Evaluation of Fiber Properties of Some Egyptian Cotton Genotypes under Different Environments Using Geometric Method

*Abeer S. Arafa ; O.D.M. Nour and I.S.M. Hassan

Cotton Research Institute, Agriculture Research Center, Giza, Egypt
Sameh_owf@yahoo.com

Abstract: The colored areas under graph are used to evaluate the behavior of the Egyptian genotypes under different locations and comparing its results with classic statistical method. The Egyptian cotton cultivars, namely, Giza 80, Giza 90 and the H6 genotype [G83x(G75x5844)]xG80 were grown at four different locations at upper Egypt, namely; El-fayoum, El-menia , Sohag, and El-matana . While, the Egyptian cotton cultivars, namely, Giza 88, Giza 92 and H10 genotype [G84x (G70xG51b)x pima62] were grown at four different locations at delta, namely; El -dkahlia , kafr El-sheikh, el-Behira and Damietta . The Experimental design was a randomized complete block design with four replications. The Upper Egypt genotypes gave their best fiber quality under Loc 4 except for, the H6 genotype gave the best fiber quality under Loc 3 . However, all the genotypes couldn't adapted to the weather conditions of the first locations . In contrast , the first location exhibited the highest fiber properties for Giza 88 and Giza 92 cultivars while the second location exhibited the highest fiber properties for H10 genotype .The color area under radar graph indicated those results as clear as compared with the statistical analysis.

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1. Introduction:

The environmental conditions differ from year to year and from location to another for that reason the breeding program and scheming varietals' zonal strategy require details of cotton fiber properties to release their new varieties instead of the deteriorated ones. Many workers indicted the importance of the location as a source of cotton fiber variations . **Eweida et al., (1984)** recorded that both variety and location have highly significant effects upon the fiber physical properties , i . e. Fiber flat bundle tensile properties , fiber length , length uniformity ratio , maturity ratio and micronaire value .While; **Bradow and Bauer(1997)Judith and Philip (1997) Liakatas *et al,*(1998)and Arafa *et al,*(2008)**subsequent efforts were exerting towards identifying those factors that induce the most significant modifications in fiber properties ,they revealed that the variation on fiber properties can be ascribed to genetic factors but they are affected by the surrounding conditions during fiber elongation and maturation stages w h i c h , lead to the variation on fiber cross section shape. **Hassan *et a l.,* (2006)** found that all the studied traits fiber length , uniformity ratio, micronaire reading and fiber strength showed highly significant difference mean squares for genotypes , environments and the interaction between them. They added, that the genotypes grown in Kafr-El-sheikh region (G45 ,G.70,G.87 , and G.88) gave the highest values for most traits. Collecting data for many genotypes over different locations and analyze them statistically are time consuming**Elms *et al.,* (2001); Ping *et al.,* (2004); Wang *et al.,* (2004**). Especially if we have a lot of field and lab's characters for each genotype yearly. So, we need fast and reliable method for the evaluation, of fiber properties.Graphing t h e is fast and easy method for representing and nderstanding data. With charts it's easy to show the different between locations and varieties radar graph is reliable and easy one especially if it accompanied with geometric equations showing the area of colored parts under graph the highest colored area representing the best locations and vice versa. Also, it's easy in reporting or setting data shows

2. Material and Methods

The present study was established to evaluate the fiber characters of some Egyptian cotton genotypes grown under different environmental conditions. Fast geometric method (the colored areas under graph)are used in this study and comparing its results with classic and time - consuming statistical method . The Egyptian cotton cultivars , namely, Giza 80, Giza 90 and the H6 genotype [G83 x (G75x 844)]x G80 were grown in2010 seasonat 4 different locationsat upper Egypt, namely; El- fayoum (Loc 1) El-menia (Loc2), Sohag (Loc 3), and El- matana (Loc 4) .While , the Egyptian cotton cultivars , namely, Giza 88,Giza 92 and H10 genotype [G84 x (G70x G51b)x pima62] were grown at another Four different locations at delta , namely ; El -dkahlia (Loc 1), kafr El-sheikh (Loc 2), el-Behira (Loc 3) and Damietta (Loc 4) the

cultivars were grown in a randomized complete block design with four replications at each location. The plot area was 13 m2 (3.25 ×4) containing five ridges of four meters long and 65 cm wide. Distance between hills was 25 cm apart. Plants were thinned to two seedlings per hill after six weeks....

