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Effect of Cotton Fiber Fineness, Maturity and Trash Content on Nep Formation in Raw Cotton and Spun Yarns

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Abstract

Three lint cotton grades; Fully good (FG), Good (G), Fully good faire (FGF) were taken from each of four Egyptian cotton varieties namely Giza95, Giza98, Giza94 and Extra-long Giza96 to investigate the effect of cotton fineness, maturity and trash content on neps formation in raw cotton and yarns. In addition, studying the relationship of trash content, fiber and yarn properties. Results showed that there were highly significant effects of varieties and lint grades on most fiber and yarn properties. Giza96 gave higher fiber and yarn properties such as micronaire value, upper half mean length, uniformity index, short fiber content, fiber strength, lea count strength product, yarn strength and yarn imperfections than Giza94 cotton variety. The lint grade Fully Good gave the best values of all studied traits. Also, it had the lowest trash content, number of neps , unevenness and yarn imperfections than the Fully good fair. The interactions between cotton varieties and lint grades were significant for all studied traits except uniformity index, micronaire, maturity and yarn imperfections (yarn count $40_s$and 3.6 twist multiplier$_)$. Upper half mean length, micronaire value and maturity ratio had negative and highly significant correlation with trash content .While, Short fiber content and trash area recorded positive and highly significant correlations with trash content. Neps / gram and number of neps/400m recorded positive and highly significant correlations with each trash contents, yarn unevenness, thin and thick places.

Keywords: Cotton fiber; Lint grade; Trash content; Maturity; Yarn quality.

Introduction

Cotton is the most important fiber crop in the world. It is a well-traded agricultural commodity mostly for textile fiber purposes, but it also yields a high grade vegetable oil from cottonseed for human consumption as well as multiple cellulosic by products and whole seeds used as a primary source of fiber and protein in animal feed [1]. Cotton fiber maturity plays an important role in determining cotton fiber and yarn quality. An immature fiber is weak as its secondary cell wall is thin, it can easily break during processing producing short fibers. Short fibers can create a series of spinning problems. Short fibers are related to fiber neps, which is a fiber entanglement.

The presence of neps per gram will increase the breaking rate and yarn imperfections. Neps made of immature fibers affect dye uptake, because thin-walled fibers pick up less dye causing defects known as white specks, which create imperfections in fabric. Another type of neps is caused by mechanical processing. These neps are connected to upper half mean length, maturity ratio, and fiber fineness. Yarns made with immature fibers have a hairy appearance. Cotton fiber quality is determined by various parameters such as maturity, fineness, micronaire

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(mic), length, strength, length uniformity, etc. these fiber properties determine the marketing value of cotton. Fibers with better quality will produce better yarns. The grade of cotton bale was one of the critical factors in determining the market value of cotton [2].

Cotton grade depends on the appearance of cotton fibers, their color and trash content. Physical fiber properties such as fiber length, strength, fineness, maturity and color are used in cotton quality classification. Growers may be discounted for high micronaire even though the fibers have adequate fineness and maturity, as high micronaire fiber is in general coarse, which is undesirable for spinning and unevenness [3]. Micronaire measurement is slightly confusing [4]. They explained that cottons with identical micronaire may have very different two-dimensional distributions of perimeter and theta. These distribution differences will translate into different processing efficiency and yarn quality. Trash content affects the processing efficiency. Trash is removed by cleaning processes during ginning, but 100% removal of trash is impossible and it could lower the quality of the ginned cotton [5]. Cotton variety and lint cotton grade play a vital role in determining yarn quality properties. Cotton (color and trash) are the most important factors that determine the cotton grade, raw cotton samples can contain different amount of trash such as dust, sand and parts of plant due to agricultural treatments, weather conditions, fungi, insects harvesting methods and the ginning process.

High grade cotton contains a small amount of trash less than 2%.While, low grade cotton contains a large amount of trash much as 10%.There is a direct correlation between the quality of raw materials and the end products [6]. The lower quality of cotton fibers means the lower quality of yarn produced from a raw material. Furthermore, fiber length, strength and micronaire value were the most contributors to yarn strength and unevenness. The measurement of fiber length distribution was very important for fiber producers and spinners [7]. Assessed alternative cotton fiber quality attributes and their relationship with yarn strength, and revealed that the substitution of alternative fiber fineness variables for micronaire or single fiber strength for bundle strength improved the prediction of yarn strength in their models [8]. The lower quality of cotton fibers means a lower quality of yarn produced from such a raw material. Also, fiber length, strength and micronaire value were the most important contributors to yarn strength and unevenness [9]. There is a direct relationship between certain quality characteristics of the fiber and the yarn.

Trash is the non-lint material that contaminates cotton lint. The term can be used for undeveloped seeds, seed coat, fragments, particles of leaf, dust, sand, and stems [10].Trash content has the potential to cause problems with fiber quality measurements [11]. Excessive trash content in the sample may create air channels through the plug of fibers, resulting in an unreliable micronaire reading. Furthermore, since the mass of trash in the sample is unknown, the true lint mass is unknown [12].Excessive sample trash may cause problems with other High Volume Instrument (HVI) measurements as well. For example, the micronaire reading is used in combination with the optical amount of the fiber beard being broken to estimate the sample mass during bundle strength measurement. An imperfect micronaire measurement will affect the estimate of the beard mass and, therefore, the strength measurement [13, 14]. Thus, the reliability of High Volume Instrument measurements is affected directly and indirectly by cotton trash.

The HVI reports the upper half mean length (UHML) and the uniformity index (UI), a percentage ratio between mean length (ML) and UHML [15, 16]. However, this method was developed on clean samples and the effects of trash on this method are not well-documented. There was significant negative correlation between yarn unevenness (CV %) and fiber length. While, yarn unevenness had significant positive correlation with short fiber content. Fiber length, fiber strength and fiber fineness were the most correlated fiber properties with yarn properties. Also, fiber elongation, fiber length, uniformity index, fiber fineness, yarn count, yarn twist, roving count and unevenness of roving had significant influence on yarn strength. However, fiber strength was the most important parameter for yarn strength [17]. the presence of trash in commercial cotton varieties influenced the end use of cotton and the market values qualities .Therefore, a number of instruments for measuring trash content were developed [18 - 20].All cotton varieties under study recorded a highly significant negative correlation between lint cotton grade and each of yellowness (+b), trash, dust, total trash% and number of neps. Conversely, a highly significant positive correlation was observed between lint cotton grade and both reflectance degree (Rd %) and micronaire value.

Total trash, micronaire value, reflectance degree (Rd %) and their interactions were the most contributing and influencing of lint cotton grades [21].The aim of this investigation was to determine the impact of cotton grade, fiber properties and trash content on neps formation in lint cotton and spun yarns. Also, study the relationship of trash content, fiber and yarn quality properties.

