GROUP BEHAVIOR OF COTTON FIBER DURING ELONGATION PROVIDES NEW PERSPECTIVES ON POSSIBLE MECHANISMS OF CONTROL OF FIBER QUALITY

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Abstract

Novel applications of imaging technologies to cotton fiber (*Gossypium hirsutum*) have allowed us to see that, after the well-known event of initiation by bulging of single epidermal cells, the fiber undergoes most of its elongation as part of large, coherent bundles created through unification of the primary walls of adjacent fibers. Our evidence suggests that, during early elongation, the fiber bundles form by a fiber tip-mediated mechanism, and then they adopt orderly packing patterns around each seed. Particular cell wall polymers at the interface between two fibers mediate the unification of adjacent fiber walls. This new understanding of elongation was achieved through: (a) observation of fast-frozen cotton fiber *in situ* within the boll using a cryo field emission scanning electron microscope; (b) novel modification of paraffin histological methods to protect native fiber packing patterns around each seed; and (c) transmission electron microscopy along with specific labeling of cell wall polymer epitopes. Strikingly beautiful images of cotton fiber in its near-native state will be presented. The relationship of these findings to prior data of others and possible implications for control of cotton fiber quality will be discussed. This research was supported by Cotton Incorporated, Cary, NC; Dept. of Crop Science and the Center for Electron Microscopy, North Carolina State University; and the Imaging Center, Dept. of Biological Sciences, Texas Tech University.