Implications of Surface Chemistry on Cotton Fiber Processing

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Increasing speeds of cotton yarn production in the textile mill have made it necessary to development complementary methods to traditional measurements of physical fiber properties, such as length and strength, as predictors of yarn spinning efficiency. With the goal of investigating possible complementary measures to address this problem, this research attempts to quantify the pectin, wax, glucose, and surface electrolyte components of the cotton fiber in order to develop a chemistry-based methodology to elucidate currently unknown factors involved in yarn spinning efficiency. The amount of each component was measured for 21 cotton samples, and the results are correlated with micronaire-normalized frictional measurements based on draft force and fiber-to-fiber friction. Results indicate that inter-fiber friction decreases primarily as a function of increasing pectin and soluble salt components on the cotton fiber surface. Variations in wax content do not appear to significantly affect inter-fiber friction relative to the effects produced by variations in pectin and salt content. These are important observations not only from the standpoint of being able to set fiber processing equipment parameters based on chemical measurements, but it also raises the possibility of breeding cotton to produce desirable spinning characteristics based on the level of surface chemical components developed during the fiber growth period. This research provides results on samples from the first year (crop year 2001) of a 5-year, leading commercial cultivars study performed by ARS. Further information obtained in subsequent crop years will be used to expand the current database.

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