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EFFECT OF CLIMATIC CONDITIONS ON THE PERFORMANCE OF SOME EGYPTIAN COTTON GENOTYPES GROWN AT DIFFERENT LOCATIONS

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ABSTRACT

Five different locations i.e. (El–Mattana, Sohag, Assiut, Beni–Soweif and El–Fayium) for two successive seasons, 2012 and 2013 enabled us to obtain ten different accumulated heat units (HU) to study the relationship between cotton genotypes development and accumulated heat units for six Egyptian long staple cotton genotypes i.e. the two commercial cultivars G.80 and G.90 and four promising strains [G.83 (G.75 x 5844)] x G.80, (G.90 x Australy), [G.83 x (G .75 x 5844)] x G.90 and [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)]. A randomized complete blocks design with four replications was conducted at each location.

The results indicated that the highest accumulated heat units exhibited the highest values of seed cotton yield and lint cotton yield (k/f) for most genotypes. Also, the highest accumulated heat units exhibited the highest values of seed index (g.) and boll weight (g.) for all genotypes. But, lint index (g) trait for all genotypes was adapted to a wide range of accumulated heat units. The commercial cultivar G.90 and the promising strain [G.83 x (G .75 x 5844)] x G.90 were adapted for seed oil percentage (%) for all accumulated heat units. The difference between all accumulated head unit was non-significant. The medium values of accumulated heat units exhibited the highest values of fiber length (mm) and fiber uniformity index (%) for all genotypes. While, The fiber elongation values showed slight changes under different accumulated heat units for most genotypes.

INTRODUCTION

Cotton (*Gossypium barbadense,*L.) is one of the most important fiber crops in the world and is likely to enjoy this advantage in the future. In Egypt, cotton is important for both export and local textile industry.

The weather is one of the most important factors that affect crop growth and yield. Crop production is directly influenced by micro-environmental conditions. Generally the environmental conditions may vary from a location to another or from year to year. In spite of the apparently uniform conditions within each of all Egyptian regions, it is of great importance to study the behavior of cotton genotypes and fiber properties in yield trials under different climatic conditions.

Several workers studied the performance of cotton varieties under different environments. Young *et al.* (1980) reported that heat units were more highly correlated than day degree units with days for growth from true leaf and flower to open boll. These differences of correlation further suggest that different stages of growth have independent responses to temperature and time. Critically limiting temperatures differ with the stage of growth. Kerby and Ruppenicker (1989) and Reddy et *al.* (1992) reported that number of seeds/boll and boll weight increased until the heat sum reached to 1750 degree / days and first fruiting position produced the largest bolls. Also; Judith and Philip (1997) stated that higher heat unit accumulation during the first fifty days after planting resulted high in number of bolls and increased variability in those fiber properties related to maturity, i.e., immature fiber, fine fiber fraction and micronaire as well as elongation percentage. Hassan *et al.,* (2000) studied the contribution percentage of maximum air temperature to lint yield variance which revealing that Giza 85 cultivar showed the highest response during the end of August, while Giza 83 showed low response during the beginning of April, meanwhile, it showed the highest response to the minimum air temperature during May to the end of July. Emara *et al.* (2006) found that late sowing on April exhibited the lowest number of total heat units and caused an increase in plant height and plant position of first fruiting node. Arafa *et al.* (2008) noticed that the highest values of boll weight (g), lint %, seed index, seed cotton yield (kentar per feddan (K/F)) and lint cotton yield (K/F) for all cultivars except, Giza 87 cultivar which was adapted to a wide range of accumulated heat units. Shaker *et al.* (2013) showed that the highest accumulated heat units exhibited the highest values of seed cotton yield, lint cotton yield, boll weight, seed index and lint index and fiber length and length uniformity ratio for most genotypes. The lowest accumulated heat units exhibited the highest values of lint percentage, fiber strength (g/tex) and earliness % for most genotypes. While, the lowest accumulated heat units exhibited the

lowest values of micronaire reading (fiber fineness and maturity in combination) for all genotypes.

The objective of this study was to evaluate four new long staple cotton strains with two commercial cultivars at ten environments in Upper Egypt through two years to study the performance of genotypes under different climatic conditions.

MATERIALS AND METHODS

The materials used in the present investigation were two commercial cotton cultivars; Giza 80 and Giza 90, in addition to four (*G.barbadese*) promising strains in segregating F_{12} i.e. [G.83 (G.75 x 5844)] x G.80, (G.90 x Australy) , [G.83 x (G .75 x 5844)] x G.90 and [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)] belonging to the Egyptian cotton long staple strains grown at Middle and Upper Egypt. These materials were tested in regional yield trials at five different locations (El–Mattana, Sohag, Assiut, Beni–Soweif and El–Fayium) for two successive seasons, 2012 and 2013. The experimental design was a randomized complete block design with four replications at each location. The sowing and harvest dates for the two seasons were showed in Table (1). The plot size was 52 m^2 and each plot contained of 20 ridges four meters long and 65 cm wide. Distance between hills was 25 cm. The plants were thinned to two plants/ hill after six weeks. All agricultural practices were done as those recommended for cotton growing at all locations.

Table 1: sowing and harvest dates for all locations grown under two seasons (2012 and 2013) at Middle and Upper Egypt.

Locations	First season (2012)		Second season (2013)	
	Sowing date	Harvest date	Sowing date	Harvest date
1-El – Mattana (luxor)	28 March	3 October	27 March	6 October
2-Dar El-Salam (Sohag)	26 March	6 October	25 March	30 September
3-El-Qusia (Assiut)	2 April	30 September	9 April	22 October
4-Beni – Soweif	27 March	5 September	20 March	25 September
5-El – Fayium	23 March	30 September	14 March	10 September

The cotton of each plot was picked together for estimated the following characteristics:-

Seed cotton yield (kentar/fed) and lint cotton yield (k/fed.).

