Quality Assessment of Some Newly Produced Egyptian Cotton Varieties

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ABSTRACT

The aim of this study is a comparison between old cultivated commercial varieties (Giza 86, Giza 90 and Giza 88) and new varieties (Giza 94, Giza 95 and Giza 96) by evaluation of the fiber characteristics and the qualities of spinning. The fiber properties of the studied varieties on HVI and Nep tester instruments were made at Cotton Arbitration and Testing General Organization (CATGO) and measure the efficiency qualities of spinning yarn varieties for 3 yarn counts at Delta company (20 - 30 - 40 'S for cotton varieties Giza 95 and Giza 90) and (50 - 60 - 70 'S for Giza 94 and Giza 86) and (50 - 90 - 120 'S for Giza 96 and Giza 88)). The mean squares of cotton varieties for all studied fiber properties were highly significant differences as well as the two growing seasons mannered the same trend for all studied fiber properties as cotton varieties except fiber length, fiber elongation, short fiber index and neps count revealed insignificant differences.

INTRODUCTION

Egyptian cotton takes an important position in the world as it is considered one of the finest cotton in the world by excellence in the yarn qualities, where the characteristics of fiber play an important role in the efficiency of the performance of spinning operations.
Cotton is one of the main pillars of the Egyptian economy. Many industries are based on this crop, where cotton lint is used in the spinning and weaving industry and the oil is extracted from the seeds, which is used in the production of oils as oil for food and the manufacture of vegetable ghee and soap, and the seed gain is used in animal feed.

The fuzz on the seed is also used to make cheap carpets and to make paper. Cottonwood is used as fuel in farmers’ homes and in the management of steam machines, and whatever exceeds the need for fuel is used for filling ponds and swamps, and for setting up sheep pens and the like.

The link between the breeders and the spinners is through the production of new varieties and replacing varieties with other ones that are superior to the yarn qualities to meet the requirements of the textile industry.

Cotton quality assessment is an important component of the global cotton trade the expectations of the spinners regarding the technological progress of textile production depend on the properties of quality fiber. The lower quality of cotton fibres means the lower quality of yarn produced. Gonca and Erhan (2006).

Wherefrom the commercial face, Egyptian cotton is considered the highest quality cotton where the quality of cotton depends on the properties of quality fiber, which depends on the quality of the yarn. However, qualify it for use in the high-quality textile industry. Quality is their most important attribute of Egyptian cotton and this is why grading and quality controls must be highly prioritized. Magdalena Nilsson (2005).

Fiber quality is an important indicator of the quality of the cotton as a yarn where spinners today are interested in other fiber properties that affect the quality of their yarns. The cotton variety had a highly significant effect on all studied fiber length and strength traits. Osman (2007).

According to CATGO the cultivated area of the Egyptian cotton in the season 2018/2019 is 336042* Feddan where the area of Extra-long varieties was 17786* Feddan while the cultivated area for long varieties was 318256* Feddan.

During the 2019/2020 season, the cultivated area was 2389987* feddan where the area of Extra-long varieties was 3215* feddan while the cultivated area for long varieties was 235491* feddan.

The latest report for the 2020/2021 season, the cultivated area was 182987.5* feddan where the area of Extra-long varieties was 1780* feddan while the cultivated area for long varieties was 180396.5* feddan.

Evaluation of new cotton varieties is very important every year for fiber properties plus agronomic characters in order to the high-quality race or varieties and good agronomic character still cultivated from year to year until the quality or agronomic trait decreased or deteriorated. So, these lower races of varieties don’t sow in Egypt area and research about new races by breeding methods (selection, hybridization and new approach by tissue culture).

The study aims to:
1- Evaluation of the fiber characteristics of some old cultivated commercial varieties Giza 86, 90 and 88.
2- Evaluation of the fiber characteristics of some new varieties Giza 94, 95 and 96.
3- Evaluate the qualities of spinning off some old cultivated commercial varieties Giza 86, 90 and 88.
4- Evaluate the qualities of spinning of some new varieties Giza 94, 95 and 96.
5- Comparison between old cultivated commercial varieties and new varieties.
MATERIALS AND METHODS

This study was carried out at the Faculty of Agriculture (Saba Basha), Alexandria University and laboratories of Central Administration for Fiber and Spinning testing at Cotton Arbitration & Testing General Organization (CATGO), Egypt.

To study Fiber properties of the new variety, measure efficiency qualities of spinning yarn variety and the relationship between the quality characteristics of new and commercial Egyptian cotton cultivars.

This investigation aimed at Identifying the quality properties of the staple and spinning quality of the new Egyptian cotton variety Giza 94 under standard test conditions for the quality properties of staple and yarn compared to the cultivated variety of the same layer Giza 86.

The Varieties of Egyptian Cotton Were Used:

- New varieties from the Cotton Research Institute (Table 1):
  - Giza 94 as long-staple cotton.
  - Giza 95 as long-staple cotton.
  - Giza 96 as Extra-long staple cotton.

- Cultivated commercial varieties from the Cotton Research Institute:
  - Giza 86 as long-staple cotton.
  - Giza 90 as long-staple cotton.
  - Giza 88 Extra-long-staple cotton.

Table 1: Pedigree and origin of some Egyptian cotton varieties:

| Variety of cotton | Pedigree                  | Original | Fiber length (mm) | Colour   | Growing zone |
|-------------------|---------------------------|----------|------------------|----------|--------------|
| Giza 94           | (Giza 86 X 10229)         | Egypt    | Long-staple      | white    | Lower Egypt  |
| Giza 95           | (Giza 83(Giza75x5844) x Giza 80) | Egypt    | Long-staple      | creamy   | Upper Egypt  |
| Giza 96           | (Giza 84(Giza 70X51 B) X625S) | Egypt    | Extra-long staple| white    | Lower Egypt  |
| Giza 86           | (Giza 81XGiza 75)         | Egypt    | Long-staple      | white    | Lower Egypt  |
| Giza 90           | (Giza83XDaudara)          | Egypt    | Long-staple      | creamy   | Upper Egypt  |
| Giza 88           | (Giza 77XGiza45B)         | Egypt    | Extra-long staple| creamy   | Upper Egypt  |

For two seasons 2018/2019 and 2019/2020, where the grade for each variety was Good (G).

