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Effect of low-quality and inexpensive cotton materials on yarn properties using rotor spinning system

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Abstract:
The current search aimed to produce medium and coarse yarns using low-quality and inexpensive cotton materials under the rotor spinning at four yarn counts being 10.s, 16.s, 20.s and 24.s with 4.4 twist multiplier. The used cotton materials were the waste from spinning extra long-staple cotton such as combed wastes, Giza 80 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 80 lint grade good fair, Giza 90 lint grade good fair, imported china variety and carded wastes. The used cotton materials were prepared from the commercial cotton samples of season 2017. The studied yarn mechanical properties were yarn strength, yarn evenness C.V.%, number of neps, number of thin places and number of thick places. However, the average values of five fiber properties being fiber length 2.5 %, short fiber content %, coefficient of variation fiber C.V. %, fiber strength and micronaire reading were measured for all used cotton materials. Results showed significant differences among cotton materials and among yarn counts for all studied yarn properties. The effect of interaction between cotton materials and yarn counts was only significant for yarn strength and yarn evenness C.V. %. Generally, it is obvious that the mean values of yarn strength were in descending order considering cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. On the contrary, the mean values of yarn evenness C.V. %**,** number of neps, number of thin places and number of thin places were in ascending order for the same aforementioned cotton materials. The mean values of yarn strength were gradually decreased when the yarn count was increased while the mean values of yarn evenness C.V. %, number of neps, number of thin places and number of thin places were gradually increased when the yarn count was increased.

Keywords:
Yarn Counts
Rotor Spinning
Yarn Properties
Evenness
Nep

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INTRODUCTION

Cotton is the most widely used fiber crop in the textile industry in the world. It plays an exceptionally important role in Egypt. It is well known that, Egyptian cotton characterized by its extra long staple fibers compared to the other imported cotton all over the world. In the present competitive age, quality of textile product is the most desirable factor at purchase counter for the consumer. It is also helpful in keeping the cost of production within satisfactory level. Therefore, quality and price are two items among the key factors for the Egyptian textile industry's success.

Kotb (2012) mentioned that Egyptian cotton is the world's finest cotton because it has some noble characteristics apart from other natural fibers. The length of the fiber makes it possible to make the finest of yarns without sacrificing the strength of the yarn. The strength of the fiber makes yarn and fabric more solid and more resistant to stress. Its ability to absorb liquids gives fabrics made of Egyptian cotton deeper, brighter and more resistant colors. Its softness feels like nothing else in the world.

As a result of the great increase of population and consumption of both raw cotton and fabrics, Egypt can export Egyptian cottons of high quality and price and import American upland cottons of low quality and price to produce blended coarse yarns (**Abdel-Ghaffar *et al*., 2019)**.

Abd El Khalik *et al*, (2017) and Tolba (2017) reported that Egyptian cotton fibers whether were long or short may be adapted to spin under the open-End spinning system to produce coarse and medium yarns that can be used in manufacture some of cotton products such as denim, outer wear and house hold textiles. These productions in Egypt need much hard currency to import these row materials especially it is not economical to produce coarse and medium yarns from high quality Egyptian cottons. So, it is planed to use the wastes of different processes of ring spinning system by blending it with long staple cotton under commercial yarn counts and twist factors, in order to reduce the cost of production and to be economical for the popular fabrics.

Many published papers have discussed the reuse of recovered fiber in spinning system. **Al Mamun *et al*, (2017)** cleared that the best process of producing better quality yarn from very poor grade of cotton and even from wastage is the rotor spinning. Rotor spinning system is rising due to the considerable reduction in space and personnel. The volume of production on rotor spinning has also increased in recent years which are quite understandable considering the present trend in the production and consumption of textile products. Rotor spinning gives a new era to produce more uniform, fuller, aerated and regular in strength cotton yarn. Rotor spinning is a recognized spinning system mainly for medium and course counts. The yarn characteristics of rotor spun yarn are affected by many factors mainly related to raw material, machine and processing parameters.

Repon *et al*, (2016) revealed that rotor spinning is considered as most suitable and successful spinning process among many open-end spinning methods. This spinning system is significantly acceptable for high production of yarn by using low to medium grade cotton even from wastage at relatively lower cost than any other existing spinning technology. It is common in rotor spinning that the yarns are spun from wastage or by mixing and blending wastage to the normal raw material. This indicates that profits are better and the raw material, namely wastes from spinning mill, is relatively cheaper to give better returns. Rotor spinning gives a new era to produce more uniform, fuller, aerated and regular in strength of cotton yarn. Rotor spinning is a recognized spinning system mainly for medium and course counts.

