Technological Characteristics of Some Egyptian Cotton Varieties as affected by Cultivation Regions

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INTRODUCTION

Cotton, a soft essential fiber, belongs to the Malvaceae family. One of the world’s most significant agricultural commodities plays a vital role in global economies and sustains the lives of millions of people worldwide develops as a boll surrounding the seeds of the cotton plant (Gossypium sp.), which is a bush that naturally grows in tropical and subtropical regions across the world.

For successful cultivation, cotton needs lots of sunshine and a longer frost-free period. Climate, soil structure, irrigation, fertilization, plant density, weed and insect infections, and fertilization are some of the environmental factors that affect the quality of cotton fiber (Darawsheh et al., 2022).

Environmental and genetic factors influence the physical properties of cotton fibers. Global factors influence not only intermediate and finished products such as yarns and...
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fabrics but also textile industrial processes and end products. Since raw cotton accounts for a significant portion of textile production costs, price is the most closely examined fiber properties H. Wang *et al.*, (2020).

Recently, cotton production has increased significantly in Egypt, the country where the plant has been grown since ancient times. Egyptian cotton, or (*Gossypium barbadense*), is considered a particularly long-lasting staple crop and is valued for its exceptional quality, which earns it a special place in the global market.

The characteristic outer surface of Egyptian cotton fibers and the ideal growing environment in the Nile Valley influence the quality of the harvest. To improve the quality of cotton and the purity of seeds, the Egyptian government took over the production of cotton seeds. The two types of environmental variations that affect cotton quality characteristics are predictable and unpredictable. For the cotton producer, the cotton yield and its components enjoy a limitless reputation. Therefore, the different environments in the extended region are affected differently from environment to environment and season to season El-Seidy *et al.*, (2018).

Cotton farming on a global scale faces constraints not only in terms of land availability but also due to limited water resources and the extensive use of pesticides, fungicides, and herbicides variations in qualitative traits studied were predominantly attributed to the impact of the environment and the interplay between the environment and the season. The unique characteristics of cotton produced in each region arise from the intricate influence of numerous interacting factors, underscoring the need for additional research in this field. Darawsheh *et al.*, (2022).

The Cotton Arbitration and Testing General Organization (CATGO) which is following the Egyptian government, identifies ten different varieties of cotton that belong to two categories: extra-long staple and long staple. In terms of planting zones, long-staple varieties are cultivated in the Delta region and in Upper Egypt.

The cotton crop in 2018-2019 has significantly improved in terms of quality and physical properties and this improvement is expected to continue in 2019-2020. The government's efforts in this regard have been evident. This development is confirmed by a CATGO analysis of the physical fiber properties of Egyptian cotton varieties. The cotton produced in the season (2019) has improved compared to the cotton produced in the season (2018) in terms of length, strength, fineness, color, waste count and maturity according to Shaza (2020).

**The Main Objectives Are Following:**
1. Factors affecting the characteristics of the cotton varieties under study.
2. Evaluate how growing season, planting location, and their interactions collectively influence the observed differences in fiber properties.
3. Determine how the varieties under study adapt and maintain their quality in different environmental conditions.
4. Examining how the interaction between different growing seasons and locations impacts the studied varieties.

**MATERIALS AND METHODS**

This study examined the effects of the cultivation area on the technological characteristics of some Egyptian cotton varieties using three long staple cultivars. The research was conducted in the summers of 2018 and 2019 at the Cotton Arbitration and Testing General Organization (CATGO) laboratories in Alexandria, Egypt, and at the Plant Production Department, Faculty of Agriculture (Saba-Basha), Alexandria University.
Technological Characteristics of Some Egyptian Cotton Varieties

1. Materials:
Three commercial long-staple Egyptian cotton varieties, originating from (*Gossypium barbadense*) represent one of the two categories of Egyptian cotton. This group represented the long staple category with a length range of (1 1/4 - 1 3/8 inch i.e., fiber length = 30-34 mm). However, in terms of color category, two cultivars under study Giza 86, and Giza 94 belong to the white category and Giza 95 stands for the creamy.

These varieties were selected based on the regional classification of cultivated cotton varieties. The cotton was grown in nine production locations in Egypt. Giza 86 was cultivated in (El-Behira, El-Munofeya and El-Gharbia), Giza 94 in (Kafr El-Sheikh, El-Dakahlia and El-Sharkeya), and Giza 95 in (Beni Suef, Fayoum and El- Menya) over two consecutive seasons (2018 and 2019). A complete randomized block design with four replications.

Table 1: The pedigree and origin of the three cotton genotypes.

<table>
<thead>
<tr>
<th>Cotton genotypes</th>
<th>Pedigree</th>
<th>Color</th>
<th>Category</th>
<th>Original</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giza 86</td>
<td>(G. 75 x G. 81)</td>
<td>White</td>
<td>long</td>
<td>Egypt</td>
<td>1996</td>
</tr>
<tr>
<td>Giza 94</td>
<td>G. 86 x10229</td>
<td>White</td>
<td>long</td>
<td>Egypt</td>
<td>2016</td>
</tr>
<tr>
<td>Giza 95</td>
<td>(G.83xDandara)</td>
<td>Creamy</td>
<td>long</td>
<td>Egypt</td>
<td>2016</td>
</tr>
</tbody>
</table>

2. Fiber Properties:
To ensure excellent outcomes, manual and instrument classification were closely supervised. The Cotton Arbitration and Testing General Organization's (CATGO) Fiber and Spinning Testing Sector laboratories in Alexandria, Egypt are the primary locations for quality monitoring.

3. Characteristics Under Study:
Sample Conditioning:
In order to balance the samples' moisture content with the permitted air conditions. The samples' moisture content was reduced by this conditioning procedure to between 6 and 8 percent (dry weight basis). The appropriate moisture content is verified by randomly inspecting the conditioned samples. For the fiber and spinning tests, about 50 kg of ginned lint cotton samples were used.

Laboratory Conditioning:
The temperature and humidity levels in the classing laboratory are strictly regulated to guarantee precise measurement of the properties of cotton fiber. After that, the sample was subjected to typical laboratory settings. for the HVI instrument and ISO 139 Standard atmospheres for conditioning and testing.

