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# STUDY ON EGYPTIAN NATURALLY COLORED COTTON COMPARED WITH SOME CONVENTIONAL UNCOLORED COTTONS

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## ABSTRACT

This study was carried out to investigate the yield and yield components, fiber physical mechanical and structural properties, color measurements, fiber morphological investigations and fiber chemical compositions for naturally colored cotton (green and brown) as well as conventional uncolored cotton cultivars i.e. Giza 89 (source of green mutation) and Giza 83 (Egyptian cotton parent for the brown cottons). The results revealed that regarding the yield components, there was no specific genotype, which was superior or inferior for all studied traits. But concerning seed cotton yield/plant (SCY/P) the results cleared that the differences between white and colored cotton were not significant. On the contrary, white cotton exhibited high values of mean performance and differ significantly for lint yield/plant (LY/P), lint percentage (L %) and lint index (LI). Fiber physical and structural properties of the colored cotton are lower than the uncolored cottons but not much different from it. Brown cotton has the highest values of ribbon width (17.06 microns), fiber diameter (18.20 micron). perimeter ( 57.15 micron) , color strength (k/s = 4.7) color differences ($\Delta$ E= 35.9 ) , and fiber protein content (0.63%). While the green cotton has the highest values of fiber wax content (2.13%) and the ash content (1.198%). By examination of the cotton fibers by the optical microscope with magnification (500 X), the pictures showed that, the colored matters distributed within the fiber and between the fiber layers and not concentrated in the fiber lumen just as it was known before, but examination with the Scanning Electron Microscope

(SEM) revealed that there are no obvious differences in all the fiber types. It is rather interesting to note that, the values of total reducing sugar % for all studied samples were in normal range under 0.3 % (not sticky) which not cause any processing problems. Green cotton fibers followed by brown cotton fibers was characterized by high amount of wax, ash content % and micro-elements content (Cu, Mn, Fe and Zn) compared with the uncolored cottons. So it could be concluded that so the Egyptian colored cotton need more studies to develop and improve its properties to cultivate it as commercial variety to be utilized in manufacturing of clothes in the future, to decrease pollution with chemicals, as textile material friendly for the environment and superiority in its properties in all over the world.

## INTRODUCTION

Naturally colored cottons have many applications for textile products consumer because of their unique "no fade" quality and environmental friendly aspects making them an attractive alternative to conventionally dyed cottons. Naturally colored cottons have an extremely soft hand or "feel.", this, combined with their unique non-fading and environmental friendly properties, has helped to assure their niche market. But, its future depends on continued improvement of fiber quality and development of appropriate manufacturing procedures. These facts excited many researchers to evaluate colored cotton quality comparing with conventional white cottons. The naturally colored cotton attracted the attention of textile manufactures to save costs of bleaching and dyeing and to avoid environmental pollution from the chemical dyeing processes. Consumer choice not reflect price and quality performances only ,but also social and health values as witnessed in the remarkable growth of the global market for organic and environmentally friendly products. The natural clothes will protect the consumer skin from the chemicals of the textile processes. Rollins (1965), Apodaca (1993) and May et al. (1994) reported that Upland colored cottons are usually shorter in staple length, weaker in fiber strength and are also characterized by low micronaire reading and maturity values compared with white cottons. Ware (1932) reported that several brown strains were found to have satisfactory maturity and strength. Amal (2001) reported that the fiber strength was 34.0 g / tex for Giza 86, but it was ranged from 20.8 g / tex for dark brown cotton to 26.3 g / tex for brown cottons. 2.5 %

