COMPARATIVE STUDY OF FIBER PROPERTIES AND YIELD OF FIVE NEW EGYPTIAN COTTON CULTIVARS

SAMY S. M.BADR AND M.A. ABDEL-AZIZ

Cotton Research Institute, Agricultural Research Centre, Giza, Egypt.

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Abstract

Two field experiments were carried out at Sakha Research Station in two successive seasons; 1997 and 1998 to study the variation and correlation of some new Egyptian varieties in yield components, technollogical, chemical and yarn strength. Five Egyptian cotton cultivars were included in this study, two of them belong to the extra-long staple category i.e. Giza 87 and Giza 88, and three belong to the long staple category i.e. , Giza 85, Giza 86 and Giza 89

The effect of genotypes was highly significant for the studied traits except for lint sugar and wax percentage.

The effect of different growing season was significant for all studied traits except seed index, 50% span length, Presely index, cellulose and wax percentages. The effect of interaction between cotton cultivars and growing season was significant for seed index, 2.5 % span length, micronaire reading, hair weght, Presely index, cellulose %wax % and yarn strength.

Positive significant correlations were found between seed cotton yield, lint cotton yield woith boll weight/g, lint percentage, maturity ratio, hair weight and yarn strength-boll weight/g with lint percentage, seed index, micronaire reading and cellulose % maturity ratio with seed index and lint strength. Also, positive interrelationhips were found among 2.5%, 50% span length with micronaire reading, fineness, hair weight, and yarn strength-yarn strength with wax % and sugar %. Negative correlations were recorded between lint span length and boll weight, seed index, lint percentage and cellulose % -Presely index and lint percentage.

INTRODUCTION

Many investigators reported that the genotypes and genotype-environmental interaction were significant for fiber length parameters (2.5% and 12.5% span length), micronaire reading, fiber maturity, flat bundle tensile properties, cellulose % and wax % of cotton lint (Eweida et al., 1984), seed index, boll weight and lint percentage (Aboue El-Zahab et al., 1992) yield, yield components, physical lint properties except fiber length parameter, fiber and yarn strength (Badr, 1994), seed cotton yield, lint cotton yield, boll weight, lint percentage, seed index, micronaire reading and fiber strength (Seyam et al., 1994), yield and yield components except seed index, physical and mechanical lint parameters except 50% span length were affected by different varieties (El-Akhdar, 1995), as well as lint cotton yield, seed

index, lint percentage, micronaire reading and 2.5% span length (Abou Tour et al., 1996). However, insignificant genotype environment interaction was reported for both micronaire reading and fiber strength (Abou El-Zahab *et al.,* 1992).

Many investigators reported on the relations and the correlations between different traits: positively significant between seed cotton yield and boll weight, fiber length and linear density (Nsrallah, 1987), hair weight, maturity ratio and micronaire readings (El-shaer *et al.,* 1984), boll weight and seed index (Seyam *et al.,* 1984), lint strength and lint length (Abdel-Fattah *et al.,*1990), lint cotton yield, and micronaire reading. However, negative significant correlations were found between lint cotton yield and mean length and between micronaire reading and mean length (Abou- Tour *et al.,* 1996).

The aim of the present investigation was to study the variation and correlation in yield components, physical, mechanical, chemical and yarn strength characteristics of five new Egyption cotton varieties as well as the interrelationshios among the studied properties. It also aimed to choose the best variety for Kafr El-Sheikh region.

MATERIALS AND METHODS

Two field experiments were conducted in 1997 and 1998 seasons at Sakha Agricultural Research Station, ARC, Kafr El-Sheikh. Five new Egyptian cotton varieties were used in this study, nemely; Giza 87, Giza 88 (Extra- long staple), Giza 85, Giza 86 and Giza 89 (long staple varieties).

A randomized complete block design was used with four replications. The plots were five rows each of four meters long and 0.6 meter apart. Distance between hills was 20 cm and each hill was thinned to two plants. Sowing date was 5 April in both seasons. Normal cultural practices were followed according to the Ministry of Agriculture recommendations. Data were recorded on the three-middle rows for the following characteristics:

1. Yield and yield components

Seed cotton yield (S.C.Y). lint cotton yield (L.C.Y.) (Kentar/feddan), boll weight in grams, seed index as average weight of 100 seed in grams, lint percentage as the ratio of the lint cotton weight to seed cotton weight expressed as a percentage.