(i.e., temperature 21°C ± 1°C at a qualified humidity of 65% ± 2%).

1- High Volume Instrument (HVI classing 1000) Fiber Properties:
1. Micronaire reading.
2. Maturity index (%).
3. Upper Half Mean Length, (UHML) (mm).
4. Uniformity index (%).
5. Fiber strength (g /Tex).
6. Fiber elongation (%).
7. Reflectance degree (Rd).
8. Yellowness degree (+b).
9. Trash Count (Tr Cnt) (%).
10. Trash Area (%) (Tr Area).
11. Short Fiber index (%).
12. Spinning Consistency Index (SCI): it calculated direct from HVI by equation:
SCI = -414.67 + (2.9×Strength) - (9.32×Micromaire) + (49.17 × UHML) + (4.74×UI) + (0.65×Rd) + (0.36×Yellowness degree). (Tesema and Hussein, 2015).

**II-Uster Nep Tester 720 Instrument:**
To count Cotton fiber neps which are created when fibers are tangled together and form a hard-central knot.

**III-Micromat:**
It is one of the latest electronic devices to measure softness (hair weight).

4. **Statistical Procedures:**
This investigation was conducted in a randomized complete blocks design with four replicates and analyzed as a factorial experiment according to the technique of Analysis of variance (ANOVA), which was performed according to the method described by (Gomez and Gomez, 1984). The data was computed using the CoStat program version 6.400, (2005). To test differences among the studied means of treatments, the least significant difference (L.S.D.) was used at 0.05 and 0.01 levels of probability using the method described by (Snedecor and Cochran, 1967).

**RESULTS AND DISCUSSION**

1. **The first cotton variety Giza 86:**

1.1. **The Mean Square of Cotton Variety Giza 86 as Affected by Growing Seasons, Location and Their Interactions:**

The presented data in Table (2) showed that significant differences or highly significant mean squares were obtained of seasons for micronaire reading, maturity index, fiber strength, fiber elongation, yellowness degree (+b), short fiber index, hair weight and spinning consistency index (SCI).

The same trend was found for the cultivation location of the above-mentioned fiber properties except for fiber elongation, trash count and trash area.

The significance of mean square for seasons and locations is due to differences in the growing season from one season to another as well as Governorate variance to another.

On the other side, fiber length (U.H.M.L), short fiber index and nep count revealed significant differences in the order interaction between growing seasons and locations meanwhile the rest of the fiber properties did not differ significantly.

These results were in the same trend as those of, Mohamed et al. (2003) Abdalla et al. (2005), Hassan et al. (2012), Idris (2012), Lingaiah et al. (2020) and Nassar et al. (2021),

The research revealed highly significant differences in the mean square values of cotton varieties across all studied fiber properties, as well as between the two growing seasons.

**Table 2:** Mean squares of some fiber properties of the cotton variety GIZA 86 as affected by growing season (S), growing locations (L) and their interactions during seasons 2018 and 2019.

<table>
<thead>
<tr>
<th>S.O.V</th>
<th>SL</th>
<th>Maturity index</th>
<th>Fiber length (U.H.M.L)</th>
<th>Fiber strength</th>
<th>Fiber elongation</th>
<th>Yellowness degree (+b)</th>
<th>Short fiber index</th>
<th>Trash area</th>
<th>Trash count</th>
<th>Short fiber grade</th>
<th>Trash weight</th>
<th>Spinning consistency index</th>
<th>Yield</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocks</td>
<td>3</td>
<td>0.04</td>
<td>0.0001</td>
<td>0.31</td>
<td>0.92</td>
<td>0.14</td>
<td>0.73</td>
<td>0.13</td>
<td>454.94</td>
<td>0.0001</td>
<td>36.58</td>
<td>1.97</td>
<td>154.84</td>
</tr>
<tr>
<td>Season (S)</td>
<td>1</td>
<td>0.43*</td>
<td>0.0005*</td>
<td>0.21</td>
<td>0.66</td>
<td>22.82**</td>
<td>2.73**</td>
<td>0.24</td>
<td>238.84</td>
<td>0.16**</td>
<td>0.57*</td>
<td>541.90**</td>
<td>726.83*</td>
</tr>
<tr>
<td>Location(L)</td>
<td>2</td>
<td>0.59**</td>
<td>0.0006**</td>
<td>1.09</td>
<td>1.92</td>
<td>37.18**</td>
<td>0.30</td>
<td>0.30</td>
<td>1813.06</td>
<td>0.30**</td>
<td>1.84**</td>
<td>327.16**</td>
<td>670.08**</td>
</tr>
</tbody>
</table>

$^{\text{ab}}$: Not significant difference at 0.05 level of probability.

$^{**}$: Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively.

The mean performance of some fiber properties for cotton variety Giza 86 as affected by growing seasons, growing locations and their interactions were shown in Table (3).
1.2.1 Fiber Length Measurement:

For each of the Upper half mean lengths, fiber uniformity didn’t give any significant differences between the two seasons whereas short fiber index season 2018 gave the highest value (6.10%) Compared with Season 2019 as shown in Table (3).

Respecting the effect of location, fiber length and short fiber index differed significantly as affected by location where Location 3 El-Garbeia gave the highest UHML (33.12 mm) as well as location 2 EL-Munofeya revealed the maximum value (6.36%) of short fiber index.

Fiber uniformity was affected by locations the differences did not reach to significant level.

1.2.2 Micronaire Reading and Maturity Index:

Season 2018 gave the highest value for the micronaire reading (4.24) and the Maturity index value (0.86) Compared with Season 2019 as shown in Table (3).

Respecting the effect of location where Location 2 EL- Munofeya gave the highest micronair reading value (4.42) and Maturity index (0.87) in Contrast with Location 3 El-Garbeia obtained the Lowest value for the two traits.

1.2.3 Fiber Strength and Fiber Elongation:

Season 2019 gave the highest value for the fiber strength value (42.65 g/tex) and the fiber elongation value (6.27%) compared with season (2018) as shown in Table (3).

Concerning the growing locations effect, location 1 EL- Beheira recorded the highest fiber strength value (43.81) while the fiber elongation did not show any significant differences.