span length was ranged from 26.4 mm for dark brown cotton to 28.9 mm for brown cottons. On the other hand, length uniformity ratio % was ranged from 43.2 % for dark brown cotton to 34.6 % for brown cottons. The micronaire reading ranged from 3.1 for dark brown cotton to 3.3 for brown cottons, so the brown cottons were fine fibers. The maturity % ranged from 67 % for dark brown cotton to 68 % for brown cottons. Reflectance (Rd %) ranged from 31.2 for dark brown cotton to 38.5 for brown cottons. The yellowness (+b) ranged from 18.5 for dark brown cotton to 19.8 for brown cottons. Amal (2003) and Dutt et al., (2004) indicated that the physical properties of brown cotton i.e. fiber strength, elongation, length, micronaire reading and fineness are on average, while it is lower than those of the white cotton. Kohel et al. (1967) indicated that the fibers of the green lint variety are not used for commercial purposes because the yield of fibers per seed is small and the fibers are short and weak. Bailey (1954) noticed that brown cottons are not much different in their length or fineness properties from their white counterparts except they contain pigments with different amounts and in some cases the lumen becomes filled with these pigments. Abd El-Gawad (1996) found that the convolution number/cm ranged from 36.1 to 46.0 and the reversals number /cm ranged from 7.2 to 7.8 for Egyptian cotton cultivars in this study. In another study, Abd El-Gawad (2005) reported that the means of fiber convolution number/cm was 33.9 and the reversals number /cm were 8.4 for Giza 86 cultivar. Many investigators i.e Holst (1942), Cook (1991), Donald and Henry (1994) and Donald (2000) referred to the importance of the metal content of cotton. Metal content may contribute to problems that occur in yarn manufactory, bleaching and dyeing process. Magnesium salts may interfere with dyeing quality. Cu, Fe and Al contribute to yellowness of finished products .....etc. Amal (2001) reported that dyeing with henna as a natural dye was the best for most Egyptian varieties (Giza 45, Giza 87, Giza 88, Giza 85 and Giza 83) which were the highest varieties in micro elements content (Cu, Zn, Fe, Mg, and Si) and she stated that, these results may be due to that these micro elements played as mordants for henna for dyeing the cellulosic fibers. Also Holst (1942) reported that, the mineral content of cotton fabric may have affect for dyeing.

## MATERIALS AND METHODS

In 2009 growing season, naturally colored cotton (green and brown) as well as conventional uncolored cotton cultivars i.e. Giza 89 (source of green mutation) and Giza 83 (Egyptian cotton parent for the brown cottons) were obtained from the Cotton Breeding Research Section, Cotton Research Institute, Agricultural Research Center, Giza, Egypt and evaluated in a field trial experiment at Giza Agricultural Research Station. The experimental design used was a randomized complete blocks design with three replications. Each plot was one row 4.0 m. long and 0.6 m. wide. Hills were 0.4 m. apart to insure 10 hills per row. Hills were thinned to keep a constant stand of one plant per hill at seedlings stage. Ordinary cultural practices were followed as the recommendations of CRI.

**Studied characteristics**

**Yield components traits:**

1. Seed cotton yield per plant in grams (S.C.Y / P): this trait was obtained by dividing the total seed cotton yield per plot by the number of plants of the plot.
2. Lint yield per plant in grams (L.Y. /P): this trait was obtained by dividing the weight of lint obtained from seed cotton yield per plot after ginning by the number of plants of the plot.
3. Boll weight in grams (B.W): this trait was estimated as the average weight of 10 bolls picked at random from each plot.
4. Number of open bolls per plant (N.B. /P): this trait was obtained by dividing the total seed cotton yield per plant by boll weight.
5. Lint percentage (L %): this trait was estimated as ratio of cotton lint to seed cotton expressed as percentage (the weight of lint obtained from 100 gram of seed cotton). L % = [total lint yield per plot / total seed cotton yield per plot] x 100
6. Seed index (S.I) : this trait was determined as the weight of 100 seed in grams taken randomly from each plant
7. Lint index (L.I.): this trait was calculated as the weight in grams of lint per 100 seed. Lint index = [(Lint % / 100 – Lint %) x seed index].

**Fiber physical and mechanical properties:**

Physical and mechanical properties of cotton fibers i.e. strength, length, elongation %, micronaire reading, maturity (%), short fiber index and predicted yarn strength (60 s carded ring yarns) were measured using Spain Lab 900B HVI instrument system according to ASTM, (1986) D: 4605. All tests conducted under constant conditions of temperature (20 °C ± 2) and (65 % ± 2 %) of relative humidity.

