COMPARATIVE STUDY ON SEED COTTON YIELD, OIL AND PROTEIN CONTENTS IN THE SEED OF SOME EGYPTIAN COTTON CULTIVARS GROWN AT DIFFERENT LOCATIONS

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Abstract

The performance of five cultivars of Egyptian cotton, Giza 80, Giza 83, Giza 85, Giza 89 and Giza 90 were evaluated during the two successive seasons, 2001 and 2002 at four locations in Middle and Upper Egypt (Sohag, El–Minia, Beni–Souief and El–Faiyum). The effect of genotypes, years, locations, genotypes by locations and genotype by location by year interactions were highly significant for all studied traits (oil %, protein %, seed index and seed cotton yield). While the effect of the interaction between genotypes and years was insignificant only for seed index trait. Also the effect of years was insignificant for protein %. Giza 85 significantly surpassed all the studied cultivars in oil %, while Giza 89 gave the less values in oil %, protein % seed index and seed cotton yield (k/f) characters. Giza 90 surpassed all studied cultivars in protein % and seed cotton yield (k/f) at all studied locations. The seed cotton yield (k/f) and oil % traits were significantly differed the highest obtained from genotypes grown at Beni–Souief region. This may be due to the environment of Beni–Souief region that helped to improve these characteristics.

Positive and significant correlations were found among (seed oil % and seed index), between (seed cotton yield and seed index) and between (oil % and seed cotton yield).

Insignificant negative correlation was recorded between seed index and protein %. The results indicated that the correlation was positive and significant for Giza 85 between oil % and protein %. It recommendation by this correlation in the breeding program to improve seed quality and seed cotton yield.

INTRODUCTION

Improving cotton quality through introducing new varieties is the most important objective of the cotton research program. Cotton yield and seed qualities are important characteristics. It is also the second best potential source of seed proteins after soybean, and the fifth best oil producing plant after soybean, palmtree and sunflower (Texier, 1993). There is mounting interest in cottonseed quality due to the world's demand for food, especially protein and oil.

Programs to improve seed quality begin with identification of the variability caused by genetic and environmental factors (Kohel and Cherry 1983). Several workers studied the performance of cotton varieties under different environments (Abo El-Zahab *et al.,* 1992; Abou-Tour *et al.,* 1996; Badr *et al.*, 1998; Hassan, 2000; El-Desuky, 2002 and Badr *et al.,* 2004), they reported that the effects of genotypes, location, year and the interactions between them were significant for some cotton characters. Many investigations studied the improved seed quality characters (Labaneiah, 1970) observed that varieties differed considerably in seed oil and seed protein contents, but the variation in oil content was much larger. Giza 45 had the highest oil content, while Giza 67 had medium oil content percent and Giza 68 had the lowest oil percent (26.4%, 23.8% and 22.7% respectively). Namich (1997) reported that, protein percent in seed kernels in four Egyptian cotton varieties were 27.9%, 26.8%, 28.1% and 29.8% for Giza 70, Giza 77, Giza 80 and Giza 83 respectively. Mohamed (2003) reported that Giza 80 and Giza 89 proved to have oil % value 21.8% and 22.6%, protein % 20.8% and 19.9% respectively. Badr *et al.* (2004) reported that Giza 45 gave the highest value for oil %, while Giza 70 gave the highest value for protein %. But Giza 88 gave the lowest value for protein %.

The aim of the present investigation was to evaluate some Egyptian long staple cotton genotypes, Giza 80, Giza 83, Giza 85, Giza 89 and Giza 90 at four locations during two seasons. Correlations between characteristics were also calculated. It also aimed at finding the best characters for genotype grown in each location.

MATERIALS AND METHODS

The materials consisted of Five Egyptian cotton varieties , Giza 80, Giza 83, Giza 85, Giza 89 and Giza 90. These were grown in two successive seasons, i.e. 2001 and 2002 at four locations (Governorates) of Middle and Upper Egypt (Sohag, El-Minia, Beni-Souief and El–Faiyum). Data of the seed cotton yield and seed index of the studied varieties were obtained from the yield miniature experiments conducted by Regional Evaluation Research Department of the Cotton Research Institute, during the two successive seasons 2001 and 2002. The experimental design was a randomized complete block with four replications at each location. Seeds were grown on March in the two growing seasons at all locations. The plot area was $13m^2$ containing five rows of four meters long and 65 cm wide. Distance between hills was 25 cm apart. Plants

were thinned to two plants per hill after six weeks. The yield was obtained from the three middle rows of each plot. Data were collected for the following characteristics:

Seed cotton yield (k/f): obtained from the three middle rows of the plot and converted to kentar per feddan.