Khan and Rahman (2015) illustrated that the cost of the raw materials has been increased in recent days as well as labor cost. Because of extreme competition in textile industry, it has been obligatory in textile industries to reduce the production cost by any means. It is reported that raw material costs about 50-70% of the total cost of the product. However; improving raw material exploitation has become the most important challenge facing scientific and industrial community. One of the main methods to reduce the production costs is waste recycling which is the most important challenge for the future. It is reported that textiles are nearly 100 % recyclable, nothing in the textile and apparel industry should be wasted. Rotor spinning is considered as most suitable spinning principle in case of acceptable yarn production by using low grade cotton at relatively lower cost than any other existed spinning technology till now. In rotor spinning it is common to spin useful yarns from waste or by adding waste to the normal raw material.

Increase in yarn count, yarn twist and type of rotor used during spinning all lead to increase in the formation of thin and thick places. Thin and thick places bring about a poor yarn and fabric appearance, lower yarn strength hence increasing in end breakages in yarns during winding, weaving and knitting operations. With these side effects, spinners should ensure that thin and thick places are minimized so as to produce yarns of the desired quality (**Mwasiagi and Mirembe, 2018)**.

The main objective of this research was to study the possibility of using extra long Egyptian cotton varieties wastes (combed wastes and carded wastes), two grads (fully good fair, good fair) of each one of Giza 95, Giza 90 and China variety under rotor spinning system with commercial yarn counts in order to reduce the cost of production and to be economical for the popular fabrics.

MATERIALS AND METHODS

The primary objective of this work is to investigate the possibility of using low quality and inexpensive cotton materials such as combed wastes,Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair , Giza 90 lint grade good fair, china variety lint grade good (Kemian) and carded wastes to produce medium and coarse yarns using rotor spinning at four yarn counts being 10.s, 16.s, 20.s and 24's with 4.4 twist multiplier. All fiber and yarn properties were carried out during 2017 season at Cotton Technological Research Laboratory, Cotton Research Institute, Agricultural Research Center. The cotton materials were spun by the Egyptian spinning factory LANA, 10^{th} Ramadan city – Elropeki road.

Cottons Material

Comber and carding wastes: The comber noils and carding flat wastes from the extra-long Egyptian Cotton varieties, Giza 45, Giza 92, Giza 93, Giza 87, Giza 88, Giza 70 and the new cultivars of Giza 96 and Giza 96 were handle blended to become homogeneous blends and used in this study. The blending was carried out according to the standard method designated by **A.S.T.M. 1974 (D. 1441-25),** the British standards (B.S. Hand book No. 11-1974) and **Hollen and Saddlers (1973).** The blends method and the desired amounts of each cotton fibers were weighted and a layer of each was spread over the preceding layer to build up a sandwich composed of many layers. Sections were then composed of many layers. Sections were then taken through the sandwich and carefully mixed.

Apparatus and machines:

Conventional carding machine: The source sample of each cotton material was carded using-conventional "carding machine to produce 0.26 Hank Slivers.

The combing process: the combing process was carried out on the second card slivers for the aim of producing finer yarns as a result of separating the short fibers from the longer ones, as well as trash content and neps,

A silver lap machine was used to prepare a silver lap consisting of 20 slivers of about 12" width to be fed to a plat type nasmith cotton comb. The second card silvers of the extra long stable varieties were combed at 10% and 20% noils. The percentage of noil was computed as follows:

Noil percent = Weight X 100 / (weight of combed sliver + noil)

The coming noils samples draw from each combing level were subjected to fiber testing.

Autocoro 288 Open-End rotor spinning machine was used to perform the spinning process for all studied samples.The autocoro spins knot-free yarns economically in counts up to 16.6 tex (Nm 60), from natural and synthetic fibers, and blends in staple lengths up to 60 mm.

The specifications of this machine were as follows:

1. Rotor speed: 100.000 r.p.m. (Cotton type rotor).
2. Opening roller speed: 8.200 r.p.m. (Cotton type opening roller).
3. Rotor diameter: 31 mm.

Yarn count and twist multipliers studied: All these treatments were carried out at the Spinning Research Section, Cotton Research Institute, Agricultural Research Center, Giza. Each cotton fiber material was spun into four carded yarn counts, *i.e.,* 10, 16, 20 and 24's, using twist multipliers 4.4. The aforementioned tests were conducted in the standard condition of (65 + 2%) relative humidity and (21 + 2°C) temperature.