Materials and Methods

The materials used in this study were four Egyptian cotton varieties namely; Giza 95, Giza 98, Super Giza 94 and Extra Giza 96.All varieties were obtained from the yield trials during 2022season cultivated by Cotton Research Institute, Agricultural Research Center, Giza, Egypt. According to the local classification system, three lint cotton grades namely: Fully Good (FG), Good (G) and Fully Good Fair (FGF) were taken from each variety under study. Cotton fiber tests were performed at laboratories of the Egyptian & International Cotton Classification Center (EICCC), Cotton Grading Department (CGD) Cotton Research Institute (CRI), Agricultural Research Center (ARC), Giza, Egypt. The Cotton Classifying System Version-5 instrument (CCS-V5) was used to measure fiber properties according to [22] fiber and yarn tests were carried out under controlled atmospheric conditions of 65% ± 2 relative to humidity and 21ºc ± 2 temperature. Data were collected for the following characteristics; fiber length, uniformity index, short fiber content, micronaire value, maturity %,fiber strength, fiber elongation, reflectance degree (Rd%), yellowness (+b), total trash% (trash, dust, fiber fragments) and number of neps/gram. Cotton fiber samples of Giza 95 and Giza 98 (Upper Egypt) were spun on ring spinning system at Ne 40's.While, fiber samples of Giza 94 and Giza 96 Cotton varieties (Delta Egypt) were spun at 60's carded yarns with 3.6 twist multiplier. Lea count strength product (LCSP) was tested on good brand [23].Number of neps per 400 meter (+200%),unevenness per 400 meter (CV %), thick places (+50%)and thin places (-50%)were measured using Uster tester 3 according to [24]. Single yarn strength (cN/tex) was measured by the Uster Tensorapid4 [25].

Statistical procedures

Completely randomized design with four replications was used in the study. Analysis of variance and L.S.D. at 5% was used to identify the significant differences between the mean values of treatments. Correlation matrix was estimated between fiber quality properties and each of the trash content and yarn quality properties according to Snedecor and Cochran (1981) [26].SPSS 20.0 [27] was used for statistical analysis.

Results and Discussion

Effect of Egyptian cotton varieties on fiber quality properties and trash content

Results in Table 1 showed that there were significant differences among the four Egyptian cotton varieties on all fiber quality properties under study except fiber maturity (%).Giza 96 recorded the greatest means of upper half mean length (34.75mm), uniformity index (85.59%) and fiber strength (42.37 g/tex) .On the other hand, it gave the lowest means of micronaire reading (3.77), elongation percentage (7.74%) and trash count (50.04). Giza 95 gave the highest means of short fiber content (10.14), micronaire value (4.11) but it gave the lowest means of upper half mean length, length uniformity index, maturity ratio and fiber strength. Giza 98 gave the highest means of fiber elongation, fiber yellowness and dust .Giza 94 showed the highest mean of fiber reflectance degree and the lowest mean value of yellowness degree. These results cleared that G94 was more whiteness and brightness than the other varieties under study. While, Giza 98 was more yellowness as compared to other varieties.

Data in the same Table indicated that cotton trash components such as; trash area, trash count, non lint (NL), dust, fiber fragment (FF), trash per gram, number of seed coat and neps per gram were significantly influenced by varieties and lint grade. Giza 95 surpassed the other cotton varieties in its trash content and its components, it gave the greatest values of trash area ,trash count and non lint, whereas, Giza 98 exhibited the highest values of dust , fiber fragment, seed coat and neps per gram.

While, Giza 96 showed the highest value of trash/ gram. On the other hand, Giza 94 gave the lowest values of short fiber content, non lint , dust , fiber fragment , trash/ gram , seed coat and neps per gram .Whereas, the lowest values of trash area and trash count obtained from Giza 96 (0.81) and (50.04) respectively.

The differences between the studied cotton varieties in fiber quality properties could be due to the genetic differences between these varieties, while the differences in their trash content could refer mainly to the handling and care during crop management especially during harvesting and ginning. There were significant differences between cotton varieties in number of neps /gram in raw cotton. Results demonstrated that both Giza 95 and Giza 98 contain higher trash content than Giza96 and Giza94. It could be explained to the tuff weather in Upper Egypt .Also, good agronomic practices exists in Delta Egypt. Many investigators came out with similar results as (Rizk et al., 2016 ;Tolba, 2017 and El-Gedwy et al., 2018) [28-30].

Effect of lint grade on fiber properties and trash content

Results in Table 1 showed that fiber properties and trash content were significantly affected by lint grade. Most of the studied fiber quality traits increased while trash content decreased as lint grade increased. The maximum values for these traits were obtained from fully good (FG) lint grade (32.83mm) for upper half mean length, (86.52 %) for length uniformity index,(4.42) for micronaire reading, (0.94%) in maturity ratio, (42.18 g/tex) in fiber strength and (71.73%) in reflectance degree. Generally, the low lint cotton grade contains a lower number of mature fibers and higher weak fibers than the high lint cotton grade. Increasing immature fibers due to cotton pests, diseases, environmental and growth factors led to a decrease in fiber strength. While, it gave the lowest values of short fiber content (5.91), elongation percentage (7.71%) and yellowness degree (9.88),on the other hand , the lowest values were obtained from fully good fair (FGF) lint grade to be (29.06mm) in upper half mean length, (82.24 %) in length uniformity index, (3.26) in micronaire reading, (0.83%) in maturity ratio,(35.09 g/tex) for fiber strength and (58.67) in reflectance degree, while, it gave the highest values of short fiber content (10.86), elongation percentage (9.21%) and yellowness degree (11.19).

It was clear that the higher lint grades recorded higher whiteness, brightness and lower yellowness than the lower lint grades. Also, the higher lint grades recorded the higher values of fiber quality. The significant differences between lint grades could be attributed to the fact that color Rd %, trash content and lint appearance in combination are the main factors affecting cotton lint grade. Cotton trash components such as; trash area , trash content, non lint (NL), dust, fiber fragment(FF), trash per gram, number of seed coat and neps per gram were significantly influenced by lint grade . the lowest values of trash area (0.47) , trash count (26.03) ,non lint (1.12), dust (0.24), fiber fragment (0.28), trash gram (125.72), seed coat (15.69) and neps per gram (125.31) obtained from lint grade fully good (FG) .While, the greatest values of trash area (2.05) , trash count (160.69), non lint (10.13), dust (0.84), fiber fragment (0.77), trash gram (235.11), seed coat (44.67) and neps per gram (335.47) obtained from fully good fair (FGF).It concluded that the low lint grade recorded high number of neps in raw cotton as compared to the high lint grade. This trend could be due to increase the immature fibers, weak fibers and foreign matter content in the low lint grade leads to an increase of neps formation in raw cotton as compared to high lint grade. All trash content increased as the cotton grade decreased (from the high grade (FG) to the low grade (FGF).The same results were in accordance with (Mabrouk et al., 2000 ; Abdel- Malak et al., 2001 and Liu et al., 2018) [31-33]. Who reported that there were highly significant correlations between lint cotton grade and each one of fiber physical properties and trash content.