Seed index (g): estimated as the weight of 100 seeds in grams.

Seed properties tests were carried out by Chemistry of Cotton and Textile Fibers Section. Cotton Research Institute. Seed samples were taken at random from each plot and grounded to fine powder to pass through 2 mm mesh for chemical analysis i.e. seed oil content % and seed protein content % were measured according to procedures outlined in A.O.A.C. (1980).

Analysis of variance was carried out as a combined analysis for the four locations and the two seasons according to Senedcor and Cochran (1982). Correlations were performed according to Sing and Chaudhary (1979).

RESULTS AND DISCUSSION

The results reported in this investigation include the evaluation of five Egyptian cotton cultivars in the two seasons, i.e. 2001 and 2002, at four different locations in order to study the effects of genotypes, locations, years and the interactions between them.

The combined analysis of the two years and four locations is shown in Table 1. The results of the combined analysis of variance showed that the effect of year (Y) was significant for all studied traits except, protein content %. While the effect of location (L) and the effect of locations by year's interaction were significant for all studied traits.

However, the effect of genotype (G), genotype by location and genotypes by locations by years interaction were highly significant for all studied traits, while the interaction between genotype by year was highly significant for all studied traits, except seed index (g). The results suggested that, comparisons among these cotton varieties for the studied characters could be dependently estimated at each region over years. These results confirm the findings of Abo-Tour *et al.* (1996), Hassan (2000), El-Desuky (2002) and Badr *et al.* (2004).

Table 1. Mean squares for studied traits for five cultivars grown at four locations for two years 2001 and 2002.

Source of variation	D.f.	Seed oil content (%)	Protein content (%)	Seed index (g)	Seed cotton yield (K/f)
Year (Y)	1	45.476**	0.003	2.169**	17.391**
Location (L)	3	9.865**	15.742**	33.381**	102.713**
L x Y	3	2.131**	6.616**	4.713**	38.637**
Reps in exper.	24	0.024	0.041	0.330	3.884
Genotype (G)	4	16.258**	52.602**	5.835**	14.860**
G x Y	4	8.716**	3.559**	0.133	12.074**
G x L	12	6.494**	6.104**	0.534**	5.517**
G x L x Y	12	1.714**	5.348**	0.484**	6.103**
Error	96	0.016	0.014	0.200	1.184

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

Genotype effect:

Mean varietal performance for all studied traits averaged over four locations and two years 2001 and 2002 are presented in Table 2 and (Figures 1 - 3). The data showed that the effect of different cotton genotypes on all studied characters were significantly different for all studied traits. However, it is obvious that any variety proved to be superior to the other varieties in all or even most of the concerned characters. For instance, Giza 85 exceeded the other varieties regarding oil % (22.28%). On the other hand, Giza 89 gave the lowest oil % (20.56%) and the differences between them were significant. Regarding protein % character, the highest value was obtained by Giza 90 (24.28%) among the examined cultivars (Table 2 and Figure 1), but Giza 85 and Giza 89 gave the lowest protein % (21.21% and 21.25%, respectively) and the differences between Giza 90 and both Giza 85 and Giza 89 genotypes were significant. Giza 83 and Giza 90 cultivars ranked first with regard to seed cotton yield in kentar per feddan (11.79 and 11.64 k/f, respectively) and the differences between them were insignificant. However Giza 89 gave the lowest value of seed cotton yield (10.10 k/f).

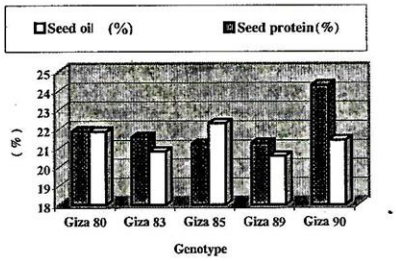

Figure 1 . Mean varietal performance for seed oil and seed protein contents averaged over four locations and two years

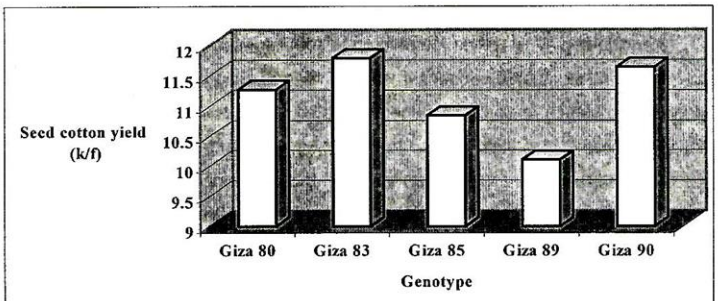

Figure 2. Mean varietal performance for seed cotton yield (k/f) averaged over four locations and two years.

