# Evaluating Cotton (*Gossypium hirsutum* L.) Genotypes for Fiber Quality Traits over Selected Agro-ecologies of Ethiopia

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## Abstract

**Background**: Cotton (*Gossypium hirsutum* L.) is one of the most important fiber crops in the world. However, the quality of cotton fiber is a major determinant of its productivity since it regulates spin ability of the fiber into yarn, which contributes to the performance of the textile. Thus, the development of varieties possessing enhanced cotton fiber quality is essential for sustaining long-term cotton production in any region and can build greater marketability and fetch higher prices.

**Objective**: The research was conducted to test the performance of cotton genotypes for fiber quality traits in different cotton growing agro-ecologies in Ethiopia.

**Material and Methods:** Eleven cotton genotypes and three check varieties were tested at Werer, Sille and Weyto districts in a randomized complete block design with three replications from 2011 to 2013 cropping seasons.

**Results**: The genotypes manifested significant ($P \leq 0.01$) differences in fiber fineness, fiber length, and fiber strength. Desirable micronaire and fiber length were obtained from the genotypes Indam 206 F5#6-1-1 and Polaris F5#3-2-2 at all locations. However, the values of fiber length of these genotypes at Werer were 32.49 mm and 32.75 mm, respectively, which were found to be lower than that of the best performing check varieties, which was 36.54 mm.

**Conclusion**: It is concluded that genotypes Polaris F5#3-2-2 and Indam 206 F5#6-1-1 had superior mean performances in terms of fiber fineness, fiber length, and fiber strength. Therefore, these genotypes can be identified as potential candidates for to release for wider adaptation and commercial production.

**Keywords:** Fiber fineness; Fiber length; Fiber strength; Genotype; *Gossypium hirsutum* L.

## 1. Introduction

The genus *Gossypium* includes 50 species, four of which are cultivated, 44 of which are wild diploids and two are wild tetraploids (Percival and Kohel, 1990). Out of the four cultivated species, *Gossypium hirsutum* L. and *Gossypium barbadense* L. commonly known as new world cottons are tetraploids (2n = 4x = 52), whereas, *Gossypium herbaceum* L. and *Gossypium arboreum* L. are diploids (2n = 2x = 26) and are commonly called as old world cottons. *Gossypium hirsutum* L. accounts for 90% of cultivation, *G. barbadense* L. accounting for 8%, whereas *G. herbaceum* L. and *G. arboretum* L. together provide 2% of the world's cotton production (Zhang et *al.* 2008). The barbadense genotypes have played an important role in the development of interspecific hybrids (*G. hirsutum* x *G. barbadense*) for improving major fiber quality traits.

Cotton (*Gossypium hirsutum* L.) is the most important fiber crop of Ethiopia. The cotton plant provides raw material to all textile mills, ginning factories, cottage industries, and oil mills. Cotton is also used for production of edible oil in the country, which, when quantified, makes a huge contribution to the national oil production. The crop is also used as an important source of cash for the growers and it offers a considerable employment opportunity for people on farms, in ginneries, oil mills, and knitting, textile and garment factories. In Ethiopia, the crop is extensively grown in the lowlands under large-scale irrigation schemes (Amibera, Gewane, Asayita, Arbaminch, sille, Weyto and Omorate areas) while rain-fed cultivation is taking place in Gambella, Humera, and Metema areas.

Cotton fiber quality is defined by the physical properties that relate to its spin ability into yarn and contributes to textile performance and quality. The most important of these properties are those associated with the length, strength, and fineness (micronaire) of the fiber. Fiber length is the normal length of a typical portion of the fibers of a cotton sample. Longer fibers



