Effect of Seed Cotton Cleaning Method and Seed Cotton Level on Ginning Efficiency and Fiber Properties of The Egyptian Cotton Cultivar Giza 86

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ABSTRACT: This research was carried out at Plant Production Department, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt, during 2018/2019 ginning season. The main objective of this research is tracking cotton fiber quality and foreign matter content through the ginning and cleaning systems. Three different seed cotton levels; namely, Good to fully good (G/FG), Good (G) and Fully Good fair to Good (FGF/G) of Giza 86 long staple Egyptian cotton cultivar, in addition to three methods of cleaning; i.e., two hand cleaning methods as belt, mesh and control treatments. Lint cotton samples collected at each cleaning methods were analyzed for foreign matter content and ginning efficiency to produce fiber for High Volume Instrument (HVI) fiber analyses. Mesh system; gave the highest mean values of the ginning efficiency parameters, i.e. gin stand capacity (0.92 kg lint/inch/hr.), lint percentage (37.65 %), lint grade code (26.83) and the lowest value of the ginning time (1.62 hr./kentar). The highest mean values for spinning consistency index (176.88), upper half mean length (32.14mm), length uniformity index (86.10%), fiber bundle strength (38.28 g/tex), maturity index (0.87), micronaire reading (4.23) and fiber reflectance degree (Rd;72.66%) were registered by the same cleaning method. The seed cotton level Good to Fully Good (G/FG) surpassed the seed cotton level Fully Good Fair to Good (FGF/G) in the ginning efficiency parameters and High Volume Instrument (HVI) fiber properties. The most studied HVI fiber properties were insignificantly ($p > 0.05$) affected by the interaction between the methods of seed cotton cleaning and seed cotton level (A × B) except, the fiber length parameters (upper half mean length [UHML], short fiber index [SFI]) and the reflectance degree ((Rd %).

Key words: Seed cotton; cotton cleaning; Fiber quality; Gin stand capacity; Lint grade, HVI.

INTRODUCTION

Egyptian cotton exporting was and still carried out by several companies through the type system. The type is actually a blend of some grades of the same cotton variety, having a specific fiber length, fineness and maturity parameters, depends upon the experience of exporting company and the specific demand of the importer (Hossam El-Din *et al.*, 2003). Production of high-quality cotton is critical to maintain the competitiveness of the cotton industry. It is very important to obtain foreign matters - free lint as seed coat fragment and other impurities using lint cleaners, despite it can be break some fiber, create neps and exclude some good quality fibers during the cleaning process. Mentioning the American cotton free of contamination is a crucial factor, where it is a provider of high fiber quality. Avoiding contamination is vitally important to uphold the U.S. cotton industry’s reputation as a supplier of high-quality cotton (Hardin *et al.*, 2018). It is very important to remove pollutants from cotton to match with the recent requirements to meet the higher production demands and worldwide competition from the synthetic fibers. The ginner plays a vital role in preserving and improving the quality of cotton to meet the demands of the textile industry (Delhom *et al.,* 2017). Results show little difference between the initial entry in the machine until the before field cleaner location, and provide an evidence that the field cleaner was the most effective system for removing foreign matter. High Volume Instrument (HVI) results indicate that the cleaning system had minimal effects on fiber characteristics not associated with foreign matter. Cleaning the seed cotton increases the most parameters to be in the same levels of hand-harvested seed cotton (Porter *et al*., 2017). Modern cotton ginning is the process which controls the moisture content and removes the foreign materials during handling, transporting and packaging many tons of bulk cotton seed and baled cotton fiber (Hughs, 2016). Effectiveness of the ginning operation affects the ginning outturn and the quality of the lint, and so influences the value of the ginned cotton. Poor ginning reduces ginning outturn and quality. Appropriate training and supervision of the work force is a key condition for the success of the ginning operation. All ginning companies should play a key role in controlling contamination of seed cotton by promoting and rewarding proper harvesting, transportation and storage techniques. Additionally, ginning companies should install the necessary seed cotton cleaning equipment and procedures, via using the proper equipment settings and maintenance, and the training of the workforce (GTZ, 2003). Fiber length, uniformity, and the content of seed coat fragments, trash, short fibers and neps were affected by the ginning process which greatly influences those above mention components. Roller ginning has a higher turn-out and produces lint that is longer, with fewer short fibers and neps, but contains more foreign matter and cottonseed (Sharma, 2014). The actual capacity depends on variety, quality, type of seed cotton cleaner and opener, the appropriate feeding rate to the gin stand, and to the correct moisture content of the seed cotton (Gérald and Nicolas, 2010). Gin machines remove foreign matter but they also impact various fiber quality characteristics. Cleaning does little to change the true color of the fiber, but combing the fibers and removing trash and dust changes the perceived color. Nevertheless, the mechanical action of seed cotton cleaners had adverse effect on some fiber properties especially length but they had a positive effect on lint grade (Abdel-Salam, 1999). On the other side, seed cotton cleaning reduces wear and tear of the fibers on the gin stand and improves ginning efficiency and lint grade by providing cotton to the gin stand in small uniform units (Garner and Baker, 1977). The seed cotton cleaning significantly surpassed uncleaning. Seed cotton cleaning increases the gin stand capacity and decreases the ginning time. Besides, improving the lint grade, fiber maturity, length parameters and the fiber mechanical properties (Hossam El-Din *et al*., 2002). The quality of gin trash varies depending on the variety of cotton, Fiber length uniformity ratio and 2.5% span length before and after lint cleaning were adversely affected by ginning at the lower moisture content (Dhongade *et al*., 2015). The seed cotton cleaning was significantly surpassed without cleaning one (Frig, 2002). The variety and quality (cleanliness, moisture content, etc.) of the cotton had a great effect on ginning outturn (Adanacioglu and Olgun 2010). Jesse and Li (2017) reported that detection of foreign matter in cleaned cotton is instrumental to accurately grading cotton quality, which in turn affect the marketability of the cotton. The trash properties gradually decreased as the lint cotton grade increased among all studied cotton varieties (Ibrahim and El-Banna, 2018 and El-Banna, 2019). Botanical foreign matter mixed with lint during cotton harvesting degrades cotton market values and appearance. In addition, this trash causes problems by increasing ends down in yarn formation furthermore affects end-use properties. The Uster® High Volume Instrument (HVI) and Shirley Analyzer are extensively used to determine trash levels in cotton lint (Fortier *et al.*, 2015). A comparison between pre- and post- Shirley analyzer cleaned cottons suggested a good harmony of micronaire value, pointing to minimum effect of cotton trash presence on micronaire result. In addition to lower micronaire values were recorded from higher instrumental leaf grade cottons (Liu and Delhom, 2018).