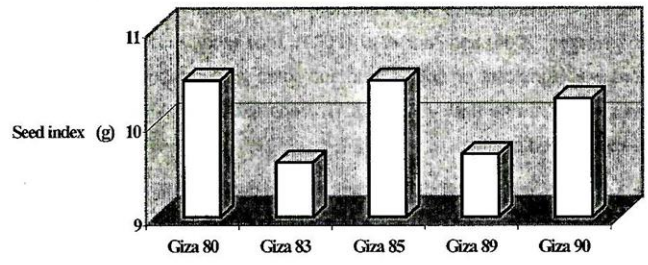

Figure 3. Mean varietal performance for seed index (g) averaged over four locations and two years.

Table 2. Mean varietal performance for all studied traits averaged over four locations and two years 2001 and 2002.

Cultivars	Seed oil content (%)	Protein content (%)	Seed index (g)	Seed cotton yield (K/f)
Giza 80	21.86	21.87	10.45	11.27
Giza 83	20.82	21.58	9.58	11.79
Giza 85	22.28	21.21	10.45	10.84
Giza 89	20.56	21.25	9.67	10.10
Giza 90	21.41	24.28	10.26	11.64
LSD (0.05)	0.06	0.06	0.22	0.54

Nevertheless, it is rather interesting to mention that Giza 89 cultivar did not excel on the other studied varieties in seed oil % and seed cotton yield in kentar per feddan traits. Hence, it could be generally stated that this variety is inferior in seed quality and seed cotton yield (k/f) to the other Egyptian cotton varieties considered in this study. These results are in agreement with those obtained by Abo El- Zahab *et al.* (1992), El-Desuky (2002) and Badr *et al.* (2004), who reported that the effect of the genotype was significant on cotton seed quality.

Growing year effect:

Table 3 shows that the average values of studied characters as affected by different growing years. The combined analysis showed highly significant differences in all the studied characters except, protein %. The first season (2001) gave the best values for all the studied traits. This may be belonging to the climatic conditions from year to year. These results are in harmony with those obtained by Abou–Tour *et al.* (1996), Hassan (2000) and Badr *et al.* (2004), they reported that the effect of growing seasons was significant on cotton yield and some yield component characters. Also El – Desuky (2002), and Badr *et al.* (2004), reported that this effect was significant in some cotton seed quality.

Table 3. Effect of years on all studied traits average over five cultivars and four locations.

Years	Seed oil content (%)	Protein content (%)	Seed index (g)	Seed cotton yield (K/f)
2001	21.92	22.04	10.20	11.46
2002	20.85	22.03	9.97	10.80
LSD (0.05)	0.04	NS	0.14	0.34

Growing location effect:

Table 4 and Figures 4 – 6 show the average values of studied characters as affected by different growing locations. The combined analysis showed that locations had a highly significant effect on all the studied traits. The highest seed cotton yield (k/f) and oil % values were obtained from genotypes grown at Beni–Souief region. The highest seed index (g) was obtained from genotypes grown at El-Minia region, but the highest values of protein % was obtained from genotypes grown at El-Faiyum location. These results are in general agreement with those obtained by Abo El-Zahab *et al.* (1992), Abou–Tour *et al.* (1996), Badr *et al.* (1998), Hassan (2000), El- Desuky (2002) and Badr *et al.* (2004), they reported that the effect of location was significant for some cotton characters.

Table 4. Effect of the four locations on all studied traits for five cultivars over two years.