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can be processed at greater efficiencies and produce finer and stronger yarns by allowing fibers to twist around each other more times, while shorter fibers require increased twisting during spinning, causing low-strength and poor-quality yarns. Fiber fineness is another important component of fiber quality because of its direct impact on processing performance and the quality of the product. Fiber strength is important because the inherent breaking strength of individual cotton fiber is considered to be the most important factor in determining the strength of the yarn spun from those fibers (Koli *et al.*, 2014). Therefore, developing cotton varieties possessing enhanced cotton fiber quality is essential for sustaining long-term cotton production in any region. Even with harsh growing conditions, such varieties will maintain a better quality than varieties with low fiber quality. Varieties possessing a genetic capacity for higher fiber quality can gain greater marketability and price. Nazir *et al.* (2020) studied genetic variations in upland cotton (*Gossypium hirsutum* L.) for yield and fiber quality traits and significant differences were present among the genotypes for all the traits.

Genetic variability and heritability studies for seed cotton yield, yield attributing and fiber quality traits in upland cotton (*Gossypium hirsutum* L.) revealed non-significant differences among the genotypes for upper half mean length (UHML) and micronaire (Nikhil *et al.* 2018 and Esmail *et al.* 2019). Hafiz *et al.* (2014) conducted a study to evaluate genetic variability of cotton genotypes for staple length, fiber strength, fiber fineness and their related traits of cotton and found significant differences for all traits. The higher micronaire readings (above 4.9 μg inch$^{-1}$) denote the coarser cottons, while lower readings (below3.5 μg inch$^{-1}$) denote the finer cottons. The micronaire readings of 3.5 to 4.9 μg inch$^{-1}$ are generally considered as being "average or near average" in micronaire (Baloch *et al.,* 2014). The terms very strong (> 31), strong (29–30), average (26–28), intermediate (24–25) and weak (< 23) describe the degree of strength (1). In Ethiopia, only Delta Pine 90 variety available for use in the irrigated lowlands with 27.7 mm fiber length, 3.7 micronaire, and 26.14 g tex$^{-1}$ fiber strength that does provide the required high quality fiber. In this study, it was hypothesized that certain cotton genotypes have significantly increased fiber fineness, fiber strength, and fiber length over other cotton genotypes. Therefore, this study was conducted to evaluate these genotypes in form of lint quality at some selected cotton growing agro-ecologies of Ethiopia to develop new varieties with improved fiber qualities for use in the textile industry of the country.

## 2. Materials and Methods

### 2.1. Description of the Study Areas

The experiment was conducted from 2011 to 2013 main growing seasons in three of cotton growing regions (Werer, Sille and Weyto). Werer Agricultural Research Center is located in the North-East of Ethiopia in Afar region at 90$^{o}$34’12” N latitude and 40$^{o}$17’22”E at 740 m elevation. Sille farm is situated in the South-East of Ethiopia in Southern Nations, Nationalities, and Peoples' Region at 5°51’42” N latitude and 37$^{o}$28’32” E longitude at an elevation of 1120 meters above sea level. Weyto is also situated in the South-East of Ethiopia in Southern Nations, Nationalities, and Peoples' Region located at 5°23’31” N latitude and 36$^{o}$58’41” E longitude at an elevation of 550 meters above sea level.

### 2.2. Description of Planting Material

Various cotton parent materials have been involved in intraspecific crosses at Werer Agricultural Research Center to improve both seed cotton yield and lint quality. A number of the crosses have passed through a series of evaluations and the best ones are now at the level of national yield trial and have almost reached homozygosity. Therefore, eleven selected homozygous cotton inbred lines, which were previously developed from various parents through a long-term breeding conducted at Werer Agricultural Research Center, were used as plant materials in this experiment (Table 1). Deltapine-90, Stam 59 A, and Ionia varieties were used as checks.

### 2.3. Treatments and Experimental Design

The treatment consisted of 11 selected homozygous cotton inbred lines as test crops and Deltapine-90, Stam 59 A, and Ionia as checks varieties (Table 1). The experiment was laid out as a completely randomized block design and replicated three times per treatment.

