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GINNING OUT-TURN AND ITS CMPONENTS IN RELATION TO LINT GRADE AND FIBER QUALITY IN EGYPTIAN COTTON

BY

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ABSTRACT

The present study was carried out to verify the importance of the factors affecting ginning out-turn (GOT) and its relation with lint grade and fiber quality. The materials used in this study included the two extra-long staple varieties Giza45 and Giza 88 as well as the two long staple varieties Giza 86 and Giza 90. The main five grades of seed cotton, i.e. FG, G, FGF, GF and FF pertaining to each variety were ginned to determine ginning out-turn and its components and fiber quality properties.

The results showed that ginning out-turn (GOT), seed index (SI) and lint index (LI) differed significantly among lint grades within the same cotton variety. In some instances, a low grade had SI value more than a high grade; the opposite occured in other cases. The same trend was obtained for GOT. Lint index was highly correlated with lint grade followed by seed index and ginning out-turn However, the later was in some cases insignificantly correlated with lint grade (Giza 90 at 2004 season).

Because of the significant relation of ginning out-turn and its components with lint grade, so the seed index, ginning out-turn and lint index were significantly correlated with each of lint grade characters, fiber quality properties and yarn quality, for exception, the correlations were insignificant in some aspects.

INTRODUCTION

Ginning out-turn (GOT) is one of the most important characters that have a direct effect on cotton yield per feddan. Thus, it is highly considered in the evaluation of cotton price. Ginning out-turn is a complex character that is governed in principle, by seed weight and lint weight. GOT is defined as the percentage of the seed cotton, which is lint.

Ginning out-turn (GOT) is predominately a varietal character, which is polygenic in inheritance. Kamal and Ragab (1991) pointed out that the extra-long staple varieties mostly yield ginning out-turn lower than the short staple types. Nevertheless, high heritability estimates were reported for (GOT) indicate that it is slightly affected by the environmental conditions (Ghoneim, 1978).

Fiber density on seed coat is the most important character associated with ginning out-turn. Each component character should be assigned appropriate weight in order to bring about a rational improvement in ginning out-turn. However, Singh and Bains (1968) concluded that the importance of lint index and seed index which with their due weights could account for about 70% of the total variability in ginning out-turn. Thus, a compromise between lint index and seed index brought about by assigning their weights would lead to maximum improvement in ginning out-turn.

Concerning the factors affecting ginning out-turn, El-Ganayni *et al.* (1984) pointed out that the plants topped on 15 June resulted in the highest seed index, lint percentage and lint index. Eweida *et al.* (1984) found that the roller tension levels, the feeding rates and cleaning lint significantly affected lint percentage.

Several works confirmed presence of high association among ginning out-turn and lint cotton grade and fiber quality characterristics. Abdel-Mohsen and Ahmed (1978), Hegab *et al.* (1981), Ahmed *et al.* (1983) and Al-Shafei (1989) stated that highly significant correlation coefficients were found for ginning out-turn with lint grade, trash content, reflectance percentage (Rd%) and micronaire value. El-Shiekh and Abdel-Rahman (1986) pointed out that the values of lint percentage, mean length, length uniformity, and yarn strength tended to increase with motes removal, whereas, neppiness tended to decrease. Davidonis *et al.* (2005) revealed that mean fiber length and cell wall thickness (maturity) were positively correlated with final seed weight. The decrease in length variability is paralleled with an increase in cell wall thickness. However, strategies to increase the number of seeds per boll may reduce micronaire value and increase length variability.

Increasing yield still has a higher priority in breeding than increasing fiber quality; in this respect, Meredith (2003) pointed out that the increase in yield have been mainly due to increase in lint percentage and micronaire value.

Because of the unexpectedly high values of ginning out-turn exhibited by the extremely low grades, it seems that GOT has no direct relation to lint cotton grades. Neverthless, in commercial transactions, it was recommended by Kamal and Ragab (1991) that the price differences between the successive grades having a constant ginning out-turn, should be maximized, while the price differences between the consecutive units of ginning out-turn for a given grade, should be minimized.

MATERIALS AND METHODS

For the present study four commercial cotton varieties from 2004 and 2005 seasons representing the two categories of staple length, i.e. Giza 45 and Giza 88 belong to the extra-long staple category and Giza 86 and Giza 90 belong to the long staple class were used.