Locations	Seed oil content (%)	Protein content (%)	Seed index (g)	Seed cotton yield (K/f)
Sohag	20.76	21.96	9.07	10.36
El-Minia	21.78	21.28	11.20	10.61
Beni-Souief	21.79	22.11	10.35	13.51
El-Faiyum	21.22	22.81	9.70	10.04
L.S.D (0.05)	0.06	0.05	0.20	0.48

Effect of the interaction between growing location and season:

Table 5 shows the average values of the studied cotton traits for the four locations during the two successive seasons 2001 and 2002 and indicated that the present four characters were significant due to the interaction of locations and seasons.

Table 5. Effect of growing location × growing season interaction on all studied traits.

Locations		Seed oil (%)	Protein (%)	Seed index (g)	Seed cotton yield (k/f)
Sohag	2001	21.51	22.02	8.88	9.81
	2002	20.01	21.91	9.26	10.91
El-Minia	2001	22.36	21.66	11.35	11.99
	2002	21.20	20.90	11.06	9.22
Beni-Souief	2001	22.38	21.54	10.27	14.45
	2002	21.20	22.68	10.43	12.56
El-Faiyum	2001	21.43	22.96	10.29	9.58
	2002	21.01	22.66	9.11	10.50
L.S.D	(0.05)	0.08	0.07	0.28	0.68

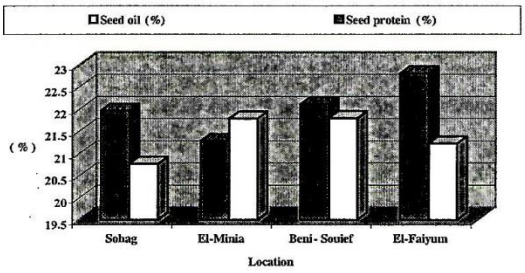

Figure 4. Effect of the four locations on seed oil and seed protein contents (%) for five cultivars over two years .

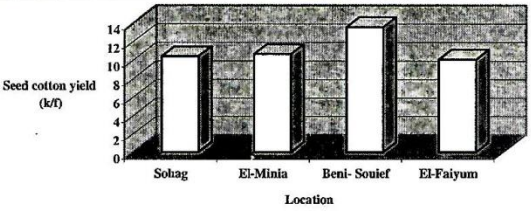

Figure 5. Effect of the four locations on seed cotton yield (k/f) for five cultivars over two years.

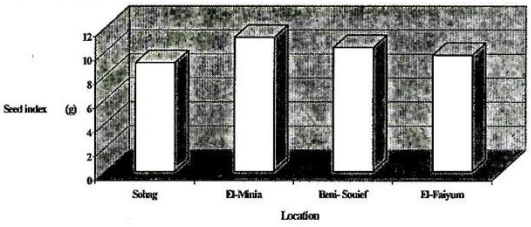

Figure 6. Effect of four locations on seed index (g) for five cultivars over two years.

The highest seed cotton yield of 14.45 k/f and oil of 22.38 % were obtained from cotton genotypes grown at Beni–Souief during the first season, protein (22.96 %) at El-Faiyum region during the first season and seed index (11.35 g) at El-Minia region during the first season. The lowest cotton yield (9.22 k/f) and protein of (20.90 %) at El-Minia region in the second season. Also the lowest oil (20.01%) at Sohag region during the second season. These some results were in according with those by Abou–Tour *et al.* (1996), El-Desuky (2002) and Badr *et al.* (2004). They reported that the effect of interaction between growing location and growing season was significant for some cotton characters.

Effect of the interaction between genotypes and growing seasons:

Table 6 shows that the average values of studied cotton characters for the interaction between genotypes and seasons, three characters showed significant effects. Seed cotton yield for both Giza 80 and Giza 90 (12.65 and 12.00 k/f, respectively) during the first season were the highest significant values.

Table 6. Effect of cotton cultivar by year interactions on all studied traits over two years combined over four locations.

Cultivars	Seed oil %		Protein %		Seed index (g)		Seed cotton Yield (k/f)	
	2001	2002	2001	2002	2001	2002	2001	2002
Giza 80	22.54	21.17	21.45	22.28	10.51	10.38	12.65	9.89
Giza 83	21.94	19.69	21.29	21.88	9.69	9.46	11.65	11.92
Giza 85	22.18	22.39	21.52	20.90	10.56	10.34	10.90	10.78
Giza 89	21.43	19.70	21.51	20.99	9.89	9.44	10.09	10.12
Giza 90	21.51	21.31	24.44	24.12	10.34	10.19	12.00	11.29
L.S.D (0.05)	0.09		0.08		n.s.		0.76	

Giza 90 during the first season gave the highest protein content and oil content (24.44 % and 22.54 %, respectively). But Giza 89 gave the lowest values for the most studied traits at the two seasons. The data indicated that genotypes under study reacted differently in different seasons. These results were generally in accordance with those obtained by Abou–Tour *et al.* (1996), Hassan (2000), El–Deusky (2002) and Badr *et al.* (2004). They reported that the effect of genotype by growing season was significant for some cotton characters.