Analysis of variance was done according to the methods described by **Snedecor and Cochran (1981)**. Moreover, Duncan's multiple range tests was used for comparisons between means according to **Waller, and Duncan (1969)**. All the data belonged to fiber characters results were changed to percentage and used in the following equation to calculate the colored areas under radar graph for each genotype under different locations.

$$Area=1/2*(A*B+B*C+C*D+D*E+E*F+F*A)*\sin(\theta)$$

Where;
(A, B, C, D, E and F) representing the following fiber properties (fiber length (mm), fiber strength(g/tex), fiber elongation%, micronaire reading , the degree of reflection % (RD %) and fiber uniformity index(%)) respectively.
$\theta = ((360/n*\pi)/180)$
n = the number of characters
$\pi = 3.142857$

During the season samples drown from each genotype at all locations, were carefully hand blended and used for fiber measurements of fiber characters according to the routine tests followed in the cotton fibers labs Cotton Research Institute ,Giza ;Egypt using the methods described in (ASTM 1986).

3. Results and Discussion

3.1. Upper Egypt genotypes:

3.1.1- Giza 80 variety:

Its clear that Loc 4, gave the highest color area Table (1)and the highest Duncan's multiple range (a) Table(2) this mean that, all the fiber characters under study gave their maximum reading in the fourth location . In contrast, the first location gave the lowest fiber quality .These reduction in the fiber properties referred to unsuitable weather conditions in the first location to both elongation and maturation period resulting in reduction in length (30.1) and micronaire reading (4.6) which accompanied both of fineness and maturity readings .So, it will be reflected on the rest characters .

3.1.2- Giza 90 variety:

Tables (1,2) and figure (2) showed that, 90 variety acted as the same as the previous variety thus the Loc 4, gave the maximum color area. On the contrary, Loc 1, gave the lowest color area and the lowest fiber properties reading in Table (1) this is usually true when compared with the statistical analysis using Duncan's multiple range shown in Table (2).

3.1.3- H 6 genotype:

Both of the color area under the radar graph presented in figure (3) and Table (1) and the statistical analysis shown in Table (2) agreed that, the H 6 cross was adapted to the climate conditions of the third locations, while, the first locations still having the lowest color area and the worst fiber properties.

It could be summarized as that, all the Upper Egypt genotypes gave their maximum fiber quality under Loc 4 except for the H6 genotype which gave it's maximum fiber quality under the third location. On the other hand, all the genotypes couldn't adapted to the weather conditions of the first locations. These results are in a harmony with those obtained by **Eweida *et al.*, (1984) and Hassan *et al.*, (2006).**

The color areas under radar graph indicated the previous results as clear as compared with the statistical analysis.

3.2. The delta genotypes:

3.2.1-Giza 88 variety:

Its obvious from Tables (1, 3) and Figure (4) that the climate conditions of the first location enhanced all the fiber characters. While, the behavior of that genotype in the fourth location indicated the less adapted to the prevailing weather conditions in that location.

3.2.2-Giza 92 variety:

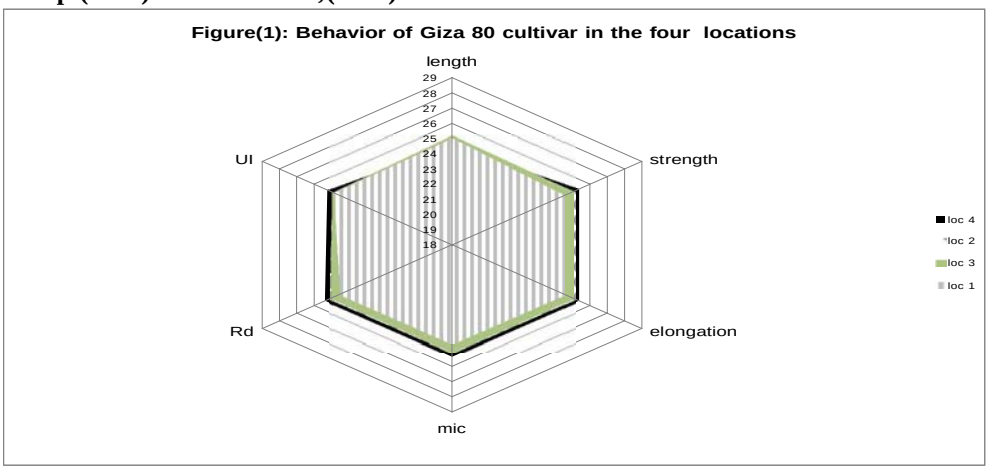
Its evidence from Tables (1,3) and figure(5) that the first location surpassed the others in fiber properties and gave the highest color area and the highest Duncan's multiple range(a) that mean the weather condition in the first location has a positive effect on all the characters under study. However, there were substantial deterioration in cotton fiber properties as impact of unsuitable weather conditions of the Loc 4