2. Lint properties

Fiber length parameters i.e. staple length (2.5% S.L.) and mean length (50 % S.L. in mm), were tested by the Digital Fibrograph method according to A. S. T. M. (D.1447-67). Fiber fineness and maturity, was measured by fineness/maturity tester (FMT) according to A.S.T.M. (D-3818-79). Micronaire reading was tested according to A.S.T.M. (D-1448). Fiber hair weight (Linear density determined as weight per centimetr expressed in millitex units according to the routine method used at C.R.I. Fiber strength : measured by Pressley according to A.S.T.M (D.3818-79). Yarn strength quoted as the product of lea strength in pounds X yarn count, 60's carded and twist multiplier 3.6.

3.Fiber chemical composition

Reducing sugar content, was determined according to Smith et al. (1956). Tolal wax in cotton was determined according to Conrad (1944). Laumer's 1965) methods was carried out to determine cellulose content.

All samples were tested under controlled atmospheric conditions of 65±2% reltive humidity and 20^{o}C at the laboratories of C.R.I., ARC, Giza, Egypt.

The analysis of variance (Snedecor and Cochran, 1967) was computed for each experiment, combined analyses for cultivars and growing seasons as diffeerences between means were tested by least sinificant diffeerences (LSD).

RESULTS AND DISCUSSION

I.Cotton varietal diffrential

Data presented in Tables (1and 2) cleared significant effect of different cotton varieties on yield, yield components, physical, mechanical properties of fiber and yarn strength except for sugar and wax contents.

The differences between varieties may be due to the differences in the gentical make up. With respect to extra long staple varieties it can be seen that the two varieties had nearly the same fiber strength values, however, Giza 88 was the coarser and surpassed Giza 87 variety in yield and yield components as in seed cotton yield by 2.14 K/f and about four kentars in lint yield, 0.25 g in boll weigth, 1.33 g in seed index and 6.26 % in lint percentage. While Gize 87 variety had higher values for both 2.5% and 50% span length, yarn trength, cellulose % and wax %.

Regarding the long staple varieties, it can be noticed that Giza 86 variety surpassed the two other varieties in seed cotton yield (K/F), lint cotton yield, boll weight, seed index, maturity ratio and yarn strength, however Giza 85 variety gave higher values fer both Lint percentage and cellulose percentage. On the other hand, Giza 89 variety was the coarser and had higher values for 50% span Length hair weight, Pressley index and wax prcentage These results were in harmony with those of Badr (1994) for yield components, physical fiber properties and yarn strengh, with Seyam et al. (1994) for seed and lint cotton yield, boll weight, Lint percentage, seed index, micromaire reading and fiber strength and with Abou- Tour et al. (1996) for lint cotton yield, seed indx, lint percentage, micronaire reading and 2.5% span length.

2.Effect of growing season

Tables (1 and 2) exhibited the average vlues of studied cotton traits as affected by diffrent growing season. The data indicated that the studied characters did not gave similar values in the two season, but some were better in the first season, mainly yield and its components, while in the second season the quality properties of fiber and yarn were the better.

3. Effect of the interaction between the cotton cultivars and growing season

Date presented in Tables 1 and 3 Showed the average valuess of studied characteritics for five new Egyptian cotton cultivars grown in two successive season. The interaction was significant for lint percentage, 2.5% span legth, 50% span length, micronaire reading, hair weight, Presley index, yarn strength, cellulose percentage and wax percentage. These rsults are in agreement with those obtained by Badr (1994).

4. Correlations between characters

Results in Table (4) indicate thats boll weight recorded positive and significant correlation with lint cotton yield, lint percentage, seed index, hair weight, cellulose%, but it was negative with 2.5% S.L., Presely index, yarn strength and wax %. Seed cotton yield (K/fed) gave positive significant correlation with lint cotton yield (k/fed), lint percentage, maturity ratio, hair weight and yarn strength, while negative significant correlations were obtained with micronaire reading, 2.5% S.L., 50% S.L., Pressly index, cellulose % and wax%. Positive significant correla-

Table 1. Analysis of variance of yield components, physical chemical properties of fiber and yarn strength of five new Egyptian cotton cultivars in two seasons.