Then to Study the fiber properties of the used varieties on:
- HVI 1000 M700 instrument according to standard methods ASTM (D 5867-12).
- Nep tester according to standard methods ASTM (D 5866-12).

The weight of the sample according to the specification ASTM (D 5867-12) and the HVI Application Handbook is 200 grams for each replication.

Measure efficiency qualities of spinning yarn varieties for 3 yarn counts at Delta company:
1. Giza 95 and Giza 90 for 3 yarn counts (20 - 30 - 40).
2. Giza 94 and Giza 86 for 3 yarn counts (50 - 60 - 70).
3. Giza 96 and Giza 88 for 3 yarn counts (60 - 90 - 120).

Yarn count according to English system as follows:
Study the properties of the fiber and yarn in four replications.

Studied Properties:

The properties of the fibers were studied under standard conditions of (65% ±2%) relative humidity and (21 ± 1° C) temperature before being tested according to the instruction manual for the HVI instrument and ISO 139 Standard atmospheres for conditioning and testing.

A. Fiber Properties:

I. (HVI) High Volume Instrument:
1. Micronaire reading
2. Maturity index (%)
3. UHML, Upper half mean length (mm)
4. Length uniformity index (%)
5. Fiber bundle strength (g/tex)
6. Fiber elongation (%)
7. Short fiber index (%)
8. Reflectance degree (Rd%) 
9. Yellowness degree (+b)
10. Trash area (%)
11. Trash count

II. Nep Tester:
The number of nep's / grams

b. Yarn Characteristics:
1. Single yarn strength (cN/tex)
2. Yarn evenness (CV%)
3. Thin places / 400 m.
4. Thick places / 400 m.

Statistical Procedures:
This investigation was carried out in a completely randomized block design with four replications for each season. The least significant difference (L.S.D.) was used at 0.05 level of probability to compare the mean of treatments cotton varieties, Yarn count.

As well as regression coefficient was used to define the relationship between fiber properties and spinning consistency index (SCI) with multiple regression model according to the following equation:

\[ Y = a + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + B_9 X_9 + B_{10} X_{10} + B_{11} X_{11} + B_{12} X_{12} \]

Where: Y is the SCI
a is the intercept from y axil
X 1 is the Micronaire reading
X 2 is the Maturity index
X 3 is the Fiber length
X 4 is the Uniformity index
X 5 is the Fiber strength
X 6 is the Elongation
X 7 is the short fiber index
X 8 is Reflectance degree
X 9 is the Yellowness degree
X 10 is the Trash count
X 11 is the Trash Area
X 12 is the Nep's

Where the regression coefficient was used to determine the relationship between the fiber properties and spinning consistency index (SCI) with the multiple regression model and the non-significant traits in their effect were excluded by repeating the regression analysis to exclude the non-significant properties.

RESULTS AND DISCUSSION

Egyptian Cotton Varieties, Two Growing Seasons (2018/2019 and 2019/2020) and the Interactions Between Them:

According to Table (2) The mean squares of cotton varieties for all studied fiber properties were highly significant differences as well as the two growing seasons mannered the same trend for all studied fiber properties of cotton varieties except fiber length, fiber
elengation, short fiber index and Neps count revealed insignificant differences. The interaction between six Egyptian cotton varieties and two growing seasons was recorded as highly significant for all studied fiber properties except two traits fiber elongation and trash area.

### Table 2: Mean squares of fiber properties as influenced by the Egyptian cotton varieties (V), growing seasons (S) and their interactions during 2018/2019 and 2019/2020 seasons.

| S.O.V | d.f. | Micronaire reading | Maturity index | Fiber length (3.0 R.M.L.) | Uniformity index | Mechanical properties | Fiber strength | Fiber elongation | Short fiber index | Spinning Consistency Index | Color | Yellowness degree | Trash Count | Trash Area | Neps |
|-------|------|---------------------|----------------|---------------------------|------------------|-----------------------|---------------|------------------|------------------|--------------------------|-------|-----------------|------------|------------|-----|
|       |      |                     |                |                           |                  |                       |               |                  |                  |                          |       |                 |            |            |     |
| Replicate | 3    | 0.0000 ns | 0.0000 ns | 0.04 ns | 0.99 ns | 0.26 ns | 0.02 ns | 0.03 ns | 13.7 ns | 0.10 ns | 0.02 ns | 187.2 ns | 0.05 | 21.93 ns |
| Cotton Variety (V) | 5 | 0.27 ** | 0.001 ** | 75.11 ** | 46.4 ** | 166.13 ** | 0.10 ** | 0.30 ** | 800.77 ** | 164.3 ** | 11.96 ** | 2057.2  ** | 0.37 ** | 1054.00 ** |
| Seasons (S) | 1 | 0.00 ** | 0.002 ** | 0.32 ns | 7.2 ** | 37.05 ** | 0.01 ns | 0.11 ns | 654.55 ** | 15.1 ** | 0.30 ** | 945.47 ** | 0.06 ** | 1.05 ns |
| Interaction (V x S) | 5 | 0.59 ** | 0.001 ** | 0.02 ** | 1.43 ** | 22.06 ** | 0.06 ns | 1.14 ** | 140.85 ** | 15.33 ** | 0.09 ** | 350.65 ** | 0.05 ** | 130.19 ** |
| Error | 20 | 0.01  | 0.0001  | 0.13  | 0.46  | 0.35  | 0.03  | 0.04  | 25.30  | 0.33  | 0.02  | 89.68  | 0.05 | 13.45 |

* *, ** Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively
n.s: Not significant difference at 0.05 level of probability

According to Table (3) cotton variety, Giza 95 recorded the highest value for short fiber index (7.6) while cotton variety Giza 90 recorded the highest values for micronaire reading (4.16), fiber elongation (7.8), short fiber index (7.8), trash count (83) and trash area (1.07).

Concerning the cotton variety, Giza 94 recorded the highest value for reflectance degree (75.1) while cotton variety Giza 86 recorded the highest values for micronaire reading (4.18), maturity index (0.88) and fiber strength (44.3).

Cotton variety Giza 96 recorded the highest values for length (35.6), fiber strength (44.2), spinning consistency index (212), reflectance degree (75) and neps (113) while Cotton variety Giza 88 recorded the highest values for length (35.5), uniformity index (88.5), fiber strength (44.5), spinning consistency index (215) and yellowness degree (11.6).