The main five grades of seed cotton, namely Fully Good (FG), Good (G), Fully Good Fair (FGF), Good Fair (GF) and Fully Fair (FF) of each variety were supplied by different exporting companies.

Four samples from each lot of 945 grams each were ginned to determine ginning out-turn (GOT) expressed as weight of lint cotton produced from seed cotton and to determine seed index (SI) expressed as the weight of 100 seeds and lint index (LI) was derived as follows, LP = GOT / 3.15 and LI = SI* LP / (100 - LP).

Where LP is lint percentage, GOT is ginning out-turn, SI is seed index and LI is lint index.

From each lint grade sub samples of 100 grams each were drawn to determine the raw fiber characteristics using the High Volume Instrument (HVI-900) according to ASTM (D:4605-86) as follows; Cotton colour expressed as reflectance percentage (Rd%), trash content (TC) measured as a percentage, Micronaire value as a measure of maturity and fineness, fiber length parameters; fiber length expressed as Upper Half Mean (UHM) and length uniformity expressed as uniformity index (UI) and fiber strength in g/tex at 1/8 inch gauge. The data of these aforesaid fiber characteristics are displayed directly on the monitor of HVI instrument without any calculations.

All fiber tests were carried out at the Grading, Fiber and Ginning Research Departments in the Cotton Research Institute (CRI) of Agriculture Research Center (ARC) under controlled conditions of 65± 2% relative humidity and of 70° F temperature. For convenience, the grades were converted into a commercial code, according to the system adopted by Cotton Grades Research Section (1973) as follow:-

Abbreviation	Code
FG	33
G	25
FGF	17
GF	9
FF	1

For the purposes, a completely randomized design with four replicates and factorial arrangement of treatments was used. All data obtained were computed using COSTAT statistical program for the analysis of variance of fiber and out-turn components for lint grades in each variety. LSD was used as the test criterion to compare means. Simple correlation coefficients were calculated between all possible pairs of traits.

RESULTS AND DISCUSSION

1- Ginning out-turn and its components in relation to lint grades:

As shown in Table (1), there were significant differences in seed index (SI), ginning out-turn (GOT) and lint index (LT) among lint cotton grades within each cotton variety through 2004 and 2005 seasons. It could be noted that the increase of ginning out-turn is associated with the increase of lint index. It is worth mentioning that infrequently, a low cotton grade might have a seed index (SI) value higher than a high cotton grade. For instance, the low grade FF of Giza 88 and Giza 86 varieties showed rather higher indexs then the two higher grades FGF and GF at 2005 season. Relatively, the same trend is obtained for ginning out-turn (GOT), for instance, the low grade FF of Giza 90 variety at 2004 season gave higher GOT than FG grade. On the other hand, lint index (LI) for all varieties showed decrease with the lowering cotton grades.

Table (2) showed the high relation of seed index (SI), ginning out-turn (GOT) and lint index (LI) with lint cotton grade. Likewise, simple correlation coefficients of these parameters with lint grades were positive and highly significant. These results are in harmony with *Singh and* Bains (1968), Hegab *et al.* (1981) and Al-Shafei (1989) findings where they pointed out that the lint grade increased with the increase of seed index, lint index and ginning out-turn.

It could be seen that the higher correlations were those of lint index followed by seed index and later comes ginning out-turn. The lowest correlation value of seed index was for Giza 88 at 2005 season and the lowest value of ginning out-turn was for Giza 90 at 2004 season, that may account for by the higher values of seed index and ginning out-turn of low grades than higher grades in the two cases, as shown in table (1). These results are in agreement with that found by Kamal and Ragab (1991) when stated that the low grades may exhibited unexpectedly high values of ginning out-turn than high grades .

2- The relation of ginning out-turn and its components with lint cotton grade properties:

The results obtained in Table (3) showed that ginning out-turn (GOT), seed index (SI) and lint index (LI) manifested significant and negative correlation coefficients with trash content (TC), whereas, the correlations were positive and significant with reflectance percentage (Rd%) and micronaire value (Mic.). These results are in harmony with the findings of Eweida *et al.* (1984), Hegab *et al.* (1981) where they found high significant relations of TC, Rd% and Mic. with seed index, lint index and lint percentage, whereas, Meredith (2003) related the increase of lint yield with the increase of lint percentage and micronaire value .