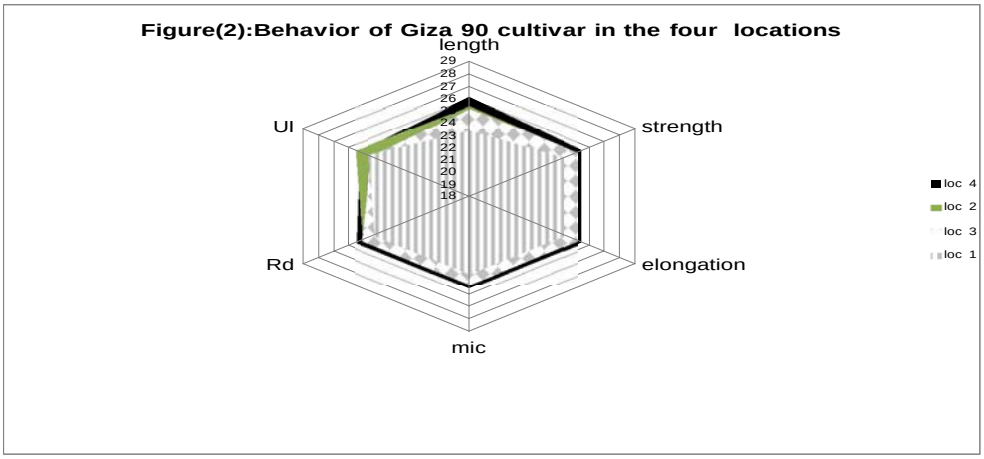
3.2.3 H10 genotype:

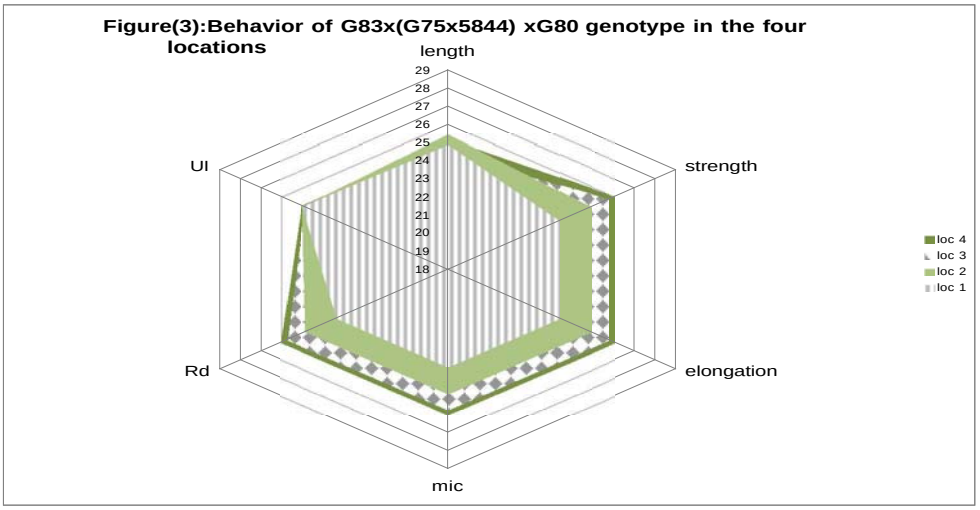
Its evidence from Tables (1,3) and figure(6) that The behavior of that genotype was different than the previous genotypes. It could be arranged in ascending order according to the color area (the highest color area the best fiber properties and vice versa) as follows Loc 4, loc 3, Loc 1 and Loc 2. Also, the statistical analysis gave the same range as a result of Duncan's multiple range .