The interaction between cotton varieties and lint cotton grade on fiber quality properties and trash content

Significant effect of the interaction between four Egyptian cotton varieties, i.e. Giza 95, Giza 98, Giza 96 and Giza 94 and three lint cotton grade (FG , G and FGF) except length uniformity index ,micronaire value, and maturity ratio as shown in Table 2 and Figure 5. Results indicated that the highest mean values of upper half mean length (36.28mm) and fiber strength (48.68g/tex) were obtained from FG lint grade in Giza 96 but it gave the lowest value of elongation percentage (6. 67%).while, the minimum values of short fiber content (3.89) and yellowness degree (8.21) were obtained from FG lint grade in G 94. Giza 98×FGF gave the lowest values of upper half mean length (26.58mm) and reflectance degree (52.90%), and it gave the highest values of elongation (9.91), yellowness degree (12.43) but Giza 95×FGF gave the lowest values of fiber strength (34.42 g/tex) .

The data in Table 3 showed that significant effect of the interaction between four Egyptian cotton varieties, i.e. Giza 95, Giza 98,Giza 96and Giza 94 and three lint cotton grade (FG , G and FGF) on trash content. Results indicated that lint cotton grade from cotton cultivar of Giza 94×FG recorded the minimum mean values of trash area , trash count ,non lint (0.28), dust (0.04), fiber fragment (0.04), trash gram (51.22), seed coat (6.33) and neps per gram (58.22). On the other hand, Giza95×FGF gave the maximum trash area (2.35) , trash count (182.44) , non lint (12.39).while, Giza 98×FGFgave the highest values of dust (1.19), fiber fragment (1.21), seed coat (56.00) and neps per gram (386.89).but Giza 96×FGF gave the highest value of trash gram (255.56).

Effect of cotton varieties on yarn quality properties

Data presented in Table 4 indicated that lea count strength product, yarn strength and unevenness (CV %) were significantly influenced by changing Egyptian cotton genotypes. In yarn count 40, The yarns obtained from Giza 98 significantly surpassed in lea count strength product, recording (2365) followed by Giza 95 with (2160).Giza98 recorded the highest values of yarn strength (15.56cN/tex) and yarn unevenness (18.92%).While, thin places, thick places and neps were not significant. Data In the same Table showed that in yarn count 60, Giza 96 gave the highest values of lea count strength product, yarn strength and thin places (3260, 22.81and 251) respectively and it gave the lowest values of unevenness (20.17%) and neps (281).While, at the same count Giza 94 gave the lowest values of lea count strength product, yarn strength and thin places. These differences in mean values of yarn technological properties under study of Egyptian cotton materials may be due to the genetic differences between Egyptian cotton varieties. It concluded that the yarn's evenness is an important property. It is determines the spinning performance, rate of end breakage and end product quality.

Effect of lint grades on yarn quality properties:

Data presented in Table 4 showed that in yarn count 40, yarns obtained from lint cotton grades fully good (FG) surpassed the other lint grade. It gave the greatest mean values of lea count strength product (2400), yarn strength (17.83 cN/tex). while, it gave the lowest mean values of unevenness (14.54%) ,thick places (378) , thin places (176) and neps/400m (98) .On other hand, lint cotton grade fully good fair (FGF) gave the greatest mean values of unevenness (23.88%),thick places (966) , thin places (749), and neps/400m (572). but it gave the lowest mean values of lea count strength product (2090), yarn strength (12.32cN/tex). It was clear that low lint grade contains higher proportion of immature fibers, neps , short fiber content and lower length uniformity than high lint grade. Consequently, yarn strength was decreased from fully good (FG) to fully good fair (FGF).While, number of thin places, thick places and the number of neps increased. These results are supported by (Abouzied, 2007) [34].

Data in the same Table indicated that in yarn count 60S,lea count strength product, yarn strength, unevenness, thick places, thin places and number of neps /400mwere significantly influenced by lint cotton grades. The yarns obtained from lint cotton grades fully good (FG) surpassed the other lint grade. It gave the greatest mean values of lea count strength product (3170), yarn strength (21.5).while, it gave the lowest mean values of unevenness (18.50%) ,thick places (178) , thin places (103) and neps/400m(153) .On other hand, lint cotton grade fully good fair (FGF) gave the greatest mean values of unevenness (24.54%), thick places (770) , thin places (407), and neps/400m (453) but it recorded the lowest mean values of lea count strength product (2845) and yarn strength (16.47 cN/tex).

Effect the interaction between cotton varieties and lint cotton grades on yarn properties

Data shown in Table 5 indicated that the interaction between cotton varieties and lint grades had significant effect on yarn properties. In yarn count 40s, lint cotton grade from cotton cultivar of Giza 98 × FG recorded the maximum mean value of lea count strength product and yarn strength. While, unevenness, thick places, thin places and number of neps /400m were not significantly. Data in the same Table showed that, in yarn count 60, the interaction between two Egyptian cotton varieties, i.e. Giza 96and Giza 94 and three lint cotton grade (FG, G and FGF) had significant effect on all yarn properties. Lint cotton grade from cotton variety of Giza 96 × FG gave the highest mean value of yarn strength but it gave the lowest mean values of unevenness, thick places (174), thin places (115) and Number of neps /400m but Giza 94 × FG gave the lowest values of thin places. On the other hand, G 94 × FGF gave the highest values of unevenness, thick places thin places and number of neps 400m. These results are in accordance with those obtained by (Kamal and Ragab, 1995; Abd El- Gawad, 2006; El-Sayed et al.,2007; Ibrahim et al.,2011 and Ibrahim, 2013) [35-39].

