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Effect of Roller Ginning on Fiber and Yarn Properties of Some Egyptian cotton Varieties

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ABSTRACT

Since 1965 the rotary knife gin stand replaced gradually the reciprocating knife one and this objective drew the attention of a considerable group of investigators. So, this investigation was carried out in Cotton Research Institute, Agricultural Research Center, Giza, Egypt, during the season of 2020. By randomized complete block design and factorial design expiate by four replicate. The aim of this study to investigate the effect of long staple, Extra-long staple and extra-long extra fine of Egyptian cotton varieties (*Gossypium barbadense* L.) and their interaction with ginning wheels, also effect of ginning on fiber properties, yarns strength, yarn evenness and neps count at the ring spinning system 40 and 60 s carded count yarns at 3.6 and 4 (T.M.) for tests of yarn properties. In this investigation used their varieties belong to extra-long extra fine i.e. Giza 45, Giza 87 and Giza 93, where Giza 88, Giza 92 and Giza 96, belong to extra-long staple Giza 86, Giza 90 ,Giza 94, Giza 95, Giza 97 and the promising cross ((Giza 83 x Giza 80) x Giza 89) x A107) belong to long staple. The fiber parameters were tested with HVI test equipment. The data for yield, fiber and ginning traits were analyzed by package M. Stat program for tested results. Lint percentage, fiber length and short fiber index is also very important parameter which influences ginned. The obtained results showed that the ginning parameters were affected significantly by the cotton variety. While, the lint cotton was insignificantly affected. The all studied traits measured by HVI were significantly differences by cotton variety, except the upper half mean length, short fiber content were differences insignificantly. While, the upper half mean length and short fiber index were significantly affected. The interaction among the three studied factors i.e.: ginning area, ginning methods and cotton varieties was significant for fiber uniformity index, yarns strength, yarn evenness and neps count. This study exerts out to do treatment and evaluate gin type and recommendation the superior type one staple for different Egyptian cotton varieties.

Keywords: Egyptian cotton varieties, long staple, extra-long, extra fine, yarn strength, yarn neps, yarn evenness, ring spinning system, fiber properties, ginning, regression, HVI test machine instrument.

1. Introduction

Aly (2019) indicated that the McCarthy roller gin stand with using the seed cotton yield recorded the highest mean values of the most important ginning efficiency properties; i.e., gin stand capacity (kg lint/inch/hr.), lint percentage. The differences in fiber length parameters, upper half mean length, uniformity index, short fiber index, strength elongation, micronaire value, yellowness degree (+b) as trash area (%) were not insignificantly ($p \geq 0.05$) and affected the gin stand type effect. Armijo and Gillum (2010) found that, three types of conventional roller gin stands being used in Egypt as single roller (McCarthy), single roller (Turkish) and double roller (Indian). Their productivity reaching to 1 Kentar/hour of lint cotton at the best conditions. The better grades had longer fibers, more mature fiber, higher fiber bundle strength and less short fiber content. Baker and Griffin (1984) the roller gin uses a laminated canvas/rubber roller with a fixed and a reciprocating knife, to pinch and pull fibers from the seed. Cocke *et al.,* (1977) found that, the saw ginning is more efficient method for short staple, fuzzy seed varieties than roller ginning. The increased opening action of saw ginning allows less trash to be

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retained, but increases short fiber content and neps. El-Banna (2013) Likewise, roller ginning upland cotton, when compared to saw ginning, produced upland fiber which was more than one staple length longer, had fewer short fiber and neps and higher turn-out. Ibrahim and El-Banna (2018) ultimate objective is to continue trying to improve yield and attaining higher fiber characters in order to face the increasing human consumption and the continuous competition of man – made fibers. It is known that conducting of ginning in Egypt is 100% using roller type McCarthy single roller gin. Ibrahim (2010) obtained that results revealed that Giza 88 the extra-long staple cultivar, surpassed the long staple cultivar, Giza 86 in Seed grid adjustment significantly affected on gin stand capacity (kg/inch/hr), ginning time and lint grade. Also, the highest mean values of gin stand capacity short ginning time (hr/Kentar). Jean *et al.,* (2018) when classifying of cotton, the results cloud that fiber quality was available at four stages of the ginning process and used to estimate the impact of each step, as well as the overall impact of ginning on the fiber quality properties. Also, when impacts ginning overall were detected, the proposed protocol helped in finding the ginning step that lay behind fiber quality degradation. Kveton (1986) the roller ginning of cotton is defined as the mechanical separation process of cotton fibers from their seeds by Means of one or more rollers. Staple length, uniformity and HVI color grade were better when using the roller gin stands. Roller ginning improved fiber length, length uniformity, and nep count, when compared to saw ginning. Mahgoub (1981) found a good chance for improving the gin productivity as well as the physical fiber properties by using the modern rotary knife roller gin stand. Also, improving the productivity of the conventional roller gin stand could be achieved by adjusting its moving parts to suit each cotton variety and grade. Mashhout *et al.,* (2019) the obtained results clarified that the ginning time and gin stand capacity parameters were significantly affected by the cotton variety, lint cotton percentage, and fiber properties i.e., upper half mean, uniformity index, fiber strength, elongation, reflectance degree, yellowness, trash count and trash area but the micronaire reading, fiber maturity was insignificantly affected. Youssef *et al.,* 1992) demonstrated that, as the seed cotton was cleaned, the lint percentage increased. Over all environments give a good estimate of the partial influence on yarn tenacity and the associated characteristics. Grosberg (1956) obtained a relationship between yarn unevenness coefficient of variation and the Means of fiber length and diameter. Phillip, (1957) found that fiber fineness and maturity were related to nippiness. Mart *et al.,* (1952) reported that, micronaire value was an excellent index of the number of neps expected in card web. Fiori *et al.,* (1954) concluded that, fiber strength does not significantly affect the evenness of silver. Hussien (1999) reported that, the reciprocating knife one gave higher fiber span length, than the rotary knife gin stand whether the ginned cotton was long staple or extra-long staple. Arafa (2000) found that the rotary knife gin stand as effects on the Egyptian cotton qualities and ginning efficiency particularly, the effect of these machines decrease in short fiber content, While the extra-long staple gave the lowest short fiber content. Ahmed *et al.,* (2015) reported that, the Egyptian extra-long staple, and long staple cotton fiber tenacity measured, strength, maturity ratio and fiber length properties were positive and in high correlation ship with yarn strength.

