23**	18.7**
L.S.D. (0.05)	0.02	0.02	0.63	0.02	0.02	2.73
<u>American cultivars</u>						
Stoneville 825	0.89	1.11	12.8	0.70	0.97	31.4
Stoneville 312	0.97	1.19	9.5	0.78	1.07	26.4
Acala SJ5	0.93	1.15	9.9	0.75	1.02	26.7
Deltapine 61	0.91	1.15	12.3	0.72	1.01	31.2
WSP	0.80	0.96	11.2	0.69	0.89	24.0
AMS	0.73	0.88	16.0	0.61	0.79	31.7
Lengupa	0.90	1.03	3.4	0.83	0.98	8.3
Lankart	0.92	1.10	7.3	0.79	1.03	19.7
\bar{x}	0.88**	1.07**	10.3**	0.73**	0.97**	24.9**
L.S.D. (0.05)	0.03	0.02	1.64	0.04	0.03	3.61
\bar{x}	0.99**	1.21**	8.34**	0.83**	1.09**	21.8**
L.S.D. (0.05)	0.02	0.02	1.21	0.03	0.03	1.62

** = Highly significant.

Table 4. Simple correlation coefficients between fibre length parameters by using Fibrograph, HVI and AFIS methods in Egyptian cotton cultivars

	Fibrograph	HVI	AFIS		
Character	50% SL UR (in.) %	ML UHML UI (in.) %	ML(w) ML(n) (in.)	SFC(w) SFC(n) %	UQL(w) UQL(n) (in.)
Fibrograph 2.5 % S.L. (in.)	0.95**	0.68	0.90**	0.79*	0.90**
Fibrograph 50 % S.L. (in.)	0.74*	-0.90**	0.74*	0.69-	0.78*
Fibrograph UR %	0.77*	-0.90**	0.77*	0.74*-	0.71*
HVI- ML (in.)	0.44	-0.57	0.44	0.32	-0.44
HVI- UHML (in.)	0.84**	-0.76*	0.84**	0.72*	-0.60
HVI- UI %	0.96**	-0.76*	0.96**	0.93**	-0.54
AFIS- ML (w) (in.)	0.98**				
AFIS- SFC (w) %	0.55	-0.69	0.55	0.42	-0.59
AFIS- UQL (w) (in.)	-0.72	1.00**	0.95**	-0.48	0.99**
AFIS- ML (n) (in.)		-0.72	-0.78*	0.92**	0.74*
AFIS- SFC (n) %			0.95**	-0.48	0.99**
				-0.57	0.94**
					-0.50

* = Significant.

** = Highly significant.

Table 5. Simple correlation coefficients between fibre length parameters by using Fibrograph, HVI and AFIS methods in American cotton cultivars

	Fibrograph	HVI	AFIS			
Character	50 % S.L. UR (in.) %	ML UHML UI (in.) %	ML(w) ML (n) (in.)	SFC(w) SFC (n) %	UQL (w) UQL (n) (in.)	
Fibrograph 2.5 % S.L. (in.)	0.59	0.29	0.99**	0.92**	0.96**	
Fibrograph 50 % S.L. (in.)	0.87**	-0.19	0.99**	0.38	0.05	0.79*
Fibrograph UR %	0.81*	0.72	0.81*	0.63	0.71	0.43
HVI- ML (in.)	0.58	-0.88**	0.32	0.36	0.25	0.72
HVI- UHML (in.)	0.90**	-0.22	0.88**	0.95**	0.71	0.64
HVI- UI %	0.86**	-0.18	0.95**	0.36	0.04	0.80*
AFIS- ML (w) (in.)	0.77*	-0.14	0.94**	0.36	0.06	0.73*
AFIS- SFC (w) %	0.55	0.90**	0.66	-0.29	0.96**	
AFIS- UQL (w) (in.)		-0.22	-0.93**	0.93**	-0.64	
AFIS- ML (n) (in.)			0.40	0.04	0.80*	
AFIS- SFC (n) %				-0.76	0.75*	
					-0.41	

* = Significant.

** = Highly significant.

Table 6. Simple correlation coefficients between fibre length parameters by using Fibrograph, HVI and AFIS methods in Egyptian and American cotton cultivars