**Fiber structural properties:**

Projection microscope G208 was used to determine convolutions number / mm, average convolution angle, maturity percentage and ribbon width. While Image analyzer was used to measure fiber diameter (micron) according to Huang and Xu (2002). The calculated perimeter =Diameter ×3.1416. On the other hand degree of thickening ($\theta$) = 0.577 × MR (maturity ratio), according to Peirce and Lord (1939) and Lord (1981). However poralyzed microscope was used to determine reversals number/mm.

**Color measurements:**

The color strength (K/S), and the color parameters (L*, a*, b* and Δ E), were measured by using the Win lab Software of the Perkin Elmer, Lambda 35 Spectrophotometer using integrated sphere, according to ASTM: D 2288-1993).

**Fiber morphological investigations**

Lint of naturally colored cotton samples and conventional white cotton were examined using the following techniques trying to identify the placement of the colored matters inside the cotton fiber:

1. The morphological investigations were carried out using scaning electron microscope (SEM) manufactured by Jeol Co. Japan at the National Research Center. The cotton fibers were adhered to the sample-holder, coated with a layer of gold by means of thermal evaporation in a vacuum coating unit, and examined in the SEM using an accelerating voltage of 20 KV. Ten pictures from each sample were taken at a magnification of 1500 X.
2. Optical microscopy tests were performed to study the location of the colored matter for the colored cotton samples (green and brown) as well as and conventional white cotton (Giza 89 and Giza 83) cultivars, the magnification of the photos is (500 X).

**Fiber chemical compositions:**

The fiber wax content (%) was determined according to the method used by Conrad (1944), total reducing sugar content (%) determined according to Smith et al. (1956), ash content % and protein content % determined according to the AOAC procedures (2000). Duplicate sample of 3 ± 0.005 g dry cotton fiber was weighed and ashed for 2.5 hr. at 650° C in a muffle furnace. The ash residues were dissolved in 5 ml concentrated hydrochloric acid (38%) and subsequently made up to 25 ml with deionized water, the dilution was made from this original solution with deionized water depending on the expected concentration of the elements in the sample and linear operating range of the atomic absorption instrument as predetermined with standard solutions. Atomic absorption was used to measure each of metal content (Mn, Fe, Cu, zn), a buck model of it is 200 A spectrophotometer reading in the absorbance mode using an air/ acetylene flame.

**Statistical analysis:**

The obtained data was subjected to analysis of variance outlined by SAS program (SAS, 1991), LSD 0.05 % test was used for comparing the different means.

## RESULTS AND DISCUSSION

**Yield and Yield components**

Data of yield components, i.e. Boll weight (BW), seed cotton yield/plant (SCY/P), lint yield/plant (LY/P), lint percentage (L %), number of open bolls/ plant (No. B. /P), seed index (SI) and lint index (LI) for naturally colored cotton (green and brown) as well as conventional white cotton ( Giza 89, Giza 83) cultivars are presented in Table 1. The means showed that there was no specific genotype, which was superior or inferior for all traits. The variety Giza 89 was the highest yielding genotype for seed cotton yield / plant (102.67g). The variety Giza 83 was the highest genotype for boll weight (3.2 g), lint yield/plant (38.64g) lint percentage (38.00%), lint index (5.82) and seed index (9.50). On the contrary, brown cotton gave the lowest values of seed cotton yield/plant (SCY/P), seed index (SI) and lint index (LI) with means of (92.00 g, 7.30 g and 3.85 g, respectively). As to the lint percentage, Giza 83 cultivar exhibited the highest value

(38.00%). In contrast, the lowest value (32.56%) was obtained from the green colored cotton. Concerning seed cotton yield/plant (SCY/P) the results cleared that the differences between white and colored cotton were not significant. On the contrary, white cotton exhibited high values of mean performance and differ significantly for lint yield/plant (LY/P), lint percentage (L %) and lint index (LI).