### 2.4. Experimental Procedure

Commonly, five main operations of land preparation, namely, land clearing, plowing, disking, land leveling and ridging were carried out. Land clearing was done by removing or cutting of big trees, bushes, termite mounds and any other obstacles for conveniences of plowing and other cultural operations. Plowing was done by a tractor-mounted mold board plough or deep plow. Disking was done to break up the soil hard-core and level the land. Land leveling was the most common practices for smooth land with a gentle slope. Ridging was the last land preparation task and accomplished by tractor-trailed ridges. Fields, ridges were built in a spacing of 90 cm. Sowing was carried out with plot size of five rows each 5 m long with plant to plant distance of 20 cm and row to row distance of 90 cm (plot size of 5 m x 5 rows x 0.9 = 22.5 $m^2$). Three seeds were hand-sown in each hole on the top of the ridges. Thinning of two of three seedlings per hole was done fifteen days after emergence to have the required population of 125 plants per plot. Appropriate agronomic practices and field evaluations were also implemented as per the schedule. Fiber quality data (micronaire, fiber length and strength) were measured using high volume fiber classification instruments.

Table 1. Description of cotton genotypes used in the study.

| Genotypes | Breeding status |
|---|---|
| Stam 59A X ICA 01 bulk | Inbred line |
| Indam 2194 F5#2-1-2 | Inbred line |
| Sanju F5#9-2-1 | Inbred line |
| Indam 206 F5#6-1-1 | Inbred line |
| Guru F5#1-2 | Inbred line |
| Polaris F5#3-2-2 | Inbred line |
| Del Cero X Cucurova 1518 F5#1-3 | Inbred line |
| Del Cero X GL-7 F5#1-4-1 | Inbred line |
| Arba X Cucurova 1518 F5#1-3/3 | Inbred line |
| Arba X Cucurova 1518 F5#1-4/3 | Inbred line |
| Arba X GL-7 F5#1-2/3 | Inbred line |
| Ionia | Cultivar |
| Deltapine-90 | Cultivar |
| Stam 59 A | Cultivar |

### 2.5. Data Collection and Measurements

Thirty boll samples were collected from fifteen plants randomly taken from the two middle rows of each experimental plot. Then, fiber length, fiber strength, and fiber fineness were tested at the Ethiopian Textile Industry Development Institute using a High Volume Instrument (HVI). Staple length was reported as the average length of the longer half of the fibers (normally called “upper-half-mean” length), measured by clamping a fiber sample, then combing and brushing to make the fibers straight and parallel. The resulting material from the brushing is referred to as a “beard” of fibers, which was then passed through a sensing point in the HVI length instrument. It was calculated from the length fibrogram sensed by the HVI. The fibrogram was an arrangement of fibers from the shortest to the longest in terms of span lengths (the distances fibers extend from a random catching point). Fiber strength, as measured on the HVI was the force in grams required to break a bundle of fibers in one tex unit in mass a tex unit being the weight in grams of 1000 meters of fiber length. Strength measurements were done conducted on the same beard of cotton used by the HVI to measure staple length and uniformity. After the length measurement was made, the beard was clamped between two sets of jaws that were spaced 1/8 inch apart, and then broken. The result was reported in “grams per tex. Micronaire is a measurement of fiber fineness and maturity. It was determined by measuring the air permeability of a constant mass of cotton fibers compressed to a fixed volume. Fine or immature fibers that were easily compressed had a lower air permeability and therefore low micronaire. Coarse or mature fibers that resist compression had a high micronaire.

### 2.6. Statistical Data Analysis

The collected data were statistically analyzed according to Steel and Torrie (1984) by using SAS software for analysis of variance (ANOVA) test to determining statistical differences among genotypes for various traits. The genotypes means for each parameter were further separated and compared by using the least significant difference (LSD) test at 5% and 1% level of probability.

## 3. Results and Discussion

The fourteen cotton genotypes showed significant ($P \leq 0.01$) differences in fiber fineness, fiber length, and fiber strength. The differences among the locations were found to be significant for all characters while the location x genotype interactions were non-significant for all characters. Therefore, the results revealed significant variations among the genotypes and locations for all of the traits studied.