1.2.4 Fiber Color and Trash:

Color Attributes:

As shown in Table (3) it is clear that the mean value of the reflectance degree (Rd) did not differ any significant differences for the two growing seasons (2018) and (2019) while the growing season (2018) gave the highest yellowness degree (+b) value (9.09%).

Respecting the effect of the growing locations, the yellowness degree (+b) differed significantly as affected by growing locations where location L2 (EL- Munofeya) gave the highest value (8.96%) meanwhile the reflectance degree (Rd.) was affected by growing locations did not reach to the highest significant level, as presented in Table (3).

Trash Attributes:

Presented in Table (3) reflected that each trash count and trash area did not differ significantly for the two growing seasons (2018) and (2019).

Concerning the effect of the growing locations, the traits trash count and trash area differed significantly, where location 2 EL-Munofeya gave the lowest trash count value (32.37) and also for the trash area revealed (0.42) as shown in Table (3).

Table 3: Mean performance of some fiber properties for the cotton variety GIZA 86 as affected by growing season (S), Location(L) and their interactions.

<table>
<thead>
<tr>
<th>Location</th>
<th>Season 2018</th>
<th>Season 2019</th>
<th>L.S.D AT 0.05</th>
<th>Location 2018</th>
<th>Location 2019</th>
<th>L.S.D AT 0.05</th>
<th>Location 2018</th>
<th>Location 2019</th>
<th>L.S.D AT 0.05</th>
<th>Location 2018</th>
<th>Location 2019</th>
<th>L.S.D AT 0.05</th>
<th>Location 2018</th>
<th>Location 2019</th>
<th>L.S.D AT 0.05</th>
</tr>
</thead>
<tbody>
<tr>
<td>BEH</td>
<td>4.34a</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
</tr>
<tr>
<td>MUN</td>
<td>3.97b</td>
<td>4.34a</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
</tr>
<tr>
<td>GAR</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
<td>3.97b</td>
<td>3.97b</td>
<td>0.24</td>
</tr>
</tbody>
</table>

**Note:**

- Mean within the columns with the same letter are not significant differences at 0.05 level of probability.
- * Significant difference at 0.05 level of probability.
- ** Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively.
Fiber neps Count:
It is obvious that the neps count did not differ significantly for the two growing seasons (2018) and (2019) as presented in Table (3).
Respecting the effect of the growing locations, the neps count did not differ significantly between the three growing locations as shown in Table (3).

1.2.5 Hair Weight:
It is obvious in Table (3) that the hair weight trait differed significantly as affected by the growing season factor as well as season (2018) gave the highest value (162.66 mg) in contrast with season (2019).
Respecting the effect of location, the hair weight differed significantly as affected by the growing locations where L2 (EL- Munofeya) gave the highest value (164.00mg).

1.2.6 Spinning Consistency Index (SCI):
Regarding Table (3), it is obvious that this trait differed significantly as affected by the growing seasons factor as well as season (2019) gave the highest value (198.46) compared with season (2018).
Concerning the effect of growing location Spinning consistency index (SCI) differed significantly as affected by location where location 1 (EL- Beheira) gave the highest (SCI) Value (202.02).
These results were in harmony with those, Mohamed et al. (2003), Hassan et al. (2012), Idris (2012) and Aly El-Banna (2019) who found that three growing locations of cotton varieties Kafr El-Dawar, Kafr El-Sheikh, and Basion affected significantly for seven fiber properties of cotton variety Giza 86.
On the contrary insignificant differences were affected by cotton cultivation location for five fiber properties i.e., UHML, uniformity, short fiber index, maturity and micronair reading.

1.3 The Interaction Between Growing Seasons(S) and Growing Locations(L) (S*L) for the Long Staple Egyptian Cotton Variety Giza 86 during (2018) and (2019) Growing Seasons.
It is clear that the growing location (L3) El-Garbeya in 2018 growing season verified the highest value of the two traits, fiber length (U.H.M.L.) was (33.51m.m) and neps count was (108.50%) while it recorded the lowest value (5.52%) of short fiber index. The location (L3) EL- EIBeheira in 2018 growing season recorded the lowest value of neps count (67.00/m).
The location (L2) El-Munofeya location (L2) in 2018 season recorded the lowest fiber length (U.H.M.L.) value (31.58 m.m) meanwhile, it recorded the highest value (7.00%) for the short fiber index, as shown in Table (4).
These results were in harmony with those of, Mohamed et al. (2003), Hassan et al. (2012), and Idris (2012).

<table>
<thead>
<tr>
<th>Season (S)</th>
<th>Location (L)</th>
<th>Fiber Length (U.H.M.L.) (mm)</th>
<th>Short fiber index (%)</th>
<th>Neps count (/m)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>EL-Beheira (L1)</td>
<td>32.96a</td>
<td>5.77b</td>
<td>67.00c</td>
</tr>
<tr>
<td></td>
<td>EL-Munofeya (L2)</td>
<td>31.58b</td>
<td>7.00a</td>
<td>89.25abc</td>
</tr>
<tr>
<td></td>
<td>El-Garbela (L3)</td>
<td>33.51a</td>
<td>5.52b</td>
<td>108.50a</td>
</tr>
<tr>
<td>2019</td>
<td>EL-Beheira (L1)</td>
<td>33.06a</td>
<td>5.67b</td>
<td>98.25ab</td>
</tr>
<tr>
<td></td>
<td>EL-Munofeya(L2)</td>
<td>32.87a</td>
<td>5.72b</td>
<td>85.00bc</td>
</tr>
<tr>
<td></td>
<td>El-Garbeia(L3)</td>
<td>32.72a</td>
<td>5.97b</td>
<td>80.50bc</td>
</tr>
<tr>
<td>L.S.D AT 0.05</td>
<td></td>
<td>1.105</td>
<td>0.529</td>
<td>23.10</td>
</tr>
</tbody>
</table>
Technological Characteristics of Some Egyptian Cotton Varieties

2 The Second Cotton Variety Giza 94:

2.1 The Mean Square of Cotton Giza 94 Variety as Affected by Growing Season, Location and Their Interactions:

Presented data in Table (5) showed that significant differences or highly significant mean squares were obtained between seasons for micronaire reading, maturity index, upper half mean length (U.H.M.L), fiber strength, fiber elongation, short fiber index, and spinning constant index.