Fiber properties: Different huge blending weight l kg were prepared from each raw material used and then a homogenous mixing 1 kg was taken to determine fiber properties at Cotton Technology Research Division, Cotton Research Institute, Giza, Egypt, at a constant relative humidity 65 % (± 2) and temperature 21 CO (± 2).

1- KEISOKKI kcf-Is-v/Is version 1.29.3. was utilized to measure 2.5% span length, short fiber content (S.F.C %), and coefficient of variation length % (C.V %) where the data of the aforementioned fiber length characteristics are displayed directly on the screen of the instrument without per-forming any calculations.

2- H.V.I Instrument System was used according to ASTM (D- 4603-86-1776-98) to determine upper half mean length by mm., uniformity index, micronaire value (microgram/inch), and fiber strength (cn/tex), while fiber elongation (FE%) was used according to the A.S.T.M.(D-1440-65).

3- Stelometer Instrument at (1/8) by the standard method of A.S.T.M. (D-1445-75, 1984) was used to measure the flat bundle tensile strength (tenacity).

Yarn mechanical properties: Yarn strength (Lea product) was determined by testing the skein strength on the Good Brand lea tester to estimate the lea strength (Lea product) in pounds (A.S.**T**.M., **1967-D 1578)**. The broken leas were weighted by a Souter Alfered Balance (A.S.**T**.M., **1967 D-1907)** to estimate its actual count. The lea breaking strength was corrected according to the actual count. Lea product was the nominal count estimate from the following formula:

Lea product = Corrected breaking load in pounds x nominal count

Coefficient of variation of the yarn evenness (C.V.%), number. of neps/400 m, number of thin places/400 m, and number of thick places/400 m of the yarn were measured by the Uster Evenness Tester III as described by the designation of the **(A.S.T.M., 1984 D-2256).**

Statistical procedures: The collected data were subjected to statistical analysis as a factorial ANOVA which is an Analysis of Variance test with more than one independent variable (factor). In the current work, the cotton materials is the first factor while the yarn count is the second factor according to the procedure outlined by **Snedecor and Cochran (1989).** Whenever the F test was significant, the least significant difference (L.S.D.) at 5% level of probability was used to calculate the significant differences among the mean values of the studied treatments.

RESULTS AND DISCUSSION

Fiber technological properties

Results presented in Tables (1) revealed the average values of five fiber technological properties being fiber length 2.5 %, short fiber content %, coefficient of variation fiber C.V. %, fiber strength and micronaire reading computed for the studied seven cotton materials of combed wastes, Giza 80 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 80 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes. It is obvious that the average values of fiber length 2.5 %, fiber strength and micronaire reading could be arranged in an descending order with regard to the cotton materials of combed wastes, Giza 80 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 80 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. On the other hand, the mean values of short fiber content % and coefficient of variation fiber C.V. % were in ascending order for the same cotton materials as above mentioned. Otherwise, these results indicated that there negative association between each one of the fiber length 2.5 %, fiber strength and micronaire reading of one side and short fiber content % and coefficient of variation fiber C.V. % of the other side. These results are in harmony with those obtained by **Mohammed and El-Sayed (2002), Mabrouk and Nour (2005), Taher *et al*. (2009), Abdel-Khalik *et al*. (2017), Tolba (2017) and Abdel-Ghaffar (2019)** who reported that cotton materials markedly varied in fiber technological properties. **Hassan *et al*. (2016)** indicated that the fiber technological properties were among the important factors that affecting the spun yarn properties.

Table (1): Summary of average values of five fiber technological properties measured for seven types of cotton materials.

Cotton materials	Fiber properties				
	Length 2.5 % (mm)	Short fiber content % (S.F.C.)	Coefficient of variation fiber (C.V.%)	Strength (g/tex) at 1/8	Micronaire value
Combed wastes	35.8	7.6	28.8	38.1	4.2
Giza 95 (fully good	33.1	8.3	29.3	37.7	4.3
Giza 90 (fully good	32.1	13.8	29.6	37.6	4.2
Giza 95 (good fair)	31.2	19.6	30.1	37.0	4.0
Giza 90 (good fair)	30.3	22.5	30.5	36.2	3.8
China variety	28.6	34.3	32.1	33.0	3.6
Carded wastes	27.1	37.0	32.6	32.4	3.1

Yarn technological properties

1- Yarn strength

Yarn strength is one of the most important parameter influencing the yarn's use in terms of quality. Results presented in Tables (2) showed significant differences among cotton materials, yarn English counts and their interaction effects.