Table 2. Mean squares and significant tests for 14 cotton genotypes for fiber fineness, fiber length and fiber strength.

| Source of variation | df | Fiber fineness (µg inch⁻¹) | | | Fiber length (mm) | | | Fiber strength (g tex⁻¹) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Mean square | F value | *P value* | Mean squares | F value | *P value* | Mean Squares | F value | *P value* |
| Rep (Year x Location) | 18 | 0.07 | 0.8 | 0.70 | 6.36 | 0.77 | 0.74 | 2.49 | 0.64 | 0.87 |
| Year | 2 | 8.16 | 86.93 | <.0001 | 15.25 | 1.84 | 0.16 | 387.93 | 100.36 | <.0001 |
| Location | 2 | 12.28** | 130.73 | <.0001 | 106.58** | 12.88 | <.0001 | 84.60** | 21.89 | <.0001 |
| Location x Year | 4 | 1.03 | 10.93 | <.0001 | 4.51 | 0.56 | 0.70 | 48.14 | 12.46 | <.0001 |
| Genotype | 13 | 0.85** | 9 | <.0001 | 54.76** | 6.62 | <.0001 | 71.70** | 18.55 | <.0001 |
| Genotype x Year | 26 | 0.09 | 1 | 0.46 | 11.71 | 1.41 | 0.09 | 6.87 | 1.78 | 0.01 |
| Genotype x location | 26 | 0.12 | 1.29 | 0.17 | 8.42 | 1.02 | 0.45 | 2.75 | 0.71 | 0.84 |
| Genotype x Location x Year | 52 | 0.08 | 0.9 | 0.68 | 9.59 | 1.16 | 0.23 | 2.91 | 0.75 | 0.89 |
| Error | 230 | 0.09 | | | 8.27 | | | 3.87 | | |
| CV (%) | | 7.79 | | | 9.63 | | | 7.12 | | |

Note: ** and ** showing significance at 5% and 1% levels, respectively and CV (%) = Coefficient of variation.*

**Fiber finesses**

The data indicated that statistically at par maximum Micronaire (coarser fiber) was found for genotypes Stam 59 A, Deltapine-90, Ionia, Arba X GL-7 F5#1-2/3, Arba X Cucurova 1518 F5#1-4/3, Arba X Cucurova 1518 F5#1-3/3, Del Cero X Cucurova 1518 F5#1-3 and Guru F5#1-2 at Werer, Sille and Weyto (Table 3). Statistically similar minimum Micronaire (finer fiber) were found for twelve genotypes at Sille. Statistically similar thickest fibers were recorded for the genotypes Stam 59 A, Deltapine-90, Arba X GL-7 F5#1-2/3, Arba X Cucurova 1518 F5#1-4/3, Arba X Cucurova 1518 F5#1-3/3, Del Cero X Cucurova 1518 F5#1-3, Guru F5#1-2. On the other hand, the thinnest fibers that were in statistical parity were recorded for the genotypes Polaris F5#3-2-2 and Indam 206 F5#6-1-1. The fiber thicknesses of all the genotypes lay in the intermediate range of these two extreme groups in terms of fiber thickness. For example, the Polaris F5#3-2-2 and Indam 206 F5#6-1-1exceeded the fiber thicknesses of best performed check variety (Deltapine-90) by about 8.9% (Table 3).

The difference in fiber finesses might be due to the difference in genetic makeup of the genotypes and environmental factors in the study area. These results are in agreement with those of Premalatha *et al.* (2020) who reported that fiber finesses is affected by the genetic makeup of genotypes. These results are also supported by Hafiz *et al.* (2014) and Nazir *et al.* (2020) who reported that fiber fineness varies significantly because of varieties but the results are not supported by the findings of Nikhil *et al.* (2018) who reported that cotton genotypes did not differ significantly for fiber finesses.