**Table (1): Yield components traits of green and brown colored cotton with of the commercial Egyptian Varieties Giza 83 and Giza 89**

| Yield and yield component characters | Uncolored cotton | | Colored cotton | | L.S.D 0.05 % |
|---|---|---|---|---|---|
| | Giza 89 | Giza 83 | Green cotton | brown cotton | |
| Seed cotton yield per plant (g) | 102.67 | 101.67 | 94.19 | 92.00 | 10.778 |
| Lint cotton yield per plant (g) | 37.88 | 38.64 | 30.67 | 31.75 | 4.290 |
| Number of open bolls per plant | 39.33 | 31.96 | 40.52 | 41.92 | 7.195 |
| Boll weight (g) | 2.61 | 3.20 | 2.33 | 2.20 | 0.379 |
| Lint percentage (%) | 36.89 | 38.00 | 32.56 | 34.50 | 0.540 |
| Seed index | 9.11 | 9.50 | 9.04 | 7.30 | 1.000 |
| Lint index | 5.32 | 5.82 | 4.37 | 3.85 | 0.552 |

**Fiber structural properties:**

The means of the number of reversals per mm, number of convolutions per mm, convolution angel, ribbon width, fiber diameter, fiber perimeter and degree of wall thickening of uncolored cotton (Giza 89 and Giza 83 cultivars) compared with colored cotton (green and brown) are shown in Table (2). The analysis of variance showed that the differences between the means of these properties were significant at 5% level, except the number of reversals was insignificant. The uncolored cotton has the highest values of the degree of wall thickening which were 0.54, 0.50, 0.36 and 0.38 for Giza 89, Giza 83, green and brown cotton; respectively. The differences between number of reversals per unit, number of convolutions per unit and convolution angle were limited. Brown cotton has the highest values of ribbon width (17.06 micron), fiber diameter (18.20 micron) and fiber perimeter (57.15 micron) compared

with the uncolored and green cotton. Abdel-Gawad (1996) found that the number of convolutions per cm ranged from 36.10 to 46.00, whereas the number of reversal per cm ranged from 7.2 to 7.8 for Egyptian cotton cultivars.

**Table (2): Fiber structural and other microscopic characters**

| Cotton character | White cotton | | Colored cotton | | L.S.D. 0.05 % |
|---|---|---|---|---|---|
| | Giza 89 | Giza 83 | Green | brown | |
| Reversals/mm | 1.18 | 1.21 | 1.25 | 1.25 | N.S |
| Convolution/mm | 3.45 | 3.41 | 3.35 | 3.33 | 0.04 |
| Average convolution Angle | 8.33 | 8.72 | 9.37 | 9.37 | 0.40 |
| Ribbon width(micron) | 15.03 | 16.06 | 16.31 | 17.06 | 0. 52 |
| Diameter(micron) | 17.81 | 18.02 | 17.80 | 18.20 | 0.59 |
| Perimeter (micron) | 55.92 | 56.58 | 55.89 | 57.15 | 1.95 |
| Degree of thickening (θ) | 0.54 | 0.50 | 0.36 | 0.38 | 0.022 |

**Fiber physical and mechanical properties:**

The means of the upper half mean (mm), uniformity index % ,short fiber index, Micronaire value, fiber strength (g / tex), fiber elongation % and fiber maturity ratio of each of uncolored cotton (Giza 89 and Giza 83 cultivars) as well as colored cotton (green and brown) are shown in Table (3). The analysis of variance showed that the differences between the means of these properties were significant at 0.05 %. Also, the predicted yarn strength means are shown in Table (3), it has significant differences between the mean at 0.05% level. The highest values of fiber length parameters, fiber strength and elongation%, and fiber maturity ratio were obtained of uncolored cotton. Whereas, the highest values of short fiber index were obtained by colored cotton, been 18.38 for brown cotton and 12.33 for green cotton. This study confirm that the brown cotton has the least values of fiber strength (28.30g / tex) as well as fiber elongation % (4.70%) compared with green cotton, it may by noticed that green cotton has the highest values of upper half mean (29.70 mm), uniformity index (84.13%), fiber strength (33.73 g/ tex), fiber elongation (5.11%) and the product of these properties, the predicted yarn strength assure that colored cotton has the good chance to improve its properties which need the breeder efforts. Rollins (1965), Apodaca (1993) and May et al. (1994) reported that Upland colored cottons are usually shorter in

staple length, weaker in fiber strength and are also characterized by low Micronaire reading and maturity values compared with white cottons.

