



Getting Cotton Moisture Just Right for Processing

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Cotton is the world's most widely used textile fiber, with U.S. growers providing 20 percent of the world's output.

Maintaining proper moisture in cotton bales is critical for successful textile processing. Too little moisture and the cotton is susceptible to damage. Too much moisture makes cotton stick to machinery components. So investigators in ARS' Cotton Quality Research Unit in Clemson, South Carolina, are working to make it easier to regulate the amount of moisture throughout processing.

The scientists, led by textile technologist David D. McAlister, used various methods to condition samples taken from a bale of cotton. Some were left in ambient room conditions, and others were sprayed with water—both with and without a wetting agent to improve water absorption. Then, the team measured fiber properties and yarn tensile strength of each sample to see which moisture level most improved cotton fiber processability.

They found that a spray of 4 percent water plus 2 percent wetting agent—a total of 6 percent added bale weight—best maintained fiber and yarn strength.

The research is now part of a 3-year cooperative research and development agreement with Cotton Conditioners, Inc. (CCI), of Knoxville, Tennessee, to see how this approach works in a real-world setting. Together, ARS and CCI will develop, evaluate, and commercialize an effective automated system to measure and adjust moisture content of cotton during processing in textile mills.

At the mill, cotton bales are typically opened and allowed to condition, or rest, for at least 24 hours. This allows them to “bloom” as they reach moisture equilibrium with their surroundings. But in this age of just-in-time manufacturing, it's no longer practical to do this. Plus, moisture levels aren't monitored during this conditioning time.

In McAlister's unit, researchers monitored 250 cotton bales being prepared for cotton mills. Bales arriving from the gin contained from 2.3 percent to 8.2 percent moisture. Those already at 8.0 percent—the recognized commercial ideal—went straight to processing.

When bales that were low in moisture were boosted to a moisture content of at least 6.5 percent, processing and fiber and yarn quality improved. Bales

processed with less moisture yielded inferior yarn.

In the future, many gins will have automated moisture-control technology so bales will emerge from the gin with a prescribed amount of moisture. ARS researchers at Clemson and at the Cotton Ginning Research Unit in Stoneville, Mississippi, are working together to determine the optimum moisture level for storage. If it's found to be the same as for initial processing at the mill, then bales may need to be hydrated only once—at the gin. In the meantime, moisture control during bale opening at the mill may provide a rapid, practical solution to the industry's cotton bale conditioning problem.—By **Jennifer Arnold**, formerly with ARS.

This work is part of Crop Quality and Utilization of Agricultural Products, an ARS National Program (#306) described on the World Wide Web at <http://nps.ars.usda.gov>.

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