The objectives of present investigation are to detect the effects of cleaning of cotton quality, and provide best practices for ginning process to maximize value fiber characteristics of the Egyptian cotton, besides specifying the best cleaning seed cotton to obtain the best results.

MATERIALS AND METHODS

This investigation was carried out at Plant Production Department, Faculty of Agriculture (Saba Basha), Alexandria University, Egypt, during 2018/2019 ginning season. Three different seed cotton levels; namely, Good to fully good (G/FG), Good (G) and Fully Good fair to Good (FGF/G) of Giza 86 long staple Egyptian cotton cultivar, three sacks about one kentar (157.5 kg) for each seed cotton level, attained from Modern Nile Cotton Company, were used in this investigation. The bulk sample of each seed cotton level sack was checked by a committee of three expert classers of the Cotton Arbitration for Testing General Organization (CATGO) at the gin plant before applying the different treatments. One sack of each seed cotton level was without cleaning (control treatment). The second sack of each seed cotton level was normal method of cleaning using the belt (normal system). The third sack of each seed cotton level was cleaning using new modified method (mesh system). The bulk sample (27 kg) of each seed cotton level was divided into nine sub- samples (3 kg/replicate), representing the various combinations of both variables (three seed cotton levels and three methods of cleaning; i.e., two hand cleaning methods and without cleaning; control treatment) with three replicate each. The investigated sub-samples were ginned using the conventional single roller gin stand (McCarthy type with 40 inche roller) with the adjustments required for each level, manufactured by Sumer Company, Turkey, in Damanhour gin plant, El-Arabia Ginning Company, El-Behaira Governorate during the 2018/2019 ginning season.

Mesh system applied according to Modern Nile Cotton Company, Egypt.
Mesh system applied was as follows:

1. Purpose:

A. To eliminate any foreign matters like polypropylene fiber from the seed cotton before ginning process.
B. To eliminate immature fiber (locks) or any stained fiber from the seed cotton.