At harvest fifty bolls were chosen at random from each plot to study the following characters:

Boll weight (g), lint % (L.P), seed index (S.I), lint index and seed oil % determined according to A.O.C.S (1982).

Samples of lint from each genotype were analyzed in the laboratories of Cotton Technology Research Division at Giza, according to (A.S.T.M. D-4605-1986 and D-1776 - 1998) for fiber properties:

1- Micronaire reading,
2- Fiber length (mm).
3- Fiber uniformity index (%).

4- Fiber strength (g/tex).
5- Fiber elongation index (%).

Data of air temperature was obtained from the Department of Meteorology. Agricultural Research Center using the data collected from each season. The data covered the period from the start of planting to harvest for all locations under study. Minimum and maximum air temperatures (C^o) through the growing seasons and heat units (HU) were calculated according to Young *et al.* (1980) equation as follows:

Heat units (HU) = mean daily min. and max. temperatures – k

(K = zero growth = 12.8 C^o)

Accumulated heat units (HU) for each location to both seasons were calculated as follows: the maximum and minimum temperatures for each day added, and divided by 2 and then the growth temperature base of 12.8 C^o are subtracted as shown in Table 2.

Analysis of variance was done according to the methods described by Senedecor and Cochran (1982). Moreover, Duncan's multiple range tests was used for comparisons between means according to Waller and Duncan (1969).

RESULTS AND DISCUSSION

The results reported in this investigation include the evaluation of two Egyptian cotton cultivars and four promising strains tested in the two years (2012 and 2013) at five different locations (ten environments).

Table (3) shows that the individual analysis of mean square for each genotype grown at ten environments for yield, yield components and seed oil percentage.

1- Mean squares for each genotype grown at ten environments:

1.1. Yield, yield components and seed oil percentage:

The results in Table 3 showed that the mean squares of ten environments were significant for all yield, yield components (seed cotton yield (k/f), lint cotton yield (k/f), boll weight (g), lint percentage, seed index (g), lint index (g)) and seed oil percentage for each genotype, except the commercial cultivar G.90 and the promising strain [G.83 x (G .75 x 5844)] x G.90 that were non-significant. The differences among locations were significant.

1.2. Fiber properties:

Table (4) shows the individual analysis of mean square for each genotype grown at ten environments for fiber properties. The mean squares of ten environments were significant for all fiber properties (micronaire value, fiber length (mm), fiber uniformity index (%), fiber strength (g\tex) and fiber elongation (%) for each genotype under study.

2- Effect of accumulated heat units on the performance of the cotton genotypes:

It s well–known that each genotype has its distinct characters. Thus, we analyzed each genotype independently to focus only the effect of heat units (HU) on its behavior specially it’s agreed that the heat units depends on the average between day and night temperatures which has a direct effect on cellulosic deposition

which is the basic material for all the technological characters. The average of accumulated heat units ranged from 2296.15 degree of heat units at Beni – Soweif region in the first season to 3271.10 degree of heat units at El-Mattana region in the second season.

Table 2: Accumulated heat units (HU) in all locations during the two seasons.

Month	2012		2013	
	(HU) / Month	Accumulated (HU)	(HU) / Month	Accumulated (HU)
Luxor (El – Mattana (Loc.1)				
March	28.20	28.2	36.25	36.25
April	367.50	395.7	385.95	422.20
May	506.85	902.55	496.50	918.70
June	571.50	1474.05	577.50	1496.20
July	576.60	2050.65	598.30	2094.50
August	567.00	2617.65	577.50	2672.00
September	508.50	3126.15	517.50	3189.50
October	40.20	3166.35	81.60	3271.10
Sohag (Loc.2)				
March	33.30	33.30	44.60	44.60
April	327.00	360.30	340.50	385.10
May	458.80	819.10	491.65	876.75
June	511.50	1330.60	529.50	1406.25
July	517.70	1848.30	545.35	1951.60
August	531.00	2379.30	558.90	2510.50
September	454.50	2833.80	465.00	2975.50
October	73.20	2907.00	…….	2975.50
Assiut (Loc.3)				
March	…….	…….	…….	…….
April	289.80	289.80	243.80	243.80
May	446.40	736.20	452.60	696.40
June	516.00	1252.20	518.50	1214.90
July	509.95	1762.15	516.15	1731.05
August	493.50	2255.65	498.00	2229.05
September	442.50	2698.15	439.50	2668.55
October	…….	2698.15	258.50	2927.05
Beni – Soweif (Loc.4)				
March	32.75	32.75	59.20	59.20
April	272.80	305.55	299.80	359.00
May	436.40	741.95	425.35	784.35
June	506.00	1247.95	495.50	1279.85
July	489.95	1737.90	486.70	1766.55
August	478.50	2216.40	492.00	2258.55
September	79.75	2296.15	388.75	2647.30
October	…….	2296.15	…….	2647.30
El – Fayium (Loc.5)				
March	41.85	41.85	89.40	89.40
April	258.00	299.85	289.90	379.30
May	385.95	685.80	422.55	801.85
June	451.50	1137.30	494.00	1295.85
July	497.55	1634.85	502.20	1798.05
August	480.00	2114.85	484.50	2282.55
September	414.00	2528.85	169.55	2452.10
October	…….	2528.85	…….	2452.10

Table 3: The individual analysis of mean square for each genotype grown at ten environments for yield, yield components and seed oil percentage.