Generally, it is clear that the mean values of yarn strength were in descending order regarding cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. The maximum yarn strength (2400) was recorded by combed wastes with significant differences than the rest cotton materials. The minimum yarn strength (2040) was recorded by carded wastes.

On the other hand, the mean values of yarn strength were significantly decreased with increasing yarn counts from 10's to 24's. The highest yarn strength (2470) was obtained by yarn count (10's) while the lowest value (1950) was obtained under yarn count (24's).

Concerning the interaction effect, although the yarn strength of all cotton materials declined with increasing yarn counts, but the percentages of decrease were markedly varied. The yarn strength values were decreased by 5.6, 15.4 and 23.7 % for the combed wastes samples produced using yarn counts being 16's, 20's and 24's respectively as compared to yarn count (10's) while the corresponding percentages of decrease for carded wastes were 5.1, 10.5 and 19.5, respectively. Accordingly, the best produced (rotor spun) yarn in terms of high yarn strength could be obtained by spinning combed wastes at count 10's. The previous results were graphically illustrated by Figure (1). Similar results were obtained by **Mohammed and El-Sayed (2002), Taher *et al*. (2009), Kotb (2012), Abdel-Khalik *et al*. (2017), Tolba (2017) and Abdel-Ghaffar (2019)**.

Table (2): Effect of cotton material, yarn count and their interaction on yarn strength.

Cotton materials (CM)	Yarn counts (YC)				Mean
	10. s	16. s	20. s	24. s	
Combed wastes	2700	2550	2285	2060	2400
Giza 95 (fully good fair)	2670	2400	2225	2030	2330
Giza 90 (fully good fair)	2580	2350	2205	2000	2285

Giza 95 (good fair)	2470	2305	2170	1990	2235
Giza 90 (good fair)	2350	2240	2050	1910	2140
China variety	2280	2205	2010	1865	2090
Carded wastes	2235	2120	2000	1800	2040
Mean	2470	2310	2135	1950	2215
L.S.D. $_{0.05}$	CM = 32.80 YC = 24.80 CM x YC = 65.60				

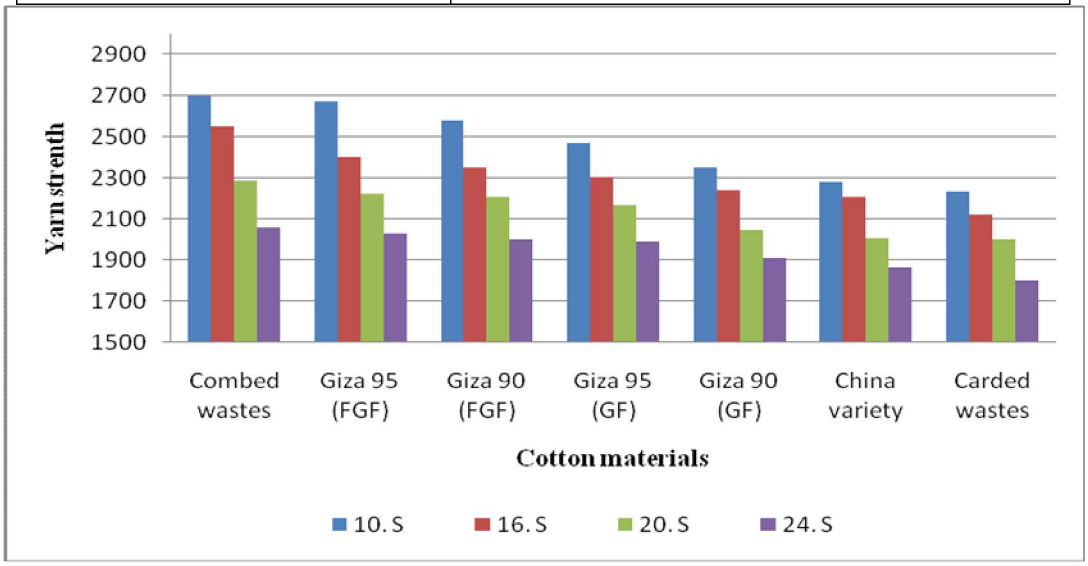

Fig. (1): The effect of interaction between cotton materials and yarn counts on yarn strength.