### Table 3: Mean performance of fiber properties as affected by the Egyptian cotton varieties (V), growing seasons (S) and their interactions during 2018/2019 and 2019/2020 seasons.

| Entries | Micronaire reading | Maturity index | Fiber length (3.0 R.M.L.) | Uniformity index | Mechanical properties | Fiber strength | Fiber elongation | Short fiber index | Spinning Consistency Index | Color | Yellowness degree | Trash Count | Trash Area | Neps |
|---------|---------------------|----------------|---------------------------|------------------|-----------------------|---------------|------------------|------------------|--------------------------|-------|-----------------|------------|------------|-----|
| Cotton Variety (V) |                     |                |                           |                  |                       |               |                  |                  |                          |       |                 |            |            |     |
| Giza 95 | 3.89 b | 0.86 b | 28.7 b | 92.3 b | 35.0 c | 6.8 b | 7.6 a | 145 c | 67.7 c | 11.4 b | 69 b | 0.91 b | 93.5 c |
| Giza 90 | 4.16 a | 0.86 a | 29.0 a | 90.3 c | 30.3 c | 7.8 b | 7.6 b | 140 c | 65.1 c | 11.4 a b | 63 a | 1.07 a | 82.9 c |
| Giza 94 | 3.79 b | 0.87 b | 29.5 b | 97.3 b | 40.5 b | 6.6 c | 5.5 c | 160 b | 75.1 a | 9.2 a | 49 c | 0.73 a | 94.2 c |
| Giza 96 | 3.76 c | 0.85 c | 35.0 a | 89.5 b | 44.2 a | 6.0 f | 5.6 b | 210 a | 75.0 a | 9.4 c | 46 c | 0.75 a | 83.3 c |
| Giza 88 | 3.80 a | 0.86 a | 35.0 a | 88.5 a | 44.5 a | 5.2 c | 5.6 c | 210 a | 76.2 c | 11.6 a | 61 a | 0.07 a | 103.1 b |
| LSD 0.05 | 0.074 | 0.005 | 0.30 | 0.70 | 0.8 | 0.18 | 0.21 | 0.52 | 0.56 | 0.16 | 9.5 | 0.11 | 3.73 |
| Seasons (S) |                     |                |                           |                  |                       |               |                  |                  |                          |       |                 |            |            |     |
| Season 2018/2019 | 3.80 b | 0.87 a | 32.4 a | 86.0 b | 39.6 b | 6.1 a | 6.4 a | 184 a | 71.3 a | 10.4 a | 52 a | 0.79 a | 94.0 a |
| Season 2019/2020 | 4.0 a | 0.86 b | 32.5 a | 86.4 b | 41.5 a | 6.7 a | 6.3 a | 190 a | 75.2 b | 10.3 b | 61 a | 0.71 a | 98.0 a |
| LSD 0.05 | 0.043 | 0.003 | 0.27 | 0.40 | 0.35 | 0.19 | 0.12 | 2.39 | 0.34 | 0.08 | 5.5 | 0.07 | 2.15 |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability
*, ** Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively
n.s: Not significant difference at 0.05 level of probability

Concerning Table (4) cotton variety Giza 95 recorded the highest value in the first season 2018/2019 for micronaire reading (4.26), maturity index (0.88 %), upper half mean length (28.93mm), strength (37.4g/tex), spinning consistency index (149), yellowness degree (11.5) and neps count (96) while cotton variety Giza 90 recorded the highest value in second season 2019/2020.

For micronaire reading (4.43), maturity index (0.87 %), strength (37.6g/tex), spinning consistency index (154), yellowness degree (11.5), trash count (99) and neps count (86) These results confirmed the finding obtained by Fouda, (2008), Ibrahim (2010), Rasha (2016), and El-Saeed et al. (2020).
Respecting Cotton variety Giza 94 the highest value recorded in the second season 2019/2020 for micronaire reading (4.20), maturity index (0.87 %), upper half mean length (34.42mm), strength (41.8 g/tex) and short fiber Index (5.6) while recorded in first season 2018/2019 highest value for Reflectance degree (77.1), trash count (57) and neps count (96) as well Cotton variety Giza 86 in first season 2018/2019 recorded the highest value for micronaire reading (4.57), upper half mean length (32.8 mm), reflectance degree (76.3), Yellowness degree (9.4) and neps count (88) whereas in the second season 2019/2020 the highest value recorded for maturity index(0.90%), strength(45.5 g/tex), short fiber index (5.9%), spinning consistency index(210) and trash count (53). Similar results were found by Hanan (2018), El-Saeed et al. (2020) and Amer (2019).

Table 4: The interaction between Egyptian cotton varieties(V) and seasons (S) for fiber properties on HVI 1000 instrument during 2018/2019 and 2019/2020 seasons.