2. Materials and Methods

In the present investigation some Egyptian cotton variety (*Gossypium barbadense*), was used to study affected gin method, gin area, and their interaction on fiber properties, yarn strength, yarn evenness and neps count on with estimated value for spun at 40'S and 60'S carded yarn with 4 and 3.6 twist multiplier using a compact-spinning machine at long and extra-long staple respectively. Egyptian cotton varieties belong to extra-long, extra fine varieties namely: Giza 45, Giza 87 and Giza 93, an length up 1.3/8 inch, where Giza 88, Giza 92 and Giza 96, belong to extra-long staple length 1.1/8 inches belong to Giza 94, Giza 86, Giza 90 and Giza 95 and the promising cross {(Giza 83 x Giza 80) x Giza 89} x A107) long staple varieties were used at the cotton research institute, Agricultural Research Center, Giza, Egypt. The samples were ginning in Sakha gin (Sk. G), Kafr El-Sheikh Governorate and Seds gin (S. G), Beni-Souf Governorate in this study. Four sub-samples representing replicates were drawn from the ginned for Egyptian cotton varieties. Every cotton samples were thoroughly blended for more homogeneity and ginned, then classified by a committee of expert classes were determined. The studied samples were ginned using the conventional single roller gin stand [a roll covered with a natural leather (McCarthy roller gin)] reciprocating knife one and rotary Knife roller gin stand and their impact on fiber and yarn properties in Egyptian cotton varieties.

The dependent variable was represented by fiber and yarn property and expressed as follows: **1.** Fiber properties as determined by High Volume Instrument (HVI) Spectrum at the were determined at the Fiber Research Department, cotton research institute, Agricultural Research Center, **II:** A representative sample of lint cotton (about 200 grams) was taken for determining all the fiber properties, which were estimated at the Laboratories of Cotton Research Institute of Giza, Egypt. All samples were opened and left for 24 hours at least under the standard conditions of (65 ± 5%) relative humidity and (21 ± 2°C) temperature before being tested and following properties were determined:

2.1. The studied characters on cotton plant

I. Yield and yield components

At harvest, the following yield attributes: lint cotton yield (Kentar/fed.), seed cotton yield (Kentar/fed.) and lint percentage (= the ginning out-turn) were measured.

II. Lint percentage (%)

As a percentage, and determined according the following equation: Lint percentage (L.P.) = Lint seed cotton weight ((kg)} / {seed cotton weight (kg)} ×100 = (%).

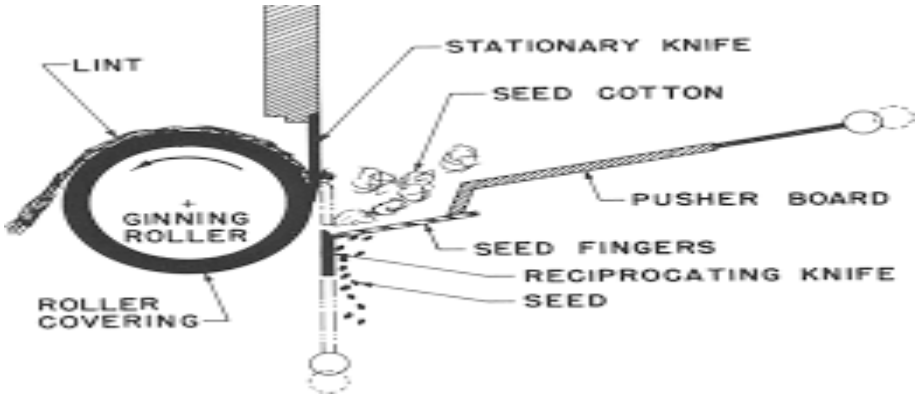
2.2. Ginning methods parameters

The basic ginning, that is, the separation of the seed from the lint and the equipment for this process are the same for almost all gins in the Egypt.

I. Conventional roller gin stands

Roller gin McCarthy (Mc) The reciprocating knife one gin stand of McCarthy 40 inch, (roller gin stationary Knife).

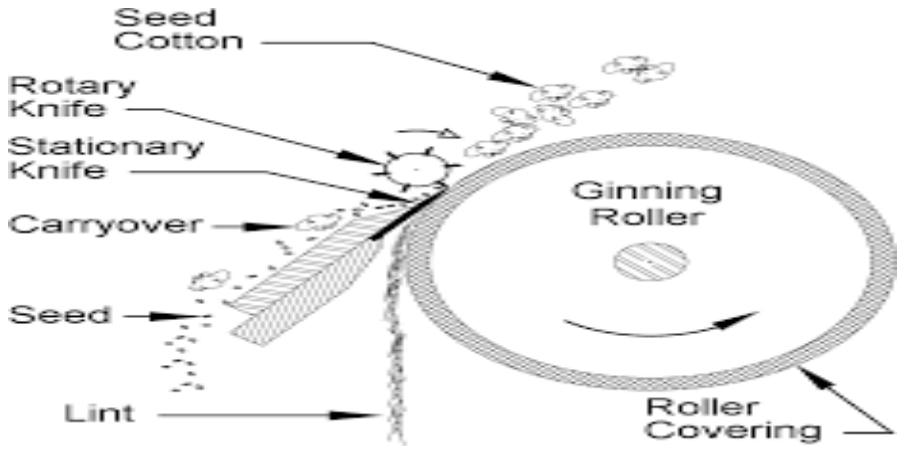
Note: The adjustment of overlap. Knife to knife clearance and seed grade adjustment were adjusted according to the regulation of the Egyptian cotton arbitration and testing organization during ginning each variety.