Relationships between fiber properties

Results in Table 6 showed the correlation coefficient between fiber quality properties for four cotton varieties under study. There were highly significant positive correlations between upper half mean length and uniformity index (0.735**), micronaire value (0.269**), maturity ratio (0.532**), fiber strength (0.836**) and fiber reflectance (0.865**).While, upper half mean length recorded highly significant negative correlations with short fiber content (-0.828**), fiber elongation (-0.773**) ,fiber yellowness(-0.870), trash area (-0.700**) and trash count(-0.711**).Likewise ,Uniformity index had highly significant positive correlation with micronaire value(0.715**), maturity ratio (0.862**), fiber strength (0.814**) and fiber reflectance (0.854**).in contrast it had highly significant negative correlations with short fiber content (-0.815**),fiber elongation (-0.695**),fiber yellowness (-0.569**), trash area (-0.887**), trash count (-0.898**). Also Short fiber content had and highly significant positive correlations with fiber elongation percentage (0.754**), fiber yellowness (0.779**), trash area (0.763**), trash count (0.789**).On other hand, it had highly significant negative correlation with micronaire value (-0.537**) maturity ratio (-0.713**), fiber strength (-0.806**) and fiber reflectance (-0.894**). Meanwhile Micronaire value showed significant positive correlations with maturity ratio (0.822**), fiber strength (0.472**), and fiber reflectance (0.538**).While, It had highly significant negative correlations with elongation percentage (-0.416**), trash area (-0.714**)and trash count(-753**). Also, Maturity ratio recorded highly significant positive correlations with each of fiber strength (0.683**) and fiber reflectance (0.735**).While, it recorded negative and highly significant correlations with elongation (-0562**), fiber yellowness (-0.394**), trash area (-0.788) and trash count (-0.861**). And results showed Positive significant correlation was found between fiber strength and fiber reflectance (0.802**). On contrast, it had negative and highly significant correlation with fiber elongation (-0.751**), yellowness (-0.707**) trash area (-0.771**), trash count (-0.768).likewise Fiber elongation had highly significant positive correlation with fiber yellowness (0.696**), trash area (0.666**) and trash count (0.634).On contrast, it had highly significant negative correlation with fiber reflectance (-0.731**). Also, Fiber reflectance showed highly significant negative correlations with fiber yellowness (-0.832**), trash area (-0.796**) and trash count (-0.815**). While, there were highly significant positive correlation between fiber yellowness and trash area (0.497**) and trash count (0.519**).Finally, Positive and highly significant correlation between trash area and trash count (0.912**) Similar results were obtained by

(Thibodeaux et al., 2008; Hager et al., 2011; Islam, 2015 and Gadallh et al., 2020) [40-42].

Relationships between fiber quality properties and trash content

Data in Table 7 indicated that upper half mean length had highly significant negative correlation with non-lint (-0.690**), dust (-0.769**), fiber fragment (-0.782**), trash gram (-0.359**), seed coat (-0.674**) and neps per gram (-0.687**). Also, length uniformity index indicated highly significant negative association with non lint (-0.906**), dust (-0.710**), fiber fragment (-0.645**), trash gram (-0.651**), seed coat (-0.781**) and neps per gram (-0.825**). Also, short fiber content recorded highly significant positive correlations with non lint (0.834**), dust (0.830**), fiber fragment (0.820**), trash gram (0.630**), seed coat (0.824**) and neps per gram (0.862**). This result demonstrated that short fiber content had highly positive effect on neps formation due to presence immature and weak fibers in raw cotton. Micronaire value recorded highly significant negative association with non lint (-0.774**), dust (-0.463**), fiber fragment (-0.353**), trash gram (-0.669**), seed coat (-0.647**) and neps per gram (-0.684**).Also, maturity ratio had highly significant negative correlation with non lint (-0.876**), dust (-0.634**), fiber fragment (-0.507**), trash gram (-0.687**), seed coat (-0.762**) and neps per gram (-0.815**).Coarser fibers and mature fibers gave lower neps/gram as compared to finer and immature fibers. Meanwhile negative and highly significant correlations between fiber strength and each of non lint (-0.729**), dust (-0.699**), fiber fragment (-0.618**), trash gram (-0.558**), seed coat (-0.654**) and neps per gram (-0.679**). Meanwhile, fiber elongation recorded highly significant positive correlations with each of non lint (0.666**), dust (0.692**), fiber fragment (0.712**), trash gram (0.406**), seed coat (0.672**) and neps per gram (0.675**). Also, fiber reflectance showed highly significant negative correlations with each of non lint (-0.872**), dust (-0.864**), fiber fragment (-0.853**), trash gram (-0.631**), seed coat (-0.874**) and neps per gram (-0.895**). While, fiber yellowness recorded highly significant positive correlations with each of non lint (0.547**), dust (0.759**), fiber fragment (0.820**), trash gram (0.386**), seed coat (0.665**) and neps per gram (0.698**).These correlations indicated that presence of trash particles in raw cotton led to decrease reflectance degree and increase yellowness degree in cotton samples. Also, trash area recorded highly significant positive correlations with each of non lint (0.879**), dust (0.652**), fiber fragment (0.601**), trash gram (0.704**), seed coat (0.724**) and neps per gram (0.718**). Finally, positive and highly significant correlations between trash count and each of non lint (0.896**), dust (0.695**), fiber fragment (0.604**), trash gram (0.665**), seed coat (0.772**) and neps per gram (0.806**).

Concerning results in Table 8 there were correlations between each one of trash contents. Non lint had highly significant positive correlations with each of dust (0.795**), fiber fragment (0.733**).Trash/gram (0.714**), seed coat (0.876**) and neps per gram (0.886**). Also, dust recorded highly significant positive correlations with each of fiber fragment (0.908**), trash/gram (0.499**), seed coat (0.874**) and neps per gram (0.833). Likewise, fiber fragment had significant positive correlations with trash gram (0.453**), seed coat (0.846**) and neps per gram (0.809**). There were highly significant positive correlation between trash/gram with both of seed coat (0.645**) and neps per gram (0.677**). Finally, highly significant correlation was found between seed coat and neps per gram (0.909**).There was highly significant correlation between non lint content and neps in raw cotton .this correlation indicated that high non lint content in cotton lead to increase neps formation in raw cotton due to the cotton fibers entangled around the particles of trash, seed coat and fragments which led to increase neps formation in raw cotton.

Relationships between fiber properties and yarn properties

Results in Table 9 demonstrated that in yarn count 40, there were positive and highly significant correlations between lea count strength product (LCSP) and each of upper half mean length (0.482**), uniformity index (0.574**), micronaire value (0.399**), fiber maturity (0.468**), fiber strength (0.444**) and fiber reflectance (0.501**).Conversely, it had negative and highly significant correlation with short fiber content (-0.342*), trash area (-0.478**) and trash count (-0.544**). Likewise, yarn strength had positive and highly significant correlations with upper half mean length (0.911**), uniformity index (0.928**), micronaire value (0.848**), fiber maturity (0.867**), fiber strength (0.927**) and fiber reflectance (0.900**).On other hand, it had negative and highly significant correlations with short fiber content (-0.864**), fiber elongation(-0.697**),fiber yellowness(-0.659**), trash area (-0.901**) and trash count (-0.876**).Also Yarn unevenness (CV %) had positive and highly significant correlations with short fiber content(0.848**), fiber elongation (0.692**), fiber yellowness (0.718**), trash area (0.919**) and trash count (0.955**).On contrary, it had negative and significant correlations with each of upper half mean length (-0.948**),uniformity index (-0.941*), micronaire value (-0.920**), fiber maturity(-0.963*), fiber strength (-0.922**) and fiber reflectance(-0.953*). Meanwhile, positive and highly significant correlations were found between thick places and each of short fiber content(0.807**),fiber elongation (0.676**), fiber yellowness (0.743**), trash area(0.920**)and trash count(0.958**).On contrast, it had negative and highly significant correlations with upper half mean length(-0.934**), uniformity index(-0.946*), micronaire value (-0.916*), fiber maturity (-0.945**), fiber strength(-0.900*) and fiber reflectance(-0.947**). Also, thin places had positive and highly significant correlations with each one of short fiber content (0.774**), fiber elongation (0.625**), fiber yellowness (0.693**), trash area (0.916**) and trash count (0.962**). On contrast, it had negative and highly significant correlations with upper half mean(-0.915**) length uniformity index(-0.931*), fiber maturity(-0.942*) and fiber reflectance(-0.950**).Finally, positive and highly significant correlations were found between number of neps/400m and each of short fiber content(0.792**), fiber elongation(0.648**), fiber yellowness(0.706**), trash area(0.917**)and trash count(0.961**).On contrast, it had negative and highly significant correlations with upper half mean length(-0.919**),uniformity index(-0.928**), micronaire value(-0.917*), fiber maturity(-0.941*) and fiber strength(-0.881**).