Characters	Replication	Environment	Error
	df 3	9	27
	Giza 80		
Seed cotton yield (k/f)	0.186	9.318**	1.657
Lint cotton yield (k/f)	0.148	13.857**	2.460
Boll weight (g)	0.039	0.192*	0.063
Lint percentage	0.406	13.366**	0.353
Seed index (g)	0.174	3.115**	0.575
Lint index (g)	0.043	1.177**	4.792
Seed oil percentage	0.549	2.368*	0.907
	Giza 90		
Seed cotton yield (k/f)	1.948	13.010**	1.411
Lint cotton yield (k/f)	3.638	17.086**	1.967
Boll weight (g)	0.053	0.646**	0.051
Lint percentage	2.035	8.798**	0.714
Seed index (g)	0.661	5.172**	0.395
Lint index (g)	0.090	0.908**	0.132
Seed oil percentage	2.553	1.064 Ns	0.710
	[G.83 x (G .75 x 5844)] x G.80		
Seed cotton yield (k/f)	2.229	21.933**	2.740
Lint cotton yield (k/f)	3.503	27.304**	4.299
Boll weight (g)	0.025	0.735**	0.022
Lint percentage	0.294	10.554**	0.770
Seed index (g)	0.324	7.891**	0.125
Lint index (g)	0.116	1.619**	0.036
Seed oil percentage	0.485	2.098**	0.658
	(G.90 x Australy)		
Seed cotton yield (k/f)	1.328	15.903**	1.053
Lint cotton yield (k/f)	2.370	21.143**	1.747
Boll weight (g)	0.011	0.482**	0.037
Lint percentage	0.091	9.803**	0.598
Seed index (g)	0.016	2.815**	0.275
Lint index (g)	0.001	0.558**	0.124
Seed oil percentage	0.172	4.184**	0.412
	[G.83 x (G .75 x 5844)] x G.90		
Seed cotton yield (k/f)	6.949	11.716**	2.305
Lint cotton yield (k/f)	11.106	16.427**	3.408
Boll weight (g)	0.084	0.704**	0.032
Lint percentage	0.548	8.521**	0.306
Seed index (g)	0.018	5.815**	0.230
Lint index (g)	0.027	1.427**	0.112
Seed oil percentage	0.211	0.361 Ns	0.512
	[G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)]		
Seed cotton yield (k/f)	1.074	23.340**	2.712
Lint cotton yield (k/f)	1.608	30.669**	3.842
Boll weight (g)	0.049	0.769**	0.037
Lint percentage	0.127	0.727**	0.896
Seed index (g)	0.144	5.561**	0.400
Lint index (g)	0.102	1.743**	0.258
Seed oil percentage	0.912	1.441*	0.461

*, ** Significant at the 0.05 and 0.01 probability levels, respectively.
Ns not significant

I - Yield, yield components and seed oil percentage:

Data presented in Table (5) showed that the lowest values for seed cotton yield (k\f) and lint cotton yield (k\f) for all genotypes were obtained at Assiut region in the second season at 2927.05 degree of heat units, but the highest values for seed cotton yield (k/f) and lint cotton yield (k\f) were obtained at El-Fayium region in the first season at 2528.85 degree of heat units for Giza 80. On the other hand, the highest values for seed cotton yield and lint cotton yield (k\f) were obtained at Sohag region in the first season at 2907.00 degree of heat units for Giza 90. The promising strains [G.83 x (G .75 x 5844)] x G.80, (G.90 × Australy), [G.83 x (G .75 x 5844)] x G.90 and [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)] gave the highest values for seed cotton yield and lint cotton yield (k\f) at El-Mattana location in the first season at 3166.35 degree of heat units.

The commercial cultivar Giza 80 gave the highest values for boll weight (g), seed index (g) and seed oil percentage at El-Mattana location at 3166.35 degree of heat units in the first season, but the highest values for lint percentage were obtained at El Fayium region at the first season 2528.85 degree of heat units in the first season and Beni-Soweif region at 2647.30 degree of heat units in the second season for the Giza 80 cultivar. The highest value for lint index (g) was obtained at El-Fayium region at 2452.10 degree of heat units in the second season for Giza 80. The Giza 90 cultivar gave the highest values for boll weight (3.32 g), seed index (11.42 g) and lint index (6.54 g) at Sohag location at 2907.00 degree of heat units in the first season, but the highest value for lint percentage (40.5 %) was obtained at El Fayium region at 2528.85 degree of heat units in the first season.

The promising strains [G.83 x (G .75 x 5844)] x G.80 and (G.90 × Australy) gave the highest values for boll weight (3.51 g) and seed index (11.18 g) at Sohag and El-Mattana region in the second season and at Assiut in the first season, respectively at highly heat units, but the highest values for lint percentage (41.6 %) and seed oil percentage (21.30 %) were obtained at highly heat units in Assiut region in the second season. While, this promising strain gave the highest values for seed oil percentage at low degree of heat at El-Fayium region in the first season. On the other hand [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)] gave the highest values for lint % at medium heat units.

Table 4: The individual analysis of mean square for each genotype grown at ten environments for fiber properties.