2. Layout

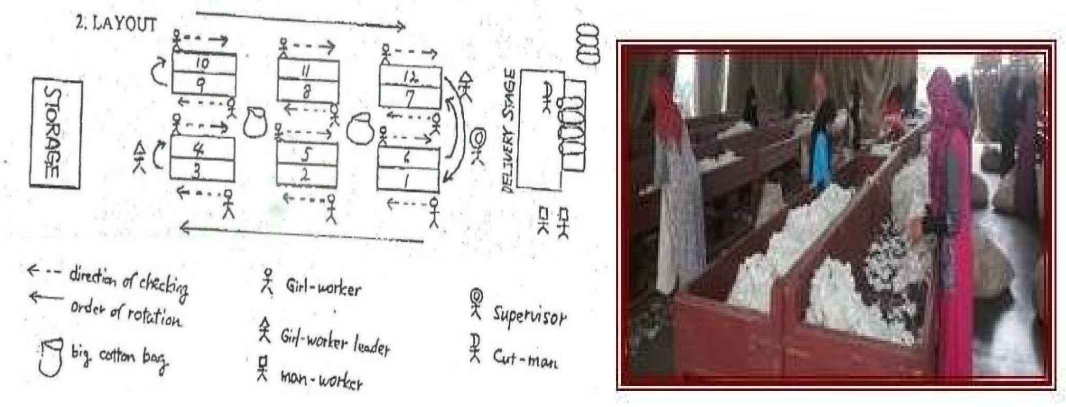

Fig (1). Show the mesh method for seed cotton cleaning

3. Workers for one unit of the system:
A. Girl- workers at each space of the tables: Each table is separated in two spaces and 1 girl-worker is located at each space and she checks seed cotton on the table piece by piece and eliminates any foreign materials or immature fiber etc.
B. Girl- worker leaders: Each girl-worker leader is located to cover 3 tables or 6 girl workers. She checks 6 girl- workers̓ work who are working at the tables which she is in charge of. She gives proper advice to each girl-worker to make the operations at the tables smooth. If she finds a certain girl-worker is behind time schedule of checking seed cotton, the leader helps such a girl-worker. The leader should be responsible for 6 girl-workers' work at the 3 tables she is in charge of.
C. Man – workers: The man-worker will deliver seed cotton to each space and collect checked seed cotton from spaces to the storage.
D. Supervisor: The supervisor is responsible for all the operation by the man and girl workers. He conducts all the operation and give proper advices to every worker. He controls the rotation of workers. He evaluates the capability of each worker. He must be well educated and very fair for evaluation of the workers.

4. Rotation: 30 minutes is one cycle of the operation of this system. The time schedule of one cycle is as follows:

5 minutes	Delivery of seed cotton to each space
10 minutes	First check
10 minutes	Second check
5 minutes	Collection of checked seed cotton

Seed cotton should be checked twice- first check and second check. Between the first check and the second check the girl-workers move from the space they checked to the next space. Therefore, the seed cotton is checked twice by two different girl-workers. The supervisor has a whistle and he gives whistle at the time of the end of the first check and the second check.

5. Tasks of each girl-worker

At the stage of delivery of seed cotton, she spreads seed cotton on the space evenly from the delivered 20 kg seed cotton suck. 1 meter width space should be kept without seed cotton at the right end of the space. Empty cotton suck is kept on the floor at the left side of the space. When she starts checking seed cotton she should starts it from the right end of the space to the left. She should pick a handful piece of seed cotton and put it on the 1 meter blank space and check the seed cotton carefully. After checking, checked piece of seed cotton should be put on the right side of the 1 meter width space in order to keep checked seed cotton completely separated from the unchecked seed cotton. She moves from right to left. Therefore, the 1 meter width spaces also move from the right end to the left as the checking progresses. If she finish checking within 10 minutes, she should restart checking once again from the right end to the left. Before starting rechecking she should keep 1 meter width space at the right end of the table again. Make sure that she always start check seed cotton from right hand to left so that the next girl-worker can easily understand from where she should start checking at the second check. Each girl-worker holds two small cotton bags from the shoulder on the both waists. One bag is for foreign materials and the other is for immature fiber. Any foreign materials or immature fiber should be eliminated from the seed cotton and kept in the cotton bags on the waists. If the worker finds her bag is full, she should spill the contents of the bag into the big cotton bags which is prepared on the floor. When the second check is finished, two girl-workers on the same table put checked seed cotton into an empty cotton sack which is prepared at the left side of the space. Two girls should help each other to fill the sacks with seed cotton.

Studied characteristics

1. Ginning efficiency parameters:

These parameters were calculated according to the following equations, proposed by Chapman and Stedronsky (1959):

1.1. Gin stand capacity (G.S.C.) expressed as the lint weight (kg) per inch per hour, as follows:

$$\text{Gin stand capacity (G.S.C.)} = \frac{60}{\text{Time (min)}} \times \frac{\text{weight of ginned lint (kg)}}{\text{Length of roller (inch)}}$$ = (kg lint /inch/hr.)