| Cotton Variety (V) | Season (S) | Fiber Properties |
|-------------------|------------|------------------|
|                   |            | Micronaire reading | Maturity index (%) | Length (CUMM, mm) | Uniformity Index (%) | Fiber strength (g tex) | Short fiber Index (%) | Spinning Consistency Index (SCI) | Reflectance degree (Rd) | Yellowness degree (+S) | Trash Count (cz) | Neps |
|                   | 2018/2019  | 2019/2020         |                  |                   |                    |                           |                       |                           |                              |                          |                     |                   |
| Giza 94           | 4.26 ±0.19 | 3.91 ±0.13       | 0.88 ±0.02       | 28.93 ±1.64       | 82.2 ±1.67         | 37.6 ±1.67             | 7.1 ±0.20               | 169 ±9.3 ±0.02 | 66.6 ±5.6 ±0.02 | 11.5 ±0.5 ±0.02 | 67 ±3.6 ±0.02 | 96 ±5.6 ±0.02 |
|                   | 5.11 ±0.19 | 3.51 ±0.13       | 0.85 ±0.02       | 28.61 ±1.64       | 82.4 ±1.67         | 32.5 ±1.67             | 8.1 ±0.20               | 142 ±9.3 ±0.02 | 88.5 ±5.6 ±0.02 | 11.1 ±0.5 ±0.02 | 72 ±3.6 ±0.02 | 90 ±5.6 ±0.02 |
| Giza 96           | 4.33 ±0.19 | 3.39 ±0.13       | 0.87 ±0.02       | 29.19 ±1.54       | 85.9 ±1.67         | 37.6 ±1.67             | 7.2 ±0.20               | 154 ±9.3 ±0.02 | 64.1 ±5.6 ±0.02 | 11.5 ±0.5 ±0.02 | 99 ±3.6 ±0.02 | 86 ±5.6 ±0.02 |
|                   | 4.93 ±0.19 | 4.40 ±0.13       | 0.87 ±0.02       | 34.42 ±1.54       | 87.1 ±1.67         | 36.5 ±1.67             | 5.4 ±0.20               | 196 ±9.3 ±0.02 | 79.1 ±5.6 ±0.02 | 9.1 ±0.5 ±0.02 | 72 ±3.6 ±0.02 | 95 ±5.6 ±0.02 |
| Giza 86           | 4.47 ±0.19 | 3.94 ±0.13       | 0.87 ±0.02       | 32.8 ±1.64        | 87.5 ±1.67         | 41.8 ±1.67             | 7.6 ±0.20               | 191 ±9.3 ±0.02 | 73.1 ±5.6 ±0.02 | 9.2 ±0.5 ±0.02 | 48 ±3.6 ±0.02 | 92 ±5.6 ±0.02 |
|                   | 3.17 ±0.19 | 3.06 ±0.13       | 0.84 ±0.02       | 35.5 ±1.54        | 85.6 ±1.67         | 43.2 ±1.67             | 6.2 ±0.20               | 206 ±9.3 ±0.02 | 74.1 ±5.6 ±0.02 | 9.6 ±0.5 ±0.02 | 65 ±3.6 ±0.02 | 106 ±5.6 ±0.02 |
|                   | 3.69 ±0.19 | 3.60 ±0.13       | 0.86 ±0.02       | 35.47 ±1.54       | 87.5 ±1.67         | 42.0 ±1.67             | 5.4 ±0.20               | 218 ±9.3 ±0.02 | 75.3 ±5.6 ±0.02 | 9.3 ±0.5 ±0.02 | 47 ±3.6 ±0.02 | 110 ±5.6 ±0.02 |
|                   | 4.02 ±0.19 | 3.55 ±0.13       | 0.86 ±0.02       | 35.52 ±1.54       | 92.9 ±1.67         | 46.2 ±1.67             | 5.3 ±0.20               | 221 ±9.3 ±0.02 | 67.1 ±5.6 ±0.02 | 11.0 ±0.5 ±0.02 | 49 ±3.6 ±0.02 | 102 ±5.6 ±0.02 |
| LSD               | 0.11       | 0.03             | 0.02             | 0.09              | 0.85              | 0.20                   | 7.2 ±0.1               | 1.03              | 23.4 ±1.1       | 3.28             | 5.28             |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability.

Regarding cotton variety Giza 96 recorded the highest value in second season 2019/2020 for micronaire reading (4.06), maturity index (0.87 %), uniformity index (88 %), strength (45.3 g/tex), Spinning Consistency Index(218), Reflectance degree (75.8), trash count (47) and neps count (119), as well as cotton variety Giza 88 recorded the highest value in the second season 2019/2020 for micronaire reading (4.02), uniformity index (89.2%), strength (46.2 g/tex), spinning consistency index (221) and trash count (49). There results were in line with those obtained by Wali (2003) and Ibrahim (2018).

Data presented in Table (5) showed the mean squares of yarn properties as influenced by the Egyptian cotton varieties (Giza 94 and 86), Yarn strength(CN/tex), Thin places/400 m, Thick places/400 m and Yarn evenness (CV%) under three yarn counts 50, 60 and 70 were highly significant differences.

Table 5: Mean squares of yarn properties as influenced by the Egyptian cotton varieties (V) (Giza 94 and 86), yarn count (c) and their interactions.

| S.O.V            | d.f | Strength | Thin places /400 m | Thick places /400 m | Yarn evenness CV% |
|------------------|-----|----------|--------------------|-------------------|----------------|
| Replicate        | 3   | 0.04 ns  | 1.04 ns            | 3.00 ns           | 0.08 ns        |
| Cotton Variety (V) | 1   | 17.90 ** | 805.04 **          | 2521.50 **        | 5.37 **        |
| Count (C)        | 2   | 5.99 **  | 11226.50 **        | 30809.40 **       | 3.07 **        |
| Interaction (V x C) | 2  | 4.58 **  | 242.50 **          | 765.12 **         | 0.29 **        |
| Error            | 15  | 0.03     | 4.37               | 3.50              | 0.02           |
| Total            | 23  |          |                    |                   |                |

* *Highly significant difference at 0.01 level of probability.
. n.s: Not significant difference at 0.05 level of probability
In Table (6) that Cotton variety Giza 94 recorded the highest value for Thin places /400 m (85.25/400 m) and Giza 86 recorded the highest values for yarn strength (27.47 cN/tex), thick places (82.25/400m) and yarn evenness (11.73%) while yarn count (50) recorded the highest value for yarn strength and yarn count (70) recorded the highest value for thin places (119), thick places(140.75) and yarn evenness (11.92).

Table 6: Mean performance of yarn properties as affected by the Egyptian cotton varieties (V), yarn count (c) and their interactions during 2018/2019 and 2019/2020 seasons.

| Entries | Traits | Strength | Thin places /400 m | Thick places /400 m | Yarn evenness CV% |
|---------|---------|----------|-------------------|-------------------|-----------------|
| **Cotton Variety (V)** | | | | | |
| Giza 94 | | 25.74 b | 85.25 a | 61.75 b | 10.79 b |
| Giza 86 | | 27.47 a | 73.67 b | 82.25 a | 11.73 a |
| L.S.D 0.05 | | 0.15 | 1.82 | 1.63 | 0.12 |
| **C 50's** | | 27.40 a | 44.50 c | 20.13 c | 10.68 c |
| **C 60's** | | 26.73 b | 74.88 b | 55.13 b | 11.18 b |
| **C 70's** | | 25.69 c | 119.00a | 140.75 a | 11.92 a |
| L.S.D 0.05 | | 0.19 | 2.23 | 2 | 0.14 |
| **Interaction** | | | | | |
| (V x C) | | ** | ** | ** | ** |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability

