MULTI-DISCIPLINARY APPROACH TO STUDY COTTON FIBER QUALITY VARIABLITY WITHIN A PLANT

Neha Kothari
Noureddine Abidi
Eric F. Hequet
International Textile Center and Dept. Plant & Soil Science, Texas Tech University
Lubbock, TX
Thea Wilkins
Dept. Plant & Soil Science, Texas Tech University
Lubbock, TX

Abstract

Our primary goal in this research is to study the spatial distribution of fiber quality within a cotton plant. Variability in fiber quality caused by changes in environmental conditions, irrigation facilities, soil pH, harvesting and ginning methods, etc has been well known. Fiber quality variability within the plant is of utmost importance for researchers (such as geneticists and biotechnologists).

The genotype selected in this study was TM-1 (Texas Marker-1), which is wild type upland cotton. Twenty plants were tagged in the field and individual cotton bolls were harvested. Cotton bolls were identified by fructifer branch number and by position within each fructifer branch. These samples were hand-ginned to prevent excessive fiber breakage caused by machine ginning. Fiber testing was carried out in two stages, namely physical analysis and structural analysis. Physical analysis of fibers was done using the Advanced Fiber Information System (AFIS) and Mantis. Pertinent fiber properties such as length, maturity ratio and their distribution, neps and tensile properties of individual fibers were measured using these instruments. Structural analysis of fibers was done using Image analysis of fiber cross-sections, Fourier Transform Infrared Spectroscopy (FTIR) and Thermogravimetric Analysis (TGA).

The results obtained from this research showed that fiber quality varies drastically depending on where the fibers are harvested within the plant. Performed fiber testing suggested that for the TM-1 plants, the quality of the fibers declines from the bottom of the plant to the top. Fiber quality also declines within a fruiting branch as we move from the first fruiting position to the last. These results demonstrate that appropriate sampling protocols need to be developed for single plant testing (cotton breeding for example). Based on the results obtained from this study, we have proposed a sampling protocol that may be helpful in reducing the effects of variability of fiber quality.