(Gin cotton machine stationary Knife)

II. Rotary Knife roller gin stand

It enables a newer ginning roller design, obtaining better cylinder sheathing materials, a better designed swivel knife and more sensitive electrical /pneumatic controls capacities in excess of 1.500 rotations per hour have been obtained on certain types of long-staple cotton. Knowing that the three main components of the gin stand are the ginning roller, the rotary-knife and stationary knife, and these three components must be set with gauge to obtain the close tolerance required to obtain the best ginning results in both grade and quality, and taking into account that the cotton fibers act as an insulator keeping the roller from having excessive temperatures, the greater amount of ginned cotton, the less heat will be on the ginning roller, this is when the correct adjustment of the three main components.



(Gin cotton machine Rotary Knife)

2.3. Fiber properties

All samples were opened and left for 24 hours at least under the standard conditions of (65 ± 2%) relative humidity and (20 ± 2°C) temperature before being tested and following properties were determined:

* Micronaire reading (Mic.).
* Maturity index (Mat. %).
* Fiber upper half means length (UHML; mm.).
* Length uniformity index (UI %).
* Short fiber index (SFI %).
* Fiber bundle strength (Str. g/tex).
* Fiber elongation (Elog. %): the percentage of elongation, which occurs before a fiber bundle breaks.

2.4. for a comprehensive examination of yarn characteristic:

Studied samples were spun at 40'S and 60'S carded yarn with 4 and 3.6 twist multiplier using compact-spinning machine at long and extra-long staple respectively, and yarn properties were determined at the Yarn Research Department of Cotton Research Institute of Giza, Egypt for tests of yarn properties.

I. Yarn Strength (YS): (lea product) was determined by testing the skein strength on the Good Brand Lea Tester to estimate the lea strength (lea product) in pounds (ASTM, 1967 D-1578) the broken legs were weighted by a Souter Al-fired Blanca (ASTM, 1967 D-1907) To estimate its actual count. Lea product was the nominal count estimate from the following formula. Lea product = corrected breaking load in pounds X nominal count.

II. Coefficient of variation (Cv.%) of the yarn evenness

III. No. of neps/ 100 m, of the yarn were measured by Uster Tester III as described by the designation of the (ASTM, 1967), D. 1578.

2.5. Statistical analysis

Statistical Procedures in this investigation was conducted in a three factor randomized complete block design Factorial ANOVA for factors in 4 replicates was used, experiment according the procedure of Snedecor and Cochran (1981). The data was computed using the M.Stat. 6.311. C.C.W. (1998-2005) program as statistical program, to test differences among studied mean values of treatments; the least significant difference (L.S.D.) at 0.05 level of probability

3. Results and Discussion

Seed cotton yield (kg/f), lint cotton yield (kg/f) and lint percentage (%) for all Egyptian cotton varieties *(Gossypium barbadense* L.*)* under this investigation calculated and the results are presented at Table 1, the results cleared that the G 94 variety was the best and gave the highest mean value for seed cotton yield with the mean value as 13.00 kentar/ feddan. Also, the lowest mean value for the

same traits recorded by G 45 and G 87 cotton varieties with the mean values 6.17 and 7.53 kent./ fed., respectively.

For the lint cotton yield (kg/f) the results also recorded that the highest mean value gave by G 94, G 86, G 95, and G 96 with mean value 14.96, 13.10, 13.36 and 13.41 kent./ fed., respectively. While, the lowest mean value for lint cotton yield recorded by G 45 and G 87 cotton varieties with the mean performances values are 6.43 and 7.93 kent./ fed., respectively.

On the other hand, for lint percentage (%) the results showed that the highest mean performances values recorded by G 94, G 96, G 95, G 97 and the promising variety (Giza 83 x G 89 x G 90 x A107) cotton varieties with the mean values are 40.89, 40.90, 40.83, 40.12, 40.51 respectively. But, the lowest mean value were recorded by G 93, G 45, and G 87 cotton varieties with the mean performances values are 33.80, 32.87 and 33.24 respectively.

Table 1: Seed cotton yield, lint cotton yield, and lint percentage traits for the studied Egyptian cotton varieties.

Characteristic Varieties	Seed cotton yield (K/f)	Lint cotton yield (K/f)	Lint percentage %
Giza 93	10.00	11.91	33.80
Giza 45	6.17	6.43	32.87
Giza 87	7.53	7.93	33.24
Giza 88	8.94	10.51	37.26
Giza 92	10.09	11.79	36.87
Giza 96	10.40	13.41	40.83
Giza 94	13.00	14.96	40.90
Giza 86	10.60	13.10	39.70
Giza 97	9.24	11.36	40.12
Giza 95	10.37	13.36	40.89
Giza 90	9.33	11.20	38.00
Promising cross	9.48	12.22	40.51
LSD at 0.05	**2.14** **	**2.83** **	**1.36** **

Promising cross ((Giza 83 x Giza 80) x G 89) x A107), kentar / feddan (K/F), means designated by the same letter within each column are not significantly different * significant at 0.05 level of probability. ** Significant at 0.01 level of probability, **Ns**: insignificant.