Characters	Replication	Environment	Error
	df 3	9	27
Giza 80			
Micronaire value	0.118	0.133**	0.012
Fiber length (mm)	0.152	0.709**	0.117
Fiber uniformity index (%)	0.709	7.162**	0.233
Fiber strength (g\tex)	2.180	12.532**	0.243
Fiber elongation (%)	0.047	0.095*	0.013
Giza 90			
Micronaire value	0.006	0.062**	0.013
Fiber length (mm)	1.946	2.400**	0.719
Fiber uniformity index (%)	0.438	3.593**	0.208
Fiber strength (g\tex)	6.968	4.396**	0.369
Fiber elongation (%)	0.009	0.357**	0.046
[G.83 x (G .75 x 5844)] x G.80			
Micronaire value	0.015	0.134**	0.023
Fiber length (mm)	0.382	2.357**	0.119
Fiber uniformity index (%)	0.114	10.205**	0.517
Fiber strength (g\tex)	4.078	8.552**	1.379
Fiber elongation (%)	0.065	0.102*	0.033
(G.90 x Australy)			
Micronaire value	0.006	0.237**	0.017
Fiber length (mm)	0.179	2.249**	0.301
Fiber uniformity index (%)	0.166	3.472**	0.132
Fiber strength (g\tex)	1.703	2.468**	0.314
Fiber elongation (%)	0.008	0.145**	0.007
[G.83 x (G .75 x 5844)] x G.90			
Micronaire value	0.053	0.892**	0.013
Fiber length (mm)	1.414	0.721*	0.274
Fiber uniformity index (%)	0.190	3.080**	0.829
Fiber strength (g\tex)	1.890	15.698**	1.100
Fiber elongation (%)	0.003	0.183**	0.035
[G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)]			
Micronaire value	0.003	0.136**	0.021
Fiber length (mm)	0.068	2.007**	0.176
Fiber uniformity index (%)	0.205	6.302**	0.245
Fiber strength (g\tex)	1.418	10.260**	0.365
Fiber elongation (%)	0.060	0.111**	0.017

*, ** Significant at the 0.05 and 0.01 probability levels, respectively.

Table 5: Impacts of locations on yield, yield components and seed oil percentage for seven Egyptian cotton genotypes grown at different locations at Middle and Upper Egypt in the two seasons.

Genotypes	Seasons	Locations	Seed cotton yield (K/F)	Lint cotton yield (K/F)	Boll weight (g)	Lint %	Seed index (g)	Lint index (g)	Oil %
Giza 80	2012	El – Mattana (luxor)	9.53 a	11.27 ab	2.89 abc	37.5 ef	10.95 ab	6.57 ab	22.24 ab
		Dar El-Salam (Sohag)	8.03 ab	9.36 bcd	3.26 a	37.1 ef	11.06 a	6.51 ab	22.83 a
		El-Qusia (Assiut)	8.09 ab	9.83 bc	2.79 bc	38.6 cd	9.78 bcd	6.14 b	22.20 ab
		Beni – Soweif	6.10 bc	7.55 cde	2.81 bc	39.2 c	10.10 abc	6.53 ab	22.60 ab
		El – Fayium	9.62 a	12.53 a	2.83 bc	41.3 a	9.40 cde	6.62 ab	22.48 ab
		Mean	8.27	10.11	2.92	38.74	10.26	6.47	22.47
	2012	El – Mattana (luxor)	6.02 bc	6.97 de	2.55 c	36.8 f	8.66 de	5.03 c	20.49 c
		Dar El-Salam (Sohag)	7.79 ab	9.26 b-e	3.00 ab	37.8 de	10.30 abc	6.25 b	21.14 bc
		El-Qusia (Assiut)	5.18 c	6.76 e	2.50 c	41.4 a	8.47 e	5.96 b	21.06 bc
		Beni – Soweif	6.00 bc	7.81 cde	2.87 abc	41.3 a	9.43 cde	6.64 ab	21.98 abc
		El – Fayium	7.22 bc	9.14 b-e	2.99 ab	40.2 b	10.45 abc	7.02 a	22.30 ab
		Mean	6.44	7.99	2.78	39.50	9.46	6.18	21.39
	G Mean		7.36	9.05	2.85	39.1	9.86	6.33	21.94
	CV %		17.49	17.34	8.80	1.52	7.69	6.66	4.34
Giza 90	2012	El – Mattana (luxor)	10.24 ab	11.75 ab	3.30 a	36.4 e	11.38 a	6.51 a	20.35
		Dar El-Salam (Sohag)	11.74 a	13.48 a	3.32 a	36.4 e	11.42 a	6.54 a	20.54
		El-Qusia (Assiut)	9.31 bc	11.28 bc	3.04 ab	38.6 cd	9.72 b	6.10 abc	19.46
		Beni – Soweif	7.95 cde	9.65 cde	2.68 c	38.5 cd	10.06 b	6.30 ab	19.52
		El – Fayium	10.87 ab	13.86 a	2.64 c	40.5 a	9.26 bcd	6.30 ab	21.09
		Mean	10.02	12.00	3.00	38.08	10.37	6.35	20.19
	2012	El – Mattana (luxor)	6.78 de	7.99 de	2.45 cd	37.6 de	8.28 d	4.99 d	20.72
		Dar El-Salam (Sohag)	9.02 bc	10.44 bc	3.35 a	36.8 e	10.99 a	6.38 ab	20.00
		El-Qusia (Assiut)	6.13 e	7.72 e	2.21 d	40.0 ab	8.43 cd	5.62 c	20.17
		Beni – Soweif	7.53 cde	9.39 cde	2.53 cd	39.6 abc	9.30 bc	6.10 abc	20.49
		El – Fayium	8.19 cd	10.04 bcd	2.80 bc	38.8 bcd	9.22 bcd	5.85 bc	20.58
		Mean	7.53	9.12	2.67	38.56	9.24	5.79	20.39
	G Mean		8.78	10.58	2.83	38.3	9.81	6.07	20.29
	CV %		13.54	13.28	8.00	2.21	6.41	5.99	4.15

Table 5: Cont.