Effect of interaction between genotypes and growing locations:

Data in Table 7 and Figures 7 – 10 show that the genotype by locations interaction was significant for all the studied traits. The highest mean values for seed

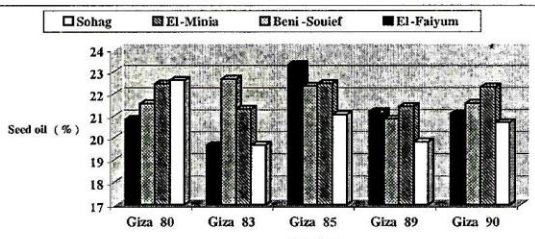

Figure 7 Effect of interaction between genotype and location on seed oil (%).

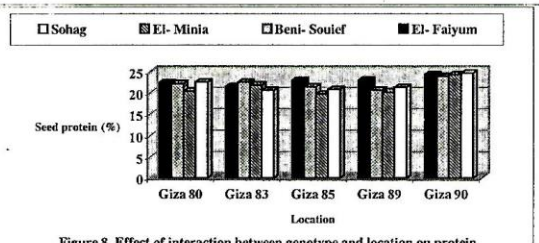

Figure 8. Effect of interaction between genotype and location on protein (%).

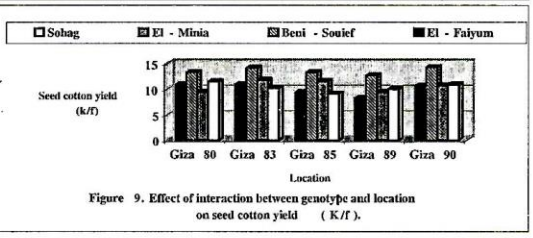

Figure 9. Effect of interaction between genotype and location on seed cotton yield (K/f).

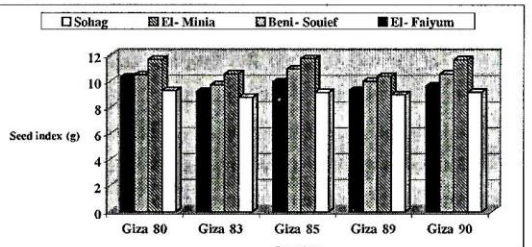

Figure 10. Effect of interaction between genotype and location on seed index (g).

cotton yield were exhibited by Giza 90, Giza 83 and Giza 85 at Beni–Souief location (14.23, 14.12 and 13.26 k/f, respectively), and the difference between them were insignificant. The highest seed index value was given from Giza 85, Giza 80 and Giza 90 grown in El–Minia region (11.74, 11.67 and 11.66 g, respectively). However Giza 90 gave the highest values for protein % character at all studied locations. But Giza 85 at El–Faiyum region gave the highest values for oil (23.31 %) and the difference between it and between all studied genotypes at all studied locations were significant. Seed oil ranged from 19.66 % for Giza 83 at Sohag location to 23.31 % for Giza 85 at El–Faiyum region. Protein ranged from 19.74 % for Giza 85 at El–Minia to 24.65% for Giza 90 at Sohag region. Seed cotton yield k/f ranged from 8.29 k/f

Table 7.Effect of cotton cultivars × locations interaction on all studied traits over four locations combined over two years.