Source of variance	Cultivar V	Year Y	Interaction VXY	Error
Degree of freedom	4	1	4	24
Seed cotton yield (k/fed)	4.92*	64.69 **	0.23	1.55
Lint cotton yield (k/fed)	17.89 **	102.50**	1.46	2.26
Boll weight (g)	0.229**	0.225*	0.035	0.034
Seed index (g)	4.453**	3.364*	0.543	0.493
Lint percentage %	56.13**	9.31**	4.391 **	0.719
2.5% Span length	43.14**	9.00**	0.603 **	0.423
50% Span length	12.01**	0.064	0.467	0.222
Micronaire reading	1.06***	1.09**	0.229**	0.016
Hair weight	1588.35**	230.40**	384.15**	11.40
Maturity ratio %	38.025**	874.23**	1.725	2.558
Pressley index	5.29**	0.324	0.4965**	0.0832
Yarn strength	588889.7**	1564203.0**	27007.06**	5573.958
Cellulose % C	1.961**	0.075	3.034**	0.342
Sugar %	0.001	0.004**	0.001	0.0004
Wax %	0.100	0.014	0.213*	0.059

* ** Significant and highly significant at 0.05 and 0.01 level, respectively

Table 2. Effect of genotypes and growing seasons on yield, yield components, physical and chemical properties of fiber and yarn strngth of five new Egyptian cotton cultivars in two seasons.

Characters	Cultivars					Season	
	Giza 87	Giza 87	Giza 85	Giza 86	Giza 89	First	Second
Seed cotton yield (k/fed)	7.17 c*	9.31 a	8.24 bc	8.70 ab	8.47 b	7.11 b	9.91 a
Lint cotton yield (k/fed)	7.14 b	11.12 a	9.90 a	10.26 a	9.79 a	8.04 b	11.24 a
Boll weight (g)	2.69 c	2.96 b	2.91 b	3.16 a	2.95 b	2.86 b	3.01 a
Seed index (g)	9.86 b	11.19 a	11.10 a	11.64 a	10.16 b	11.08	10.50
Lint percentage %	31.65 c	37.91 a	38.02 a	37.23ab	36.45 b	35.77 b	36.73 a
2.5% Span length	35.38 a	35.25 a	30.23 d	31.50c	32.00 b	33.02 a	32.72 b
50% Span length	17.82 a	17.57 b	15.25 d	15.30 d	16.15 c	16.46	16.38
Micronaire reading	3.20 d	3.83 b	3.55 c	3.90 d	4.15 a	3.89 a	3.56 b
Hair weight	117.75 d	139.75 b	130.50 c	148.00 b	153.0 a	153.4 a	140.2 b
Maturity ratio %	76.0 b	78.0 a	72.0 c	76.0 b	75.40 b	80.15 a	70.80 b
Pressley index	11.40 a	11.55 a	9.68	10.15 b	10.38 b	10.72	10.54
Yarn strength	3007 a	2814 b	c2415 d	2495 c	2397 d	2428 b	2823.5 a
Cellulose % C	96.94 b	96.53 b	96.69 b	97.67 a	97.49 a	97.02	97.11
Sugar %	0.25	0.25	0.23	0.25	0.24	0.24 b	0.25 a
Wax %	0.84	0.66	0.58	0.58	0.74	0.70	0.66

* Means followed by the same letter(s) within a character are not significantly different at 0.05 level.

Table 3 . Effect of variety-growing season interaction on yield, yield components, physical and chemical fiber properties and yarn strength of five new Egyptian cotton cultivars in two seasons.