Genotypes	Seasons	Locations	Seed cotton yield (K/F)	Lint cotton yield (K/F)	Boll weight (g)	Lint %	Seed index (g)	Lint index (g)	Oil %
[G.83 x (G .75 x 5844)] x G.80	2012	El – Mattana (luxor)	13.06 a	15.46 a	3.12 b	37.6 e	11.05 a	6.64 b	21.28 a
		Dar El-Salam (Sohag)	12.68 ab	15.05 a	3.32 ab	37.6 e	11.55 a	6.95 a	20.44 abc
		El-Qusia (Assiut)	9.41 cd	11.43 bcd	2.85 c	38.6 cde	9.84 b	6.20 de	20.29 abc
		Beni – Soweif	7.61 de	9.35 cd	2.60 d	39.0 cd	9.51 b	6.08 de	20.97 ab
		El – Fayium	11.03 abc	14.27 ab	2.84 c	41.1 ab	9.36 b	6.53 bc	21.58 a
		Mean	10.76	13.11	2.95	38.78	10.26	6.48	20.91
	2012	El – Mattana (luxor)	8.80 cde	10.58 cd	2.41 d	38.1 de	8.44 c	5.19 f	19.48 c
		Dar El-Salam (Sohag)	10.45 bc	12.28 abc	3.51 a	37.3 e	11.18 a	6.64 b	19.68 bc
		El-Qusia (Assiut)	6.28 e	8.26 d	2.08 e	41.6 a	7.00 d	4.98 f	21.30 a
		Beni – Soweif	7.08 de	9.12 cd	2.56 d	41.0 ab	8.55 c	5.93 e	19.60 c
		El – Fayium	7.74 de	9.71 cd	2.87 c	39.8 bc	9.52 b	6.31 cd	20.74 abc
		Mean	8.07	9.99	2.69	39.56	8.94	5.81	20.16
	G Mean		9.41	11.55	2.82	39.2	9.60	6.15	20.51
	CV %		17.58	17.95	5.28	2.24	3.69	3.10	3.96
(G.90 x Australy)	2012	El – Mattana (luxor)	12.45 a	14.88 a	3.31 a	38.0 c	10.30 a	6.31 a	21.94 ab
		Dar El-Salam (Sohag)	11.02 ab	13.40 ab	3.24 ab	38.5 c	9.67 ab	6.06 a	21.50 abc
		El-Qusia (Assiut)	9.46 cd	11.96 bc	2.57 de	40.1 b	8.96 bc	5.99 ab	21.05 bcd
		Beni – Soweif	8.66 d	10.87 cd	2.84 cd	39.8 b	8.16 cd	5.40 cd	20.80 cde
		El – Fayium	10.86 bc	14.24 a	2.67 d	41.6 a	8.45 c	6.03 a	22.38 a
		Mean	10.49	13.07	2.93	39.60	9.11	5.96	21.53
	2012	El – Mattana (luxor)	8.57 d	10.22 cde	2.28 e	37.9 c	8.30 cd	5.06 d	19.89 efg
		Dar El-Salam (Sohag)	9.12 d	11.05 cd	3.00 bc	38.5 c	9.40 b	5.88 abc	19.74 fg
		El-Qusia (Assiut)	6.83 e	9.03 de	2.34 e	42.0 a	7.51 d	5.44 bcd	20.00 efg
		Beni – Soweif	6.47 e	8.41 e	2.54 de	41.3 a	8.17 cd	5.75 abc	20.35 def
		El – Fayium	6.84 e	8.78 e	2.69 d	40.8 ab	8.42 c	5.82 abc	19.24 g
		Mean	7.57	9.50	2.57	40.10	8.36	5.59	19.84
	G Mean		9.03	11.29	2.75	39.8	8.73	5.77	20.69
	CV %		11.37	11.71	6.95	1.94	6.01	6.10	3.10

Table 5: Cont.