The significance of the mean square for cultivation location is only the fiber length (U.H.M.L) character as Presented in Table (5).

The significance of mean square for growing seasons and growing locations is due to differences in the growing season from one season to another as well as Governorate variance to another.

**Table 5:** Mean squares of some fiber properties of the cotton variety GIZA 94 as affected by growing season(S), Location(L) and their interactions during seasons 2018 and 2019.

<table>
<thead>
<tr>
<th>S.O.V</th>
<th>df</th>
<th>Micronaire Reading</th>
<th>Maturity Index</th>
<th>Fiber Length (U.H.M.L)</th>
<th>Fiber Uniformity</th>
<th>Fiber Strength</th>
<th>Refractive Index</th>
<th>Yellowness Index</th>
<th>Trash Content</th>
<th>Trash Area</th>
<th>Short Fiber Index</th>
<th>Hare weight</th>
<th>Spinning Constant</th>
<th>Neqov content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Block</td>
<td>3</td>
<td>0.03</td>
<td>0.0001</td>
<td>0.12</td>
<td>3.55</td>
<td>1.53</td>
<td>0.23</td>
<td>0.19</td>
<td>0.49</td>
<td>60.5</td>
<td>0.1</td>
<td>0.01</td>
<td>19.61</td>
<td>87.17</td>
</tr>
<tr>
<td>Season(S)</td>
<td>1</td>
<td>0.25 **</td>
<td>0.0010 **</td>
<td>7.00 **</td>
<td>1.45</td>
<td>18.20 **</td>
<td>19.53 **</td>
<td>0.06 **</td>
<td>0.15 **</td>
<td>1014.00 **</td>
<td>0.079 **</td>
<td>0.50 **</td>
<td>24.00 **</td>
<td>718.59 **</td>
</tr>
<tr>
<td>Location(L)</td>
<td>2</td>
<td>0.02 **</td>
<td>0.0001 **</td>
<td>0.79 *</td>
<td>0.31</td>
<td>1.53 **</td>
<td>0.07 **</td>
<td>2.18 **</td>
<td>0.16 **</td>
<td>322.16 **</td>
<td>0.02 **</td>
<td>0.06 **</td>
<td>26.54 **</td>
<td>41.98 **</td>
</tr>
<tr>
<td>Interaction</td>
<td>2</td>
<td>0.01 ns</td>
<td>0.0002 ns</td>
<td>0.36 ns</td>
<td>1.58 ns</td>
<td>1.28 *</td>
<td>0.08 ns</td>
<td>0.04 ns</td>
<td>68.50 ns</td>
<td>0.17 ns</td>
<td>0.02 ns</td>
<td>0.17 ns</td>
<td>57.97 ns</td>
<td>466.52 ns</td>
</tr>
<tr>
<td>Error</td>
<td>1</td>
<td>0.04</td>
<td>0.0001</td>
<td>0.2</td>
<td>0.88</td>
<td>1.67</td>
<td>0.27</td>
<td>1.08</td>
<td>0.15</td>
<td>269</td>
<td>0.05</td>
<td>0.02</td>
<td>15.54</td>
<td>40.21</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

As: Not significant difference at 0.05 level of probability

**,***: Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively.

On the other side, fiber elongation revealed significant differences in the interaction between growing seasons and growing locations, while the rest of the fiber properties did not show any significant differences as shown in Table (5).

These results were in the same trend as the researchers Idris (2012) who found the mean square of cotton varieties for all studied fiber properties were highly significant differences as well as the two growing seasons as well as Mohamed et al. (2003), Hassan et al. (2012), Idris (2012) El-Banna (2019), Lingaiah et al. (2020), Nassar et al. (2021) and Zaheer et al. (2021).

2.2. The Mean Performance of Some Fiber Properties for Cotton Variety Giza 94 as Affected by Growing Season, Locations and Their Interactions:

2.2.1 Fiber Length Measurement:

Fiber uniformity didn’t give any significant differences between the two seasons whereas fiber length (U.H.M.L) and short fiber index season 2018 gave the highest value (34.28 mm) for the fiber length (U.H.M.L) and (5.68%) for the short fiber index, Compared with season 2019.

Respecting the effect of location, fiber length (U.H.M.L) differed significantly as affected by location whereas Location 2 El-Dakahlia gave the highest UHML value. (33.98 mm) as well as location 1 Kafr El-Sheikh as affected by locations recorded the lowest fiber length (U.H.M.L) value (33.38m.m) while the fiber uniformity and the short fiber index differences did not reach to significant level as shown in Table (6).

2.2.2 Micronair Reading and Maturity:

Season 2018 gave the highest value for the micronair reading (4.05) and the Maturity index (0.86) Compared with season 2019 as shown in Table (6).

Respecting the effect of location the differences did not reach any significant level.
2.2.3 Fiber Strength And Fiber Elongation:
Season 2019 gave the highest value fiber elongation value (6.98%) compared with season (2018) meanwhile the fiber strength didn’t give any significant differences as shown in Table (6).

Concerning the effect of growing location the differences did not reach to any significant level.

Table 6: Mean performance of some fiber properties for the cotton variety Giza 94 as affected by growing season (S), Location(L) and their interactions.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Micronaire reading</th>
<th>Maturity Index</th>
<th>Fiber Length (G.M.E.) (mm)</th>
<th>Fiber Uniformity (%)</th>
<th>Break Strength (g/mm²) (%)</th>
<th>Break Length (%)</th>
<th>Refractive Index (Rd)</th>
<th>Micronaire reading (Ma) (%)</th>
<th>Micronaire reading (Mb) (%)</th>
<th>Trash count (t) (%)</th>
<th>Trash area (T) (%)</th>
<th>Spinning Consistency Index (SCI) (m)</th>
<th>Neps count (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season 2018</td>
<td>4.05a</td>
<td>0.06a</td>
<td>34.24a</td>
<td>86.63a</td>
<td>39.23b</td>
<td>5.65b</td>
<td>77.08a</td>
<td>8.95a</td>
<td>32.04a</td>
<td>0.55a</td>
<td>5.68a</td>
<td>153.41 (a)</td>
<td>189.57b</td>
</tr>
<tr>
<td>Season 2019</td>
<td>3.84b</td>
<td>0.04b</td>
<td>33.20b</td>
<td>87.12b</td>
<td>40.97b</td>
<td>6.98b</td>
<td>76.68b</td>
<td>8.78b</td>
<td>45.06b</td>
<td>0.62b</td>
<td>5.40b</td>
<td>151.41a</td>
<td>200.66a</td>
</tr>
<tr>
<td>L.S.D AT 0.05</td>
<td>0.17</td>
<td>0.006</td>
<td>0.39</td>
<td>0.30</td>
<td>0.18</td>
<td>0.46</td>
<td>0.37</td>
<td>0.55</td>
<td>0.13</td>
<td>0.13</td>
<td>0.55</td>
<td>0.51a</td>
<td>0.51a</td>
</tr>
</tbody>
</table>

Concerning the effect of growing location the differences did not reach to any significant level.