Characters		Cotton Cultivars					LSD	
		Giza 87	Giza 88	Giza 85	Giza 86	Giza 89	5%	1%
Seed cotton yield (k/fed)	1st	6.11	8.07	7.08	7.26	7.03	NS	-
	2nd	8.24	10.56	9.41	10.15	9.91		
Lint cotton yield (k/fed)	1st	6.16	9.64	8.36	8.27	7.78	NS	-
	2nd	8.12	12.60	11.44	12.25	11.81		
Boll weight (g)	1st	2.55	2.83	2.90	3.07	2.95	NS	-
	2nd	2.83	3.10	2.93	3.25	2.95		
Seed index (g)	1st	10.23	11.08	11.40	11.93	10.78	NS	-
	2nd	9.50	11.30	10.80	11.35	9.55		
Lint percentage %	1st	32.08	37.97	37.53	36.18	35.10	1.24	1.68
	2nd	31.22	37.85	38.52	38.28	37.80		
2.5% Span length	1st	35.15	35.50	30.45	31.50	32.50	0.30	0.41
	2nd	35.60	35.00	30.00	31.50	31.50		
50% Span length	1st	17.70	17.80	15.50	15.00	16.30	0.22	0.29
	2nd	17.95	17.35	15.00	15.60	16.00		
Micronaire reading	1st	3.40	3.95	3.90	3.80	4.40	0.19	0.25
	2nd	3.00	3.70	3.20	4.00	3.90		
Hair weight	1st	118.00	133.00	136.00	136.00	154.00	4.93	6.68
	2nd	117.50	146.50	125.00	160.00	152.00		
Maturity ratio %	1st	81.00	82.00	77.00	81.00	80.00	NS	-
	2nd	71.00	74.00	67.00	71.00	71.00		
Pressley index	1st	11.30	11.90	10.05	10.05	10.30	0.42	0.57
	2nd	11.50	11.20	9.30	10.25	10.45		
Yarn strength	1st	2812	2682	2130	2280	2235	109	147
	2nd	3201	2946	2700	2710	2560		
Cellulose % C	1st	96.34	96.31	96.64	98.67	97.14	0.85	1.16
	2nd	97.53	96.75	96.75	96.67	97.83		
Sugar %	1st	0.25	0.23	0.24	0.24	0.22	-	-
	2nd	0.26	0.27	0.23	0.26	0.26		
Wax %	1st	1.03	0.67	0.67	0.33	0.82	0.35	-
	2nd	0.66	0.67	0.50	0.83	0.66		

NS not significant

Table 4 .Correlation coefficients between studied traits of five Egyptian cotton cultivars combined over two years.

Traits		X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15
Seed cotton yield (k/fed)	X1	0.432**	0.483**	0.485**	0.435**	0.285*	0.236	0.552**	0.335*	0.410**	0.277	0.124	0.299*	0.185	0.134
Lint cotton yield (k/fed)	X2		0.975**	0.433**	0.087	0.064	0.501**	0.360*	0.092	0.073	0.131	0.327*	0.041	0.233	0.218
Boll weight (g)	X3			0.617**	0.164	0.046	0.482**	0.448**	0.209	0.191	0.212	0.199	0.067	0.187	0.231
Seed index (g)	X4				0.385**	0.423**	0.028	0.564**	0.534**	0.53**	0.407**	0.351*	0.100	0.052	0.207
Lint percentage %	X5						0.300*	0.217	0.247	0.356 *	0.238	0.375**	0.084	0.246	0.213*
2.5% Span length	X6						0.432**	0.795**	2.252	0.253	0.094	0.676**	0.020	0.262	0.067
50% Span length	X7							0.067	0.337*	0.271	0.373**	0.401**	0.028	0.287*	0.050
Micronaire reading	X8								0.351*	0.354*	0.256	0.379**	0.077	0.038	0.056
Hair weight	X9									0.960**	0.889**	0.655**	0.209	0.223	0.287*
Maturity ratio %	X10										0.888**	0.634**	0.314*	0.178	0.317*
Pressley index	X11											0.512**	0.221	0.130	0.157
Yarn strength	X12												0.177	0.414**	0.147
Cellulose % C	X13													0.167	0.281*
Sugar %	X14														0.363**
Wax %	X15														1.000