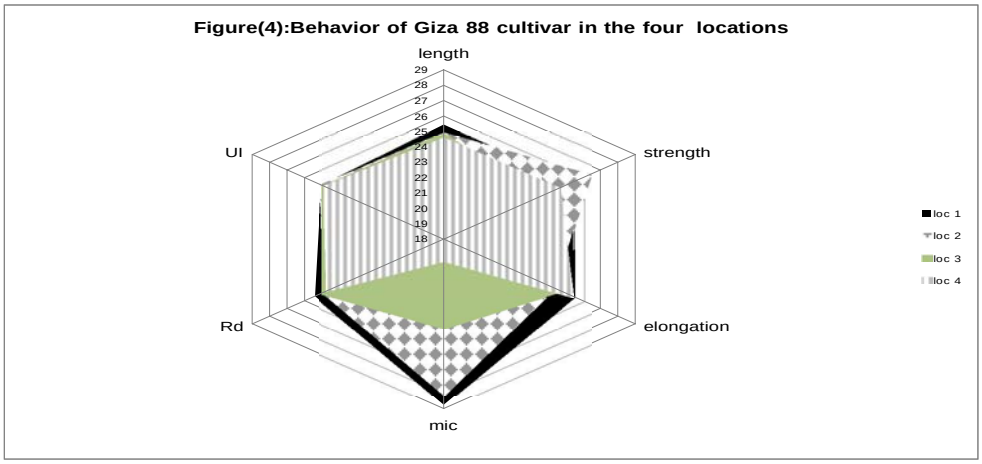
It might be summarized like that, all the delta genotypes got the highest fiber quality under Loc 1 excepting the H10 genotype which gave its maximum fiber quality under the second location. On

the other hand, all the genotypes couldn't adapted to the weather conditions of the fourth locations. these results are in line with **Bradow and Bauer(1997) Judith and Philip (1997) Liakatas *et al.*,(1998) and Arafa *et al.*,(2008)**.Also, the color areas under radar graph indicated the previous results as clear as compared with the statistical analysis .








Figure(4):Behavior of Giza 88 cultivar in the four locations
length
strength
elongation
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Rd
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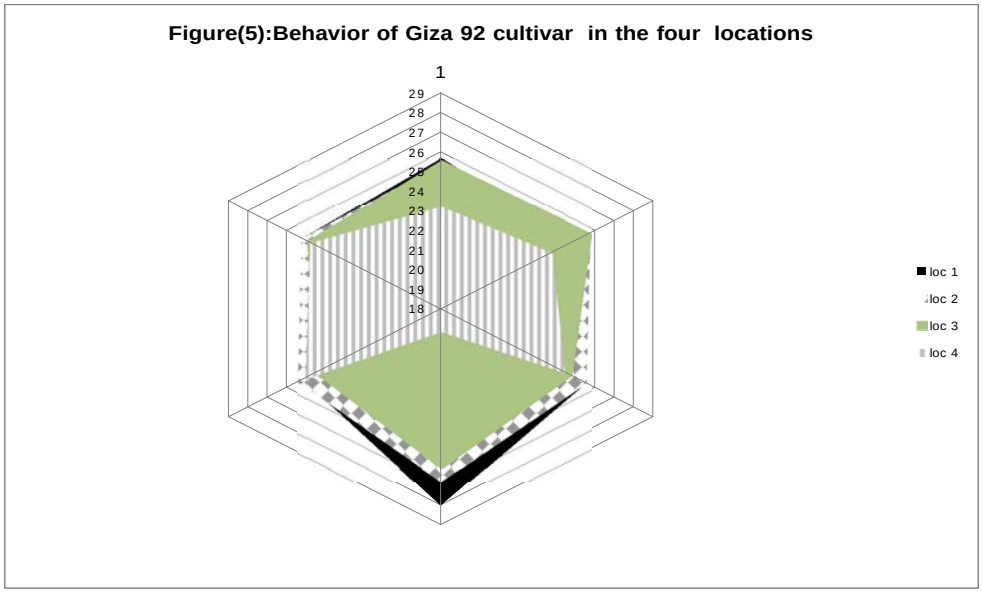
19
18
loc 1
loc 2
loc 3
loc 4