2.2.4 Fiber Color and Trash:
Color Attributes: As shown in Table (6), it is clear that the mean value of the reflectance degree (Rd) and yellowness degree (+b) did not differ significantly for the two seasons (2018) and (2019).

Respecting the effect of growing locations, reflectance degree (rd) and yellowness degree (+b) the differences did not reach the highest significant level, as presented in Table (6).

Trash Attributes: As presented in Table (6) reflected that each trash count and trash area did not show significant differences for the two seasons (2018) and (2019).

Concerning the effect of location, trash count and Trash area did not differ any significant differences.

Fiber neps Count: It is obvious that the neps count did not differ significantly for the two seasons (2018) and (2019) as presented in Table (6).

Respecting the effect of location, neps count did not show any significant differences between the three locations as shown in Table (6).

2.2.5 Hair Weight: It is obvious in Table (6), that the hair weight did not differ significantly between the two seasons (2018) and (2019) also the location effect did not differ significantly between the three growing locations.

2.2.6 Spinning Consistency Index (SCI): Table (6) (SCI) did not differ significantly for the two seasons (2018) and (2019) also the location effect did not differ significantly between the three locations.

These findings align with the results reported by Rahouma et al. (2008), Dana Jawdat et al. (2012), indicating stability in specific fiber traits such as micronaire reading, fiber length, and strength, which were genotype-specific. Notably, fiber elongation remained unaffected by cultivation practices and environmental conditions, implying robust genetic foundations governing this trait. Similarly, studies by Hassan et al. (2012), Shaker (2013), and Riham et al. (2015) emphasized that the impact of genotypes and environmental conditions varied from one environment to another.
2.3 The Interaction Between Growing Season(S) and Location(L) (SxL) for the Long Staple Egyptian Cotton Variety Giza 94 during 2018 and 2019 Seasons:

It is clear that the growing location (L3) El-El-Sharkeya in the 2019 growing season verified the highest value of fiber elongation (7.25%) while location (L2) El-Dakahleya in 2018 growing season recorded the lowest fiber elongation value (5.30).

Several works studied the traits performance of cotton genotypes under different environments i.e. Killi and Harem (2006) Satish et al. (2009), Dewdar (2013) and Navdeep. et al. (2016).

Table 7: The interaction between season(S) and location(L) (S*L) for the cotton variety Giza 94 fiber properties.

<table>
<thead>
<tr>
<th>Season (S)</th>
<th>Location (L)</th>
<th>Fiber Elongation (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Season 2018</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kafr El-Sheikh (L1)</td>
<td>6.17bc</td>
<td></td>
</tr>
<tr>
<td>El-Dakahleya (L2)</td>
<td>5.30d</td>
<td></td>
</tr>
<tr>
<td>El-Sharkeya (L3)</td>
<td>5.50cd</td>
<td></td>
</tr>
<tr>
<td>Season 2019</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kafr El-Sheikh (L1)</td>
<td>6.57ab</td>
<td></td>
</tr>
<tr>
<td>El-Dakahleya (L2)</td>
<td>7.12a</td>
<td></td>
</tr>
<tr>
<td>El-Sharkeya (L3)</td>
<td>7.25a</td>
<td></td>
</tr>
<tr>
<td>L.S.D AT 0.05</td>
<td>0.79</td>
<td></td>
</tr>
</tbody>
</table>

3 The Third Cotton Variety Giza 95:

3.1 The Mean Square of Cotton Variety Giza 95 as Affected by Growing Season, Location and Their Interactions (Table 8).

It was clear that significant differences or highly significant mean squares were obtained between growing seasons for maturity index, short fiber index, and neps count.

The same trend was found for cultivation location for the next fiber properties: maturity, fiber uniformity and fiber elongation. The significance of mean square for seasons and locations is due to differences in the growing season from one season to another as well as Governorate variance to another. On the other side, micronaire reading, maturity index, fiber elongation, yellowness degree (+b) and hair weight revealed significant differences in the First order interaction between growing seasons and growing locations.

These findings align with those studied by Hassan et al. (2005), Rahoumah et al. (2008), Shaker (2013) and El-Seidy et al. (2017). In their report, they noted that the influence of environmental conditions varied from one location to another and from one season to another.

Table 8: Mean squares of some fiber properties of the cotton variety Giza 95 as affected by growing season(S), Location(L) and their interactions during seasons 2018 and 2019.