The results at **Table 2,** indicated that the effect of the ginning area (GA), on Sakha gin (Sk. G) and Seds gin (S. G)} for fiber and yarn properties in Egyptian cotton varieties. It was significant for fiber elongation and yarn evenness (CV.% %). But, it was highly significant differences at yarn strength. On the other hand, rest of the attributes fiber and yarn properties insignificant for these traits.

Table 2: Mean values of ginning area (GA), Sakha gin (Sk. G) and Seds gin (S. G), for fiber and yarn properties in Egyptian cotton varieties.

Characteristic	Fiber properties						Yarn properties			
	Mic	Mat	UHM	UI	SFI	Steri.	Elong	(YS)	Cv.%	Neps
Sakha gin (Sk. G)	3.95	0.916	33.06	85.03	9.24	43.10	6.99	2538.03	12.45	111.69
Seds gin (S. G)	3.94	0.915	32.92	83.38	9.30	42.36	6.91	2525.00	12.11	110.56
L. S. D. 0.05	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**	**0.080** *	**12.582** **	**0.305** *	**Ns**

Ginning area (GA) = Sakha gin (Sk. G) and Seds gin (S. G),yarn strength (YS), coefficient of variation of the yarn evenness (Cv. %), means designated by the same letter within each column are not significantly different * and ** Significant at 0.05 and 0.01 level of probability, Ns: insignificant.

In Table 3, it is obvious that the ginning methods conventional roller gin stand and rotary knife roller gin stand on the mean values of fiber and yarn properties of Egyptian cotton varieties the fiber properties {micronaire value (Mi.), maturity ratio (MR.), upper half mean (UHM), uniformity index (UI), short fiber index (SFC), fiber bundle tensile: (strength g./tex. and elongation %: the percentage

of elongation, which occurs before a fiber and yarn strength (YS), yarn evenness (Cv.%.%) and neps count (Neps) highly significant differences.

Table 3: Mean values of ginning methods (GM), Conventional roller gin stand and Rotary Knife roller gin stand for fiber and yarn properties in Egyptian cotton varieties.

Characteristic / Methods	Fiber properties							Yarn properties		
	Mic	Mat	UHM	UI	SFI	Steri.	Elong	(YS)	Cv.%	Neps
Conventional roller gin stand	3.86	0.928	33.86	86.32	7.87	44.20	7.33	2626.8	11.38	100.73
Rotary Knife roller gin stand	4.03	0.904	32.11	84.08	10.67	41.26	6.58	2525.0	13.17	121.51
L. S. D. 0.05	**0.059 ****	**0.004 ****	**0.149 ****	**1.860 ****	**0.294 ****	**0.953 ****	**0.080 ****	**12.582 ****	**0.305 ****	**3.827 ****

Ginning method (GM) = conventional roller gin stand and rotary knife roller gin stand, yarn strength (YS), coefficient of variation of the yarn evenness (Cv. %), means designated by the same letter within each column are not significantly * and ** Significant at 0.05 and 0.01 level of probability, **Ns**: insignificant.

The results attained in Table 4, indicated that, the mean value of the first order interaction between the ginning area (Sakha gin and Seds gin) and ginning methods (conventional roller gin stand and Rotary Knife roller gin stand) for fiber and yarn properties in Egyptian cotton varieties it was insignificant with except fiber elongation which was significant. But out her there side it was of high significant for the adjective of yarn strength.

Table 4: Mean value of the first order interaction between the ginning area (GA) and ginning methods (GM) for fiber and yarn properties in Egyptian cotton varieties.

Characteristic		Fiber properties							Yarn properties		
		Mic	Mat	UHM	UI	SFI	Steri.	Elong	(Ys)	Cv.%	Neps
Sakha gin (Sk. G)	**Conventional roller gin stand**	3.85	0.927	33.91	85.82	7.92	44.40	7.33	2588.4	11.55	106.44
	Rotary Knife roller gin stand	4.04	0.906	32.20	84.23	10.56	41.79	6.66	2487.6	13.35	116.94
Seds gin (S. G)	**Conventional roller gin stand**	3.87	0.929	33.81	82.82	7.53	43.99	7.34	2665.2	11.21	95.03
	Rotary Knife roller gin stand	4.01	0.902	32.02	83.93	10.78	40.73	6.50	2562.3	13.00	126.08
L.S.D. 0.05		**Ns**	**Ns**	**Ns**	**Ns**	**Ns**	**Ns**	**0.113 ***	**Ns**	**Ns**	**5.413 ****

Ginning method (GM) = conventional roller gin stand and rotary knife roller gin stand., ginning area (LG) = Sakha gin (Sk. G),Seds gin (S. G),yarn strength (YS), coefficient of variation of the yarn evenness (Cv. %), means designated by the same letter within each column are not significantly different * and ** Significant at 0.05 and 0.01 level of probability, **Ns**: insignificant.

The results attained in Table 5, indicated that the effect of the varieties was highly significant for fiber and yarn properties in all the studied traits for micronaire value, maturity ratio, the differences in fiber length parameters i.e. upper half mean length (UHML), uniformity index (UI) and short fiber contend (SFI), of the fiber mechanical properties: fiber bundle strength and elongation percentage, were high significantly effected due to the fiber properties tested by H.V.I. instrument. With regard to the main effect of varieties, data in the same Table 5, also, of the same factor had a significant effect on yarn properties: yarn evenness (CV.% %), nep count (Neps) and Yarn Strength (YS): yarn strength (g/tex), were measured using Tenso-lab Tensile Strength Tester of Egyptian cotton varieties. In

addition, **Etman, Hanan (2010)** indicated that the physical properties of the cotton fiber, significantly, differed depend on the genetic structure of the used cotton cultivar.