* * Highly significant difference at 0.01 level of probability.

n.s: Not significant difference at 0.05 level of probability

Table 7: The interaction between Egyptian cotton varieties(V) and yarn count (c) for yarn properties.

| Cotton Variety (V) | Yarn Count (c) | Yarn Properties |
|-------------------|---------------|-----------------|
| | Strength (cN/tex) | Thin places /400m | Thick places/400m | Yarn evenness CV % |
| **Giza 94** | 50’s | 27.36 b | 56.5 d | 18.5 f | 10.03 e |
| | 60’s | 25.72 c | 78.75 b | 24.25 d | 10.68 d |
| | 70’s | 24.15 d | 120.5 a | 132.5 b | 11.64 b |
| **Giza 86** | 50’s | 27.45 b | 32.5 e | 21.75 e | 11.34 c |
| | 60’s | 27.74 a | 71 c | 76 c | 11.67 b |
| | 70’s | 27.22 b | 117.5 b | 149 a | 12.19 a |
| **LSD** | | 0.26 | 3.15 | 2.82 | 0.20 |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability.

Data presented in Table (8) indicated the mean squares of yarn properties, Yarn strength(cN/tex), Thin places /400 m, Thick places /400 m and Yarn evenness (CV%) under three yarn counts 20, 30 and 40 of some Egyptian cotton varieties (Giza 95 and 90).

With regard to Table (9) that Cotton variety Giza 95 recorded highest value for Yarn strength (18.10cN/tex), Thick places (54.42/400 m) and Yarn evenness (14.6%) while Cotton variety Giza 90 recorded highest value for Yarn strength (17.9cN/tex) and Thin places (24.8/400 m) whilst yarn count (20) recorded highest value for Yarn strength (18.36cN/tex) and yarn evenness (16.9%) and yarn count (30) recorded highest value for Yarn strength (18.42cN/tex) and yarn count (40) recorded highest value for Thin places (25.8 /400 m) and Thick places (77/400 m).
Table 8: Mean squares of yarn properties as influenced by the Egyptian cotton varieties (V) (Giza 95 and 90), yarn count (c) and their interactions.

| S.O.V          | d.f | Strength | Thin place /400 m | Thick places /400 m | Yarn evenness CV% |
|----------------|-----|----------|-------------------|---------------------|-------------------|
| Cotton Variety (V) | 1   | 0.148 n.s| 400.16 **         | 80.66 **            | 4.71 **           |
| Yarn Count (C)   | 2   | 3.241 ** | 191.16 **         | 8728.16 **          | 43.67 **          |
| Interaction (V x C) | 2   | 1.694 ** | 5.16 n.s          | 112.16 **           | 0.30 n.s          |
| Error           | 15  | 0.13     | 1.58              | 2.51                | 0.11              |
| Total           | 23  |          |                   |                     |                   |

, * * Significant and Highly significant difference at 0.01 level of probability
n.s: Not significant difference at 0.05 level of probability

Table 9: Mean performance of yarn properties as affected by the Egyptian cotton varieties (V), yarn count (c), and their interactions:

| Traits Entries | Strength (cN/tex) | Thin places /400 m | Thick places /400 m | Yarn evenness CV% |
|----------------|-------------------|---------------------|---------------------|-------------------|
| Cotton Variety (V) |                   |                     |                     |                   |
| Giza 95         | 18.10 a           | 16.6 b              | 54.42 a a          | 14.6 a            |
| Giza 90         | 17.9 a            | 24.8 a              | 50.75 b            | 13.7 b            |
| L.S.D 0.05      | 0.31 b            | 1.1                 | 1.38               | 0.30              |
| COUNT (C)       |                   |                     |                     |                   |
| C 20'ss         | 18.36 a           | 16.0 c              | 15.00 c            | 16.9 a            |
| C 30'ss         | 18.42 a           | 20.3 b              | 65.75 b            | 13.0 b            |
| C 40'ss         | 17.29 b           | 25.8 a              | 77.00 a            | 12.7 b            |
| L.S.D 0.05      | 0.39 b            | 1.34                | 1.69               | 0.36              |
| Interaction (V x C) | **              | ns                  | **                 | ns                |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability
* * Significant and Highly significant difference at 0.01 level of probability
n.s : Not significant difference at 0.05 level of probability

Presented data in Table (10) showed Mean squares of the Egyptian cotton varieties (Giza 96 and 88) highly significant for yarn count (60,90,and120).
In Table (11) that Cotton variety Giza 96 recorded the highest value for Thin places (74.3 /400 m) and Thick places (68.42/400 m) while Cotton variety Giza 88 recorded the highest value for Yarn strength(26.86cN/tex), Thick places (66.17/400 m) and yarn evenness (12.47%) and yarn count (60) recorded the highest value for Yarn strength (27.10 cN/tex) and yarn count (120) recorded the highest value for Thin places (106.5 /400 m) , Thick places (105.38/400 m) and yarn evenness ( 15.9%).
Table 10: Mean squares of yarn properties as influenced by the Egyptian cotton varieties (V) (Giza 96 and 88), yarn count (c) and their interactions:

| S.O.V            | d.f | Strength (cN/tex) | Thin places /400 m | Thick places /400 m | Yarn evenness CV% |
|------------------|-----|-------------------|---------------------|---------------------|------------------|
| Replicate        | 3   | 0.012 ns          | 27.22 ns            | 16.93 ns            | 0.017 ns         |
| Cotton Variety (V) | 1   | 57.20 **         | 112.67 **           | 30.38 ns            | 0.18 **          |
| Count (C)        | 2   | 38.39 **         | 8994.67 **          | 9350.04 **          | 75.7 **          |
| Interaction (V x C) | 2   | 0.56 **         | 228.67 **           | 143.38 **           | 1.03 **          |
| Error            | 15  | 0.030             | 9.49                | 16.73               | 0.013            |
| Total            | 23  |                   |                     |                     |                  |

* *Highly significant difference at 0.01 level of probability
n.s: Not significant difference at 0.05 level of probability

Table 11: Mean performance of yarn properties as affected by the Egyptian cotton varieties (V), yarn count (c) and their interactions.