Figure(5):Behavior of Giza 92 cultivar in the four locations
1
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28
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20
19
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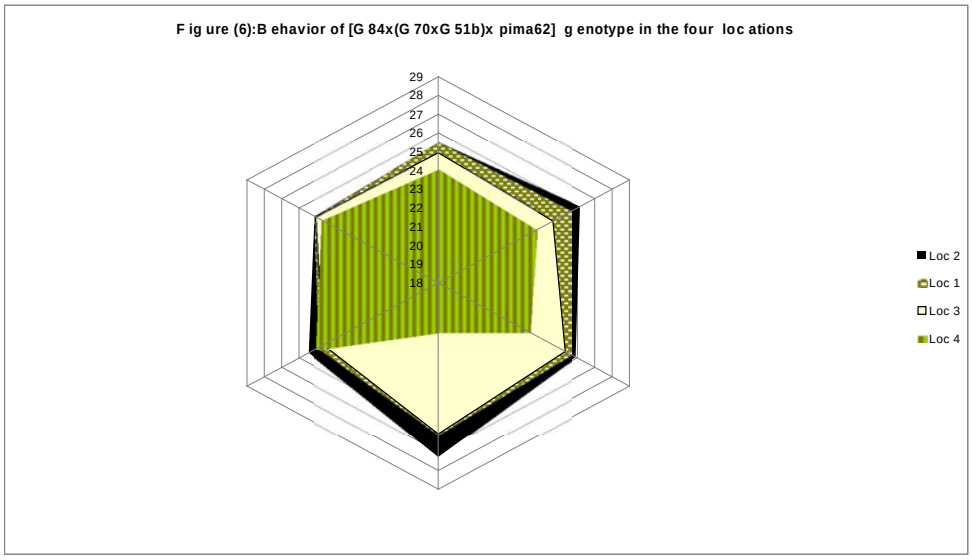
loc 1
loc 2
loc 3
loc 4


F ig ure (6):B ehavior of [G 84x(G 70xG 51b)x pima62] g enotype in the four loc ations
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18
Loc 2
Loc 1
Loc 3
Loc 4

Table (1): The color area of each genotype under different locations.

Upper Egypt								
Genotype	**Location**	**Length**	**Strength**	**Elonga.%**	**Mic**	**Rd%**	**UI%**	**Color area**
G80	**loc 1**	25.07954	24.5158	24.5158	24.5158	24.5158	24.86474	**1580.924**
	loc 2	25.07954	25.08919	25.08919	25.08919	25.08919	24.96547	**1632.460**
	loc 3	25.23863	25.03823	25.03823	25.03823	25.03823	24.94532	**1631.042**
	loc 4	24.60229	25.35678	25.35678	25.35678	25.35678	25.22447	**1650.996**
G90	**loc 1**	23.39522	24.26511	24.26511	24.26511	24.26511	24.68629	**1520.104**
	loc 2	25.37674	25.08319	25.08319	25.08319	25.08319	25.55947	**1651.358**
	loc 3	25.14362	25.15252	25.15252	25.15252	25.15252	24.52727	**1629.812**
	loc 4	26.08442	25.49917	25.49917	25.49917	25.49917	25.22697	**1696.083**
H 6	**loc 1**	24.90477	23.35885	23.35885	23.35885	23.35885	25.02397	**1483.632**
	loc 2	25.47208	24.86281	24.86281	24.86281	24.86281	25.02397	**1622.609**
	loc 3	24.41851	25.74351	25.74351	25.74351	25.74351	24.89904	**1673.887**
	loc 4	25.20464	26.03482	26.03482	26.03482	26.03482	25.05302	**1720.455**
Delta								
Genotype	**Location**	**Length**	**Strength**	**Elonga.%**	**Mic**	**Rd%**	**UI %**	**Color area**
G88	**loc 1**	25.4363	25.38101	25.47529	28.75000	25.38472	25.02235	**1743.290**
	loc 2	24.97704	26.41520	24.33460	28.12500	24.91256	25.08662	**1705.680**
	loc 3	24.94171	23.53037	24.71483	23.75000	24.98251	24.96647	**1556.713**
	loc 4	24.64495	24.67342	25.47529	19.37500	24.72020	24.92456	**1489.338**
G92	**loc 1**	25.69500	24.89532	25.46816	28.02548	25.13675	25.16381	**1719.474**
	loc 2	25.48962	25.66752	25.46816	26.75159	25.36984	25.17787	**1709.696**
	loc 3	25.59965	25.73821	24.71910	26.11465	24.49030	24.91634	**1657.636**
	loc 4	23.21573	23.69895	24.34457	19.10828	25.00311	24.74198	**1412.926**
H10	**loc 1**	25.50769	25.63181	25.60241	26.06061	24.88666	25.11512	**1685.011**
	loc 2	25.49364	26.14525	25.90361	27.27273	25.45899	25.12354	**1742.696**
	loc 3	24.94554	24.58783	25.30120	26.06061	24.60693	25.05335	**1635.679**
	loc 4	24.05312	23.63512	23.19277	20.60606	25.04743	24.70800	**1439.240**

Table (2): The effect of location on fiber properties of the Upper Egypt genotypes.