**Fiber length**

Staple length is one of major fiber quality traits. The longest and statistically at par fiber length was recorded for genotypes Ionia, Indam 206 F5#6-1-1 and Polaris F5#3-2-2 at Werer, Weyto and Sille, and for variety Stam 59 A at Werer (Table 3). Cotton genotypes Stam 59A X ICA 01 bulk, Indam 2194 F5#2-1-2, Guru F5#1-2, Del Cero X GL-7 F5#1-4-1, and Arba X Cucurova 1518 F5#1-3/3 exhibited statistically similar lowest fiber length at Sille and Weto. Overall mean values of fiber length revealed that the check variety Stam 59 A produced the longest fiber followed by Polaris F5#3-2-2, Indam 206 F5#6-1-1 and Ionia and the shortest fiber was recorded for Stam 59A X ICA 01 bulk cotton genotype, whicwas found statistically at par with eight genotypes (Table 4).

The variation in genotypes for staple length might be due to genotypic differences. These results are in contrast to those of Nikhil *et al.* (2018) and Esmail et al.(2019) who reported that staple length showed non-significant differences among the different varieties whilst the above findings are well supported by Koli *et al.* (2014), Hafiz *et al.* (2014) and Shah *et al.* (2014) who reported that the staple length showed significant differences due to variation among different varieties. Premalatha *et al.* (2020) showed a close correspondence between PCV and GCV that indicates less environmental influence over the expression of fiber length.

**Fiber strength**

The data indicated that a statistically similar maximum fiber strength was found for varieties Ionia and Stam 59 A at all locations, while the minimum and statistically at par fiber strengths were found for genotypes Stam 59A X ICA 01 bulk, Indam 2194 F5#2-1-2 ,Del Cero X GL-7 F5#1-4-1 and Deltapine-90 at Werer, Weyto and Sille (Table 3). Overall fiber strengths ranged from 25.57 g $tex^{-1}$ to 30.98 g $tex^{-1}$ among cotton genotypes. The check variety Ionia exhibited the strongest fiber strength followed by genotypes Stam 59 A and Arba X GL-7 F5#1-2/3. However, Indam 2194 F5#2-1-2 genotype exhibited the minimum fiber strength, which was in statistical parity with the fiber lengths of Stam 59A X ICA 01 bulk, Del Cero X GL-7 F5#1-4-1 and Deltapine-90 genotypes (Table 4). The differences among the genotypes for fiber strength might have been due to the difference in genetic potential of the genotypes. Several authors (Nikhil et al. 2018; Hafiz et al., 2014; Koli *et al.,* 2014; Premalatha *et al.,* 2020 and Nazir *et al.* 2020) also reported significant differences among varieties for fiber strength. Huseyin *et al.* (2017) reported significant differences for fiber strength among inter- and intraspecific cotton populations.

Table 3. Mean performances of cotton genotypes for fiber fineness, fiber length, and fiber strength for each location.