(Length of roller = 40 inch of the McCarthy roller gin stand)

1.2. Ginning time (G.T.) was determined according to the following equation:

$$\text{Ginning time (G.T.)} = \frac{\text{Ginning time (minute)}}{\text{Seed cotton weight (kg)}} \times \frac{157.5}{60}$$ = (hr. / kentar)

(1 metric seed cotton kentar = 157.5 kilograms)

1.3. Lint percentage (%): was expressed as a percentage, and determined according to the following equation:

$$\text{Lint percentage (L.P.)} = \frac{\text{Lint cotton weight (kg)}}{\text{Seed cotton weight (kg)}} \times 100$$ = (%)

1.4. Lint grade: The grade of ginned lint of each sample was determined by three export classers, at (CATGO), Alexandria. For statistical analysis, the grades were converted to code numbers according to Sallouma (1970) as shown in the following Table (1).

Table (1). Lint cotton grades, abbreviation and their codes

Grade	Abbreviation	Code
Extra	Extra	41
Fully good/Extra	FG/Extra	37
Fully good	FG	33
Good/fully good	G/FG	29
Good	G	25
Fully good fair/good	FGF/G	21
Fully good fair	FGF	17
Good fair/fully good fair	GF/FGF	13
Good fair	GF	9
Fully fair/good fair	FF/GF	5
Fully fair	FF	1

Each 1/8 grade is represented by one mark (number).

2. Determination of fiber properties using HVI instrument:

A representative sample of lint cotton (about 200 grams) was drawn from each replicate to determining the fiber properties. The High Volume Instrument (HVI) Spectrum II system was used to determine the fiber properties at the Laboratories of Cotton Arbitration for Testing General Organization (CATGO), Alexandria, Egypt.

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 the following properties were determined:

- Spinning consistency index (SCI).
- Fiber upper half mean length (UHML; mm.).
- Length uniformity index (UI, %).
- Short fiber index (SFI, %).
- Fiber bundle strength (g/tex).
- Fiber elongation (%).
- Micronaire reading (Mic.).
- Maturity index (Mat., %).
- Fiber brightness or reflectance degree (Rd %).
- Chroma or degree of yellowness (+b).
- Trash count.
- Trash area (%).

3. Lint (%) and non-lint (%): were determined by Shirley analyzer Instrument**.**

4. Statistical procedures

This investigation was conducted in a completely randomized design with three replicates and analyzed as a factorial experiment according the procedure of Snedecor and Cochran (1967). The mean values were computed using the CoStat 6.311(1998-2005) as a statistical program**,** to test significant differences among treatments using the least significant difference (L.S.D.) at 0.05 level of probability.

RESULTS AND DISCUSSION

The attained results could be presented and discussed in two main categories as follows:

1. The effect of seed cotton cleaning method and seed cotton level on ginning efficiency:

1.1 Ginning efficiency parameters: The orthogonal comparisons of the studied treatments presented in Table (2) demonstrated that the seed cotton hand cleaning methods significantly ($p \leq 0.05$) surpassed the other cleaning methods all aforementioned studied ginning efficiency traits.

It is obvious, that the method of seed cotton cleaning (mesh system); gave the highest mean values for the studied ginning efficiency parameters, i.e. gin stand capacity (0.92 kg lint/inch/hr.), lint percentage (37.65 %), lint grade code (26.83) and the lowest value of the ginning time (1.62 hr./kentar). Whereas, the lowest mean values (0.79 kg lint/inch/hr., 35.86 % and 25.38), respectively, of same traits and the highest value of the ginning time (1.80 hr./kentar) was recorded by the seed cotton without cleaning of cotton cultivar ' Giza 86'.These results could be explained on the basis that this method of seed cotton cleaning discards a large amount of foreign matters, dust, trash and tight locks and increases the fluffiness of the semi-tight locks; which reflect positively on increasing the ginning performance. Seed cotton cleaning before ginning process is a necessary demand, especially using the hand method (mesh system) as shown by the attained results.

Results attained, also indicate that seed cotton level had a highly significant ($p \leq 0.01$) effect on ginning efficiency parameters, as given in Table (2).It is worthy to mention that the seed cotton level Good to Fully Good (G/FG) was superior to the seed cotton level Fully Good Fair to Good (FGF/G) in the ginning efficiency parameters.

It is obvious that the highest mean value of the gin stand capacity (1.11 kg lint/inch/hr.) and the lowest mean value of the ginning time (1.36 hr./kentar) were attained from the highest seed cotton level of Good to Fully Good (G/FG) with seed cotton cleaning (mesh system). Meanwhile, the lowest mean value of the gin stand capacity (0.67 kg lint/inch/hr.) and the highest mean value of the ginning time (2.02 hr./kentar) were recorded for the seed cotton level Fully Good Fair to Good (FGF/G) without cleaning. These finding agree with those of Ibrahim and El-Banna (2018) and El-Banna (2019).