Table 5: Mean values of Egyptian cotton varieties for fiber and yarn properties.

Characteristic	Fiber properties							Yarn properties		
Varieties	Mic	Mat	UHM	UI	SFI	Steri.	Elong	(YS)	Cv.%	Neps
Giza 93	3.10	0.897	35.95	85.84	6.12	46.13	6.46	2802.1	9.74	77.25
Giza 45	2.97	0.895	35.45	86.14	7.64	45.23	6.43	2794.7	9.98	78.33
Giza 87	2..87	0.881	33.85	85.09	7.69	44.36	6.72	2826.5	10.12	78.16
Giza 88	3.30	0.905	34.64	84.85	8.14	45.68	6.48	2596.6	12.61	91.16
Giza 92	3.75	0.895	34.11	86.07	8.21	46.71	6.42	2748.7	12.90	157.41
Giza 96	4.19	0.925	35.48	86.03	7.54	46.09	6.46	2802.9	15.07	114.91
Giza 94	4.56	0.932	33.28	84.97	8.61	43.14	6.96	2543.7	14.58	107.35
Giza 86	4.48	0.944	32.97	85.06	8.79	44.40	6.83	2546.6	14.04	131.08
Giza 97	4.52	0.937	32.39	84.73	8.19	43.79	7.07	2557.9	11.59	76.41
Giza 95	4.70	0.931	29.45	84.75	9.20	36.83	7.86	2257.0	11.18	149.41
Giza 90	4.26	0.928	29.61	83.52	10.34	37.11	7.88	2198.3	13.16	142.83
Promising cross	4.59	0.921	28.65	83.38	10.78	33.28	7.87	2235.4	12.37	129.25
L.S.D. 0.05	**0.147** **	**0.011** **	**0.364** **	**4.555** **	**0.720** **	**2.335** **	**0.196** **	**31.157** **	**0.46** **	**9.375** **

Promising cross ((Giza 83 x Giza 80) x G 89) x A107), yarn Strength (YS), coefficient of variation of the yarn evenness (Cv. %), means designated by the same letter within each column are not significantly different * and ** Significant at 0.05 and 0.01 level of probability, **Ns**: insignificant.

In Table 6, it could be noticed that the first order interaction between the ginning area (GA) and Egyptian cotton varieties for fiber and yarn properties of the studied factors, ginning area (GA): Sakha gin and Seds gin and cotton varieties was significant for fiber properties: uniformity index (UI) and short fiber index (SFI). While, the remain interaction between the ginning area (GA) and Egyptian cotton varieties for 3 case were high significant, especially for yarn properties indicating and indicated that each factor may be acted as an independent factor. The lowest mean values of the yarn evenness (CV.% %), 9.68 % and given using the Seds gin for Giza 93 variety. whereas, the lowest mean value of the nep count was 76.83 for Giza 97 in the Seds gin, and the highest mean value of yarn Strength (YS): yarn strength (g/tex), (2892.5) were recorded using the by Giza 96 variety, in the Seds gin, respectively, as shown in Table 6.

The results presented in Table 7, indicated that the effect of the mean value of the first order interaction between the ginning methods (Conventional roller gin stand and Rotary Knife roller gin stand) and cotton verities for fiber and yarn properties in Egyptian cotton varieties it was insignificant in the fiber maturity. Meanwhile, the differences in short fiber index (SFI)) and fiber mechanical properties such as fiber bundle strength, were significantly affected due to the ginning such as (GM), with regard to the main effect of cotton verities. Data in the same table showed that the two factors had a highly significant effect on yarn properties for cotton varieties studied i.e.: yarn evenness (CV.% %) and nep count (Neps), while yarn strength (YS) was significant. These results are in agreement with the findings of Ahmed *et al.,* (2015). These results are in agreement with those obtained by Patil and Arude (2014) they concluded that conventional roller gin stand technology is a gentle ginning and hence less or no damage to fibers and yarn properties, better fiber properties could be calculated, but the higher length for fiber compared with other ginning methods (Rotary Knife roller gin stand), retaining of natural luster and moisture, lower nep content. Also, Nomeir *et al.,* (1990) mentioned that the important physical properties of cotton fiber such as fiber length, maturity and strength vary considerably depending on the variety of cotton.

Table 6: Mean value of the first order interaction between the ginning area (GA) and Egyptian cotton varieties for fiber and yarn properties.