<table>
<thead>
<tr>
<th>S.O.V</th>
<th>df</th>
<th>Micronaire reading</th>
<th>Maturity index</th>
<th>Short staple %</th>
<th>Fiber uniformity</th>
<th>Fiber elongation</th>
<th>{}</th>
<th>Yellowness degree</th>
<th>{}</th>
<th>{}</th>
<th>Hair weight</th>
<th>{}</th>
<th>{+b}</th>
<th>%</th>
<th>Neps count</th>
<th>{}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blocks</td>
<td>3</td>
<td>0.17</td>
<td>0.0002</td>
<td>0.05</td>
<td>0.65</td>
<td>2.05</td>
<td>2.03</td>
<td>1.23</td>
<td>1.31</td>
<td>0.13</td>
<td>1.370.26</td>
<td>0.15</td>
<td>0.37</td>
<td>1.0116</td>
<td>25.30</td>
<td>279.13</td>
</tr>
<tr>
<td>SEASON</td>
<td>1</td>
<td>0.31</td>
<td>0.0004*</td>
<td>0.03</td>
<td>0.47</td>
<td>0.42</td>
<td>0.42</td>
<td>0.16</td>
<td>0.11</td>
<td>0.11</td>
<td>0.044.96</td>
<td>0.009</td>
<td>7.57*</td>
<td>0.1691</td>
<td>153.04</td>
<td>792.64**</td>
</tr>
<tr>
<td>LOCATION</td>
<td>2</td>
<td>0.24</td>
<td>0.0002*</td>
<td>0.04</td>
<td>0.55**</td>
<td>1.90**</td>
<td>1.17*</td>
<td>2.57</td>
<td>0.36</td>
<td>0.36</td>
<td>0.050.16**</td>
<td>0.009</td>
<td>10.16**</td>
<td>10.62**</td>
<td>25.36</td>
<td>1057.67**</td>
</tr>
<tr>
<td>Interaction (S*L)</td>
<td>4</td>
<td>0.40</td>
<td>0.0008**</td>
<td>0.03</td>
<td>1.84</td>
<td>4.90**</td>
<td>2.34**</td>
<td>2.73</td>
<td>0.50*</td>
<td>0.50</td>
<td>0.631.16**</td>
<td>0.006</td>
<td>0.89*</td>
<td>172.04*</td>
<td>232.74**</td>
<td>254.04**</td>
</tr>
<tr>
<td>Error</td>
<td>15</td>
<td>0.08</td>
<td>0.0001</td>
<td>0.12</td>
<td>1.47</td>
<td>2.47**</td>
<td>0.19</td>
<td>2.13</td>
<td>0.11</td>
<td>0.11</td>
<td>482.69</td>
<td>0.072</td>
<td>0.34</td>
<td>43.56</td>
<td>92.36</td>
<td>293.01</td>
</tr>
<tr>
<td>Total</td>
<td>21</td>
<td>0.11</td>
<td>0.0002</td>
<td>0.12</td>
<td>1.47</td>
<td>2.47**</td>
<td>0.19</td>
<td>2.13</td>
<td>0.11</td>
<td>0.11</td>
<td>482.69</td>
<td>0.072</td>
<td>0.34</td>
<td>43.56</td>
<td>92.36</td>
<td>293.01</td>
</tr>
</tbody>
</table>

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

*: Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively.
3.2. The Mean Performance of Some Fiber Properties for Cotton Variety Giza 95 as Affected by Growing Season, Locations and Their Interactions:

3.2.1 Fiber Length Measurement:
Each of the Upper half mean length and fiber uniformity didn’t show any significant differences between the two seasons. Respecting the effect of location where Location 2 EL-Fayoum gave the highest fiber uniformity value (83.83%) in contrast Location 1 Beni suef recorded the Lowest fiber uniformity value (82.22) shown in Table (9).

3.2.2 Micronair Reading and Maturity Index:
Season 2018 gave the highest maturity index value (0.86), Season 2019 gave the lowest maturity index value (0.85) while the micronair reading didn’t show any significant differences between the two seasons. as shown in Table (9).

Respecting the effect of the growing location where Location 2 EL- Fayoum gave the highest micronair reading value (4.31) and Maturity index (0.86) in Contrast with the growing Location 3 El-Menya recorded the Lowest value of the two characters.

3.2.3 Fiber strength and fiber elongation:
Each fiber strength and fiber elongation didn’t give any significant differences between the two growing seasons. as shown in Table (9).

Respecting the effect of location where Location 1 Beni Suef gave the highest fiber elongation value (7.02%) in Contrast with Location 2 EL- Fayoum recorded the Lowest fiber elongation value (6.31), while fiber strength didn’t give any significant differences relating to Table (9).

3.2.4 Fiber Color and Trash:
Color attributes: As shown in Table (9) it is clear that the mean value of the reflectance degree (Rd) and yellowness degree (+b) did not differ significantly between the two seasons (2018) and (2019).

Respecting the effect of location, where Location 1 Beni Suef gave the highest yellowness degree (+b) value (12.07) in contrast the reflectance degree (Rd) differences did not reach the highest significant level, as presented in Table (9).

Trash Attributes: Table (9), reflected that each trash count and trash area did not differ significantly during the 2018 and 2019 seasons. Concerning the effect of location, trash count and Trash area there were no significant differences.

Fiber neps Count: It is obvious that season 2019 gave the highest neps count value (93.16) while season (2018) recorded the lowest neps count value (71.08) as presented in Table (9).

Respecting the effect of location, where Location did not differ any significant differences offered in Table (9).

3.2.5 Hair Weight: Data in Table (12), that the hair weight did not differ significantly for the two seasons (2018) and (2019).

Respecting the effect of location, the hair weight did not differ any significant differences.

3.2.6 Spinning Consistency Index (SCI):
Regarding Table (9) (SCI) did not differ significantly for the two seasons (2018) and (2019) also the location effect did not differ significantly between the three locations.
Table 9: Mean performance of some fiber properties for the cotton variety Giza 95 as affected by growing season (S), Location(L) and their interactions.

<table>
<thead>
<tr>
<th>Variety</th>
<th>Micronaire reading</th>
<th>Maturity index</th>
<th>Fiber length (mm)</th>
<th>Fiber Uniformity</th>
<th>Fiber Strength</th>
<th>Fleece Fineness</th>
<th>Fineness Value</th>
<th>Yellowness degree (%)</th>
<th>Trash content</th>
<th>Trash Area</th>
<th>Micronaire reading (SCT)</th>
<th>Hair weight (mg)</th>
<th>Spinning consistency index</th>
</tr>
</thead>
<tbody>
<tr>
<td>Giza 95</td>
<td>6.34a</td>
<td>5.03b</td>
<td>30.16a</td>
<td>6.68a</td>
<td>69.93a</td>
<td>2.46a</td>
<td>35.05a</td>
<td>12.47a</td>
<td>5.77a</td>
<td>11.50a</td>
<td>5.53a</td>
<td>20.43a</td>
<td>43.45a</td>
</tr>
<tr>
<td>Giza 86</td>
<td>6.31b</td>
<td>5.00b</td>
<td>30.00b</td>
<td>6.66b</td>
<td>69.89b</td>
<td>2.45b</td>
<td>35.02b</td>
<td>12.45b</td>
<td>5.76b</td>
<td>11.49b</td>
<td>5.52b</td>
<td>20.42b</td>
<td>43.44b</td>
</tr>
</tbody>
</table>

Means within each column with the same letter are not significant differences at 0.05 level of probability. n.s: Not significant difference at 0.05 level of probability.