*** Significant and highly significat at 0.05 and 0.01 level, respectively.

tions were recorded between lint cotton yield (k/fed) and lint percentage, maturity ratio, and hair weight, while negative significant correlations were recorded with 2.5% S.L., % S.L. Pressley index, cellulose % and wax%. Lint percentage had positive significant correlations with seed index, micronaire reading and, hair weight and negative significant correlations with 2.5% S.L., Pressley index, yarn strength and cellulose%. Seed index had positive significant correlation with maturity ratio, while negative significant correlations were found with 50% S.L., yarn strength, and wax%. Positive significant correlations were recorded between micronaire reading, maturity ratio and hair weight, while negative significant correlation was recorded with yarn strength. Maturity ratio gave positive significant correlations with 2.5% span length and pressely index, while negative significant correlations were found with yarn strength and sugar percentage. Hair weight had negative significant correlations with 50% span length and yarn strength. Span length(2.5%) had positive significant correlations with 50% span length, Pressely index, yarn strength and wax percentage. Positive sighnificent correlations were found between 50% S.L. and Pressley index, yarn strength and wax %, while negative significant correlations were found with cellulose%. Pressley index had positive significant correlation with yarn strength. Positive correlation was found between yarn strength and sugar %. Cellulose % had negative significant correlation with wax %. Positive significant correlation was found between sugar% and wax%.

These results were in accordance with those obtained by El-Sheikh *et al.* (1995) and Abou- Tour *et al.* (1996).

REFERENCES

1. Abdel- Fattah, M.Kh, A.R. Ashour and T.A. Nafisa 1990. Mechanicel and struchral properties as affected by different group lengths in some Egyptian cotton cultivars. Ann. Agric. Sci. Moshtohor 28 (3):1403-1414.

2. bou El-Zahab, A.A., F.F. Saad, M.A. El-Kilany and A. Abdel-Ghani 1992.Cultivar environment interaction in Egypt. 1. Seed cotton yield and its components.2. Fiber quatity. Proc. 5th Conf. Agron., Zagazig Univ., 2:775-788.

3. Abou-Tour, H.B., S.M. Seyam and L.M.A. Abd El-Rahman 1996. Analytical study on the economic characters of new and commercial Egyptian cotton varieties. Agric. Res. Rev., 74(3): 781-791.

4. Abou-Tour, H.B., M.M. Awaad, L.M. Haikal and S.S.B. Badr 1996. Stepwise regrssion analyser of the primary lint yield component of Egyption cotton. Egypt. J. Appl. Sci., 11(3): 139-143.

5. ASTM 1984. American Society for Testing and Materials"D:1447-83,D:3818-79, and D:1445-75.

6. ASTM 1967. American Society for testing and materials. Standards of Textile Materials. D: 1445-67, D: 1448-67 and D: 2253-67-70. The association, Philadelphia, USA.

7. Badr, S.S. M. 1994. Studies on lint, yarn and seed qualities of cotton as affected by differnt locations in Egypt. Ph.D. Theseis, Fac. Agric., Seba Basha, Alex. Univ.

8. Conrad, C.M. 1944. Determination of wax in cotton fiber. A new alcohol extraction method. Ind. Eng. Chem. Anal. 16:745.

9. El-Akhdar, A.A.A. 1995. Studies on yields and yield componests of some Egyptian cotton varieties. M.Sc. Thesis, Agric., Saba Basha, Alex. Univ.

10. El-Shaer, M.H., Reda Shabana, A.H. El-Shiekh and Laila M.A. Abd El-Rahman 1984. Path coefficient analysis of some character contributing to yield and quality of cotton. Ageic. iRes. Rev., Vol. 62(6):23-31.

11. El-Sheikh, A.H., M.A.M. Ghorab ands A.M. Ismal 1995. Fiber mechanical properties as related to physical and structural properties of the Egyptian cotton. Egyptian Cotton Gzette.

12. Eweida, M.H.T., M.A. Rizk, N.I. Darwish and A.I.Yousef 1984. Effect of cotton varieties and location on the chemical contents and physical properties of cotton fibers. Agric. Res., Egypt. Vol. 62(6): 251-258.

13. Launer, H.F. 1965. Determination of cellulose. Heat of dilution Dichormate method-methods in carbohydrate chemistry, Ch. (7):29-31. Academic Press, New York.and London.

14. Nsrallah, A.K. 1984. Evaluation of Upland cotton Varieties and interrelationships among studied traits. Com. in Sci. Dev., 18:73-89.

15.Seyam, S.M., A.A. Abo El-Zhab, H.N., El-Rassas, F.M. El-Rayes 1984. The use of stepwise regression analysis in determining characters for yield selection in Egyptian cotton. Agric. Res. Egypt., 62:41-47.