Characteristic		Fiber properties							Yarn properties		
Ginning area	**Varieties**	**Mic**	**Mat**	**UHM**	**UI**	**SFI**	**Steri.**	**Elong.**	**(YS)**	**Cv.%**	**Neps**
Sakha gin (Sk. G)	**Giza 93**	3.18	0.893	35.92	86.24	6.12	46.27	6.45	2742.5	9.80	77.67
	Giza 45	2.97	0.893	35.46	86.14	7.64	45.28	6.48	2745.8	10.03	77.50
	Giza 87	2.95	0.885	34.10	84.75	7.69	45.50	6.80	2776.7	10.08	78.50
	Giza 88	3.28	0.903	34.83	84.93	8.14	46.00	6.67	2533.3	13.47	90.83
	Giza 92	3.71	0.895	34.31	86.30	8.21	46.80	6.41	2699.2	13.20	151.17
	Giza 96	4.19	0.927	35.56	86.36	7.54	46.36	6.44	2713.3	16.02	113.50
	Giza 94	4.57	0.935	33.29	84.81	8.61	43.15	7.12	2489.2	13.58	112.50
	Giza 86	4.49	0.945	33.03	84.75	8.38	43.99	6.81	2500.0	14.30	149.67
	Giza 97	4.50	0.938	32.60	84.65	8.20	43.69	7.10	2515.8	11.58	76.00
	Giza 95	4.74	0.933	29.42	84.89	8.79	36.90	7.87	2280.8	11.37	151`.00
	Giza 90	4.29	0.930	29.54	83.64	10.90	37.06	7.83	2204.2	12.88	142.33
	Promising cross	4.55	0.918	28.17	82.86	10.39	36.16	7.99	2255.5	12.82	119.67
Seds gin (S. G)	**Giza 93**	3.03	0.902	35.99	85.45	6.28	45.99	6.48	2861.7	9.68	76.83
	Giza 45	2.97	0.897	35.44	86.13	8.71	45.19	6.38	2843.7	9.92	79.17
	Giza 87	2.79	0.877	33.60	85.43	8.92	43.23	6.64	2876.5	10.15	77.83
	Giza 88	3.33	0.907	34.46	84.78	7.62	45.36	6.29	2660.0	11.75	91.50
	Giza 92	3.79	0.895	33.91	85.85	8.26	46.61	6.43	2798.3	12.60	163.67
	Giza 96	4.22	0.923	35.40	85.80	8.14	45.81	6.48	2892.5	14.12	116.33
	Giza 94	4.56	0.928	33.27	85.12	8.77	43.14	6.79	2598.3	15.32	102.00
	Giza 86	4.48	0.943	32.92	85.37	8.20	44.80	6.86	2593.3	13.78	112.50
	Giza 97	4.55	0.935	32.19	84.81	8.17	43.89	7.05	2600.0	11.60	76.83
	Giza 95	4.67	0.928	29.48	84.61	7.61	36.75	7.85	2233.3	11.00	147.83
	Giza 90	4.23	0.927	29.67	83.39	8.77	37.16	7.94	2192.5	13.43	143.33
	Promising cross	4.63	0.923	28.69	83.91	10.16	30.40	7.74	2215.3	11.92	138.83
L.S.D. 0.05		**Ns**	**Ns**	**Ns**	**6.442 ****	**1.018 ****	**Ns**	**Ns**	**44.062 ****	**1.055 ****	**13.258 ****

Promising cross ((Giza 83 x Giza 80) x G 89) x A107), ginning method (GM) = conventional roller gin stand and rotary knife roller gin stand, yarn strength (YS), coefficient of variation of the yarn evenness (Cv. %), means designated by the same letter within each column are not significantly different * and ** Significant at 0.05 and 0.01 level of probability, **Ns**: insignificant.

Table 7: Mean value of the first order interaction between ginning methods (GM) and verities for fiber and yarn properties in Egyptian cotton varieties.

Characteristic		Fiber properties							Yarn properties		
Ginning methods	**Varieties**	**Mic**	**Mat**	**UHM**	**UI**	**SFI**	**Steri.**	**Elong**	**(YS)**	**Cv.%**	**Neps**
Conventional roller gin stand	**Giza 93**	2.99	0.905	37.10	86.96	8.00	47.51	6.84	2870.0	9.27	67.66
	Giza 45	2.95	0.907	36.27	87.47	8.54	46.20	6.82	2862.8	9.22	69.16
	Giza 87	2.95	0.885	34.37	66.03	7.98	45.18	7.05	2900.8	9.33	67.83
	Giza 88	3.50	0.913	35.10	85.35	7.77	46.85	6.55	2640.8	11.22	76.83
	Giza 92	3.69	0.903	34.99	87.07	7.99	48.06	6.76	2795.8	12.13	155.38
	Giza 96	4.04	0.940	36.66	86.83	6.68	47.30	6.84	2850.0	15.62	95.83
	Giza 94	4.40	0.952	34.09	86.15	7.01	43.60	7.36	2591.6	12.95	78.33
	Giza 86	4.45	0.957	33.59	86.33	7.48	46.61	7.35	2581.6	12.18	109.33
	Giza 97	4.42	0.950	33.48	85.93	6.87	46.58	7.29	2620.0	10.52	67.66
	Giza 95	4.53	0.947	30.30	85.41	7.83	37.74	8.39	2307.5	10.97	149.00
	Giza 90	4.08	0.938	30.66	84.32	9.44	37.87	8.25	2245.0	12.37	142.00
	Promising cross	4.33	0.937	29.77	84.01	8.87	36.89	8.44	2255.6	10.82	129.33
Rotary Knife roller gin stand	**Giza 93**	3.22	0.890	34.81	84.73	10.23	44.76	6.09	2734.1	10.22	86.83
	Giza 45	2.99	0.883	34.63	84.80	10.74	44.26	6.04	2726.6	10.73	87.50
	Giza 87	2.80	0.887	33.33	84.15	11.40	43.55	6.39	2752.3	10.90	88.50
	Giza 88	3.11	0.897	34.18	84.36	10.50	44.51	6.40	2552.5	14.00	105.50
	Giza 92	3.81	0.887	33.23	85.07	10.44	45.35	6.08	2701.6	13.67	159.00
	Giza 96	4.34	0.910	34.30	85.23	10.40	44.87	6.08	2755.8	14.52	134.00
	Giza 94	4.73	0.912	32.47	83.78	10.21	42.69	6.55	2495.8	16.22	136.16
	Giza 86	4.52	0.932	32.36	83.78	10.10	42.18	6.32	2511.6	15.90	152.83
	Giza 97	4.63	0.923	31.31	83.52	9.51	41.00	6.86	2495.8	12.67	85.16
	Giza 95	4.88	0.915	28.61	84.09	10.08	35.92	7.33	2206.6	11.40	149.83
	Giza 90	4.45	0.918	28.56	84.72	11.03	36.35	8.52	2151.6	13.95	143.66
	Promising cross	4.85	0.905	27.54	82.76	10.68	29.67	7.29	2215.1	13.92	129.16
L.S.D. 0.05		**0.207** **	**Ns**	**0.515** **	**6.442** **	**1.018** *	**3.303** *	**0.278** **	**44.062** *	**1.055** **	**13.258** **

