SUMMARY

5. SUMMARY

Cotton is classed essentially to determine its grade, which reflects largely the spinning performance and yarn quality, hence the market value of cotton. Determination of cotton grade is usually dependent on the personal judgment of some factors such as color, foreign matter, bloom, and luster and stained or damaged cotton lint. The grade is therefore a subjective measure with inconsistencies inherent in subjective measurements. A definite step forward would be the assessment of grade on the basis of objective tests of its elements. Physical properties of cotton fibers vary considerably depending on the variety, environmental conditions and preparatory treatments such as harvesting and ginning.

This investigation was carried out to put the cotton grades of Egyptian cottons together with their fiber and yarn properties and ginning out-turn in the picture to elucidate some of the many aspects involved in controversy of cotton grading and accordingly may be helpful in suggesting achieving accurate criteria of cotton grades and fiber quality of cotton varieties.

The materials used in this study comprised nine commercial varieties from 2004 and 2005 seasons; three of these varieties, belong to the extra- long staple category, i.e., Giza 45, Giza 70 and Giza 88 and the other six belong to the long staple class, i.e., Giza 85, Giza 86, Giza 89, Giza 83 and Giza 90.

Every variety was represented by five seed cotton grades; these were Fully Good (FG), Good (G), Fully Good Fair (FGF),

Good Fair (GF) and Fully Fair (FF). Thus, a total of 90 entries were available for this study. After ginning, turn out characters, i.e., seed index (SI) and ginning out-turn (GOT) were measured, lint index (LI) was derived from them.

Estimated fiber properties included; the trash content (TC), color (Rd %), micronaire value (MIC), fiber length expressed as upper half mean (UHM), length uniformity index (UI %), fiber strength (FS) at 1/8 inch gauge and fiber elongation percentage (FE %). All of these characters were measured by HVI-900 (High Volume Instrument) according to ASTM-Designations. Grade factor (Gr. F) and fiber quality index (FQI) were derived as follows;

$$Gr.F = MIC * Rd\% / TC$$

$$FQI = UHM * FS / MIC$$

Cotton sub samples were spun into 60_s carded yarn using a twist factor of 3.6, yarn strength expressed as single yarn strength (YS), yarn elongation percentage (YE%), yarn unevenness (CV%) and nippiness (neps) were measured also according to ASTM- Designations.

From 2006 season, seven lint cotton grades namely FG, G/FG, G, FGF/G, FGF, GF/FGF and GF representing Giza 45, Giza 70, Giza 85, Giza 86, Giza 80 and Giza 90 varieties, were used in a separate run to determine micronaire value, then these samples were cleaned and their micronaire values were measured again.

Data obtained were analyzed using COSTAT Statistical Program. For each variety, simple correlation coefficient among all possible pairs were computed and multiple regression

analysis to display the relative contribution of the most important characters of fiber to variation in yarn quality properties was performed. For the 90 observations, multiple correlations and stepwise regression analysis were used to verify the two equations of Gr.F and FQI.

The results obtained could be summarized in the following points:

1-Lint cotton grade characters, i.e., trash content, reflectance percent and micronaire value differed from one variety to another within the same grade and from one lint grade to another, whereas, yellowness degree (+b) differed insignificantly. These characters, except, +b correlated highly with lint grade.

2-The grade factor (Gr.F) of the same grade among varieties was highly different. The differences in Gr.F between the high grade FG and the low grade were very large.

3-Because of trash content, micronaire value, reflectance percent and grade factor were not independent in their relation to lint grade, correlations among these characters were highly significant.

4-For each variety, trash content, reflectance percent and micronaire value jointly contributed high R^2 percentage that in some varieties accounted for more than 92% of the variation of Gr.F. According to computed F value, trash content ranked first followed by micronaire value and reflectance percent. Whereas, for the 90 observations, the overall contribution of TC, Rd% and MIC equals 49 %.

Micronaire value ranked first in contribution to Gr.F variation followed by Rd % and TC.

5-Cotton grades resulted in high significant differences in fiber length (UHM), length uniformity (UI %) and fiber strength (FS) and fiber elongation (FE %) among varieties and lint grades. The first three parameters correlated high significantly with lint grade, whereas, the later one (FE %) correlated significantly. According to this relation with lint grade, the correlations among these parameters were highly significant.

6-Fiber quality index (FQI) showed significant differences among cotton varieties; whereas, the differences among lint grades were insignificant. Extra-long staple varieties exhibited higher values of FQI than the long staple varieties. FQI loses its sensitivity in judging fiber quality for lint grades higher than FG grade.

7-For each variety, micronaire value fiber length and fiber strength altogether contributed highly to variation of FQI R^2 percentages that in some varieties reached more than 90%. According to computed F value, micronaire value ranked first followed by fiber strength and fiber length. Therefore, for the 90 observations, the overall contribution of MIC, FS and UHM equals 92.4%.

8-Pronounced relation of grade properties and fiber quality properties with lint cotton grade existed, whereas, fiber quality index in several aspects correlated insignificantly with trash content, reflectance percentage and micronaire value. As a result of the deviations of Gr.F and FQI

especially, from the high grade FG to low grades, the assumed pronounced tendency of Gr. F and FQI did not obvious.

9-The fiber quality index values differed from one season to another within each variety and from one variety to another. FQI did not exhibit neither increase nor decrease across the seasons expect for G86 that shows slight differences.

10-Ginning out-turn (GOT) and its components, i.e., seed index (SI), and lint index (LI) differed significantly among and within cotton varieties. In some varieties, a low grade had GOT value higher than a high grade; the same trend obtained of SI in other varieties. Lint index was highly correlated with lint grade followed by seed index and ginning out-turn which was in some cases insignificantly correlated (Giza 90 at 2004 season).

11-Yarn quality properties i.e. yarn strength (YS), yarn unevenness (CV %) and nep count (neps) differed significantly among and within cotton varieties, On the other hand, yarn elongation (YE %) was insignificantly different. The correlations of lint grade with YS, CV% and neps were significant, whereas, these with YE% show indefinite trend. Accordingly, obtained significant correlation among, yarn strength, unevenness and neppiness.

12-YS, CV% and neps were significantly correlated with lint grade characters, i.e., trash content, reflectance percent and micronaire value; And also with fiber quality properties,

i.e., fiber strength, fiber, length, and length uniformity. On the other hand, fiber quality index exhibit insignificant correlations except, for Giza 83 in 2004 season significant, correlation was detected.

13-According to the stepwise regression equations, UHM, UI%, FS, and MIC jointly contributed high to the variation of yarn strength, unevenness and neppinness. According to F values, most effect of the variation of yarn strength, unevenness and neppinnes came from fiber strength, micronaire value and uniformity index, respectively. Whereas, for each variety, fiber length exhibited the most of the effect of the variation of YS, CV% and neps.

14-Micronaire value decreased progressively by cleaning cotton. In low grades large reduction in the values of Micronaire occurred after cleaning, on the other hand, reductions in high grades were very slight.