| Traits Entries | Strength (cN/tex) | Thin places /400 m | Thick places /400 m | Yarn evenness (CV%) |
|----------------|-------------------|--------------------|---------------------|---------------------|
|                | Cotton Variety (V) |                    |                     |                     |
| Giza 96        | 23.77 b           | 74.3 a             | 68.42 a             | 12.3 b              |
| Giza 88        | 26.86 a           | 70.0 b             | 66.17 a             | 12.47 a             |
| L.S.D 0.05     | 0.15              | 2.68               | 3.56                | 0.10                |
|                | YARN COUNT (C)    |                    |                     |                     |
| C 60’s         | 27.10 a           | 39.5 c             | 39.25 c             | 10.17 c             |
| C 90’s         | 25.98 b           | 70.5 b             | 57.25 b             | 11.09 b             |
| C 120’s        | 22.87 c           | 106.5 a            | 105.38 a            | 15.90 a             |
| L.S.D 0.05     | 0.19              | 3.28               | 4.36                | 0.12                |
|                | Interaction       | **                 | **                   | **                   |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability
* * *Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively
n.s: Not significant difference at 0.05 level of probability

The Interaction Between Egyptian Cotton Varieties (V) and Yarn Count (C) For Yarn Properties:

Cotton variety Giza 95 recorded the highest value for single yarn strength (18.78 cN/tex) by yarn count (20'S) and thick places (77.75) by yarn count (40'S) while Cotton variety Giza 90 recorded the highest value for single yarn strength (18.15 cN/tex) by yarn count (30'S) and thick places (76.25) by yarn count (40'S) as shown in Table (7). Similar results were found by Haitham (2019).

With regard to cotton variety, Giza 94 recorded the highest value for yarn strength (27.36 cN/tex) by yarn count (50’S) , thin places (120.5/400m.) by yarn count (70’S) , thick places (132.5/400m.) by yarn count (70’S) and yarn evenness (11.64 %) by yarn count (70’S) while Cotton variety Giza 86 recorded the highest value for yarn strength (27.74 cN/tex) by yarn count (60’S) , thin places (117.5/400m.) by yarn count (70’S) , thick places
(149/400m.) by yarn count (70’S) and yarn evenness (12.19%) by yarn count (70’S) as shown in Table (12).

Table 12: The interaction between Egyptian cotton varieties(V) and yarn count (c) for yarn properties.

| Cotton Variety (V) | Yarn Count (c) | Yarn Properties |
|--------------------|----------------|-----------------|
|                    |                | Strength (cN/tex) | Thick places /400 m |
|                    |                |                 |                   |
| Giza 95            | 20’S           | 18.78 a          | 13.75 e           |
|                    | 30’S           | 18.69 ab         | 71.75 b           |
|                    | 40’S           | 16.85 d          | 77.75 a           |
| Giza 90            | 20’S           | 17.95 c          | 16.25 d           |
|                    | 30’S           | 18.15 b          | 59.75 c           |
|                    | 40’S           | 17.74 c          | 76.25 a           |
| LSD                |                | 0.55             | 2.39              |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability.

Concerning cotton variety Giza 96 in Table(13) recorded the highest value for yarn strength (25.76 cN/tex) by yarn count (60’S) while by yarn count(120’S) recorded the highest value for thin places (104/400m.), thick places (111/400m.) and yarn evenness (16%) while Cotton variety Giza 88 recorded the highest value for yarn strength (28.45 cN/tex) by yarn count (60’S) whilst yarn count(120’S) recorded highest value for thin places (109/400m.), thick places (99/400m.) and yarn evenness (15%). Their results were in line with those obtained by Pharoun(2020).

Table 13: The interaction between Egyptian cotton varieties(V) and yarn count (c) for yarn properties.

| Cotton Variety (V) | Yarn Count (c) | Yarn Properties |
|--------------------|----------------|-----------------|
|                    |                | Strength (cN/tex) | Thin places /400m | Thick places/400m | Yarn evenness CV % |
|                    |                |                 |                   |                   |                   |
| Giza 96            | 60’S           | 25.76 c          | 47 d              | 39 d              | 10 e              |
|                    | 90’S           | 24.54 d          | 71 c              | 55 c              | 10 d              |
|                    | 120’S          | 21.03 e          | 104 b             | 111 a             | 16 a              |
| Giza 88            | 60’S           | 28.45 a          | 32 e              | 39 d              | 10 e              |
|                    | 90’S           | 27.43 b          | 69 e              | 59 c              | 11 c              |
|                    | 120’S          | 24.72 d          | 109 a             | 99 b              | 15 b              |
| LSD                |                | 0.26             | 4.64              | 6.16              | 0.18              |

Means within each column followed by the same letter are not a significant difference at 0.05 level of probability.

Regression Coefficient Between Spinning Consistency Index (SCI) and 12 Fiber Properties for Cotton Varieties Giza 95 and 90:

The regression coefficient which describes the relationship between the spinning constant index and the fiber properties for Giza 95 and Giza 90, was explained by the equation:

\[
SCI = -293.81 -16.97 \text{ (micronaire)} -3.90(\text{Length})+2.27(\text{Strength})+66.30(\text{Maturity})+6.58(\text{fiber length Uniformity})
\]

The equation was the suitable one to define the relationship between the spinning constant index with significant fiber properties where the fiber properties were micronaire, length, strength, maturity and uniformity as shown in Table (14).
Table 14: Mean square of regression coefficient between Spinning Consistency Index (SCI) and 12 fiber properties and cancelation trait by trait according to significance F value with 12 fiber properties (cotton varieties Giza 95 and Giza 90).