Promising cross ((Giza 83 x Giza 80) x G 89) x A107), ginning method (GM) = conventional roller gin stand and rotary knife roller gin stand, yarn strength (YS), coefficient of variation of the yarn evenness (Cv. %), means designated by the same letter within each column are not significantly different * and ** Significant at 0.05 and 0.01 level of probability, **Ns**: insignificant.

In Table 8, the result showed that the first-order interaction between the studied factors for fiber and yarn properties for ginning area: (Sakha gin and Seds gin), ginning methods: (conventional roller gin stand and rotary knife roller gin stand) and the varieties were significant for uniformity index (%), followed its same trend yarn properties. While, the remain interactions (6 case) were not significant, especially for HVI indicating that each factor may be acted as an independent factor. The highest mean values of the micronaire value (4.96) were given using the conventional roller gin stand. Whereas, the highest mean value of the fiber maturity index (0,96 %) and the lowest mean value of fiber length parameters: upper half mean length (27.50) were recorded using the ginning methods: rotary knife roller gin stands respectively. As for length uniformity index (UI), the highest mean values (87.68%) were recorded using the ginning methods: conventional roller gin stand. while the lowest mean value of the short fiber index (6.03), were obtained by the ginning methods: conventional roller gin stands. Recorded the highest mean value of fiber bundle strength (48.02 g/tex) and the lowest mean value at (33.91) for ginning methods by rotary knife roller gin stand. While, the conventional roller gin stand recorded the highest mean values (8.46 %) for fiber elongation (%). So, it could be concluded that these results were in harmony with those obtained by Abdel-Aal (2006), Solieman (2016) and Ahmed *et al.,* (2020) they found affected the fiber bundle strength related to the rotary knife roller gin stand and the better conventional roller gin stand had longer fibers. These results are in agreement with the findings of Estur and Gergely (2010) they mentioned that the choice of ginning technology is an important factor of performance and also has an impact on lint quality, and, as roller ginning is less damaging to the fiber properties than saw ginning.

4. Conclusion

Generally, it could be concluded that the ginning methods parameters of the studied cotton varieties were found to be more affected with the rotary Knife roller gin stand system compared with the reciprocating knife gin stand. The parameters of the ginning method with the rotary Knife roller gin stand system were the most affected on the fiber and yarn properties has decreased, compared to the reciprocating knife gin stand system.

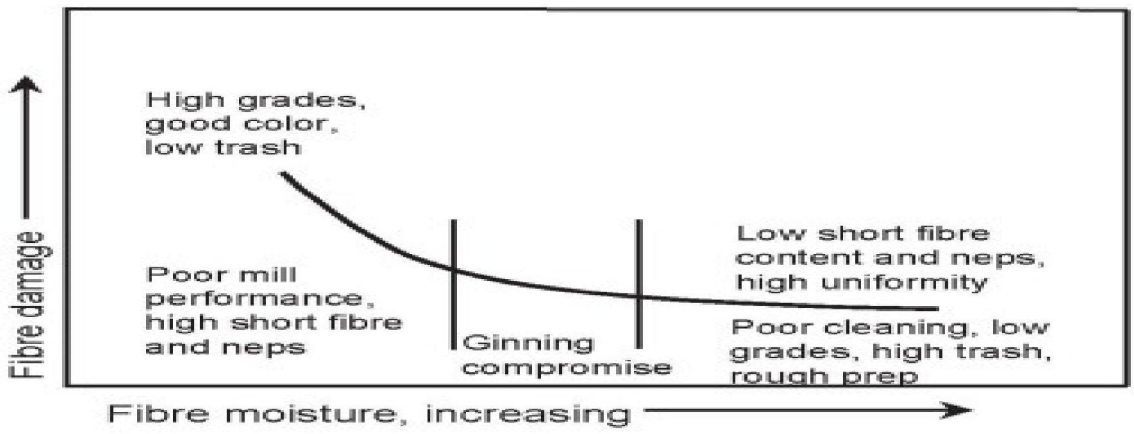


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Table 8: Mean value of the first order interaction among the ginning area (GA), ginning methods (GM) and cotton varieties for fiber and yarn properties.