2- Yarn evenness C.V. % (per 400 m)

Yarn evenness C.V. % (per 400 m).is one of the undesirable parameter influencing the yarn's use in terms of quality. There were significant differences among cotton materials, yarn counts and their interaction effects as presented by Tables (3) and Figure (2).

Results indicated that the mean values of yarn evenness were in ascending order regarding cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. The lowest yarn evenness value (12.1) was observed by combed wastes with significant differences between it and the other cotton materials. The highest yarn evenness (15.1) was recorded by carded wastes. However, the mean values of yarn evenness were significantly increased with the increment of yarn counts from 10's to 24's. The lowest yarn evenness (12.8) was obtained by yarn count (10's) while the highest value (14.3) was obtained under yarn count (24's).

Regarding the interaction effect, its significance indicated that the relative response of cotton materials to the yarn count is different. It is noted that yarn evenness values were increased by 5.6, 15.4 and 23.7 % for the combed wastes samples produced by yarn counts being 16's, 20's and 24's respectively as compared to yarn count (10's) while the opposite percentages of increase for carded wastes were 7.2, 12.2 and 30, respectively. Accordingly, the good quality yarn (rotor spun) in terms of low yarn evenness could be obtained by spinning combed wastes at low yarn count. These results were in agreement with those obtained by **Abdel-Khalik *et al*. (2017) and Abdel-Ghaffar (2019)** who explained the yarn evenness of rotor spun yarn have been increased with increasing the yarn counts.

Table (3): Effect of cotton material, yarn count and their interaction on yarn evenness C.V. % (per 400 m).

Cotton materials (CM)	Yarn counts (YC)				Mean
	10. s	16. s	20. s	24. s	
Combed wastes	11.6	11.8	12.1	12.8	12.1
Giza 95 (fully good fair)	11.9	12.2	12.6	12.9	12.4
Giza 90 (fully good fair)	12.8	12.9	13.3	13.8	13.2

Giza 95 (good fair)	12.9	13.8	13.9	14.1	13.7
Giza 90 (good fair)	13.1	14.3	14.7	14.9	14.2
China variety	13.5	14.8	15.2	15.5	14.8
Carded wastes	13.9	14.9	15.6	15.9	15.1
Mean	12.8	13.5	13.9	14.3	13.6
L.S.D. $_{0.05}$	CM = 0.15 YC = 0.12 CM x YC = 0.31				

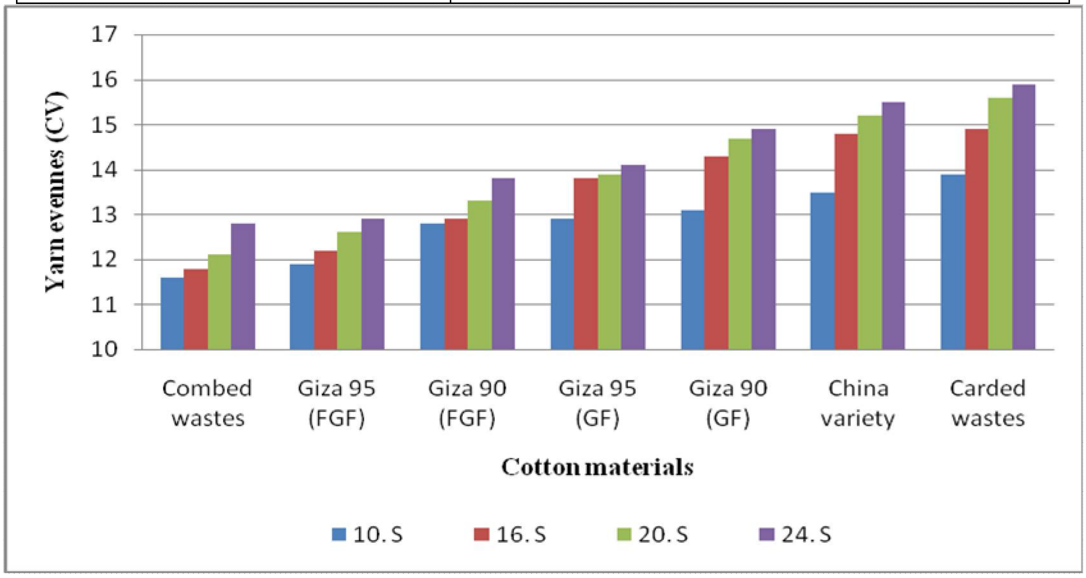

Fig. (2): The effect of interaction between cotton materials and yarn counts on yarn evenness (CV %).