Genotypes	Seasons	Locations	Seed cotton yield (K/F)	Lint cotton yield (K/F)	Boll weight (g)	Lint %	Seed index (g)	Lint index (g)	Oil %
[G.83 x (G .75 x 5844)] x G.90	2012	El – Mattana (luxor)	8.34 cde	9.56 bc	3.08 b	36.4 f	10.99 a	6.30 a	20.82
		Dar El-Salam (Sohag)	11.69 a	13.88 a	3.36 a	37.7 e	10.69 ab	6.46 a	20.68
		El-Qusia (Assiut)	7.65 b-e	9.40 bc	2.62 de	38.9 cd	10.00 bc	6.38 a	20.03
		Beni – Soweif	6.98 cde	8.58 c	2.61 de	39.0 c	8.82 d	5.65 b	20.65
		El – Fayium	9.42 abc	11.96 ab	2.64 de	40.3 ab	8.60 d	5.80 b	20.78
		Mean	8.82	10.68	2.86	38.46	9.82	6.12	20.59
	2012	El – Mattana (luxor)	8.50 bcd	9.78 bc	2.41 e	36.6 f	9.34 cd	5.40 b	20.33
		Dar El-Salam (Sohag)	8.17 b-e	9.82 bc	2.84 bcd	38.2 de	9.28 cd	5.73 b	21.00
		El-Qusia (Assiut)	5.99 e	7.69 c	1.80 f	40.7 a	6.72 e	4.61 c	20.86
		Beni – Soweif	6.37 de	7.82 c	2.78 cd	39.0 c	9.85 c	6.31 a	20.39
		El – Fayium	9.82 ab	12.33 ab	2.98 bc	39.9 b	9.75 c	6.47 a	20.38
		Mean	7.77	9.49	2.56	38.88	8.99	5.70	20.59
G Mean			8.29	10.08	2.71	38.7	9.40	5.91	20.59
CV %			18.31	18.31	6.59	1.43	5.10	5.66	3.47
G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)]	2012	El – Mattana (luxor)	13.24 a	15.54 ab	3.29 a	37.2 ef	11.66 a	6.92 a	21.38 a
		Dar El-Salam (Sohag)	13.37 a	16.27 a	3.47 a	38.6 cde	11.57 a	7.29 a	21.03 ab
		El-Qusia (Assiut)	10.68 bc	12.69 bc	2.84 c	37.7 def	11.01 ab	6.65 a	20.72 a-e
		Beni – Soweif	6.59 d	8.06 d	2.91 c	38.8 bcd	10.71 abc	6.81 a	21.01 abc
		El – Fayium	10.66 bc	13.62 ab	2.87 c	40.6 a	9.80 c	6.69 a	20.92 a-d
		Mean	10.91	13.24	3.08	38.58	10.95	6.87	21.01
	2012	El – Mattana (luxor)	11.82 ab	13.62 ab	2.49 d	36.6 f	10.01 bc	5.78 b	19.91 cde
		Dar El-Salam (Sohag)	10.28 bc	12.77 bc	2.98 bc	39.6 abc	10.01 bc	6.60 a	19.95 b-e
		El-Qusia (Assiut)	6.50 d	8.24 d	1.92 e	40.2 ab	7.52 d	5.06 b	20.45 a-e
		Beni – Soweif	8.35 cd	10.20 cd	2.92 c	38.8 bcd	10.53 bc	6.66 a	19.73 e
		El – Fayium	10.01 bc	12.52 bc	3.25 ab	39.6 abc	10.80 abc	7.10 a	19.82 de
		Mean	9.39	11.47	2.71	38.96	9.77	6.24	19.97
G Mean			10.15	12.35	2.90	38.8	10.36	6.56	20.49
CV %			16.22	15.87	6.60	2.44	6.10	7.74	3.31

Not: Means followed by the same letter within a character are not significantly different (probability of 0.05). CV % : Coefficient of Variation %.

The promising strains (G.90 ×Australy), [G.83 x (G .75 x 5844)] x G.90 and [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)] gave the highest values for boll weight, seed index and lint index at highly heat units in each season at El-Mattana and Sohag, but the highest values of lint and oil percentage was obtained at Assiut region in the second season.

These results are in line with those obtained by Reddy *et al.* (1992), Hassan *et al.* (2000), Emara *et al*. (2006), Arafa *et al*. (2008) and Shaker *et al*. (2013).

Π- Fiber properties:

Accumulation heat units on fiber properties for all genotypes grown at different locations are presented in Table 6 were significant effect on properties. The highest values were obtained at El-Fayium region at the first season, while, the lowest values for micronaire reading were obtained at the second season. The highest values for fiber uniformity index and fiber length (mm) was obtained at El-Mattana region in the first and second seasons, respectively, also Giza 90 gave the highest value for fiber length (31.02 mm) at Beni-Soweif region at the first season.

The promising strain [G.83 x (G .75 x 5844)] x G.80 gave the highest values for fiber length (32.08 mm), fiber strength (39.25 g/tex) and fiber elongation (8.02 %) at Assiut region at the first season (2698.15 degrees of heat units intermediate of degree of heat units (HU)), but the highest value for fiber uniformity index (86.58 %) was obtained at El-Mattana region at the second season (3271.10 of high HU) for this promising strain. The promising strain (G.90 ×Australy) gave the highest values for fiber length (31.60 mm) and fiber elongation (8.28 %) at El-Mattana region at the second season (3271.10 of high HU), but the highest value for fiber uniformity index (86.55 %) was obtained at Beni-Soweif region at the first season (2296.15 of low HU) for this promising strain. This promising strain gave also the highest value for fiber strength (36.75 g/tex) at Sohag region at the first season (2907.00 of high HU).

Also, the results in Table (6) showed that the highest values of fiber length (32.25 mm) was obtained at Assiut region in the second season for the promising strain [G.83 x (G .75 x 5844)] x G.90, but the highest value for fiber uniformity index (85.00 %) and fiber strength (37.45 g/tex) were obtained at Sohag region in the second season.

Table 6: Impacts of locations on fiber properties for seven Egyptian cotton genotypes grown at different locations at Middle and Upper Egypt in 2012 and 2013 seasons.

