EFFECT OF COTTON FIBER MATURITY ON YARN QUALITY

Eric F. Hequet
AgriLife Research and Fiber and Biopolymer Research Institute – Texas Tech University
Lubbock, Texas
Noureddine Abidi
Fiber and Biopolymer Research Institute – Texas Tech University
Lubbock, Texas
Randall Keith Boman
AgriLife Extension
Lubbock, Texas
John Wanjura
USDA-ARS
Lubbock, Texas

Abstract

Global textile mills emphasize those cotton growths with fiber profiles adapted to the ring spinning market (fiber that are long, uniform, mature, fine, strong, and with low contamination levels, such as neps, bark, and seedcoat fragments). Among these fiber properties fiber maturity is paramount because immature fibers are weak. Therefore, they have a higher propensity to break during mechanical handling. Unfortunately, part of the production in the High Plains of Texas cannot always reach an adequate level of fiber maturity. This may translate into higher than desired short fiber content and neps. For example, for the Lubbock classing office, the percentages of bales having a micronaire of 3.4 or below were 7.9%, 35.8%, 34.0%, 34.9%, 12.2%, 40.2%, 36.8%, and 11.7% respectively for the years 2003 through 2010. Our hypothesis is that picker harvesting could at least partly alleviate this problem.

To study this hypothesis, a total of eight tests were performed (3 locations in 2008-09, 1 location in 2009-10, and 4 locations in 2010-11). For each location, one module was harvested with a stripper equipped with a field cleaner, and one module was harvested with a picker. This was replicated 4 times at each location, totaling 64 modules (8 locations * 2 treatments * 4 replications). Industrial ginning was performed on each module. Picked cotton was ginned with a typical picker sequence and stripped cotton with a typical stripper sequence. One bale from each module was purchased.

From each bale, after fiber testing (High Volume Instrument and Advanced Fiber Information System), ring spun yarn was produced (30Ne, carded and combed, conventional and compact ring spinning) and the yarn tested.

Results from 2008-09 and 2009-10 for the carded ring spun yarn are summarized below (only statistically significant differences are reported):

Picker harvested cottons have on average better HVI fiber properties:

- Micronaire : +0.27 (+8.1%)*
- Upper Half Mean Length : +0.01 inch (+1.0%)
- Uniformity Index : +0.6 % (+0.8%)
- Reflectance : 1.3 % (+1.6%)
- Yellowness : -0.3 (-3.3%)

Picker harvested cottons have on average better AFIS fiber properties:

- Neps : -183 count/g (-35.4%)
- Upper Quartile Length : +0.01 inch (+1.1%)
- Mean Length by number : +0.04 inch (+5.5%)
- Mean Length by number CV : -3.7 % (-6.3%)
- Short Fiber Content by number : -3.9% (-11.7%)
- Visible Foreign Matter : -1.3% (-40.3%)
- Fineness : +4 mtex (+2.8%)
- Immature Fiber Content : -1.1 % (-10.9%)
- Maturity Ratio : +0.01 (+1.7%)

Picker harvested cottons have on average better yarn quality:

- CVm : -0.62 % (-3.9%)
- Thin places : -6 count/km (-34.8%)
- Thick places : -78 count/km (-30.2%)
- Neps 200% : - 175 count/km (-37.2%)
- Total Imperfections : -259 count/km (-34.7%)
- Hairiness : -0.24 (-4.5%)

*Number in parenthesis is: 100 x (Picker-Stripper)/Stripper

In conclusion, for low micronaire cottons, picker harvesting is clearly beneficial. It translates into better fiber quality, but more importantly into better yarn quality for all evenness related parameters. This year, micronaire readings are much better ((≥ 4.0) than in previous years. Spinning tests will be performed in early 2011.

Acknowledgements

The authors would like to thank Cotton Incorporated, the Texas Department of Agriculture, Food and Fibers Research Grant Program, and the International Cotton research Center for providing financial support for this project.