3- No. of neps (per 400 m)

Number of neps (per 400 m) is one of the imperfection parameter affecting the yarn quality. Significant differences were observed among cotton materials and yarn counts while the interaction effect was no significant. Results shown in Tables (4) illustrated that the average values of number of neps were in ascending order regarding cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. The lowest number of neps (56) was observed by combed wastes with significant differences between it and the other cotton materials. The highest number of neps (77) was recorded by carded wastes. However, the mean values of number of neps were significantly increased with the increment of yarn counts from 10's to 24's. The lowest number of neps (46) was obtained by yarn count (10's) and it is nearly doubled to record the highest value (86) with yarn count (24's).

It is noted that interaction effect between cotton materials and yarn count was no significance indicating that the relative responses of cotton materials to the increments of yarn count were almost similar. These results were graphically confirmed by Figure (3). The current results are in parallel line with those obtained by **Mohammed and El-Sayed (2002), Taher *et al*. (2009), Abdel-Khalik *et al*. (2017), Tolba (2017) and Abdel-Ghaffar (2019)**.

Table (4): Effect of cotton material, yarn count and their interaction on number of neps (per 400 m).

Cotton materials (CM)	Yarn counts (YC)				Mean
	10. s	16. s	20. s	24. s	
Combed wastes	35	47	66	75	56
Giza 95 (fully good fair)	38	52	71	78	60
Giza 90 (fully good fair)	42	56	73	82	63
Giza 95 (good fair)	48	61	76	86	68

Giza 90 (good fair)	50	63	75	89	69
China variety	53	68	80	93	74
Carded wastes	56	72	85	95	77
Mean	46	60	75	86	67
L.S.D. $_{0.05}$	CM = 3.05 YC = 2.50 CM x YC = NS				

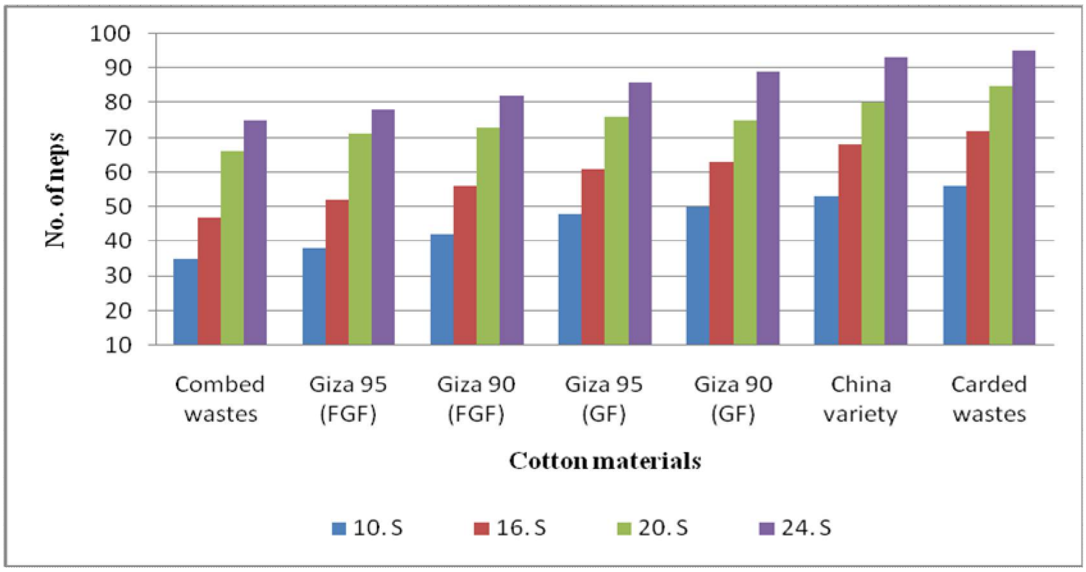

Fig. (3): The effect of interaction between cotton materials and yarn counts on No. of neps.

Number of thin places (per 400 m)

Number of thin places (per 400 m) is one of the unfavorable yarn technical parameter affecting the yarn quality. There were significant differences observed among cotton materials and yarn counts while the interaction effect was no significant as shown by Table (5) and Figure (4).