No significant ($p > 0.05$) interaction was found between method of seed cotton cleaning and seed cotton level (A × B) for lint percentage (%) and lint grade code of the cotton cultivar Giza 86 (Table 3).

Table (2). Average values of the ginning efficiency parameters of Giza 86 cotton cultivar as affected by seed cotton cleaning method, seed cotton level and their interaction during 2018/2019 ginning season

Characters / Treatments	Gin stand capacity (kg lint/inch/hr.)	Ginning time (hr./kentar)	Lint (%)	Lint grade code
	Seed cotton cleaning method (A)			
Without cleaning (control)	0.79c	1.80a	35.86c	25.38b
Normal system	0.88b	1.69b	37.20b	25.50b
Mesh system	0.92a	1.62c	37.65a	26.83a
L.S.D. $_{0.05}$	**0.02**	**0.04**	**0.38**	**0.33**
	Seed cotton level (B)			
Good/Fully Good	1.03a	1.45c	38.10a	30.44a
Good	0.82b	1.76b	36.66b	25.72b
Fully Good Fair /Good	0.74c	1.90a	35.96c	21.55c
L.S.D. $_{0.05}$	0.02	**0.04**	**0.38**	**0.33**
	Interaction			
A × B	**	*	**ns**	**ns**

Means designated by the same letters within each column are not significantly different at 0.05 level of probability.
*, ** : Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.
ns: Not significant.

2. The effect of seed cotton cleaning method and seed cotton level on HVI fiber properties for the cotton cultivar Giza 86:

All studied High Volume Instrument (HVI) fiber properties were significantly ($p < 0.05$) affected by seed cotton hand cleaning method as indicated in Table (4).

The hand method of seed cotton cleaning (mesh system); resulted in the highest mean values for spinning consistency index (SCI; 176.88), upper half mean length (UHML; 32.14 mm), length uniformity index (UI; 86.10%), fiber mechanical property (fiber bundle strength; 38.28 g/tex), maturity index(0.87%), micronaire reading (4.23) and fiber reflectance degree (Rd; 72.66 %) in addition to the lowest mean values of short fiber index (SFI; 5.75 %), fiber elongation (5.51 %), yellowness degree (+b; 8.84) and trash attributes (trash count; 62.88 and trash area; 0.75 %) compared to the non-cleaned seed cotton. This could be attributed to the big chance of eliminating the tight locks in the hand cleaning method. These results go in line with those of (Hossam El-Din *et al.,* 2003).

Table (3). The interaction between seed cotton cleaning method and seed cotton level (A × B) for the ginning efficiency parameters of Giza 86 during 2018/2019 ginning season

Variables		Gin stand capacity (kg lint/inch/hr.)	Ginning time (hr./kentar)
Seed cotton cleaning method (A)	Seed cotton level (B)		
Without cleaning	G/F G	0.91	1.59
	G	0.78	1.80
	FGF/G	0.67	2.02
Normal system	G/F G	1.07	1.40
	G	0.81	1.76
	FGF/G	0.76	1.89
Mesh system	G/F G	1.11	1.36
	G	0.86	1.70
	FGF/G	0.80	1.78
L.S.D.$_{0.05}$		**0.04**	**0.06**

It is worthy to mention that the HVI fiber properties of all studied seed cotton levels were improved using the hand seed cotton cleaning method (Mesh system). These findings could be attributed to the better effect of seed cotton cleaning, which resulted in a noticeable improvement to the quality of the ginned lint as well as the seed cotton cleaning increased the fiber length and reduced the short fiber content.

Results shown in Table (4) reveal that all studied HVI fiber properties were significantly ($p \leq 0.05$) affected by the seed cotton level. The highest mean values of spinning consistency index (SCI; 186.00), upper half mean length (UHML; 32.87 mm), length uniformity index (UI; 87.37 %), fiber bundle strength (39.48 g/tex), maturity index (0.87%), micronaire reading (4.57) and fiber reflectance degree (Rd; 77.52 %). In addition to the lowest mean values of short fiber index (SFI; 5.50 %), fiber elongation (5.57 %), yellowness degree (+b; 8.66) and trash attributes (trash count; 38.77 and trash area; 0.39 %) were recorded by the highest seed cotton level (Good/Fully Good). The short fiber index, fiber elongation, yellowness degree and trash attributes (trash count and trash area) were increased as the seed cotton level decreased. The attained result could be attributed to the amount of infested locks and foreign matter which usually increased as the seed cotton level decreased (Ibrahim and El-Banna, 2018 and El-Banna, 2019).

The interaction between the methods of seed cotton cleaning and seed cotton level (A × B) was not significant for most studied High Volume Instrument (HVI) fiber properties, except the fiber length parameters (upper half mean length and short fiber index) and the lint colour reflectance degree (Table 4).