| Source | SCI With 12 p | SCI With 11 p | SCI With 10 p | SCI With 9 p | SCI With 8 p | SCI With 7 p | SCI With 6 p |
|--------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Mic    | 254.88**     | 254.88**     | 254.88**     | 254.88**     | 254.88**     | 254.88**     | 254.88**     |
| Length | 56.77*       | 56.77*       | 56.77*       | 56.77*       | 56.77*       | 56.77*       | 56.77*       |
| Strength| 64.23         | 64.23         | 64.23         | 64.23         | 64.23         | 64.23         | 64.23         |
| Maturity| 51.16         | 51.16         | 51.16         | 51.16         | 51.16         | 51.16         | 51.16         |
| uniformity| 76.07         | 76.07         | 76.07         | 76.07         | 76.07         | 76.07         | 76.07         |
| SFI    | 46.95         | 46.95         | 46.95         | 46.95         | 46.95         | 46.95         | 46.95         |
| Elongation| 0.006        | ----          | ----          | ----          | ----          | ----          | ----          |
| Rd     | 10.57         | 5.00         | 5.00         | 5.00         | 5.00         | 5.00         | 5.00         |
| b      | 1.50          | 5.05         | ----          | ----          | ----          | ----          | ----          |
| Trash count| 12.80         | 13.34         | 10.61         | 10.61         | 10.61         | 15.60         | ----          |
| Trash area| 8.17          | 8.78          | 16.07         | 16.07         | ----          | ----          | ----          |
| Neps   | 2.89          | 3.63          | 2.73          | ----          | ----          | ----          | ----          |

*: *significant and highly significant differences at 0.05 and 0.01 levels of probability, respectively
ns: not significant differences at 0.05 level of probability

Regression Coefficient Between Spinning Consistency Index (SCI) and 12 Fiber Properties for Cotton Varieties Giza 94 And 86:

The regression coefficient which describes the relationship between the spinning constant index and the fiber properties for Giza 94 and Giza 86, was explained by the equation:

SCI = -393.81 - 9.94 (micronaire) + 2.03 (Length) + 3.13 (Strength) - 25.12 (Maturity) + 4.66 (Uniformity) + 0.01 (Elongation) + 0.67 (Reflectance degree)

The equation was the suitable one to define the relationship between the spinning constant index with significant fiber properties where the fiber properties were micronaire, length, strength, maturity, uniformity, elongation and reflectance degree as shown in Table (15).

Table 15: Mean square of regression coefficient between Spinning Consistency Index (SCI) and 12 fiber properties and cancelation trait by trait according to significance F value with 12 fiber properties (cotton varieties Giza 94 and Giza 86).

| Source | MS SCI With 12 p | MS SCI With 11 p | MS SCI With 10 p | MS SCI With 9 p | MS SCI With 8 p | MS SCI With 7 p | MS SCI With 6 p |
|--------|------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| Mic    | 72.57**          | 72.57**          | 72.57**          | 72.57**          | 72.57**          | 72.57**          | 72.57**          |
| Length | 47.58**          | 47.58**          | 47.58**          | 47.58**          | 47.58**          | 47.58**          | 47.58**          |
| Strength| 449.86**         | 449.86**         | 449.86**         | 449.86**         | 449.86**         | 449.86**         | 449.86**         |
| Maturity| 13.34**          | 13.34**          | 13.34**          | 13.34**          | 13.34**          | 13.34**          | 13.34**          |
| uniformity| 129.83**         | 129.83**         | 129.83**         | 129.83**         | 129.83**         | 129.83**         | 129.83**         |
| SFI    | 0.12 ns           | 0.12 ns           | 0.12 ns           | 0.12 ns           | 0.12 ns           | 0.12 ns           | 0.12 ns           |
| Elongation| 1.49**           | 1.49**           | 1.49**           | 1.49**           | 1.49**           | 1.49**           | 1.49**           |
| Rd     | 4.75**           | 4.75**           | 4.75**           | 4.75**           | 4.75**           | 4.75**           | 5.09**           |
| b      | 0.01 ns           | 0.01 ns           | ------           | ------           | ------           | ------           | ------           |
| Trash count| 0.05 ns           | 0.05 ns           | 0.05 ns           | 0.05 ns           | 0.05 ns           | 0.05 ns           | 0.05 ns           |
| Trash area| 0.03 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           |
| Neps   | 0.03 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           | 0.06 ns           |

**: Highly significant differences at 0.01 level of probability
ns: not significant differences at 0.05 level of probability

Regression Coefficient Between Spinning Consistency Index (SCI) And 12 Fiber Properties for Cotton Varieties Giza 96 And 88:

The regression coefficient which describes the relationship between the spinning constant index and the fiber properties for Giza 96 and Giza 88, was explained by the equation:

SCI = -399.42 - 10.17 (Mic) + 1.62 (Length) + 2.94 (Strength) - 5.39 (Maturity) + 4.85 (Uniformity) - 0.07 (SFI) + 0.06 (Elongation) + 0.60 (Rd)
The equation was the suitable one to define the relationship between the spinning constant index with significant fiber properties where the fiber properties were micronaire, length, strength, maturity, uniformity, short fiber, elongation and reflectance degree as shown in Table (16).

Table 16: Mean square of regression coefficient between Spinning Consistency Index SCI and 12 fiber properties and cancelation trait by trait according to significance F value with 12 fiber properties (cotton varieties Giza96 and Giza 88).

| Source    | SCI With 12 p | SCI With 11 p | SCI With 10 p | SCI With 9 p | SCI With 8 p |
|-----------|--------------|--------------|--------------|--------------|--------------|
| Mic       | 522.19 **    | 522.19 **    | 522.19 **    | 522.19 **    | 522.19 **    |
| Length    | 26.03 **     | 26.03 **     | 26.03 **     | 26.03 **     | 26.03 **     |
| Strength  | 173.43 **    | 173.43 **    | 173.43 **    | 173.43 **    | 173.43 **    |
| Maturity  | 20.59 **     | 20.59 **     | 20.59 **     | 20.59 **     | 20.59 **     |
| uniformity| 147.14 **    | 147.14 **    | 147.14 **    | 147.14 **    | 147.14 **    |
| SFI       | 22.88 **     | 22.88 **     | 22.88 **     | 22.88 **     | 22.88 **     |
| Elongation| 2.93 *       | 2.93*        | 2.93 **      | 2.93 **      | 2.93 **      |
| Rd        | 20.11 **     | 20.11 **     | 20.11 **     | 20.11 **     | 20.11 **     |
| +b        | 0.20 ns      | 0.20 ns      | 0.20 ns      | -----        | -----        |
| Trash count| 3.44 ns     | 3.44 ns      | -----        | -----        | -----        |
| Trash area| 0.32 ns      | 0.32 ns      | 0.25 ns      | 0.06         | -----        |
| Nepse     | 2.20 ns      | ----         | ----         | -----        | -----        |