It is obtained that the mean values of number of thin places were in ascending order regarding cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. The minimum number of thin places (16) was recorded by combed wastes with significant differences than the rest cotton materials while the maximum number of thin places (43) was recorded by carded wastes. On the other hand, the mean values of number of thin places were significantly increased with increasing yarn counts from 10's to 24's. The lowest number of thin places (21) was obtained by yarn count (10's) and it is nearly doubled to record the highest value (39) with yarn count (24's). **Mwasiagi and Mirembe (2018)** found that the effect of count on the number of thin places/km showed that an increase in count from 15 Ne to 24 Ne increased the number of thin places in the spun yarns. This may have been attributed to reduce number of fibers in the yarn cross section as regards to finer counts causing spinning difficulties and hence contributing to thin places in the yarns. It is remarkable that interaction effect between cotton materials and yarn count was no significance indicating that the effect of increasing yarn count on cotton materials was almost similar.

Table (5): Effect of cotton material, yarn count and their interaction on number of thin places (per 400 m).

Cotton materials (CM)	**Yarn counts (YC)**				**Mean**
	10. s	**16. s**	**20. s**	**24. s**	
Combed wastes	8	13	17	25	16
Giza 95 (fully good fair)	12	18	20	29	20
Giza 90 (fully good fair)	19	23	26	32	25
Giza 95 (good fair)	22	26	30	36	28

Giza 90 (good fair)	24	31	36	45	34
China variety	29	37	42	49	39
Carded wastes	31	39	46	57	43
Mean	21	27	31	39	29
L.S.D. $_{0.05}$	CM = 3.20 YC = 2.42 CM x YC = NS				

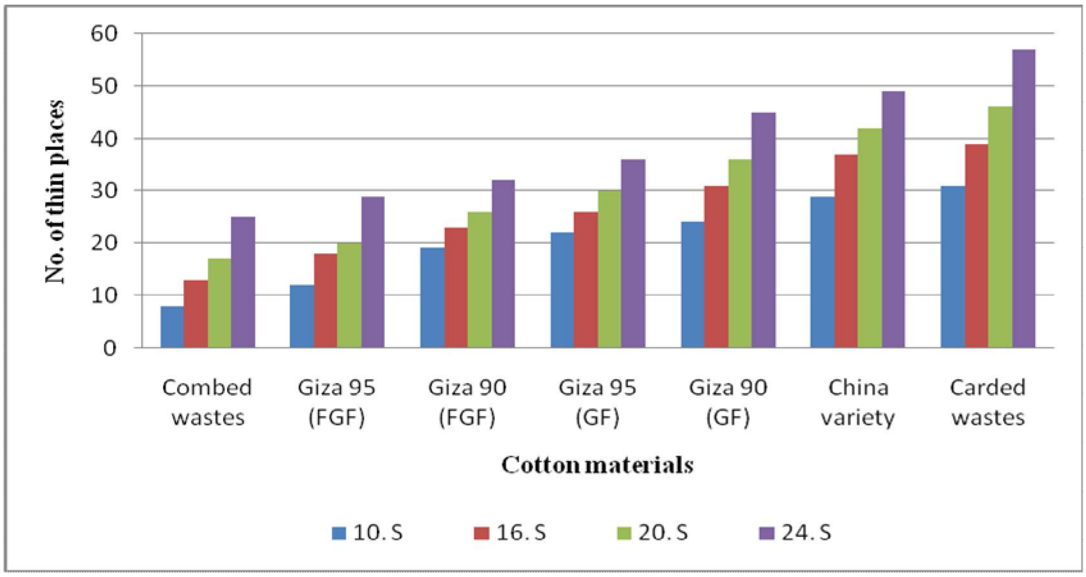

Fig. (4): The effect of interaction between cotton materials and yarn counts on No. of thin places.

Number of thick places (per 400 m)

Number of thick places (per 400 m) is one of the imprefection yarn technical parameter impacting the yarn quality. Significant differences were shown among cotton materials and yarn counts while the interaction effect was no significant as presented by Table (6) and Figure (5).

Results showed that the number of thick places were in ascending order regarding cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively. The minimum number of thick places (10) was recorded by combed wastes with significant differences than the other cotton materials while the maximum number of thick places (33) was recorded by carded wastes. However, the number of thin places was significantly increased with increasing yarn counts according to the order 10's < 16's < 20's < 24's. The lowest number of thin places (14) was obtained by yarn count (10's) and it is nearly doubled to record the highest value (29) with yarn count (24's). **Halimi *et al*. (2008) and Mwasiagi and Mirembe (2018)** reported that the number of thick places increased drastically with increase in count. They added that Increase in yarn count increased both defects (thick and thin) in the yarns. **Ul-Hasan *et al.* (2014) and Khan and Rahman (2015)** found that the number of thick places and neps per 1000 m of yarn are up to 60% and 80% lower in rotor-spun yarn than in ring-spun yarn. Accordingly, the rotor yarn has less imperfection than ring yarn. It is noted that interaction effect between cotton materials and yarn count was no significance indicating that the relative responses of cotton materials to the increments of yarn count were almost similar.