Genotypes	Locations	Micronaire value	Fiber length (mm)	Fiber uniformity index (%)	Fiber strength (g/tex)	Fiber elongation (%)
Giza 80	Loc. 1 2012	4.88 b	32.22 a	86.05 a	37.58 bc	8.00 ab
	Loc. 2 2012	5.10 a	32.08 ab	86.55 a	37.55 bc	8.05 ab
	Loc. 3 2012	4.75 b	31.45 c	83.42 de	38.32 ab	7.85 b
	Loc. 4 2012	4.85 b	31.50 c	84.10 cd	34.05 d	8.05 ab
	Loc. 5 2012	4.55 c	31.58 bc	86.70 a	38.65 a	8.28 a
	Loc. 1 2013	4.802 b	32.25 a	85.20 b	37.45 c	7.85 b
	Loc. 2 2013	5.08 a	32.00 a	86.40 a	37.45 c	8.05 ab
	Loc. 3 2013	4.80 b	30.90 d	83.32 e	38.22 abc	7.75 b
	Loc. 4 2013	4.78 b	31.68 bc	84.28 c	33.70 d	8.00 ab
	Loc. 5 2013	4.55 c	31.52 c	86.28 a	38.32 ab	8.15 a
Mean		4.81	31.72	85.23	37.13	8.00
CV %		2.30	1.08	0.57	1.33	2.28
Giza 90	Loc. 1 2012	4.35 bcd	30.68 a	85.78 a	36.68 a	8.25 a
	Loc. 2 2012	4.58 a	30.80 a	83.58 c	34.58 b	7.68 b
	Loc. 3 2012	4.48 abc	29.92 ab	83.92 bc	36.25 a	8.28 a
	Loc. 4 2012	4.30 cd	31.02 a	85.68 a	36.55 a	7.72 b
	Loc. 5 2012	4.28 d	29.00 b	84.48 b	36.70 a	8.30 a
	Loc. 1 2013	4.38 bcd	30.62 a	85.78 a	36.45 a	8.25 a
	Loc. 2 2013	4.62 a	30.88 a	83.52 c	33.60 c	7.68 b
	Loc. 3 2013	4.50 ab	30.65 a	83.90 bc	35.92 a	8.25 a
	Loc. 4 2013	4.38 bcd	30.90 a	85.60 a	36.48 a	7.70 b
	Loc. 5 2013	4.28 d	28.98 b	84.40 b	36.60 a	8.30 a
Mean		4.41	30.34	84.66	35.98	8.04
CV %		2.56	2.79	0.54	1.69	2.68
[G.83 x (G .75 x 5844)] x G.80	Loc. 1 2012	4.55 b	31.80 a	86.52 a	37.85 abc	7.92 a
	Loc. 2 2012	5.05 a	30.48 bc	85.92 a	35.05 d	7.52 c
	Loc. 3 2012	4.60 b	32.08 a	84.02 c	39.25 a	8.02 a
	Loc. 4 2012	4.55 b	30.85 b	82.30 d	38.40 abc	7.92 a
	Loc. 5 2012	4.58 b	29.95 cd	85.60 ab	37.15 c	7.90 ab
	Loc. 1 2013	4.60 b	31.65 a	86.58 a	37.72 abc	7.90 ab
	Loc. 2 2013	4.95 a	30.42 bc	85.85 a	35.02 d	7.62 bc
	Loc. 3 2013	4.55 b	30.92 b	83.95 c	39.18 ab	7.92 a
	Loc. 4 2013	4.60 b	30.70 b	82.30 d	37.82 abc	7.85 ab
	Loc. 5 2013	4.55 b	29.80 d	84.70 bc	37.30 bc	8.00 a
Mean		4.65	30.86	84.78	37.48	7.86
CV %		3.26	1.12	0.83	3.13	2.32

Table 6: Cont.

Genotypes	Locations	Micronaire value	Fiber length (mm)	Fiber uniformity index (%)	Fiber strength (g/tex)	Fiber elongation (%)
(G.90 x Australy)	Loc. 1 2012	4.70 b	31.38 ab	85.58 b	35.70 bc	8.25 a
	Loc. 2 2012	5.08 a	30.32 cd	84.42 c	36.75 a	8.22 a
	Loc. 3 2012	4.60 b	30.08 cd	83.88 c	36.50 ab	8.08 b
	Loc. 4 2012	4.35 c	29.70 d	86.55 a	31.85 cd	7.88 c
	Loc. 5 2012	4.68 b	29.92 cd	85.2 b	36.32 ab	7.85 c
	Loc. 1 2013	4.71 b	31.60 a	85.58 b	35.12 cd	8.28 a
	Loc. 2 2013	5.02 a	30.60 bc	84.38 c	36.70 a	8.15 ab
	Loc. 3 2013	4.55 b	31.35 ab	83.88 c	36.50 ab	8.02 b
	Loc. 4 2013	4.32 b	29.78 cd	86.22 a	34.78 d	7.78 c
	Loc. 5 2013	4.65 b	29.68 d	85.15 b	36.48 ab	7.82 c
Mean		4.66	30.44	85.08	35.97	8.03
CV %		2.81	1.80	0.43	1.56	1.07
[G.83 x (G .75 x 5844)] x G.90	Loc. 1 2012	4.42 b	32.10 abc	83.65 abc	33.50 c	7.88 bc
	Loc. 2 2012	5.00 a	31.42 a-d	85.02 a	37.48 a	8.02 ab
	Loc. 3 2012	4.60 b	31.10 d	82.65 bc	35.28 b	7.58 d
	Loc. 4 2012	3.70 d	31.48 a-d	83.20 bc	35.5 b	8.20 a
	Loc. 5 2012	3.98 c	31.25 cd	83.60 abc	31.90 c	7.92 ab
	Loc. 1 2013	4.48 b	32.15 ab	83.85 ab	33.50 c	7.95 ab
	Loc. 2 2013	4.92 a	31.35bcd	85.00 a	37.45 a	8.02 ab
	Loc. 3 2013	4.60 b	32.25 a	82.32 c	35.08 b	7.60 cd
	Loc. 4 2013	3.68 d	31.42 a-d	83.18 bc	35.42 b	8.20 a
	Loc. 5 2013	4.05 c	31.22 d	83.52 bc	31.92 c	7.82 bcd
Mean		4.34	31.58	83.60	34.70	7.92
CV %		2.62	1.66	1.09	3.02	2.36
[G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)]	Loc. 1 2012	4.88 b	32.05 a	84.28 bc	35.82 c	8.18 a
	Loc. 2 2012	5.15 a	31.18 b	83.90bcd	38.22 a	8.22 a
	Loc. 3 2012	4.88 b	31.05 b	83.50 cd	34.65 de	7.88 bc
	Loc. 4 2012	4.58 c	30.75 bc	83.82bcd	37.12 b	7.85 bc
	Loc. 5 2012	4.88 b	30.05 d	86.72 a	34.18 e	8.02 ab
	Loc. 1 2013	4.92 b	32.20 a	84 58 b	35.28 cd	8.12 a
	Loc. 2 2013	5.05 ab	31.02 b	84.05 bc	38.28 a	8.15 a
	Loc. 3 2013	4.90 b	30.75 bc	83.22 d	34.58 de	7.90 bc
	Loc. 4 2013	4.55 c	30.68 bc	83.72 cd	36.92 b	7.72 c
	Loc. 5 2013	4.82 b	30.10 cd	86.72 a	34.22 e	7.92 bc
Mean		4.86	30.98	84.45	35.93	8.00
CV %		2.98	1.35	0.59	1.68	1.65

Note: Means followed by the same letter within a character are not significantly different (probability of 0.05).