**Table (3): Fiber physical and mechanical properties**

| Cotton character | White cotton | | Colored cotton | | L.S.D. at 0.05 % |
|---|---|---|---|---|---|
| | Giza 89 | Giza 83 | Green | brown | |
| Upper half mean (mm ) | 32.88 | 30.31 | 29.70 | 28.13 | 0.78 |
| Uniformity Index (UI %) | 86.81 | 84.00 | 84.13 | 82.06 | 0.90 |
| Short fiber index | 8.00 | 11.11 | 12.33 | 18.38 | 0.51 |
| Micronaire value | 4.00 | 4.3 | 3.30 | 3.50 | 0.17 |
| Strength(g/tex) | 46.62 | 40.33 | 33.73 | 28.30 | 1.83 |
| Elongation% | 7.31 | 7.92 | 5.11 | 4.70 | 0.43 |
| Maturity ratio (MR) | 0.93 | 0.86 | 0.63 | 0.66 | 0.03 |
| Predicted yarn strength | 2735 | 2280 | 1990 | 1555 | 125.66 |

**Color measurements:**

Color measurements of white and colored cottons fibers determined by using UV/VIS spectrophotometer are shown in Table 4. It is clear that the differences between white and colored cotton were highly significant. Brown cotton showed the highest value color strength (K/S=4.7),while green cotton (K/S = 2.61) and white cotton G.89 (K/S =0.189),G.83(K/S=0.264 respectively. While brown cotton showed the highest value of color difference (ΔE) followed by green and white cottons respectively. The lightness (L*) showed the opposite of this trend. These results are in agreement with Amal (2003).

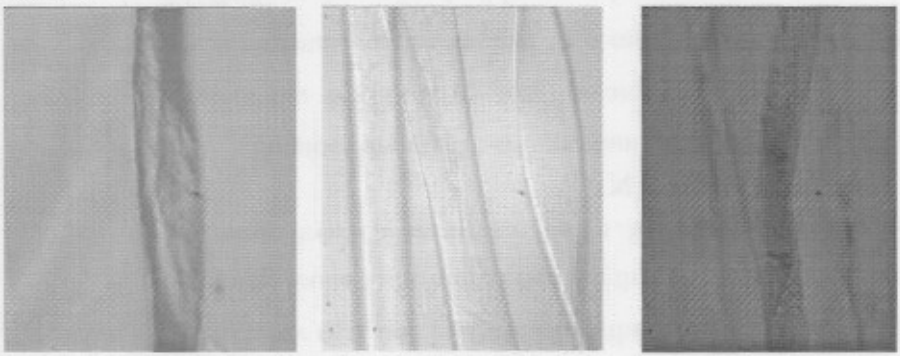
**Table (4). Means of color measurements and chemical analysis of white and colored cotton fibers**

| Color measurements | Giza 89 | Giza 83 | Green | Brown | L.S.D. at 0.05 % |
|---|---|---|---|---|---|
| L* | 88.07 | 80.07 | 67.46 | 62.3 | 5.08 |
| a* | 0.77 | 0.18 | -5.87 | 6.59 | 1.04 |
| b* | 6.46 | 8.72 | 22.87 | 20.02 | 2.79 |
| ΔE | 5.00 | 6.40 | 28.87 | 35.9 | 3.71 |
| color strength (K/S) | 0.189 | 0.264 | 3.6 | 4.7 | 0.42 |

L* = lightness a*= (+) redness, (-) greenness
b* = (+) yellowness, (-) blueness ΔE = color difference

**Fiber morphological investigations**

Lint of naturally colored cotton samples and conventional white cotton were examined using the optical microscope and scaning electron microscope in a trial to identify the placement of the colored matters inside the cotton fiber. By examination with the optical microscope with magnification (500 X), Figure (1) showed that, the colored matters distributed within the fiber and between the fiber layers and not concentrated in the fiber lumen just as it was known before.