16. Seyam, S.M., L.M.A. Abdel-Rahman, H,B. Abou-Tour and S.S. Badr 1994. Genotypic stability for some Egyptian cotton cultivars under different environments. Egypt. J. Appl. Sci., 9:135-146.

17. Smith, F., M.A. Gills, J.K. Hamilton, J.K. Robers and P.A. Bu Bois 1956. Calorimetric method for determination of sugar and related substances. Analysis Chemis. Cpt. 28,pp.350.

18.Snedecor, D.M. and W.G. Cochran 1967. Statistical Methods. 6 th. Ed., Iowa State Univ. Press, Ames, Iowa, USA.

دراسة مقارنة لصفات الألياف والمحصول لخمسة أصناف حديثة من القطن المصرى

سامى سعد بدر محمد عبد المجيد عبد العزيز

معهد بحوث القطن - مركز البحوث الزراعية

أجرى هذا البحث بمنطقة كفر الشيخ خلال موسمى الزراعة ١٩٩٧ -١٩٩٨ لدراسة التباين والارتباط والمقارنة بين صفات المحصول والصفات الفيزيائية والميكانيكية والكيمائية للالياف وكذا متانة الغزلس لخمسة أصناف من القطن المصرى الحديثة وهى جيزة ٨٧ وجيزة ٨٨ ، من طبقة الاقطان فائقة الطول ، جيزة ٨٥ جيزة ٨٦ وجيزة ٨٩ من طبقة الاقطان الطويلة

صممت التجربة بطريقة القطاعات العشوئية الكاملة وتمت جميع المعاملات الزراعية طبقاً لتوصيات وزارة الزراعة وكان الميعاد هو ٥ أبريل في كلا الموسمين. وأشارت النتائج التى تم الحصول عليها إلى:

١. إختلاف الأصناف معنوياً فيما بيتهما فى جميع الصفات التى تم دراستها فيما عدا النسبة المئوية لكل من الشمع والسكر بالتيلة.

٢. داخل مجموعة الأصناف فائقة الطول تفوق الصنف جيزة ٨٨ فى كل من صفات المحصول ومكوناته بينما تفوق الصنف جيزة ٨٧ فى طول التيلة عند ٢,٥٪ ، ٥٠٪ span length ومتانه الغزل وكذا النسبة المئوية لكل من السكر والشمع.

٣. داخل مجموعة الأقطان الطول تفوق الصنف جيزة ٨٦ فى صفات المحصول ومكوناته ومتانة الغزل بينما تفوق الصنف جيزة ٨٥ فى تصافى الحليج والصنف جيزة ٨٩ كان الأكثر خشونة والأعلى نعومة بالوزن .

٤. كان لموسم الزراعة تأثير معنوية على الصفات التى تم دراستها وبصفة عامة كانت صفات المحصول ومكوناته أعلى فى الموسم الأول وصفات الجودة للتيلة ومتانة الغزل أعلا فى الموسم الثانى.

٥. أعطى تفاعل التركيب الوراثى مع موسم الزراعة تأثير معنوياً على صفات معامل البذرة ، معدل الحليج . طول التيلة عند نسبة التوزيع ٢,٥٪ span length ، قراءة الميكرونير ، النعومة بالوزن ، معامل البريسلى ، نسبة السليولوز ، متانة الشلة.

٦. وجد أن هناك إرتباط معنوى موجب بين محصول القطن الزهر والشعر للفدان وكل من وزن اللوزة ، معدل الحليج ، نسبة النضج ، النعومة بالوزن ، ومتانة الشلة.

٧. كان الارتباط معنوياً وموجباً بين وزن اللوزة بالجرام وكل من معدل الحليج معامل البذرة ، قراءة الميكرونير ، التعومة بالوزن ونسبة السليولوز .

٨. هناك إرتباط معنوى موجب بين نسبة نضج التيلة وكل من معامل البذرة ، الطول النعومة بالوزن ، متانة التيلة ونسبتى السكر واالشمع ومتانة الغزل.

٩. وجد إرتباط معنوى سالب بين كل من طول التيلة وكل من وزن اللوزة بالجرام ، معدل الحليج ، معامل البذرة ، النسبة المئوية للسلليلوز وأيضا بين معامل البريسلى ومعدل الحليج.