Results in the same Table indicated that in yarn count 60, lea count strength product (LCSP) recorded positive and highly significant correlations with each of upper half mean length (0.855**), uniformity index (0.597**), micronaire value (0.379**), fiber maturity (0.419**), fiber strength (0.734**), fiber reflectance (0.329*). Conversely, it had negative and highly significant correlations with each of short fiber content (-0.343*), fiber elongation(-0.580**), trash area (-0.718**)and trash count (-0.623**).Also, yarn strength had negative and highly significant correlated with each of short fiber content (-0.324*),fiber elongation (-0.618*), trash area (-0.687**)and trash count (-0.587**).While, it had positive and highly significant correlations with each of upper half mean length (0.837**), uniformity index (0.610**) , micronaire value (0.346*), fiber maturity (0.433**), fiber strength (0.759**) and fiber reflectance (0.321*).Likewise, yarn unevenness (CV%) recorded positive and highly significant correlations with each of short fiber content (0.764**), fiber elongation (0.755**), fiber yellowness (0.651**) , trash area (0.878**) and trash count (0.876**). On other hand, it had negative and highly significant correlations with each of upper half mean length (-0.934**), uniformity index (-0.898**), micronaire value (-0.805**), fiber maturity (-0.824**), fiber strength (-0.939**) and fiber reflectance (-0.770**). Also Thick places (+50%) showed positive and highly significant correlations with each of short fiber content (0.831**) fiber elongation percentage (0.647**), fiber yellowness (0.861**) , trash area (0.865**) and trash count (0.823**).On contrast, it showed negative and highly significant correlations with each of upper half mean length (-0.729**), uniformity index (-0.842**) , micronaire value (-0.830**), fiber maturity (-0.815**), fiber strength (-0.809**) and fiber reflectance (-0.888**). Meanwhile positive and highly significant correlations were found between thin places and each of short fiber content (0.865**), fiber elongation (0.559**), fiber yellowness (0.849**), trash area (0.736**)and trash count (0.813**).On contrast it had negative and highly significant correlations with each of upper half mean length (-0.700**), uniformity index (-0.829**), micronaire value (-0.907**), fiber maturity (-0.896**), fiber strength (-0.757**) and fiber reflectance (-0.895*). Finally, positive and highly significant correlations were found between number of neps/400m and each of short fiber content (0.844**), fiber elongation (0.684**), fiber yellowness (0.797**), trash area (0.849**) and trash count (0.884**). Conversely, it had negative and highly significant correlations with each of upper half mean length (-0.818**), uniformity index (-0.882**), micronaire value (-0.866**), fiber maturity (-0.851**), fiber strength (-0.856**) and fiber reflectance (-0.862**). These results are in the same line with These results are in the same line with (Gonca and Erhan, 2006; Thibodeaux et al.,2008; El-Sayed, 2009; Fares et al., 2010; Hager et al., 2011; Islam, 2015; Hassan and Hager,2016 and Gadallh et al .,2020) [6, 17] and [40-43].

Relationships between trash content and yarn quality properties

The correlation between trash content and yarn quality properties under two yarn counts shown in Table 10 the results revealed that in yarn count 40,lea product recorded negative and highly significant correlations with each of non-lint (-0.489**), dust (-0.297*), trash per gram (-0.414**) , seed coat (-0.429**), neps / gram (-0.427**), yarn unevenness (-0.452**), thick places (-0.529**), thin places (-0.554**) and number of neps/400m (-0.535**).While, it had a positive and highly significant correlation with yarn strength (0.594**). Negative and highly significant correlations were found between yarn strength and each of non lint (-0.929**), dust (-0.806**),fiber fragment (-0.800**), trash per gram (-0.782**) and seed coat (-0.894**),neps per gram (-0.927**) yarn unevenness (-0.923**) and thick places (-0.907**).The highly significant negative correlations between yarn strength and trash contents due to High trash content, low fiber quality, high number of end breakage in spinning lea to low yarn strength. Yarn unevenness recorded positive and highly significant correlations with each of non lint (0.961**), dust (0.845**), fiber fragment (0.830**), trash per gram (0.866**) and seed coat (0.950**), neps per gram (0.981**), thick places (0.974**), thin places (0.964**) and number of neps/400m (0.968**).Also, thick places showed positive and highly significant correlations with each of non lint (0.934**), dust (0.773**), fiber fragment (0.775**), trash per gram (0.845**) and seed coat (0.916**), neps per gram (0.974**), thin places (0.988**) and number of neps/400m (0.986**). Positive and highly significant correlations were found between thin places and each of non lint (0.927**), dust (0.775**), fiber fragment (0.757**), trash per gram (0.842**) seed coat (0.923**) and neps per gram (0.954**). Number of neps/400mrecorded positive and highly significant correlations with each of non lint (0.929**), dust (0.796**), fiber fragment (0.784**), trash per gram (0.815**), seed coat (0.934**) and neps per gram (0.960**).Trash content effected on yarn evenness, thin places, thick places and number of neps. High content of trash cause increase the number of end breakage and neps during spinning process. Consequently, it increased yarn unevenness, number of thin, thick places and neps/400m in spun yarns.