*, **: significant and highly significant differences at 0.05 and 0.01 levels of probability, respectively
ns: not significant differences at 0.05 level of probability

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ARABIC SUMMARY

تقييم جودة بعض أصناف القطن المصرى المنتجة حديثا

محمد أحمد عبد الجواد نصار 1, إبراهيم عباس السيد 1, محمد عبد الرحمن نجم 2, دينا محمود عبد الرحيم عبد الكريم 3

1- قسم الإنتاج النباتي -كلية الزراعة- جامعة الأسكندرية
2- مركز بحوث القطن- مركز البحوث الزراعية- الجيزة
3- الهيئة العامة للتحكيم واختبارات القطن – الإسكندرية

أجرى هذا البحث في قسم الإنتاج النباتي بكلية زراعة ساها جامعة الأسكندرية ومعامل الهيئة العامة للتحكيم واختبار القطن و شركة دلتا لقياس خصائص الخيوط من خلال مقارنة النماذج الأتيتة في الأصناف التجارية المزروعة (جيزة 86، وجيزة 90، وجيزة 95، والأصناف الجديدة (جيزة 94 وجيزة 96 و.Provider: Nile Testers) Nep Tester وقياس خصائص القطن - الإسكندرية

وأوضح النتائج ما يلي:

خيوط الغزل لثلاثة نمذج غزل في شركة دلتا ((20 - 30 - 40 لصنف جيزة 90 و (50-60-70 لصنف جيزة 94 وجيزة 86) و (60-90-120 لصنف لجيزة 96 وجيزة 88)).
كان المتوسطات لأصناف القطن لجميع خواص الألياف المدرجة ذات فروق عالية المعنوية كما أن مسومي الزراعة حفظت نفس النتائج ما عدا طول الألياف و استطالة الألياف و معامل الشعيرات القصيرة و عدد العقد كانت النتائج لولا غير معنوية.

سجل التفاعل بين أصناف القطن المصري و متوسط زراعة فروق عالية المعنوية سجلت أعلى قيمة لمتانة الخيط في الصنف بحذاء (86 الصنف في الموسم الثاني 2019/2020. بينما متوسط الطول للفصل الفعلي كانت أعلى قيمة (35.55 ± 3.52 ملم) في الصنف بحذاء (86 في كل الأصناف دون ان تم فرق معنوي على التوالي بالنسبة للمعدات انتظامية الطول لفترة أن جذع 88 سجلت أعلى قيمة في الصنف بحذاء (89.2)٪ في الموسم الثاني 2019/2020. فيما يقص متانة الألياف أظهر أن جذع 88 سجلت أعلى قيمة لفترة الصنف بحذاء (46.2)٪ تكس) في الموسم الثاني 2019/2020.

- صنف القطن (جزء 96 و جزء 86) وكذا نمر الخيط (30-60) كان عاليا المعنوي لخصائص الغزل.
- صنف القطن (جزء 95 و جزء 90) كان عاليا المعنوي لخصائص الغزل ماعدا متانة الخيط أما نمر الخيط (40-40).
- صنف القطن (جزء 96 و جزء 88) كان عاليا المعنوي لخصائص الغزل ماعدا متانة الخيط و大家分享 الأحذية امام الكمية (30-20) كانت عاليا المعنوي لجميع صفات الخيط.
- التفاعل بين أصناف القطن المصري (جزء 94 و جزء 86) و نمرة الخيط كان عاليا المعنوي لخصائص القطن حيث سجلت أعلى قيمة (7.7 سم نيوتن/تكس) لفترة الصنف بحذاء (86 لفترة الخيط) (60) كما أن صنف القطن بحذاء (94) أظهر أعلى قيمة (120.5 م/الكمسة الرفيعة / 400 م) لكل الأماكين بحذاء (70) مما احتضن على أعلى قيمة (149 م/الكمسة الشملية/ الصنف بحذاء (86 مع نمرة الخيط (70) و سجل صنف القطن بحذاء (86 أعلى قيمة (12.19 ٪) للاستطالة الخيوط مع نمرة الخيط (70).
- كان التفاعل بين أصناف القطن المصري (جزء 95 و جزء 90) و نمرة الخيط معنوي عالية لفترة الخيط و大家分享 الأحذية امام الكمية فقط حيث سجل جذع 95 عاليا قيمة لفترة الخيط (8.78 سم نيوتن/تكس) من خلال نمرة الخيط (40) و大家分享 الأحذية امام الكمية. تم تسجيل عاليا قيمة (77.77 م/الكمسة الشملية/ من خلال نمرة الخيط (40).
- التفاعل بين أصناف القطن بحذاء (96 و جزء 88 و نمرة الخيط ذات معنوي عالية لجميع خواص القطن حيث سجل صنف القطن بحذاء (96 و جزء 88 أعلى قيمة (28.44 سم نيوتن/تكس) لفترة الصنف بحذاء (88 أعلية قيمة (109 م/الكمسة الرفيعة / 400 م مع نمرة الخيط (120) و سجلت أعلى قيمة (111 م/الكمسة الشملية/ بالصنف القطني (%CV) سجلت بواسطة صف (120) من فترات الخيط (120). انتظامية الخيط لفترة الخيط (120).
- علاقة الاحذية التي توضح العلاقة بين معامل ثابت الغزل وخصائص الألياف لفترة 95 و 90 والتي تم تفسيرها بالمعادلة:

معمل ثابت الغزل = 293.81 - 16.97 (قراءة الميكروتير) - 3.90 (طول) + 2.27 (مثابة) + 66.30 (نقط) + 6.58 (نقط) (إنتظامية طول)

- علاقة الاحذية التي توضح العلاقة بين مؤشر ثابت الغزل وخصائص الألياف لفترة 94 و 86 والتي تم تفسيرها بالمعادلة:

معمل ثابت الغزل = 393.81 - 9.94 (قراءة الميكروتير) - 2.03 (طول) + 3.13 (مثابة) - 25.15 (نقط) + 4.66 (نقط) + 0.2 (دورة انعطاس طول) + 62.1 (دورة انعطاس طول) + 0.5 (نقط) + 5.39 (نقط) + 4.88 (نقط) (إنتظامية طول) - 0.07 (معامل شعيرات قصيرة) - 0.06 (دورة انعطاس).