Green cotton uncolored cotton Brown cotton

**Figure (1). Examination with optical microscope for the Egyptian naturally colored and uncolored cotton fiber**

On the other hand by examination with the scan electron microscope with same magnification power (20 μm), the pictures as shown in Figure (2) reveal that, there are no obvious differences in all the fiber types, whether natural colored (brown or green) and uncolored cotton.

**Figure (2). Examination with scan electron microscope for the Egyptian naturally colored and uncolored cotton fibers**

**Fiber chemical compositions**

The data presented in Table 5 and Figure 3 showed that, the average values of fiber chemical constituents i.e, total reducing sugar %, wax %, protein % and ash % for Giza 83 and Giza 89 (as Egyptian commercial varieties) & green and brown as Egyptian colored cotton. These data clarify that the corresponding values of total reducing sugar % was 0.19 % for Giza 89 , 0.17 % for Giza 83, 0.12 % for the green cotton and 0.15 % for the brown cotton. It is rather interesting to note that, the values of total reducing sugar % for all studied samples were in normal range under 0.3 % (not sticky) which not case any processing problems.

Regarding the fiber wax content %, the highest value was obtained by green cotton fibers (2.13 %) among the examined cultivars followed by the brown cotton (1.13 %), so that the green and brown cotton fibers was characterized by high amount of wax component (waxy cotton). This results are in agreement with Elesini *et al* 2002 and Ioelovich *et al* 2008. However Giza 89 and Giza 83 gave the lowest wax % (0.86 % and 0.75 %, respectively).

Regarding the fiber protein content %, brown cotton fibers exceeded the other varieties (0.63 %) followed by green cotton fibers (0.37 %), Giza 83 (0.32 %) and Giza 89 (0.31 %).

On the other hand, both colored cotton fibers (green and brown) ranked first with regard to ash content % (1.198 % and 1.178 %, respectively), however Giza 89 gave the lowest value of ash content (1.079 %), while Giza 83 had 1.098 % ash content.

It is worthwhile to mention that the differences between Giza 83 and Giza 89 (as Egyptian commercial varieties) & green and brown as Egyptian colored cotton were significant among the studied chemical compositions, These results are in agreement with Amal (2001 and 2003).

**Table (5): Means of chemical composition of Giza 83, Giza 89, green and brown Egyptian colored cotton.**

| Properties / varied | Giza 89 | Giza 83 | Green cotton | brown cotton | L.S.D 0.05 % |
|---|---|---|---|---|---|
| Total reducing sugars % | 0.19 | 0.17 | 0.12 | 0.15 | 0.0136 |
| Wax % | 0.86 | 0.75 | 2.13 | 1.13 | 0.112 |
| Protein % | 0.31 | 0.32 | 0.37 | 0.63 | 0.0315 |
| Ash % | 1.07904 | 1.09897 | 1.19864 | 1.17835 | 0.0123 |