Table (6): Effect of cotton material, yarn count and their interaction on number of thick places (per 400 m).

Cotton materials (CM)	Yarn counts (YC)				Mean
	10. s	16. s	20. s	24. s	
Combed wastes	5	7	10	18	10
Giza 95 (fully good fair)	9	11	14	18	13
Giza 90 (fully good fair)	11	15	17	22	16

Giza 95 (good fair)	14	18	20	29	20
Giza 90 (good fair)	18	23	24	35	25
China variety	21	28	32	39	30
Carded wastes	23	31	35	42	33
Mean	14	19	22	29	21
L.S.D. $_{0.05}$	CM = 2.40 YC = 1.81 CM x YC = NS				

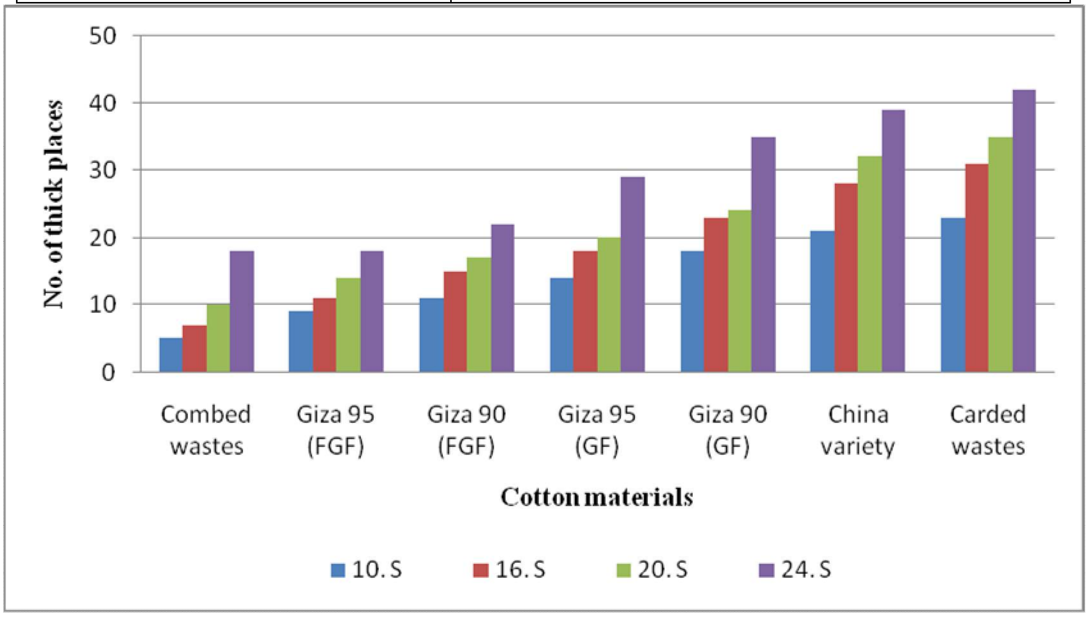

Fig. (5): The effect of interaction between cotton materials and yarn counts on No. of thick places.

CONCLUSION

The current investigation studies the influence of low-quality and inexpensive cotton materials and yarn count on the yarn quality using rotor spinning system. It is obvious that the yarn strength values were in descending order regarding cotton materials of combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair, Giza 95 lint grade good fair, Giza 90 lint grade good fair, china variety and carded wastes, respectively while the yarn evenness (CV %), number of neps, thin places and thick places were in ascending order for the same aforementioned cotton materials. On the other hand, yarn strength values were gradually decreased with increasing yarn counts from 10's to 24's while the yarn evenness (CV %), number of neps, thin places and thick places were gradually increased with increasing yarn counts from 10's to 24's. The interaction effect between cotton materials and yarn count was only significant for yarn strength and yarn evenness (CV %) indicating that the relative response of cotton materials to the yarn count is different. Finally, it is possible to produce medium and coarse yarns using low-quality and inexpensive cotton materials such as combed wastes, Giza 95 lint grade fully good fair, Giza 90 lint grade fully good fair under rotor spinning at lower yarn counts.

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