It could be noted that insignificant correlations were exhibited for seed index with trash content for Giza 88 at 2005 season, and ginning out-turn with trash content, reflectance percentage and micronaire value for Giza 90 variety at 2004 season.

3- The relation of ginning out-turn and its components with fiber quality properties:

It could be seen clearly from data in Table (4) that fiber length (UHM), length uniformity (UI) and fiber strength (F. St.) exhibited highly significant and positive correlation coefficients with seed index, ginning out-turn and lint index except in some cases, especially in Giza 90 variety at 2004 season and Giza 86 variety at 2005 season, the correlations were insignificant. These results agree with that found by El Shiekh and Abdel-Rahman (1986) where they pointed that fiber

strength, mean length and lingth uniformity are related with increasing lint percentage. Wheras, Davidonis *et al.* (2005) related the increase of seed index with the increase of micronaire value, fiber length and length uniformity.

Table (1): The average values of seed index (SI), Ginning out-turn (GOT) and lint index (LI)

		Seed index (SI)		Ginning out-turn (GOT)		Lint index (LI)	
		2004	2005	2004	2005	2004	2005
	FG	10.18	10.27	108.9	108.8	5.38	5.43
	G	8.88	8.75	111.7	105.8	4.88	4.43
	FGF	7.67	7.90	99.8	106.8	3.57	4.05
	GF	7.28	7.48	97.5	106.3	3.27	3.82
	FF	6.11	6.13	94.1	100.3	2.61	2.87
	Mean	**8.02**	**8.11**	**102.4**	**105.6**	**3.94**	**4.12**
	L.S.D.	**0.514**	**0.314**	**1.14**	**0.912**	**0.249**	**0.159**
	FG	13.09	9.81	119.7	120.9	8.02	6.11
	G	8.86	9.73	119.3	118.2	5.41	5.85
	FGF	7.56	7.78	114.6	112	4.32	4.30
	GF	7.58	7.49	106.3	100.8	3.87	3.53
	FF	6.71	8.79	71.5	92.7	1.97	3.71
	Mean	**8.76**	**8.72**	**106.3**	**108.9**	**4.72**	**4.70**
	L.S.D.	**0.486**	**0.389**	**1.15**	**1.08**	**0.249**	**0.237**
	FG	10.42	10.96	127.5	130.3	7.09	7.74
	G	9.13	9.73	127.3	124.7	6.18	6.38
	FGF	6.78	8.84	118.1	123.9	4.07	5.73
	GF	6.82	7.81	112.3	116.0	3.78	4.55
	FF	7.32	8.60	88.3	72.3	2.83	2.56
	Mean	**8.09**	**9.19**	**114.7**	**113.5**	**4.79**	**5.39**
	L.S.D.	**0.14**	**0.739**	**1.40**	**0.800**	**0.112**	**0.454**
	FG	9.69	10.94	107.2	124	5.05	7.12
	G	8.58	9.59	119.9	120.1	5.28	5.92
	FGF	6.76	8.90	117.2	119.3	4.0	5.42
	GF	6.27	7.78	113.2	112.6	3.52	4.32
	FF	5.78	6.96	110.1	108	3.10	3.63
	Mean	**7.42**	**8.83**	**113.5**	**116.8**	**3.18**	**5.28**
	L.S.D.	**0.170**	**0.503**	**1.11**	**0.597**	**0.120**	**0.329**

Table (2): Simple correlation coefficients between lint grades and ginning out- turn (GOT), seed index (SI) and lint index (LI).

Variety	Treatment Season	Seed index	Ginning out-turn	Lint index
	2004	0.967**	0.912**	0.971**
	2005	0.974**	0.806**	0.967**
	2004	0.868**	0.857**	0.967**
	2005	0.614*	0.978**	0.925**
	2004	0.832**	0.916**	0.972**
	2005	0.811**	0.836**	0.974**
	2004	0.966**	0.030	0.936**
	2005	0.974**	0.974**	0.982**

*: Significance at 5% level **: Significance at 1% level

Table (3): Simple correlation coefficients between lint grade properties and seed index (SI), ginning out -turn (GOT) and lint index (LI).