	Fibrograph	HVI	AFIS			
Character	50 % S.L. UR (in.) %	ML UHML UI (in.) %	ML(w) ML (n) (in.)	SFC(w) SFC (n) %	UQL (w) UQL (n) (in.)	
Fibrograph 2.5 % S.L. (in.)	0.93**	-0.26	0.99**	0.97**	0.79**	
Fibrograph 50 % S.L. (in.)	0.95**	-0.65**	0.97**	0.88**	-0.55*	0.94**
Fibrograph UR %		-0.99**	0.32	-0.62	0.95**	-
HVI- ML (in.)	0.41	-0.60	0.12	-0.41	-0.08	0.12
HVI- UHML (in.)			-0.34	0.64	-0.93**	
HVI- UI %	0.42	0.54	-0.03	0.42	0.07	-0.14
AFIS- ML (w) (in.)	0.48	0.48	0.34	0.48	0.87**	
AFIS- SFC (w) %	0.92**					
AFIS- UQL (w) (in.)	0.26	-0.14	-0.42	-0.26	-0.81*	-
AFIS- ML (n) (in.)	0.24	-0.38	0.18	-0.24	-0.67	-0.75*
AFIS- SFC (n) %				0.20	0.38	
		0.74*	0.59	1.00**	0.68	0.64
			0.02	0.74*	0.73*	0.65
				0.59	0.31	0.64
					0.68	0.68
						0.95**

* = Significant

** = Highly significant.

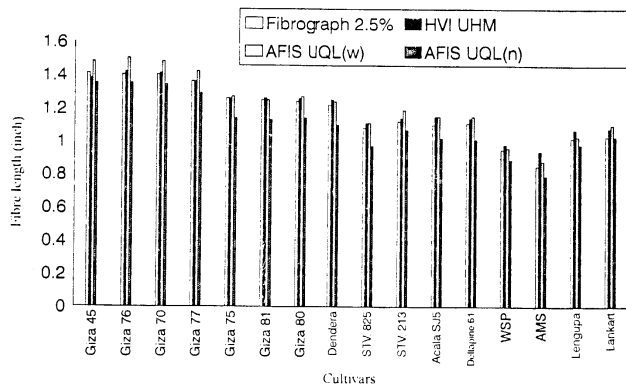


Figure 1. Fibre length parameters obtained from Fibrograph, HVI and AFIS instruments for Egyptian and American cotton cultivars.

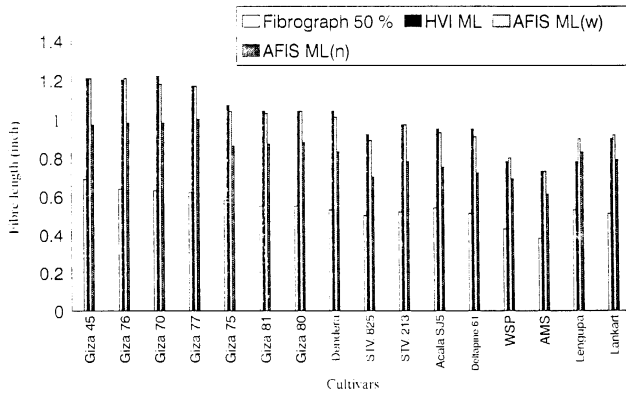


Figure 2. Fibre length parameters obtained from Fibrograph, HVI and AFIS instruments for Egyptian and American cotton cultivars.

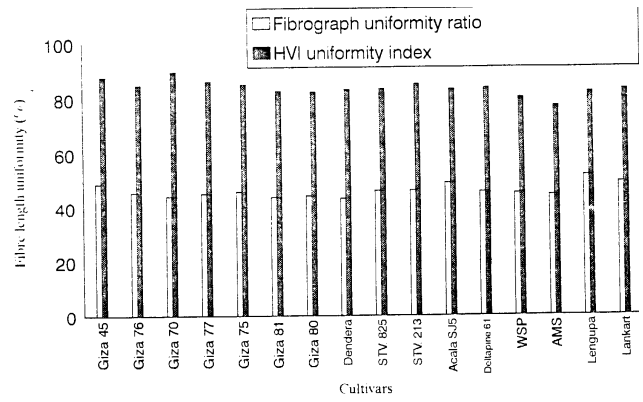


Figure 3. Fibre length uniformity obtained from Fibrograph and HVI instruments for Egyptian and American cultivars.

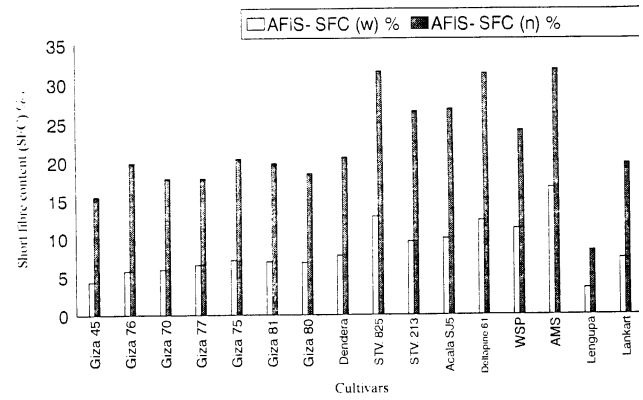


Figure 4. Short fibre content % obtained from AFIS instrument for Egyptian and American cotton cultivars.