* *: Significant and highly significant difference at 0.05 and 0.01 levels of probability, respectively.

3.3 The Interaction Between Growing Season(S) and Location(L) (S*L) for The Long Staple Egyptian Cotton Variety Giza 95 during (2018) and (2019) Growing Seasons.

It is clear that growing location (L1) Beni Suef in 2019 growing season recorded the highest fiber elongation value (7.32%), meanwhile, it recorded the lowest micronair reading value (3.62).

The growing location (L1) Beni Suef in 2018 growing season obtained the highest yellowness degree (+b) value (12.47%) and the highest hair weight value (157.75).

The growing location (L2) El-Fayoum in 2019 growing season verified the highest value of the 2 characters, micronair reading(4.43) and Maturity index(0.87) whereas recorded the lowest fiber elongation value (5.77%) as presented in Table (10).

The growing location (L1) Beni Suef in 2019 growing season recorded the lowest maturity index value (0.84), also the lowest micronair reading(3.62) during the same growing season. While El-Menya Governorate recorded the lowest value for the trait hair grain weigh (144.2 mg) for the Giza 95 variety during the growing season of 2018.

Several works studied the traits performance of cotton genotypes under different environments i.e. Killi and Harem (2006) Satish et al. (2009), Dewdar (2013) and Navdeep et al. (2016). These findings corroborate those discussed by Hassan et al. (2005), Rahoumah et al. (2008), Shaker et al. (2013), and El-Seidy et al. (2017), who noted that the impact of environmental conditions varied from one location and season to another.

Table 10: The interaction between growing season(S) and location(L) (S*L) for the cotton variety Giza 95 fiber properties.

<table>
<thead>
<tr>
<th>Season (S)</th>
<th>Location (L)</th>
<th>Micronair reading</th>
<th>Maturity index</th>
<th>Fiber Elongation</th>
<th>Yellowness degree (+b)</th>
<th>Hair weight (mg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>Beni Suef (L1)</td>
<td>4.24ab</td>
<td>0.86ab</td>
<td>6.72a</td>
<td>12.47a</td>
<td>157.79a</td>
</tr>
<tr>
<td></td>
<td>El-Fayoum (L2)</td>
<td>4.18ab</td>
<td>0.85bc</td>
<td>6.58a</td>
<td>11.85b</td>
<td>157.50a</td>
</tr>
<tr>
<td></td>
<td>El-Menya (L3)</td>
<td>4.28ab</td>
<td>0.87a</td>
<td>5.95a</td>
<td>11.60b</td>
<td>144.25b</td>
</tr>
<tr>
<td>2019</td>
<td>Beni Suef (L1)</td>
<td>3.62b</td>
<td>0.84f</td>
<td>7.25a</td>
<td>11.67b</td>
<td>145.75b</td>
</tr>
<tr>
<td></td>
<td>El-Fayoum (L2)</td>
<td>4.43a</td>
<td>0.87a</td>
<td>5.77b</td>
<td>11.57b</td>
<td>151.75ab</td>
</tr>
<tr>
<td></td>
<td>El-Menya (L3)</td>
<td>3.89bc</td>
<td>0.84ed</td>
<td>6.90a</td>
<td>11.80b</td>
<td>150.50ab</td>
</tr>
<tr>
<td>L.S.D at 0.05</td>
<td></td>
<td>0.43</td>
<td>0.01</td>
<td>0.67</td>
<td>0.51</td>
<td>9.94</td>
</tr>
</tbody>
</table>

Recommendations:

Based on the study results, clear effects of growing seasons and growing locations on the properties of cotton varieties were observed. Significant differences were found in variables such as strength, elongation, yellowness degree, hair weight, and spinning consistency index (SCI) for Giza 86, along with other properties for Giza 94 and Giza 95. The results highlight the specific interaction between season and location that affects certain
properties. This emphasizes the importance of studying this interaction to achieve better cotton variety performance.

The results of this study offer crucial insights for enhancing the management of cotton cultivation. They underscore the significance of investigating the interplay between climatic and environmental factors to achieve optimal performance for cotton varieties. It is advisable to persist in the comprehensive evaluation of cotton varieties across diverse conditions and environments, spanning multiple seasons and locations, prior to formulating recommendations regarding the selection and utilization of specific varieties in designated locations.

In conclusion, this research underscores the significance of integrating seasonal and location variables in analysing the performance of cotton plant varieties.

**Declarations:**

**Ethical Approval:** Ethical Approval is not applicable.

**Competing Interests:** The authors declare no conflict of interest.

**Authors Contributions:** I hereby verify that all authors mentioned on the title page have made substantial contributions to the conception and design of the study, have thoroughly reviewed the manuscript, confirm the accuracy and authenticity of the data and its interpretation, and consent to its submission.

**Funding:** No funding was received.

**Availability of Data and Materials:** All datasets analysed and described during the present study are available from the corresponding author upon reasonable request.

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**REFERENCES**


تأثر أماكن الزراعة على الخصائص التكنولوجية لبعض أصناف القطن المصري

Mohamed Ahmed Abd El-Aziz El-Saieda و إبراهيم عباس السيدا و علي أحمد علي الصاوي البنا و مي على بوقت

1. قسم الأنتاج النباتي - جلالة الزراعة - ساسي-جامعة الأسكندرية.
2. الهيئة العامة للتحكم و اختبارات القطن - الأسكندرية.

أجري هذا البحث بغية التأكد من تأثير الأماكن في حالة الزراعة (سايسا) – جامعة الأسكندرية - مصر. وفي مختبرات الهيئة العامة للتحكم و اختبارات القطن (CATGO) الخاصة بوزارة التجارة و الصناعة على بعض أصناف القطن المصري والتي تنتمي إلى فئة القطن طويل اللبيرة و هي جبزة 86، جبزة 46 و جبزة 95 خلال موسم الصيف المتاحلين (٢٠١٩-٢٠٢٠).