Results in the same table demonstrated that in yarn count 60,lea count strength product had positive and highly correlation with yarn strength (0.975**) and showed negative and highly significant correlation with each of non lint (-0.449**), yarn unevenness (-0.777**), thick places (-0.448**), thin places (-0.312*) and number of neps/400m (-0.526**).Also, yarn strength recorded negative and highly significant correlations with each of with non lint (-0.437**), unevenness (-0.781**), thick places (-0.443*) and number of neps/400m (-0.529**).Positive and highly significant correlations were found between yarn unevenness (CV %) and each of non lint (0.840**), dust (0.545**), fiber fragment (0.348**), trash per gram (0.577**) seed coat (0.515**), neps per gram (0. 545**), thick places (0. 853**), thin places (0.810**) and number of neps/400m (0.918**). Also, thick places showed positive and highly significant correlations with each of non lint (0.900**), dust (0.654**), fiber fragment (0.633**), trash per gram (0.843**) and seed coat (0.714**),neps per gram (0.735**), thin places (0.904**) and number of neps/400m (0.947**). Likewise, thin places recorded positive and highly significant correlations with each of non lint (0.892**), dust (0.681**), fiber fragment (0.631**), trash per gram (0.728**), seed coat (0.756**), neps per gram (0.858**) and number of neps/400m (0.943**). Number of neps/400m recorded positive and highly significant correlations with each of non lint (0.895**), dust (0.624**), fiber fragment (0.561**), trash per gram (0.712**), seed coat (0.671**) and Neps per gram (0.748**).The relationship between trash content and number of neps/400m could be explained by the formation of neps during spinning process due to the cotton fibers entangled around the particles of trash, seed coat and fragments which led to increase neps formation in the yarns. Increasing neps per gram in raw cotton led to increase number of thin places, thick places due to increase end breakage during process.

Conclusion

The main objective of this study was to determine the impact of fiber properties and trash content on the formation of neps in raw and yarn cotton. In addition, it studied the relationships between fiber, trash content and yarn properties. Three long staple cotton varieties namely Giza95, Giza98, and Giza 94 and extra-long staple cotton variety Giza96 were used. Giza 95 and Giza 98 were spun into 40's yarn count. While, Giza 94 and Giza 96 Cotton varieties were spun into 60's carded yarns with 3.6 twist multiplier. The Cotton Classifying System Version-5 instrument (CCS-V5) was used to measure fiber properties. Lea count strength product was tested on good brand, number of neps per 400 meter, unevenness, thick places and thin places were measured using Uster tester 3 and single yarn strength (cN/tex) was measured by the UsterTensorapid4. Completely randomize design with four replications was used. Results indicated that Giza96 gave better fiber, yarn properties and trash content as compared with Giza 94.The lint cotton grade Fully Good (FG) gave the best values of all studied traits. Neps/gram and number of neps/400m increased with increasing each one of non-lint, dust, fiber fragment, trash per gram, seed coat, lea count strength product, yarn unevenness, thin and thick places. While, they decreased with increasing upper half mean length, uniformity index, micronaire value and high content of trash cause increasing the number of end breakages and neps during the spinning process. Consequently, it increased yarn unevenness, number of thin, thick places and neps/400m in spun yarns.

Conflicts of interest:

"There are no conflicts to declare".

Table 1. Effect of cotton varieties and lint grade on fiber properties and trash content

Fiber properties	Varieties				LSD at 5%	Lint grade			LSD at 5%
	Giza 94	Giza 96	Giza 95	Giza 98		FG	G	FGF	
UHML	32.47	34.75	28.57	28.69	0.26	32.83	31.47	29.06	0.22
UI%	84.77	85.59	83.71	84.18	0.35	86.52	84.93	82.24	0.30
SFC	6.60	7.00	10.14	9.72	0.50	5.91	8.33	10.86	0.43
MIC	3.82	3.77	4.11	3.95	0.10	4.42	4.06	3.26	0.09
MAT	0.90	0.90	0.89	0.89	NS	0.94	0.91	0.83	0.02
Str	39.14	42.37	36.39	36.67	0.51	42.18	38.94	35.09	0.44
Elg.	8.25	7.74	9.01	9.15	0.30	7.71	8.69	9.21	0.26
Rd	71.27	70.00	61.89	60.82	0.79	71.73	67.28	58.97	0.63
+b	9.03	9.50	11.76	11.94	0.49	9.88	10.59	11.19	0.42
Trash area	1.35	0.81	1.46	1.44	0.13	0.47	1.28	2.05	0.11
Trash count	81.74	50.04	101.63	99.00	11.24	26.03	62.58	160.69	9.73
Non lint	4.21	4.25	6.64	6.35	0.54	1.12	4.84	10.13	0.46
Dust	0.24	0.38	0.74	0.82	0.09	0.24	0.55	0.84	0.08
F.Fragment	0.20	0.39	0.77	0.85	0.06	0.28	0.60	0.77	0.06
Trash /gram	166.15	199.78	185.07	189.89	10.23	125.72	194.83	235.11	0.86
Seed coat	17.26	27.93	35.15	37.07	3.03	15.69	27.69	44.67	2.63
Neps /gram	130.33	217.07	258.33	264.44	8.84	125.31	191.86	335.47	7.66

Abbreviations: Upper Half Mean Length (UHML), Uniformity Index (UI%) ,Short Fiber Content (SFC) ,Micronaire Reading (MIC), Maturity % (MAT) fiber strength (Str),Elongation Percentage (Elg.) ,Reflectance degree (Rd%),yellowness degree(+b) and Fiber fragment (Fragment).

Table 2. Effect the interaction between cotton varieties and lint cotton grades on fiber properties.

Fiber properties	Lint grade	Varieties				LSD at 5%
		Giza 94	Giza 96	Giza 95	Giza 98	
	FG	34.19	36.28	30.33	30.50	
UHML	G	33.14	34.99	28.76	29.00	0.49
	FGF	30.08	32.99	26.61	26.58	
	FG	86.51	87.77	85.79	86.00	
UI%	G	84.96	85.90	84.09	84.75	NS
	FGF	82.84	83.10	61.24	81.78	
	FG	3.89	4.95	7.83	6.96	0.86
SFC	G	6.30	6.23	10.43	10.33	
	FGF	9.60	9.83	12.14	11.88	
	FG	4.34	4.21	4.70	4.42	
MIC	G	3.97	3.94	4.22	4.11	NS
	FGF	3.15	3.17	3.41	3.31	
	FG	0.94	0.95	0.94	0.94	
Mat	G	0.91	0.92	0.91	0.91	NS
	FGF	0.85	0.83	0.83	0.82	
	FG	43.01	48.68	38.39	38.62	
Strength	G	39.30	43.38	36.34	36.72	0.88
	FGF	35.12	36.14	34.42	34.68	
	FG	7.89	6.67	8.17	8.12	
Elongation	G	8.22	7.91	9.21	9.41	0.52
	FGF	8.64	8.63	9.66	9.91	
	FG	77.84	75.04	67.69	66.34	
Rd%	G	70.86	71.50	63.56	63.21	1.37
	FGF	65.12	63.44	54.42	52.90	
	FG	8.21	8.58	11.27	11.47	
+b	G	8.96	9.71	11.78	11.93	0.84
	FGF	9.91	10.21	12.22	12.43	

Table 3.**Effect the interaction between cotton varieties and lint cotton grades on trash content**