Characteristic			Fiber properties							Yarn properties		
Ginning area	**Ginning methods**	**Varieties**	**Mic**	**Mat**	**UHM**	**UI**	**SFI**	**Steri.**	**Elong**	**(YS)**	**Cv.%**	**Neps**
Sakha Gin (Sk. G)	**Conventional Roller gin stand**	**Giza 93**	2.960	0.910	37.25	86.74	8.07	47.35	6.84	2925.0	9.17	65.33
		Giza 45	2.950	0.917	36.28	87.68	8.78	46.20	6.72	2912.3	9.20	70.00
		Giza 87	2.950	0.880	33.90	46.95	7.99	43.05	7.00	2951.6	9.33	66.66
		Giza 88	3.553	0.917	34.85	85.50	8.03	46.45	6.40	2701.6	10.63	81.66
		Giza 92	3.733	0.897	34.87	87.02	7.99	48.02	6.83	2865.0	11.80	157.33
		Giza 96	4.007	0.940	36.67	86.77	6.36	46.95	6.89	2951.6	14.60	86.00
		Giza 94	4.430	0.953	34.07	86.26	7.29	43.72	7.37	2643.3	14.70	75.00
		Giza 86	4.400	0.960	33.71	86.77	6.55	46.78	7.45	2633.3	11.37	73.66
		Giza 97	4.410	0.950	33.51	86.00	6.85	46.79	7.24	2661.6	10.17	64.66
		Giza 95	4.510	0.947	30.36	85.32	7.88	37.80	8.46	2283.3	10.73	137.33
		Giza 90	4.077	0.937	30.64	84.41	8.77	37.93	8.27	2220.0	12.73	130.00
		Promisin cross	4.443	0.937	29.86	84.48	9.33	36.89	8.44	2233.6	10.10	132.66
	Rotary Knife roller Gin stand	**Giza 93**	3.020	0.900	36.04	87.18	7.93	47.66	6.83	2815.0	9.37	70.00
		Giza 45	2.950	0.897	36.25	87.27	8.29	46.20	6.92	2813.3	9.23	68.33
		Giza 87	2.950	0.890	34.85	85.10	7.97	47.30	7.10	2850.0	9.33	69.00
		Giza 88	3.450	0.910	35.35	85.20	7.51	47.25	6.71	2580.0	11.80	72.00
		Giza 92	3.650	0.910	35.11	87.13	7.97	48.10	6.70	2726.6	12.47	154.33
		Giza 96	4.063	0.940	36.64	86.89	7.00	47.65	6.78	2748.3	16.633	105.66
		Giza 94	4.367	0.950	34.12	86.04	6.73	43.47	7.34	2540.0	11.20	81.66
		Giza 86	4.497	0.953	33.47	85.89	8.40	46.45	7.24	2530.0	13.00	145.00
		Giza 97	4.433	0.950	33.46	85.86	6.89	46.37	7.35	2578.3	10.87	70.66
		Giza 95	4.543	0.947	30.43	85.50	7.77	36.37	8.33	2331.6	11.20	160.66
		Giza 90	4.073	0.940	30.67	84.22	10.10	37.81	8.23	2270.0	12.00	154.00
		Promisin cross	4.213	0.937	29.68	83.54	8.41	36.89	8.44	2277.6	11.53	126.00
Sedes Gin (CD)	**Conventional roller gin stand**	**Giza 93**	3.330	0.887	34.89	85.30	9.97	44.88	6.06	2670.0	10.23	85.33
		Giza 45	3.000	0.890	34.68	85.02	10.83	44.35	6.04	2678.3	10.83	86.66
		Giza 87	2.950	0.880	33.35	84.40	10.96	43.70	6.50	2703.3	10.83	88.00
		Giza 88	3.100	0.897	34.30	84.65	9.80	44.75	6.63	2486.6	15.13	109.66
		Giza 92	3.767	0.880	33.51	85.47	10.36	45.50	6.13	2671.6	13.93	148.00
		Giza 96	4.233	0.913	34.47	85.83	10.89	45.08	6.10	2678.3	15.40	121.33
		Giza 94	4.763	0.920	32.47	83.58	10.17	42.83	6.90	2438.3	16.50	143.33
		Giza 86	4.487	0.937	32.58	83.60	10.35	41.54	6.37	2470.0	15.60	154.33
		Giza 97	4.557	0.927	31.74	83.43	9.51	41.00	6.84	2453.3	12.30	81.33
		Giza 95	4.927	0.920	28.41	84.28	9.82	36.14	7.42	2230.0	11.53	141.33
		Giza 90	4.507	0.920	28.42	83.05	11.70	36.32	7.43	2138.3	13.77	130.66
		Promisin cross	4.883	0.900	27.56	82.18	12.37	35.43	7.55	2233.3	14.10	113.33

Table 8: Cont.

	Giza 93	3.100	0.893	34.72	84.16	10.49	44.64	6.12	2798.3	10.20	88.33
	Giza 45	2.997	0.887	34.59	84.59	10.65	44.18	6.03	2775.0	10.63	88.33
	Giza 87	2.643	0.873	33.30	83.90	11.85	43.40	6.28	2801.3	10.97	89.00
	Giza 88	3.113	0.897	34.07	84.07	11.20	44.27	6.17	2618.3	12.87	101.33
	Giza 92	3.847	0.893	32.96	84.67	10.53	45.21	6.04	2731.6	13.40	170.00
Rotary Knife Roller Gin stand	**Giza 96**	4.437	0.907	34.13	84.64	9.91	44.67	6.07	2833.3	13.63	146.66
	Giza 94	4.697	0.903	32.48	83.98	10.25	42.55	6.21	2553.3	15.93	129.00
	Giza 86	4.553	0.927	32.13	83.97	9.86	42.82	6.27	2553.3	16.20	151.33
	Giza 97	4.693	0.920	30.87	83.61	9.50	41.00	6.87	2538.3	13.03	89.00
	Giza 95	4.827	0.910	28.80	83.90	11.04	35.70	7.24	2183.3	11.27	158.33
	Giza 90	4.833	0.917	28.70	82.38	10.77	36.39	7.61	2165.0	14.13	156.66
	Promisin cross	4.820	0.910	27.50	83.34	10.99	33.91	7.04	2197.0	13.73	145.00
L S D 0.05		**Ns**	**Ns**	**Ns**	**9.111 ****	**Ns**	**Ns**	**Ns**	**62.313 ****	**1.491 ***	**18.750 ****

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