The highest mean value of the upper half mean length (UHML; 33.32mm), lint colour reflectance degree (Rd; 78.93%) and the lowest mean value of short fiber index (SFI; 5.16%) were gained owing to the hand seed cotton cleaning method (mesh system) with the highest seed cotton level (Good/Fully Good). While the lowest mean value of the upper half mean length (29.01mm), reflectance degree (Rd; 62.63%) and the highest mean value of short fiber index (7.93%) were recorded for the seed cotton without cleaning and normal cleaning of the same seed cotton level (Fully Good Fair /Good)

3. The effect of seed cotton cleaning method and seed cotton level on Lint (%) and non-lint (%) using Shirley analyzer for the cotton cultivar Giza 86:

Lint (%) and non-lint (%) measured using Shirley analyzer had a highly significantly ($p \leq 0.01$) effect by seed cotton cleaning method of Giza 86 cotton cultivar (Table 6).

The hand cleaning method seed cotton (mesh system); recorded the highest mean value (95.54%) for the lint percentage and the lowest mean value (4.45 %) of the non-lint percentage using Shirley analyzer compared to the other studied methods of seed cotton cleaning.

The seed cotton level had a highly significant ($p \leq 0.01$) effect on lint (%) and non-lint (%) of Giza 86 cotton cultivar in the same Table. The lowest seed cotton level (Fully Good Fair/Good) gave the lowest mean value (87.65 %) of the lint percentage and the highest mean value (12.34%) of the non-lint percentage. It could be mention that the non-lint percentage was correspondingly increased due to decreasing the seed cotton level as a direct negative correlation, while, the lint percentage was gradually, increased in an opposite correlation. These results were in harmony with those obtained by Abdel-Aal (2006) who concluded that lint percentage as measured by the Shirley analyzer was affected by seed cotton grades.

Table (4). Average values of the HVI fiber properties of ' Giza 86 ' as affected by seed cotton cleaning method, seed cotton level and their interaction during ginning season 2018/2019

Characters / Treatments	SCI	UHML (mm)	Uniformity index (%)	Short fiber index (%)	Fiber strength (g/tex)	Fiber elongation (%)	Maturity index (%)	Micronaire reading	Reflectance degree (Rd %)	Degree of yellowness (+ b)	Trash count	Trash area (%)
Seed cotton cleaning method (A)												
Without cleaning	161.33b	30.48c	83.92b	6.78a	36.50b	6.97a	0.85c	3.93b	69.57b	9.57a	101.77a	1.61a
Normal system	166.77b	31.38b	85.07a	6.30b	37.11ab	6.07b	0.86b	4.11 ab	70.11b	9.16b	81.44b	1.22b
Mesh system	176.88a	32.14a	86.10a	5.75c	38.28a	5.5 c	0.87a	4.23a	72.66a	8.84c	62.88c	0.75c
L.S.D. $_{0.05}$	**6.95**	**0.38**	**1.06**	**0.36**	**1.36**	**0.41**	**0.01**	**0.23**	**0.68**	**0.24**	**16.76**	**0.36**
Seed cotton level (B)												
Good/Fully Good	186.00a	32.87a	87.37a	5.50c	39.48a	5.57c	0.87a	4.57a	77.52a	8.66c	38.77c	0.39c
Good	169.22b	31.02b	84.74b	6.47b	37.07b	6.23b	0.85b	3.74b	70.60b	9.11b	83.00b	1.26b
Fully Good Fair /Good	149.77c	30.11c	82.97c	6.86a	35.33c	6.75a	0.85b	3.96b	64.23c	9.81a	124.33a	1.93a
L.S.D. $_{0.05}$	**6.95**	**0.38**	**1.06**	**0.36**	**1.36**	**0.41**	**0.01**	**0.23**	**0.68**	**0.24**	**16.76**	**0.36**
Interaction												
A × B	**ns**	*****	**ns**	******	**ns**	**ns**	**ns**	**ns**	*****	**ns**	**ns**	**ns**

Means designated by the same letters within each column are not significantly different at 0.05 level of probability.
*, ** : Significant and highly significant at 0.05 and 0.01 levels of probability, respectively.
ns: Not significant.
UHML: Upper Half Mean Length.
SCI: Spinning consistency index.

