FIAS LONGITUDINAL MEASUREMENTS MODIFIED - MORE ACCURATE COTTON FIBER MATURITY

Patricia D. Bel
Southern Regional Research Center,ARS, USDA
New Orleans, LA
Bugao Xu
X. Yao
The University of Texas at Austin
Austin, TX

Abstract

A projected 2-D image of a cotton fiber has large variations in fiber width due to the convolutions along the longitudinal axes. The ratio of the maximum width to the minimum width of a fiber ribbon could be used as a maturity indicator. Another important factor related to cotton maturity is fibers translucence. The translucence, as seen with a transmitting light microscope, is dictated by the thickness of the secondary cell wall. This paper will report the new developments of FIAS (Fiber Image Analysis System), which identifies the translucent fibers as immature and then follows the entire skeleton and identifies the whole fiber as immature. In the previous version of FIAS, the dark sections of the fiber were identified as mature (sometimes due to reversals and viewing the fiber's twists on it's side due to the convolutions), but a fiber's maturity is generally consistent through the length of the fiber and the new version now corrects for that.

The maturity data from both versions are compared to the levels of white specks in the dyed fabrics. FIAS has fast sample preparation and data processing and therefore has great potential to be regularly used for cotton maturity, especially for breeding programs.

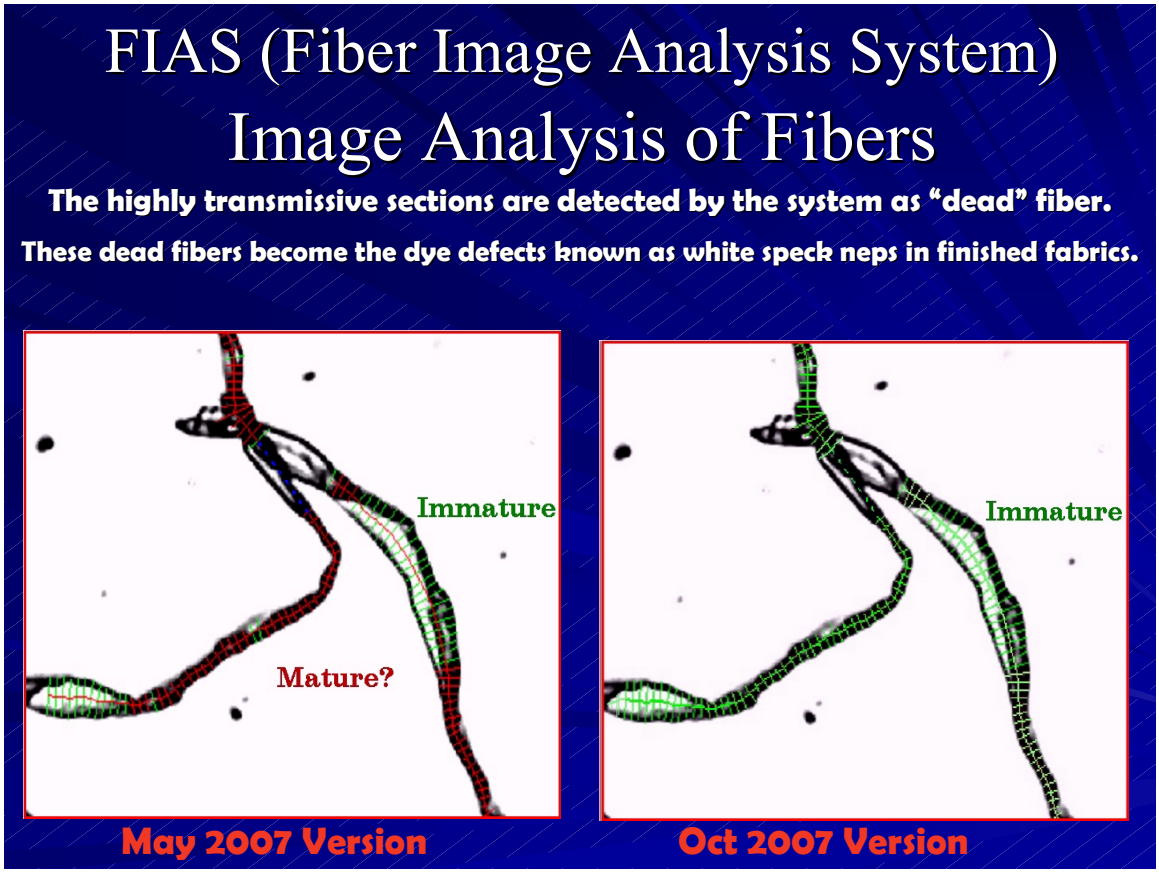

Figure 1. Image analysis of fibers

FIAS – Longitudinal measurements

In the previous version of FIAS (April 2006 & May 2007), the dark sections of the fiber were identified as mature, but in some cases this was erroneous due to reversals and viewing the fiber's twists on it's side.

The new developments of FIAS (October 2007), identifies the translucent fibers as immature and then follows the entire skeleton and identifies the whole fiber as immature.

Fiber's maturity is generally consistent through the length of the fiber and the new version now corrects for that.

The DA Dead Scan Area (Dead fibers) were much higher for the October 2007 version of FIAS and showed stronger relationships to white specks in the dyed fabrics than the older versions.

DA (Dead Scan Area ratio) by number as calculated by FIAS is a strong predictor of white specks in the finished fabrics with an R^2 of 0.90 (v1-Oct 07) and an R^2 of 0.92 (v3-Oct 07).

FIAS - Cross-Sections

Micronaire is the single strongest predictor of white specks in the finished fabrics with an $R^2$of 0.859.

Advantage of Longitudinal measurements over Cross-sections

Fast sample preparation and data processing and therefore has great potential to be regularly used for cotton maturity, especially for breeding programs.

Data is less biased due to sample preparation leaving the immature fibers in the sample, where combing removes these fibers in cross-section preparation.