		TC vs			Rd% vs			Mic. vs		
		SI	GOT	LI	SI	GOT	LI	SI	GOT	LI
	2004	-0.866**	-0.801**	-0.849**	0.927**	0.914**	0.958**	0.919**	0.882**	0.941**
	2005	-0.894**	-0.808**	-0.894**	0.945**	0.704**	0.927**	0.860**	0.537*	0.831**
	2004	-0.644**	-0.970**	-0.840**	0.787**	0.903**	0.926**	0.842**	0.385	0.774*
	2005	-0.244	-0.930**	-0.702**	0.628*	0.853**	0.921**	0.746**	0.654**	0.809**
	2004	-0.839**	-0.614*	-0.831**	0.972**	0.868**	0.949**	0.700**	0.577*	0.724**
	2005	-0.797**	-0.755**	-0.914**	0.823**	0.467*	0.733**	0.749**	0.518*	0.734**
	2004	-0.915**	-0.078	-0.914**	0.974**	0.064	0.962**	0.980**	0.106	0.906**
	2005	-0.869**	-0.956**	-0.886**	0.916**	0.844**	0.914**	0.855**	0.798**	0.858**

* Significance at 5% level ** Significance at 1% level

Table (4): Simple correlation coefficients between fiber quality properties and seed index (SI), ginning out-turn (GOT) and lint index (LI).

		UHM vs			UI% vs			F.St. vs		
		SI	GOT	LI	SI	GOT	LI	SI	GOT	LI
	2004	0.894**	0.786**	0.871**	0.925**	0.849**	0.921**	0.916**	0.864*	0.919**
	2005	0.687**	0.342	0.657**	0.797**	0.477*	0.772**	0.893**	0.762**	0.890**
	2004	0.772**	0.492*	0.764**	0.668**	0.605*	0.733**	0.774**	0.573*	0.785**
	2005	0.610*	0.489*	0.631**	0.739**	0.444*	0.674**	0.534*	0.806**	0.763**
	2004	0.826**	0.516*	0.772**	0.780**	0.601*	0.782**	0.862**	0.564*	0.818**
	2005	0.775**	0.471*	0.706**	0.498*	0.181	0.382	0.079	0.157	0.141
	2004	0.898**	0.114	0.916**	0.914**	0.170	0.941**	0.729**	0.386	0.840**
	2005	0.689**	0.618*	0.688**	0.743**	0.748**	0.757**	0.785**	0.737**	0.777**

* Significance at 5% level ** Significance at 1% level

In fact, the spinner has little or no interest in ginning out-turn, as he buys lint only after it has been separated from the seed, but to the ginner who buys seed cotton the figure has great commercial significance. Whereas, in this study substantiated the high relation of ginning out-turn with lint grade and fiber quality parameters to confirm the importance of ginning out-turn that due breeders to look forward to manage it, for this purpose, a moderately high ginning out-turn with moderately large seed or seed index, rather than small light seeds is desirable.

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دراسة علاقة مكونات تصافي الحليج بالرتبة وصفات جودة التيلة والخيط في القطن المصري

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أجريت هذه الدراسة علي أربعة أصناف من الأقطان التجارية لموسمي ٢٠٠٤ ، ٢٠٠٥ تمثل فئتى الطول فى القطن المصرى وهي جيزة ٤٥ ، جيزة ٨٨ ، جيزة ٨٦ ، جيزة ٩٠ ، وقد تم تجهيز الخمس رتب الرئيسية من القطن الزهر لكل عينة وهي فجـ ، جـ ، فجف ، جف ،قف وبعد أن تم الحليج أجرى تقدير تصافي الحليج ومعامل البذرة ثم أجرى حساب معامل الشعر منهما و أجريت القياسات المختلفة للتيلة علي جهاز HVI ثم أجرى الغزل وقدرت صفات جودة الخيط . وقد أشارت نتائج الدراسة إلي أن صفات تصافي الحليج (معامل البذرة ومعدل التصافي ، معامل الشعر) أظهرت اختلافات واضحة بين رتب الصنف الواحدة . وعموما كانت تربط هذه الصفات برتبة القطن الشعر علاقة قوية ، وإن كان قد وجد في بعض الحالات أن رتبة منخفضة كان لها معامل البذرة أكبر من رتبة أعلي منها ، ونفس الشأن حدث فى حالات أخرى فى معدل التصافي. نظرا للعلاقة القوية بين رتبة القطن الشعر وصفات التصافي فقد كان لهذه الصفات علاقة قوية بالصفات المحددة لرتبة القطن وكذلك صفات جودة التيلة وبالتالي جودة خيط الغزل وإن كانت هذه العلاقة غير مباشرة.