| Treatment | Fiber fineness (μg/inch) | | | Fiber length (mm) | | | Fiber strength (g tex$^{-1}$) | | |
|---|---|---|---|---|---|---|---|---|---|
| | Werer | Sille | Weyto | Werer | Sille | Weyto | Werer | Sille | Weyto |
| Stam 59A X ICA 01 bulk | 4.07$^{b}$ | 3.65$^{abc}$ | 4.13$^{ab}$ | 28.82$^{b}$ | 27.13$^{e}$ | 28.32$^{g}$ | 26.99$^{def}$ | 23.77$^{g}$ | 26.21$^{ef}$ |
| Indam 2194 F5#2-1-2 | 4.02$^{b}$ | 3.43$^{bc}$ | 4.03$^{abcd}$ | 28.44$^{b}$ | 27.49$^{e}$ | 29.06$^{efg}$ | 25.85$^{f}$ | 24.18$^{fg}$ | 26.69$^{def}$ |
| Sanju F5#9-2-1 | 4.04$^{b}$ | 3.72$^{abc}$ | 3.8$^{cde}$ | 30.7$^{b}$ | 28.96$^{c}$ | 30.74$^{cd}$ | 28.76$^{bcd}$ | 27.11$^{bcde}$ | 28.58$^{bc}$ |
| Indam 206 F5#6-1-1 | 3.72$^{c}$ | 3.35$^{c}$ | 3.71$^{e}$ | 32.49$^{ab}$ | 30.44$^{ab}$ | 32.48$^{a}$ | 29.39$^{bc}$ | 27.19$^{bcde}$ | 28.3$^{dc}$ |
| Guru F5#1-2 | 4.29$^{ab}$ | 3.85$^{a}$ | 4.2$^{ab}$ | 28.45$^{b}$ | 27.67$^{de}$ | 28.4$^{g}$ | 27.2$^{def}$ | 26.1$^{def}$ | 27.7$^{dce}$ |
| Polaris F5#3-2-2 | 3.66$^{c}$ | 3.37$^{c}$ | 3.74$^{de}$ | 32.75$^{ab}$ | 30.71$^{a}$ | 32.15$^{ab}$ | 29.47$^{bc}$ | 27.53$^{bcd}$ | 28.43$^{bcd}$ |
| Del Cero X Cucurova 1518 F5#1-3 | 4.29$^{ab}$ | 3.53$^{abc}$ | 4.28$^{ab}$ | 29.82$^{b}$ | 28.79$^{cd}$ | 28.94$^{efg}$ | 28.08$^{bcde}$ | 26.77$^{cde}$ | 26.73$^{def}$ |
| Del Cero X GL-7 F5#1-4-1 | 4.16$^{ab}$ | 3.47$^{bc}$ | 3.99$^{bcde}$ | 29.69$^{b}$ | 27.64$^{de}$ | 28.73$^{fg}$ | 26.79$^{def}$ | 24.98$^{efg}$ | 25.24$^{f}$ |
| Arba X Cucurova 1518 F5#1-3/3 | 4.29$^{ab}$ | 3.55$^{abc}$ | 4.21$^{ab}$ | 30.07$^{b}$ | 28.23$^{cde}$ | 29.94$^{efg}$ | 28.41$^{bcde}$ | 26.01$^{defg}$ | 28.46$^{bcd}$ |
| Arba X Cucurova 1518 F5#1-4/3 | 4.41$^{a}$ | 3.62$^{abc}$ | 4.25$^{ab}$ | 29.19$^{b}$ | 29.34$^{bc}$ | 29.82$^{def}$ | 27.7$^{cdef}$ | 26.7$^{cde}$ | 26.72$^{def}$ |
| Arba X GL-7 F5#1-2/3 | 4.18$^{ab}$ | 3.78$^{ab}$ | 4.15$^{ab}$ | 30.11$^{b}$ | 29.26$^{bc}$ | 30.28$^{de}$ | 29.31$^{bc}$ | 28.63$^{abc}$ | 28.9$^{bc}$ |
| Ionia | 4.12$^{ab}$ | 3.53$^{abc}$ | 4.1$^{abc}$ | 31.73$^{ab}$ | 30.34$^{ab}$ | 31.95$^{abc}$ | 31.73$^{a}$ | 30.14$^{a}$ | 31.17$^{a}$ |
| Deltapine-90 | 4.41$^{a}$ | 3.63$^{abc}$ | 4.16$^{ab}$ | 29.89$^{b}$ | 28.33$^{cde}$ | 30.14$^{de}$ | 26.41$^{ef}$ | 25.32$^{defg}$ | 26.34$^{ef}$ |
| Stam 59 A | 4.42$^{a}$ | 3.64$^{abc}$ | 4.36$^{a}$ | 36.54$^{a}$ | 29.23$^{bc}$ | 30.97$^{bcd}$ | 29.96$^{ab}$ | 29.13$^{ab}$ | 30.17$^{ab}$ |
| Mean | 4.15 | 3.58 | 4.08 | 30.65 | 28.83 | 30.14 | 28.29 | 26.68 | 27.83 |
| CV (%) | 6.97 | 9.16 | 7.36 | 15.28 | 4.12 | 4.26 | 6.6 | 8.15 | 6.19 |
| LSD (5%) | 0.23 | 0.31 | 0.28 | 4.47 | 1.12 | 1.2 | 1.78 | 2.04 | 1.62 |