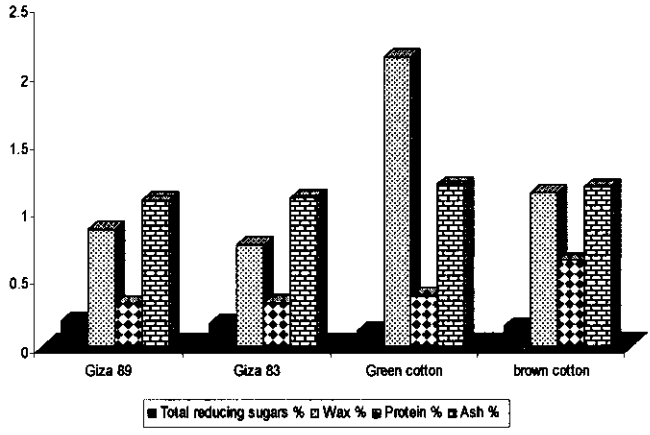



**Figure (3). Means of chemical composition of Giza 83, Giza 89, green and brown Egyptian colored cotton**

However as shown in Table 6 and Figure 4 it is clear that, the cotton fiber micro-elements content (Cu, Mn, Fe and Zn) for the colored cotton (brown and green) generally exceeded the other uncolored cotton varieties, followed by Giza 83 and Giza 89 respectively. But the brown colored cotton ranked first with regard to Cu, Fe and Zn elements. This result may be due to the coloring matters in the colored fibers appears or depended on presence of these micro-elements in the chemical composition for this naturally colored fibers. These results are in agreement with Holst (1942) and Amal (2001 and 2003).

**Table (6): Means of micro-elements (ppm) of Giza 83, Giza 89, green and brown Egyptian colored cotton**

| Variety / Micro-elements | Cu | Mn | Fe | Zn |
|---|---|---|---|---|
| Giza 89 | 1.63 | 7.35 | 50.91 | 6.27 |
| Giza 83 | 3.26 | 7.04 | 67.12 | 5.97 |
| Green | 4.02 | 7.54 | 82.98 | 9.18 |
| Brown | 4.04 | 11.74 | 92.88 | 15.76 |
| LSD 0.05 % | 0.1673 | 0.1673 | 0.4762 | 0.1673 |

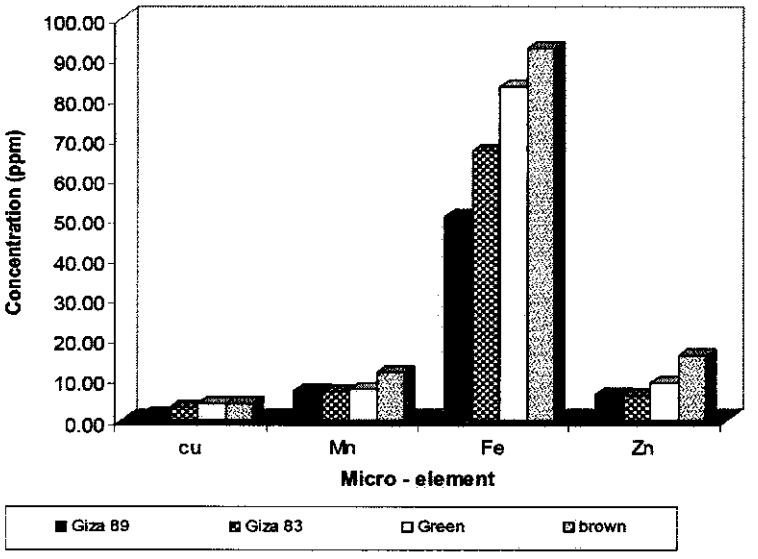



**Figure (4). Means of micro-elements (ppm) of Giza 83, Giza 89, green and brown Egyptian colored cotton**

## Conclusion

This study revealed that:

1- Regarding the yield and yield components, i.e. Boll weight (BW), seed cotton yield/plant (SCY/P), lint yield/plant (LY/P), lint percentage (L%), number of open bolls/ plant (No. B./P), seed index (SI) and lint index (LI) for naturally colored cotton (green and brown) ,as well as, conventional white cotton ( Giza 89, Giza 83) cultivars there was no specific genotype, which was superior or inferior for all studied traits. But concerning seed cotton yield/plant (SCY/P) the results cleared that the differences between white and colored cotton were not significant. On the contrary, white cotton exhibited high values of mean performance and differ significantly for lint yield/plant (LY/P), lint percentage (L %) and lint index (LI).

2- Brown cotton has the highest values of ribbon width (17.06 micron) , fiber diameter (18.20 micron) , and perimeter (57.15 micron).