Cultivars	Sohag	El–Minia	Beni–Souief	El–Faiyum
Oil content (%)				
Giza 80	22.60	22.44	21.55	20.84
Giza 83	19.66	21.30	22.65	19.65
Giza 85	21.04	22.45	22.34	23.31
Giza 89	19.80	21.41	20.85	21.19
Giza 90	20.69	22.29	21.56	21.10
LSD (0.05)	0.13			
Protein content (%)				
Giza 80	22.53	20.38	22.15	22.40
Giza 83	20.55	21.85	22.49	21.45
Giza 85	20.79	19.74	21.40	22.91
Giza 89	21.30	20.15	20.60	22.95
Giza 90	24.65	24.26	23.89	24.33
LSD (0.05)	0.12			
Seed index (g)				
Giza 80	9.29	11.67	10.50	10.33
Giza 83	8.77	10.57	9.74	9.22
Giza 85	9.15	11.74	10.95	9.97
Giza 89	8.97	10.38	10.01	9.32
Giza 90	9.18	11.66	10.57	9.65
LSD (0.05)	0.44			
Seed cotton yield (K/F)				
Giza 80	11.50	9.45	13.26	10.87
Giza 83	10.23	11.83	14.12	10.98
Giza 85	9.11	11.59	13.26	9.39
Giza 89	10.02	9.44	12.69	8.29
Giza 90	10.93	10.73	14.23	10.68
LSD (0.05)	1.08			

for Giza 89 at El–Faiyum region to 14.23 k/f for Giza 90 at Beni–Souief location. Seed index trait ranged from (8.77 g) for Giza 83 at Sohag region to (11.74 g) for Giza 85 at El–Minia location. These results generally corresponded with the finding of Abo El–Zahab *et al.* (1992), Abou–Tour *et al.* (1996), Hassan (2000), El–Deusky (2002) and Badr *et al.* (2004). They reported that the effect of genotype by location interaction was significant for some cotton characters.

Effect of second order interaction:

Table 8 shows that the genotypes by seasons by locations interaction was significant for all studied traits. These results were in according with those

Table 8. The average value of oil content (%), protein content (%), seed index (g) and seed cotton yield (K/f) for different combinations of varieties x locations x years.

Cultivars	Sohag		El–Minia		Beni–Souief		El–Faiyum	
	2001	2002	2001	2002	2001	2002	2001	2002
Oil content (%)								
Giza 80	23.80	21.40	23.30	21.58	21.60	21.50	21.48	20.20
Giza 83	21.10	18.23	22.60	20.00	23.90	21.40	20.18	19.13
Giza 85	21.80	20.28	22.10	22.80	22.18	22.50	22.63	24.00
Giza 89	20.20	19.40	21.33	19.50	22.50	19.20	21.68	20.70
Giza 90	20.65	20.73	22.48	22.10	21.73	21.40	21.18	21.03
LSD (0.05)	0.18							
Protein content (%)								
Giza 80	21.73	23.33	20.08	20.70	21.30	23.00	22.70	22.10
Giza 83	19.30	21.80	23.50	20.20	20.98	24.00	21.40	21.50
Giza 85	22.30	19.28	20.08	19.40	21.20	21.60	22.50	23.33
Giza 89	22.10	20.50	20.03	20.28	20.20	21.00	23.70	22.20
Giza 90	24.68	24.68	24.63	23.90	24.00	23.78	24.48	24.18
LSD (0.05)	0.17							
Seed index (g)								
Giza 80	9.16	9.42	11.54	11.79	10.33	10.67	11.01	9.66
Giza 83	8.46	9.08	10.95	10.20	9.74	9.75	9.63	8.81
Giza 85	8.80	9.49	11.94	11.53	11.00	10.90	10.49	9.46
Giza 89	8.63	9.30	10.49	10.27	10.10	9.91	10.35	8.30
Giza 90	9.36	9.00	11.83	11.50	10.20	10.94	9.95	9.34
LSD (0.05)	0.63							
Seed cotton yield (K/f)								
Giza 80	12.15	10.84	12.50	6.40	14.02	12.49	11.92	9.83
Giza 83	9.35	11.10	12.26	11.39	14.64	13.61	10.37	11.59
Giza 85	7.15	11.08	12.28	10.90	14.53	11.99	9.64	9.14
Giza 89	9.04	11.00	10.43	8.45	14.33	11.01	6.56	10.01
Giza 90	11.34	10.52	12.50	8.96	14.74	13.72	9.42	11.95
LSD (0.05)	1.52							

obtained by Abo El-Zahab *et al.* (1992), Abou-Tour *et al.* (1996) and Badr *et al.* (2004). They reported that the effects of the second interaction were significant on yield and yield components characters. Also El-Desuky (2002) and Badr *et al.* (2004), reported that this effect was significant on some cotton seed quality characters.

Correlation between studied characters:

Results in Table 9 indicate significant positive correlations for combined analysis for all genotypes were found among seed oil % and seed index, between seed cotton yield and seed index and between oil % and seed cotton yield.