تم استخدام هذه الدراسة ثلاثة أصناف للقotton المصري التجارية ينتميان إلى مجموعة الأقاطان الآلية من النسل المولن: لأصناف القطن المنزوع، حيث تم الزراعه في ٩ أماكن انتاج في مصر (إلفنجية، دمياط، بورسعيد، الفيوم، المنيا، الأسكندرية، الإسكندرية، الجيزة، الصعيد) و أخيراً أصناف جبزة 95 من الزراعه في (نبي سوق، الفيوم، المنيا) في موسمين متتاليين (٢٠١٨/٨٩). وتلك الأدوات للدراسة:

1. العوامل المؤثرة على خصائص أصناف القطن محل الدراسة.
2. تقييم كيفية تأثير موسم النمو و موقع الزراعة و تفاعلاتهما بشكل جماعي في الاختلافات المحذولة في خصائص الألياف.
3. تحديد كيفية تكيف الأصناف محل الدراسة و الحفاظ على جودتها في ظروف جوية مختلفة.
4. تحليل تأثير التداخل بين مواسم الزراعة و مواقع الزراعة على أصناف القطن محل الدراسة.

النتائج:
- اختفت الامواج الزراعية ٢٠١٨ و ٢٠١٩ عن طريق العينة في صفة جبزة 86 لق延安ة الميكرونير. معالج التوضيح: مادة الألياف، استطالة الألياف و درجة الإصفرار، معالج الشعيرات القصيرة، وزن خلاصة الشعرات بسلاسلت و تابع النقل.

- سجلت الامواج الزراعية المحذزة لليبيا L1، منطقة مكشوفة L2، ألمانية L3 - اختلافات معنوية أو عالية في سبيل التأثين في معدل الزرواح، معالج الشعرات القصيرة و معدل الشعرات القصيرة و معدل الشعرات القصيرة .
- أحضر التفاعل بين مواسم الزرواح والاعتقادات في مناطق المحذزة لليبيا L1، و عالية الفاعلية في معدل الشعرات القصيرة و معالج التوضيح، معالج الشعرات القصيرة و معدل الشعرات القصيرة
- سجل الصصف جبزة 86 افضل القيم موسم ٢٠١٨ لصفة قرآة الميكرونير (٤.٤٢) ملحفة الألياف و معالج الشعرات القصيرة و معالج الشعرات القصيرة (٠.٨٧) علنج درجة الإصفرار (١.٠٥) و معالج الشعرات القصيرة (٠.٨٧) علنج درجة الإصفرار (١.٠٥) و معالج الشعرات القصيرة (٠.٨٧).}

ABSTRACT


- و على الجانب الآخر أظهرت ملاحظات مقارنة رغم الأعين، ما هو أفضل قرود من الميكروني (3.93%)
- سمك الشعيرات (3.12 مم) و استخراج الألياف (6.16 مم)
- وسجل التفاعل بين عاملي الدراسة المواسم الزراعية والواقع على القدرات المقارنة في بقرة الميكروني 2018
- للفصل 86 لصفة طول الشعيرات (33.51 مم) و صفه عدد العقد (108.5 مم) و بينما سجلت محافظة المنوفية
- L2 للفصل الموسم الزراعي (0.9 %)
- أظهرت العاملين الزراعيين 2018 و 2019 اختلافا معنوي أو عالياً في الميكروني في صفات جبيرة 94 لقراء الميكروني.
- استخراج الألياف، و القدرات المقارنة في بقرة الميكروني، و ثابت العقد.
- سجلت مواسم الزراعية المحافظة الثلاثة (كفر الشيخ، الدقهلية، المحافظة الشرقية) اختلافات معنوية أو عالية
- الصنف جبيرة 94 و هي طول الشعيرات بينما لم تسجل باقي الصنف أي اختلافات معنوية.
- أظهرا التفاعل بين عاملي الدراسة المواسم الزراعية والمواقع اختلافاً معنوي للفصل طول الشعيرات بينما لم تسجل
- باقي الصنف أي اختلافات معنوية.
- للفصل جبيرة 94 للفصل الموسم الزراعي 2018 (11.4 %) أظهر ارتفاع معنوي في صفات جبيرة 95 للفصل النموذجي.
- للفصل شعبيرات جبيرة 94 متوسطة للفصل العاملي (1.65 مم) و (6.6 %) و كان أفضل للفصل الصلب (200.66 مم).
- سجلت المحافظات الثلاثة (كفر الشيخ، الدقهلية، المحافظة الشرقية) أعلى القيم للفصل جبيرة 94 و هي إطالة الشعيرات، طول الشعيرات (33.98 مم).
- Graham) من المحافظات، بينما سجلت المحافظة المنوفية، كانت أقوى في الصنف جبيرة 94 و هي إطالة الشعيرات
- استخراج الألياف. سجلت المحافظة المنوفية للفصل الألياف (94.28 مم) و أفضل القيم موسم 2018 (0.86 %)
- للفصل النموذجي (95 %) و كان أعلى للفصل العاملي (31.61 مم).
- اختلفت المحافظات 2019 للفصل جبيرة 95 و هي نضج الشعيرات، امتصاص الأطوار، استخراج الألياف بينما لم تسجل باقي الصناف أي اختلافات
- معنوية.
- أظهرت التفاعلات بين عاملي الدراسة المواسم الزراعية والمواقع اختلافاً معنوي و عالياً في الميكروني للفصل
- الشعيرات استخراج الألياف، درجة الإصفرار وزن الشعيرات، اسمم الألياف بالملعومات بينما لم تسجل باقي الصناف أي اختلافات
- معنوية.
- للفصل جبيرة 95 للفصل العاملي 2018 (17.46 %) و كان أفضل للفصل العاملي (31.61 مم).
- اختلفت المحافظات 2019 للفصل جبيرة 95 و هي نضج الشعيرات، امتصاص الأطوار، استخراج الألياف بينما لم تسجل باقي الصناف أي اختلافات
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- للفصل جبيرة 95 للفصل العاملي 2018 (17.46 %) و كان أفضل للفصل العاملي (31.61 مم).
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