3- Fiber physical and structural properties of the colored cotton are lower than the uncolored cottons but not much different from it.

4- Examination of the cotton fibers by the optical microscope with magnification (500 X), the pictures showed that, the colored matters distributed within the fiber and between the fiber layers and not concentrated in the fiber lumen just as it was known before.
5- It is rather interesting to note that, the values of total reducing sugar % for all studied samples were in normal range under 0.3 % (not sticky) which not cause any processing problems.
6- Green cotton fibers followed by brown cotton fibers were characterized by high amount of wax and ash content % compared with the uncolored cottons.
7- Cotton fiber micro-elements content (Cu, Mn, Fe and Zn) for the colored cotton (brown and green) generally exceeded the other un colored varieties.
8- So it could be concluded that the Egyptian colored cotton need more studies to develop and improve its properties to cultivate it as commercial variety to be utilized in manufacturing of clothes in the future, to decrease pollution with chemicals, as textile material friendly for the environment and superiority in its properties in all over the world.

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# دراسة على الاقطان المصرية الملونة طبيعيا مقارنة ببعض الاقطان غير الملونة التقليدية

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أجريت هذه الدراسةِ لتقدير المحصول و مكوّناتهِ،الخواص الطبيعية و الميكانيكية و التركيبة لالياف القطن والخواص اللونية مع الفحص المورفولوجى لسطح الالياف والتركيب الكيميائي للاقطان المصرية المُلوَّنِه طبيعياً (أخضر وبنى) مقارنة بالقطن غير الملون التقليدي صنف جيزة 89 (الذى ظهر به الطفرة الخضراء) و صنف جيزة 83 (الاب المصرى للقطن البنى) ، وقد كشفتْ النَتائِجَ عما يلى:

1- بالنسبة لمكوّناتَ المحصولَ، لم يكن هناك بين التراكيب الوراثية الملونة التى اجريت عليها هذة الدراسة تركيب وراثى معين متفوّق بدرجة عالية جدا أو دون المستوى لكُلّ الصفات المدروسة. و فيما يتعلق بمحصول قطن الزهر / نبات أ وضّحتْ النَتائِجَ بأنّ الإختلافاتَ بين القطن غير الملون والمُلوَّن ليس معنويا. وقدأظهر القطنَ غير الملون قِيَمَ عاليةبالنسبة لمحصول القطن الشعر / نبات ، نسبة التصافى ومعامل الشعر مقارنة بالقطن الملون.

2- و بالنسبة للخواص الطبيعية للالياف الملونة البنية و الخضراء و تركيب الليف الهيكلي لها اظهرت هذة الدراسة انها ليستْ مختلفة كثيرًا عنْ القطن غير الملون.

3- بالفحص بالميكرسكوب الضوئى للاقطان الملونة المصرية المختبرة تبين أن المادة الملونة داخل الالياف موزعة بن الطبقات و ليست مركزة داخل القناة كما كان معروفا من قبل

4- ووجد ان جميع العينات المختبرة الملونة وغير الملونة محتواها من السكريات المختزلة الكلية فى المدى الطبيعي أقل من 0.3 % (غير لزج).

5- و جدير بالذكر أن الياف القطن الخضراء يعقبها الالياف البنية تتميز بارتفاع محتواها من الشموع فهى اقطان شمعية و ايضا تتميز بارتفاع محتوها من الرماد و العناصر الصغرى ( النحاس – المنجنيز – الزنك – الحديد) مقارنا بالالياف القطنية غير الملونة.

و لذا يجب اجراء المزيد من الدراسات على الاقطان الملونة المصرية لتطوير وتحسين خواصها حتى يمكن زراعتها في المستقبل على نطاق تجارى لكى تُستَعملُ في تصنيع المنسوجات صديقهِ للبيئةِ و المتفوقة فى خواصها التكنولوجية كباقى الاصناف التجارية المصرية المميزة إجمالاً على مستوى العالم.