Table (5). The interaction between seed cotton cleaning method and seed cotton level (A × B) for reflectance degree (Rd %) of Giza 86 during 2018/2019 ginning season

Variables		UHML (mm)	Short fiber index (%)	Reflectance degree (Rd %)
Seed cotton cleaning method (A)	Seed cotton level (B)			
Without cleaning	G/F G	32.49	5.46	76.43
	G	29.95	6.96	68.86
	FGF/G	29.01	7.93	63.43
Normal system	G/F G	32.81	5.86	77.20
	G	31.00	6.53	70.50
	FGF/G	30.34	6.50	62.63
Mesh system	G/F G	33.32	5.16	78.93
	G	32.11	5.93	72.43
	FGF/G	30.98	6.16	66.63
L.S.D. $_{0.05}$		**0.66**	**0.63**	**1.18**

UHML: Upper Half Mean Length.

Table (6). Average values of the lint (%) and non-lint (%) of Shirley analyzer as affected by seed cotton cleaning method, seed cotton level and their interaction during ginning season 2018/2019

Characters / Treatments	Lint (%)	Non lint (%)
	Seed cotton cleaning method (A)	
Without cleaning	88.74 c	11.25 a
Normal system	93.07 b	6.92 b
Mesh system	95.54 a	4.45 c
L.S.D. $_{0.05}$	**1.13**	**1.13**
	Seed cotton level (B)	
Good / Fully Good	95.91 a	4.08 c
Good	93.80 b	6.20 b
Fully Good Fair/Good	87.65 c	12.34 a
L.S.D. $_{0.05}$	**1.13**	**1.13**
	Interaction	
A × B	**ns**	**ns**

- Means designated by the same letters within each column are not significantly different at 0.05 level of probability.
- ns: Not significant.

CONCLUSION

It could be recommended from the previous results that the Egyptian gin plants should continue seed cotton cleaning process for the different seed cotton levels and trash content of cotton using the method of seed cotton cleaning (mesh system) to eliminate any foreign matters like polypropylene fiber from the seed cotton before ginning process, and eliminate immature fiber (locks) or any stained fiber from the seed cotton. Generally, it could be concluded that the highest seed cotton level and cleaned using mesh system had a good effect on the ginning efficiency and fiber properties.

REFERENCES

Abdel-Aal, W.M. (2006). Effect of feeding method of conventional roller gin stand and seed cotton level on ginning efficiency. M.Sc. Thesis, Fac. Agric., (Saba Basha), Alex. Univ., Egypt.

Abdel-Salam, M.E.(1999). Effect of ginning processes on fiber quality. The Egyptian cotton Elkalema Press, Giza, Cairo, 403 pp.

Adanacioglu, H. and F.A Olgun (2010). Profitability and efficiency in the cotton ginning industry: a case study from the Aegean region of Turkey. 6(2): 163-182 Available at Mai/Ago www.custoseagronegocioonline.com.br.

Champman, W.E. and V.L. Stedronsky (1959). Ginning acala cotton in the south-west. USDA. Agric. Res. Serv. Prod. Res. Rep. No. 27.

CoStat 6.311, C. C. W. (1998-2005). Cohort software798light house Ave. PMB320, Monterey,CA93940,andUSA.email:info@cohort.com. *http://www.cohort.com/DownloadCoStatPart2.html* .

Delhom, D. C., V. B. Martin, and M. K. Schreiner (2017). Textile industry needs. J. Cotton. Sci. 21:210–219. http://journal.cotton.org, © The Cotton Foundation 2017

Dhongade G.K., S. Bansod and N.J Shirbhate (2015). Cotton ginning parameters - A review. Lecturer, Dep. of Mech. Engine. IJSRD International J. Scientific Research & Development| - (online) 3(1): 755-758.

El-Banna, A. A. A. (2019). Relationship between roller gin type and ginning efficiency of Egyptian cotton cultivar ‹Giza 86’. Mid. East J. Agri. Res. 8 (1): 117-125.

Fortier, C., J. Rodgers and J.Foulk (2015). Botanical trash mixtures analyzed with near-Infrared and attenuated total reflectance fourier transform spectroscopy and thermogravimetric Analysis. J. Cotton Sci., 19:603-612 http://Journal.cotton.org, © The Cotton Foundation 2015.

Frig, N. A. **(2002).** Effect of cleaning and blending of seed cotton on ginning efficiency. M. Sc. Thesis, Fac. Agric. Saba Basha, Alex. Univ., Egypt.

Garner, K.W. and R.V. Baker (1977). Cleaning and Extracting. U.S.D.A., Cotton Handbook, Agric. Handbook, No. 503: 19.

Gérald, E. and G. Nicolas (2010). The Economics of roller ginning technology and implications for African cotton sectors - prepared for the world bank.

GTZ. (2003). Egyptian Cotton Sector Strategy. Ministry of Agriculture and Land Reclamation Egyptian German Cotton Sector Promotion Program & Cotton Council - CSPP 113 (15).