Trash content	Lint grade	Varieties				LSD at 5%
		Giza 94	Giza 96	Giza 95	Giza 98	
Trash area	**FG**	0.13	0.13	0.47	0.72	0.22
	G	1.56	0.93	1.3	1.33	
	FGF	2.2	1.37	2.35	2.28	
Trash count	**FG**	5.67	3	48.67	46.78	19.47
	G	72.67	32	73.78	71.89	
	FGF	166.89	115.11	182.44	178.33	
Nl	**FG**	28	0.98	1.6	1.62	0.93
	G	4.52	3.28	5.91	5.65	
	FGF	7.85	8.5	12.39	11.79	
Dust	**FG**	0.04	0.12	0.36	0.46	0.15
	G	0.29	0.29	0.82	0.81	
	FGF	0.39	0.75	1.05	1.19	
Fiber fragment	**FG**	0.04	0.23	0.4	0.44	0.03
	G	0.22	0.4	0.88	0.9	
	FGF	0.32	0.53	1.02	1.21	
Trash/gm	**FG**	51.22	139.44	154.11	156.11	17.72
	G	215.44	204.33	177.78	181.78	
	FGF	231.78	255.56	223.33	229.78	
Seed coat	**FG**	6.33	15	20	21.44	5.25
	G	17.89	26.11	33	33.78	
	FGF	27.56	42.67	52.44	56	
Neps/gr	**FG**	58.22	134.33	149.89	158.78	15.32
	G	97.67	182.67	239.44	247.67	
	FGF	235.11	334.22	385.67	386.89	

Table .4. Effect of cotton varieties and lint grad on lea count strength product, yarn strength, unevenness (CV %) thick places, thin
places and number of neps/400m

Yarn properties \ Varieties	Ne40 s			Ne60 s		
	Giza95	Giza98	LSD at 5%	Giza96	Giza94	LSD at 5%
lea count strength product	2160	2365	52.96	3260	2750	21.81
Yarn strength (cN/tex)	14.70	15.56	0.34	22.81	14.99	0.28
Unevenness (CV %)	18.51	18.92	0.32	20.17	22.57	0.20
Thick(+50)	617.0	624.0	NS	505.0	509.0	NS
Thin(-50)	389.0	398.0	NS	251.0	220.0	14.05
Neps (+200%)	281.0	293.0	NS	281.0	312.0	12.41

Yarn properties \ Grades	Ne40s				Ne 60s			
	FG	G	FGF	LSD at 5%	FG	G	FGF	LSD at 5%
lea count strength product	2400	2300	2090	64.86	3170	2990	2845	26.71
Yarn strength (cN/tex)	17.83	15.25	12.32	0.41	21.50	18.73	16.47	0.34
Unevenness (CV %)	14.54	17.72	23.88	0.40	18.50	21.06	24.54	0.20
Thick(+50)	378.0	517.0	966.0	21.01	178.0	573.0	770.0	10.80
Thin(-50)	176.0	256.0	749.0	10.71	103.0	197.0	407.0	17.21
Neps (+200%)	98.0	192.0	572.0	17.82	153.0	283.0	453.0	14.88

Table .5. Effect the interaction between cotton varieties and lint grad on lea count strength product (LCSP), yarn strength (cN/tex), unevenness (CV %), thick places, thin places and number of neps/400m

Count 40							
Varieties	**Grades**	**LCSP**	**Yarn strength**	**CV%**	**Thick (+50)**	**Thin (-50)**	**Neps (+200)**
Giza95	**FG**	2270	17.36	14.54	370.0	171.0	96.00
	G	2160	14.53	17.31	516.0	252.0	189.0
	FGF	2055	12.22	23.70	964.0	744.0	558.0
Giza98	**FG**	2635	18.30	14.54	385.0	180.0	100.0
	G	2335	15.97	18.13	519.0	259.0	194.0
	FGF	2120	12.41	24.07	968.0	753.0	585.0
LSD at 5%		91.73	0.58	NS	NS	NS	NS
Count 60							
Giza96	**FG**	3420	26.16	16.84	174.0	115.0	124.0
	G	3265	22.64	20.33	627.0	248.0	310.0
	FGF	3085	19.63	23.32	714.0	391.0	410/0
Giza94	**FG**	2925	14.84	20.16	183.0	90.0	183.0
	G	2720	14.81	21.79	519.0	146.0	256.0
	FGF	2600	13.31	25.76	825.0	423.0	495.0
LSD at 5%		37.79	0.49	0.34	15.27	24.33	21.04

Table 6. Correlation matrix among some fiber quality properties

Fiber properties	UHML	UI	SFC	MIC	Mat.	Str.	Elg	Rd	+b	TrAr	TrCnt
UHML	1										
UI	0.735**	1									
SFC	-0.828**	-0.815**	1								
MIC	0.269**	0.715**	-0.537**	1							
Mat.	0.532**	0.862**	-0.713**	0.822**	1						
Str.	0.836**	0.814**	-0.806**	0.472**	0.683**	1					
Elg	-0.773**	-0.695**	0.754**	-0.416**	-0.562**	-0.751**	1				
Rd	0.865**	0.854**	-0.894**	0.538**	0.735**	0.802**	-0.731**	1			
+b	-0.870**	-0.569**	0.779**	-0.126	-0.394**	-0.707**	0.696**	-0.832**	1		
TrAr	-0.700**	-0.887**	0.763**	-0.714**	-0.788**	-0.771**	0.666**	-0.796**	0.497**	1	
TrCnt	-0.711**	-0.898**	0.789**	-0.753**	-0.861**	-0.768**	0.634**	-0.815**	0.519**	0.912**	1

Table 7. Correlation matrix between fiber quality properties and trash content

	UHML	UI	SFC	MIC	Mat.	Str.	Elg	Rd	+b	TrAr	TrCnt
Non lint	-0.690**	-0.906**	0.834**	-0.774**	-0.876**	-0.729**	0.666**	-0.872**	0.547**	0.879**	0.896**
Dust	-0.769**	-0.710**	0.830**	-0.463**	-0.634**	-0.699**	0.692**	-0.864**	0.759**	0.652**	0.695**
Fiber fr.	-0.782**	-0.645**	0.820**	-0.353**	-0.507**	-0.618**	0.712**	-0.853**	0.820**	0.601**	0.604**
Trash /gm	-0.359**	-0.651**	0.630**	-0.669**	-0.687**	-0.558**	0.406**	-0.631**	0.386**	0.704**	0.665**
Seed Coat	-0.674**	-0.781**	0.824**	-0.647**	-0.762**	-0.654**	0.672**	-0.874**	0.665**	0.724**	0.772**
Neps	-0.687**	-0.825**	0.862**	-0.684**	-0.815**	-0.679**	0.675**	-0.895**	0.698**	0.718**	0.806**

Table 8. Correlation matrix among trash content

Trash content	Non lint	Dust	Fiber fragment	Trash /gm	Seed coat	Neps
Non lint	1					
Dust	0.795**	1				
Fiber fragment	0.733**	0.908**	1			
Trash /gm	0.714**	0.499**	0.453**	1		
Seed coat	0.876**	0.874**	0.846**	0.645**	1	
Neps	0.886**	0.833**	0.809**	0.677**	0.909**	1