Cultivar	**Fiber charac.** / **location**	**Length (mm)**	**UI %**	**Strength (g/tex)**	**Elongat.%**	**Mic**	**Rd%**
Giza 80	Loc-1	30.1 d	86.1 d	37.9 c	7.1 cb	4.6 c	65.7 b
	Loc-2	31.4 b	86.6 b	39.5 b	7.2 b	4.7c b	65.5 c
	Loc-3	30.7 c	86.3 c	39.4 b	7.6 a	4.9 a	65.5 c
	Loc-4	31.8 a	87.6 a	39.6 a	7.6 a	4.9 a	65.8 a
Mean		**31.0**	**86.7**	**39.1**	**7.4**	**4.8**	**65.6**
Giza 90	Loc-1	28.1 c	85.2 d	35.4 c	7.5 b	4.2 c	68.2 c
	Loc-2	30.4 b	86.0 b	35.6 b	7.4 a	4.2 c	68.6 b
	Loc-3	30.3 b	85.4 c	37.0 a	7.4 a	4.5 b	68.5 b
	Loc-4	31.5 a	87.7 a	37.0 a	7.4 a	4.6 a	68.9 a
Mean		**30.1**	**86.1**	**36.3**	**7.4**	**4.4**	**68.5**
H 6	Loc-1	30.5 c	86.1 a	35.0 c	7.5 b	4.5 c	70.0 c
	Loc-2	31.4 a	86.1 a	36.5 b	7.8 ab	4.6 b	69.3 d
	Loc-3	30.2 d	86.0 b	38.8 a	7.9 a	4.7 a	70.8 a
	Loc-4	30.9 b	86.0 b	38.1 ab	7.9 a	4.6 b	70.1 b
Mean		**30.8**	**86.1**	**37.1**	**7.8**	**4.6**	**70.1**

Table (3): The effect of location on fiber properties of the delta genotypes

Cultivar	Fiber charac. / location	Length (mm)	UI %	Strength (g/tex)	Elongat.%	Mic	RD%
Giza 88	Loc-1	35.9 **a**	89.9 a	48.2 a	6.9 a	4.6 a	72.2 a
	Loc-2	35.0 b	89.5 b	46.8 b	6.3 d	4.5 b	70.9 b
	Loc-3	35.1 b	89.3 c	45.7 c	6.7 b	3.7 c	70.9 b
	Loc-4	34.6 c	89.2 d	42.8 d	6.4 c	3.0 d	70.9 b
Mean		**35.2**	**89.5**	**45.9**	**6.6**	**4.0**	**71.2**
Giza 92	Loc-1	35.1 a	89.5 a	47.5 a	6.8 a	4.3 a	81.5 a
	Loc-2	34.9 b	89.4 a	47.1 ab	6.8 a	4.2 a	80.6 b
	Loc-3	34.9 b	89.0 ab	45.8 b	6.5 b	4.0 ab	78.3 c
	Loc-4	31.8 c	87.5 b	43.2 c	6.5 b	3.0 b	80.5 b
Mean		**34.2**	**88.9**	**45.9**	**6.7**	**3.9**	**80.2**
H 10	Loc-1	36.3 a	89.5 a	45.1 b	8.5 b	4.3 b	78.3 ab
	Loc-2	36.2 ab	89.4 b	45.9 a	8.6 a	4.5 a	78.9 a
	Loc-3	35.6 b	89.5 a	42.8 c	8.4 c	4.2 c	76.5 c
	Loc-4	34.0 c	87.8 c	41.5 d	7.7 d	3.3 d	77.7 b
Mean		**35.5**	**89.1**	**43.8**	**8.3**	**4.1**	**77.9**

Corresponding author:
Abeer S. Arafa
Cotton Research Institute, Agriculture Research Center, Giza, Egypt
Sameh_owf@yahoo.com

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