CV % : Coefficient of Variation %

The highest value of fiber elongation (8.20 %) was obtained at Beni-Soweif region at the first and second seasons (2296.15 and 2647.30,

respectively of intermediate HU) for the promising strain [G.83 x (G.75 x 5844)] x G.90.

The promising strain [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)] gave the highest values for fiber length (32.20 mm) at El-Mattana region at the second season (3271.10 of high HU), but the highest value for fiber uniformity index (86.72 %) was obtained at El-Fayium region at the first and second seasons (2452.10 and 2528.85, respectively). This promising strain gave also the highest value for fiber strength (38.28 g/tex) at Sohag region at the second season (2975.50 of high HU), but the highest value of fiber elongation (8.22 %) was obtained at Sohag region at the first season (2907.00 of high HU) for the promising strain [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)].

These results are in agreement with those obtained by Kerby and Ruppenicker (1989), Judith and Philip (1997), Arafa *et al*. (2008) and Shaker *et al.* (2013).

CONCLUSION

The results indicated that the highest accumulated heat units resulted in the highest values of seed cotton yield (k/f), lint cotton yield (k/f), fiber length (mm) and fiber strength (g/tex) for the promising strains [G.83 x (G .75 x 5844)] x G.80 and [G.83 x (G .75 x 5844)] x [G.83 x (G .72 x Dandara)] at Sohag Governorate. While, the lowest accumulated heat units exhibited the highest values of lint percentage for the promising strain (G.90 x Australy) at El-Fayium Governorate. The commercial cultivar G.90 and the promising strain [G.83 x (G .75 x 5844)] x G.90 were adapted for seed oil percentage (%) for all accumulated heat units. But, the fiber elongation and fiber uniformity index (%) values showed slight changes under different accumulated heat units for most genotypes.

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تأثير الظروف المناخية على أداء بعض التراكيب الوراثية من القطن المصري المنزرعة في مواقع مختلفة

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أجرى هذا البحث لدراسة العلاقة بين درجات الحرارة المتجمعة خلال موسم النمو وسلوك تراكيب وراثية من القطن المصري حيث شملت الدراسة سلوك ستة تراكيب وراثية عبارة عن صنفين تجاريين منزرعين هما جيزة 80 ، جيزة 90 بالإضافة إلى أربعة سلالات مبشرة هى [جـ83×(جـ75× 5844)] ×جـ80 ، (جـ 90 × أسترالي) ، [جـ83×(جـ75× 5844)]× جـ90 ،[جـ83 × (جـ75 × 5844)] × [جـ83 × (جـ72 × دندرة)]. والتي تم زراعتها في خمس محافظات (الأقصر (محطة بحوث المطاعنة) ، سوهاج ، أسيوط ، بنى سويف ، الفيوم) بمحافظات الوجه القبلي خلال موسمي 2012 ، 2013 حيث صممت التجارب بنظام القطاعات الكاملة العشوائية ذات أربعة مكررات وقد اختبرت بعض صفات المحصول ومكوناته وكذلك بعض صفات الجودة.

ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلي :

- زادت قيم صفات محصول القطن الزهر والشعر (قنطار / فدان) كلما زادت قيم درجات الحرارة المتجمعة لمعظم التراكيب الوراثية تحت الدراسة.
- أظهرت النتائج أنه كلما زادت قيم درجات الحرارة المتجمعة كلما أدى ذلك إلى زيادة قيم وزن اللوزة (جم) ، ومعامل البذرة (جم) لكل التراكيب الوراثية المستخدمة بينما أظهرت قيم معامل الشعر (جم) لكل التراكيب الوراثية قيما متفاوتة لدرجات الحرارة المتجمعة.
- لوحظ أن الصنف التجاري جيزة 90 والسلالة المبشرة [جـ83 × (جـ75 × 5844)] × جـ90 أوضحا ثباتا فى صفة نسبة الزيت بالبذرة (%) ولم يتأثر سلوكهما باختلاف درجات الحرارة المتجمعة حيث كان الاختلاف بين درجات الحرارة المتجمعة بالمناطق المختلفة غير معنوي لتلك التراكيب الوراثية.
- أدت الزيادة فى درجات الحرارة المتجمعة إلى زيادة قيم متانة التيلة (جم / تكس) لمعظم التراكيب الوراثية المستخدمة بينما أدى الانخفاض فى قيم درجات الحرارة المتجمعة إلى انخفاض قيم قراءة الميكرونير (نعومة التيلة) لكل التراكيب الوراثية تحت الدراسة.
- أدت درجات الحرارة المتجمعة المتوسطة إلى زيادة قيم طول التيلة (مم) والانتظام (%) لكل التراكيب الوراثية بينما كانت قيم صفة الاستطالة (%) ذات تغيرات محدودة لدرجات الحرارة المتجمعة لمعظم التراكيب الوراثية تحت الدراسة.