Table 9. Correlation coefficients between studied traits for five Egyptian cotton cultivars and combined over two years.

Characters	Cultivars	Seed oil (%)	Protein (%)	Seed cotton yield (k/f)
Seed index (g)	Giza 80	0.020	- 0.479**	- 0.200
	Giza 83	0.405*	0.464**	0.395*
	Giza 85	0.156	- 0.431*	0.636**
	Giza 89	0.242	- 0.273	0.127
	Giza 90	0.888**	- 0.317	0.002
	Comb.	0.389**	- 0.051	0.181*
Seed oil (%)	Giza 80		- 0.450**	0.312
	Giza 83		0.156	0.521**
	Giza 85		0.614**	- 0.135
	Giza 89		0.166	0.186
	Giza 90		- 0.283	0.137
	Comb.		0.094	0.200*
Protein (%)	Giza 80			0.143
	Giza 83			0.453**
	Giza 85			- 0.403*
	Giza 89			- 0.574**
	Giza 90			- 0.254
	Comb.			0.009

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

Insignificant negative correlation for combined analysis for all genotypes were found among seed index and protein %. But insignificant positive between (seed oil % and protein %) and between (protein % and seed cotton yield).

Regarding to correlation for single cultivar, it was obvious that the commercial variety Giza 85 gave significant positive correlation among seed oil content % and protein content %. It is recommended by this correlations in the breeding program to improve seed quality. Some our results were in accordance with those obtained by

Badr *et al.* (1998) and Badr *et al.* (2004), they reported that the relationship between seed cotton yield and seed index was positive correlation and significant. El–Kilany *et al.* (1980), El–Desuky (2002) and Badr *et al.* (2004), reported that the correlation among seed oil content % and protein content % was negative and significant.

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دراسة مقارنة على محصول القطن الزهر ومحتوى الزيت والبروتين في بذور بعض أصناف القطن المصري التجارية والمنزرعة في عدة مناطق

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يهدف هذا البحث إلى دراسة تأثير التركيب الوراثي وموسم الزراعة على صفات محصول القطن الزهر ومعامل البذرة وكذلك على جودة البذور (محتوى الزيت والبروتين) لبعض أصناف القطن المصري طويلة التيله (جيزة ٨٠ – جيزة ٨٣ – جيزة ٨٥ – جيزة ٨٩ – جيزة ٩٠) والمنزرعة في عدة مناطق (سوهاج – المنيا – بنى سويف – الفيوم) خلال موسمي ٢٠٠١ ، ٢٠٠٢.

وقد أظهرت الدراسة أن تأثير الأصناف والسنوات والمناطق والتفاعل بين الأصناف و المناطق وكذلك التفاعل بين الأصناف والمناطق والسنوات كان عالي المعنوية لجميع الصفات تحت الدراسة بينما كان التفاعل بين الأصناف والسنوات غير معنوي لصفة محتوى البروتين % .

تفوق الصنف جيزة ٨٥ معنويا على باقي الأصناف التي تم دراستها في نسبة الزيت % – بينما كان الصنف جيزة ٨٩ أقل الأصناف إنتاجية في جميع الصفات تحت الدراسة (نسبة الزيت % – نسبة البروتين % – معامل البذرة – محصول القطن الزهر قنطار / فدان) .

تفوق الصنف جيزة ٩٠ في صفة نسبة البروتين % والمحصول الزهر قنطار / فدان معنويا على الأصناف الأخرى المنزرعة معه في جميع المناطق .

أظهرت النتائج أن المتوسط العام لجميع الأصناف التي زرعت في منطقة بنى سويف في كلا الموسمين قد تفوقت على باقي المناطق تحت الدراسة في صفتي المحصول الزهر (قنطار / فدان) ونسبة الزيت %.

أوضحت النتائج أن هناك ارتباط موجب ومعنوي بين صفتي (نسبة الزيت % ومعامل البذرة) وبين صفتي (محصول القطن الزهر قنطار / فدان ومعامل البذرة) وبين (نسبة الزيت % ومحصول القطن الزهر قنطار / فدان) .

بينما أوضحت نتائج الارتباط لكل صنف على حده بان هناك ارتباط موجب ومعنوي بين نسبة الزيت % ونسبة البروتين % وذلك للصنف جيزة ٨٥ .