Table 9. Correlation matrix between fiber properties and each one of six yarn quality properties

Yarn properties	UHML	UI	SFC	MIC	Mat.	Str.	Elg	Rd	+b	TrAr	TrCnt
40 $_S$ yarn count											
Lea count strength	0.482**	0.574**	-0.342*	0.399**	0.468**	0.444**	-0.129	0.501**	-0.231	-0.478**	-0.544**
Yarn strength (cN/tex)	0.911**	0.928**	-0.864**	0.848**	0.867**	0.927**	-0.697**	0.900**	-0.659**	-0.901**	-0.876**
Unevenness (CV %)	-0.948	-0.941*	0.848**	-0.920**	-0.963*	-0.922**	0.692**	-0.953*	0.718**	0.919**	0.955**
Thick (+50)	-0.934**	-0.946*	0.807**	-0.916*	-0.945**	-0.900*	0 .676**	-0.947**	0.743**	0.920**	0.958**
Thin (-50)	-0.915**	-0.931*	0.774**	-0.913	-0.942*	-0.872	0.625**	-0.950**	0.693**	0.916**	0.962**
Neps (+200)	-0919**	-0.928*	0.792**	-0.917*	-0.941*	-0.881**	0 .648**	-0.942	0.706**	0.917**	0.961**
60 $_S$ yarn count											
Lea count strength	0.855**	0.597**	-0.343*	0.379**	0.419**	0.734**	-0.580**	0.329*	-0.133	-0.718**	-0.623**
Yarn strength (cN/tex)	0.837**	0.610**	-0.324*	0.346*	0.433**	0.759**	-0.618*	0.321*	-0.138	-0.687**	-0.587**
Unevenness (CV %)	-0.934**	-0.898**	0.764**	-0.805**	-0.824**	-0.939**	0.755**	-0.770**	0.651**	0.878**	0.876**
Thick (+50)	-0.729**	-0.842**	0.831**	-0.830**	-0.815**	-0.809**	0.647**	-0.888**	0.861**	0.865**	0.823**
Thin (-50)	-0.700**	-0.829**	0.865**	-0.907**	-0.896*	-0.757**	0.559**	-0.895*	0.849**	0.736**	0.813**
Neps (+200)	-0.818**	-0.882**	0.844**	-0.866**	-0.851**	-0.856**	0.684**	-0.862**	0.797**	0.849**	0.884**

Table 10. Correlation matrix between trash content properties and each one of six yarn quality properties

	Non lint	Dust	Fiber fragment	Trash /gm	Seed coat	Neps	Lea product	Yarn strength	Unevenness	Thick	Thin	Neps
40_S yarn count												
Lea count strength	-0.489**	-0.297*	-0.228	-0.414**	-0.429**	-0.427**	1					
Yarn strength(cN/tex)	-0.929**	-0.806**	-0.80**	-0.782**	-0.894**	-0.927**	0.594**	1				
Unevenness (CV %)	0.961**	0.845**	0.830**	0.866**	0.950**	0.981**	-0.452**	-0.923*	1			
Thick (+50)	0.934**	0.773**	0.775**	0.845**	0.916**	0.974**	-0.529**	-0.907*	0.974**	1		
Thin (-50)	0.927**	0.775**	0.757**	0.842**	0.923**	0.954**	-0.554**	-0.883	0.964**	0.988**	1	
Neps (+200)	0.929**	0.796**	0.784**	0.815**	0.934**	0.960**	-0.535**	-0.9	0.968**	0.986**	0.992**	1
60_S yarn count												
Lea count strength	-0.449**	-0.109	0.165	-0.196	0.01	0.034	1					
Yarn strength(cN/tex)	-0.437**	-0.123	0.173	-0.165	-0.005	0.027	0.975**	1				
Unevenness (CV %)	0.840**	0.545**	0.348**	0.577**	0.515**	0.545**	-0.777**	-0.781**	1			
Thick (+50)	0.900**	0.654**	0.633**	0.843**	0.714**	0.735**	-0.448**	-0.443*	0.853**	1		
Thin (-50)	0.892**	0.681**	0.631**	0.728**	0.756**	0.858**	-0.312*	-0.311*	0.810**	0.904**	1	
Neps (+200)	0.895**	0.624**	0.561**	0.712**	0.671**	0.748**	-0.526**	-0.529**	0.918**	0.947**	0.943**	1

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تأثير النعومه والنضج ومحتوى الياف القطن من الشوائب على تكوين العقد فى القطن الخام والغزل

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أجرى البحث بمعامل تكنولوجيا بحوث القطن - معهد بحوث القطن - مركز البحوث الزراعية - جيزة لدراسة تأثير نعومة القطن ونسبة النضج ومحتوى القطن من الشوائب على تكوين العقد في القطن الخام وخيوط الغزل بالإضافة إلى دراسة العلاقات بين صفات جودة الألياف ومحتوى القطن من الشوائب وصفات جودة الغزل. تم أخذ أربعة أصناف من القطن وهي سوبر جيزة 94 ، جيزة 95 ، جيزة 98 و جيزة 96 فائق الطول وثلاثة رتب هى فولى جود جود وفولى جود فيرمن كل صنف من الاصناف محل الدراسة. أظهرت النتائج وجود تأثيرات عالية المعنوية للأصناف ورتب القطن لمعظم صفات جودة التيلة والغزل. أعطى صنف جيزة 96 أعلى القيم لصفات جودة الألياف والغزل مثل قيمة الميكرونير ، طول التيلة ، انتظام الطول ، محتوى الألياف القصيرة ، متانة التيلة ، متانة الغزل ، متانة الخيط وعيوب الغزل مقارنة بصنف جيزة 94. كما أعطت رتبة فولى جود (FG) أفضل القيم لجميع الصفات المدروسة . كان تأثير التفاعل بين أصناف القطن ورتب القطن معنوى لجميع الصفات المدروسة فيما عدا انتظام الطول ، وقيم الميكرونير ، نسبة النضج وعيوب الغزل (نمرة خيط 40 ومعامل برم 3.6) .ارتبط طول التيلة ، قيم الميكرونير، نسبة النضج ارتباط سالب وعالى المعنوية مع محتوى القطن من الشوائب، بينما سجل محتوى الشعيرات القصيرة، مساحة الشوائب ارتباط موجب وعالى المعنوية مع محتوى الشوائب و سجلت كلا من العقد/جرام وعدد العقد/400متر ارتباط موجب وعالى المعنوية مع كلا من محتويات الشوائب وعدم الانتظام و عدد الاماكن الرفيعة والسميكة فى الخيط .

الكلمات المفتاحية: الياف القطن، رتبة التيلة ، محتوى الشوائب، النضج، جودة الخيط