Hardin, I. R.G., E. M. Barnes, T. D. Valco, V. B. Martin and D. M. Clapp (2018). Effects of gin machinery on cotton quality. J. Cotton Sci., 22:36-46. http://Journal.cotton.org, © The Cotton Foundation 2018.

Hossam El-Din, A.E., M.G.I. Beheary and H.E. Abdel-Gelil (2002). Instrumental grading of the Egyptian cotton using the HVI. J. Adv. Agric. Res., 7 (1): 87- 102.

Hossam El-Din, A.E., M.G.I. Beheary, A.K. Nassr-allah and N. Ferig (2003). Effect of seed cotton cleaning and blending on ginning efficiency and fiber properties. J. of Agric. Res. Tanta Univ., 29 (1): 34- 49.

Hughs, S.E. (2016). Cotton Ginners Handbook (2016 Revised Edition). The J. Cotton Sci., 20:154-154. http://Journal.cotton.org, © The Cotton Foundation 2016

Ibrahim, A. E. I. and A. A. A. El-Banna (2018). Response of fiber quality to temperature degree and lint cotton grade in two long staple varieties. Alex. Sci. Exchange J., 39 (3): 482- 489.

Jesse, K. and C. Li (2017). A pulsed thermographic imaging system for detection and identification of cotton foreign matter. Sensors, 17(3):518-532.

Liu, Y. and C. Delhom (2018). Effect of instrumental leaf grade on HVI micronaire measurement in commercial cotton bales. The J. Cotton Sci., 22:136–141. http://Journal.cotton.org, © The Cotton Foundation 2018.

Porter, W.M., J. D. Wanjura, R. K. Taylor, R. K. Boman, and M. D. Buser (2017). Tracking cotton fiber quality and foreign matter through a stripper harvester. The J. of Cotton Sci., 21:29–39. http://Journal.cotton.org, © The Cotton Foundation 2017.

Sallouma, B.M. (1970). Grades analysis of long staple Egyptian cotton. Ph. D. Thesis, Fac. of Agric., Ain Shams Univ., Egypt.

Sharma, M.K (2015). New directions in roller ginning industry. Retrieved at 27, June, 2015 from: http://www.bajajngp.com/images/technical/new_directions_2014.pdf. 2:6.

Snedecor, G.W. and W.G. Cochran (1967). Statistical method, 6*th* ed. Iowa Stat Univ. Press, 593p.

الملخص العربي

تأثير طريقة تنظيف القطن الزهر ومستوى القطن الزهر على كفاءة الحليج وخواص الالياف لصنف القطن المصري جيزة ٨٦

على أحمد على البنا

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أجرى هذا البحث بقسم الانتاج النباتى – كلية الزراعة (ساباباشا) – جامعة الاسكندرية – مصر خلال موسم حليج ٢٠١٨/٢٠١٩ باستخدم ثلاثة مستويات من القطن الزهر (جود / فولى جود ، و جود ، و فولى جود فير / جود) لصنف القطن المصرى الطويل (جيزة ٨٦) لدراسة تأثير طرق تنظيف القطن الزهر (بدون معاملة (كنترول) ، و النظام العادى بالحصيرة ، والنظام اليدوى Mesh system) على كفاءة الحليج ، ونسبة الشعر ، ورتبة الشعر بالاضافة الى خواص الشعيرات المختبرة بجهاز HVI بمحلج الشركة العربية بدمنهور. أوضحت النتائج المتحصل عليها تفوق معاملة نظام اليدوي (Mesh system) لتنظيف القطن الزهر معنويا على المعاملات الاخرى حيث سجلت أعلى القيم المتوسطة للقدرة الانتاجية للحلاجة ، ونسبة الشعر ، وكود رتبة الشعر بالإضافة الى أقل زمن حليج أما من حيث خواص الشعيرات المختبرة بجهاز HVI أعطت أعلى القيم المتوسطة لكلا من ثابت الغزل (SCI) ، ومتوسط طول النصف العلوى من الشعيرات (UHML) ، ومعامل الانتظامية (UI)، ومتانة خصلة الالياف (g/tex) ، وقراءة الميكرونير (.Mic)، ونسبة الانعكاس (% Rd) بالاضافة الى أقل قيمة متوسطة لمعامل الشعيرات القصيرة (SFI). كما تفوق مستوى القطن الزهر (جود / فولى جود) معنويا على المستويين الاخريين حيث سجل أعلى القيم المتوسطة لنفس الصفات المدروسة. وكان التفاعل بين عاملى الدراسة معنويا لكلا من القدرة الانتاجية للحلاجة ، وزمن الحليج ، ومتوسط طول النصف العلوى من الشعيرات ، ومعامل الشعيرات القصيرة ، ونسبة الانعكاس.