Table 4. Mean performances of cotton genotypes for fiber fineness, fiber length and fiber strength.

| Genotype | Fiber fineness (μg inch$^{-1}$) | Fiber length (mm) | Fiber strength (g tex$^{-1}$) |
|---|---|---|---|
| Stam 59A X ICA 01 bulk | 3.95$^{bcde}$ | 28.09$^{d}$ | 25.66$^{h}$ |
| Indam 2194 F5#2-1-2 | 3.82$^{e}$ | 28.32$^{d}$ | 25.56$^{h}$ |
| Sanju F5#9-2-1 | 3.85$^{de}$ | 30.13$^{bc}$ | 28.15$^{cdef}$ |
| Indam 206 F5#6-1-1 | 3.59$^{f}$ | 31.81$^{a}$ | 28.29$^{cde}$ |
| Guru F5#1-2 | 4.11$^{ab}$ | 28.16$^{d}$ | 26.99$^{fg}$ |
| Polaris F5#3-2-2 | 3.59$^{f}$ | 31.87$^{a}$ | 28.48$^{cd}$ |
| Del Cero X Cucurova 1518 F5#1-3 | 4.04$^{abcd}$ | 29.18$^{cd}$ | 27.19$^{ef}$ |
| Del Cero X GL-7 F5#1-4-1 | 3.87$^{de}$ | 28.69$^{cd}$ | 25.67$^{h}$ |
| Arba X Cucurova 1518 F5#1-3/3 | 4.01$^{abcd}$ | 29.39$^{cd}$ | 27.6$^{def}$ |
| Arba X Cucurova 1518 F5#1-4/3 | 4.09$^{abc}$ | 29.45$^{cd}$ | 27.04$^{fg}$ |
| Arba X GL-7 F5#1-2/3 | 4.04$^{abcd}$ | 29.89$^{bcd}$ | 28.95$^{bc}$ |
| Ionia | 3.91$^{cde}$ | 31.32$^{ab}$ | 30.98$^{a}$ |
| Deltapine-90 | 4.07$^{abc}$ | 29.45$^{cd}$ | 26.03$^{gh}$ |
| Stam 59 A | 4.14$^{a}$ | 32.25$^{a}$ | 29.75$^{b}$ |
| Mean | 3.93 | 29.86 | 27.59 |
| CV (%) | 7.79 | 9.63 | 7.12 |
| LSD (5%) | 0.17 | 1.55 | 1.06 |

## 4. Conclusion

The results of this study have demonstrated that significant variations were observed among the cotton genotypes and locations for the important fiber quality traits. Genotypes Polaris F5#3-2-2 and Indam 206 F5#6-1-1 had better fiber quality than the other genotypes in form of fiber fineness (3.59 μg inch$^{-1}$) (3.59 μg inch$^{-1}$), fiber length (31.87mm) (31.81mm) and fiber strength (28.48 g tex$^{-1}$) (28.29 g tex$^{-1}$), respectively. However, the values of fiber lengths and fiber strengths of genotypes Polaris F5#3-2-2 and Indam 206 F5#6-1-1 were lower than the fiber lengths and fiber strengths of the best performing check varieties. Based on these results, it is recommended that the cotton genotypes Polaris F5#3-2-2 and Indam 206 F5#6-1-1 can be released for cultivation for producing improved quality garments by textile industries in the country. This study is helpful for the future researchers working on the improvement of cotton for fiber quality. However, not all fiber quality traits were included in the study since this study focused only on the major fiber quality variables. Researching on additional fiber quality variables, namely, length uniformity, color grade, trash, and leaf grade can give additional picture of the performance of cotton genotypes for fiber quality traits.

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