Temporal control of early fiber morphogenesis in *Gossypium hirsutum* cotton

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Abstract

Cotton fibers are single-celled extensions of the cotton ovule epidermis that initiate on the day of anthesis, or flowering. The control of cellular morphogenesis, including polar elongation and diameter, underlies the development of the fiber quality traits that are important to the textile industry. Although elongation continues for about 21 days in commonly grown *Gossypium hirsutum*, our unpublished work shows that fiber diameter is set within the first two days post anthesis (DPA) with substantial control occurring near the fiber tip. Furthermore, two distinct fiber tip types form--*hemisphere*, which is rounded and blunt, and *tapered*, which is pointed and more narrow. Given that narrow fibers support the production of stronger, silkier, textiles, we want to understand how the *tapered* tip type is controlled, focusing on the cytoskeletal microtubules. We applied a microtubule inhibitor, colchicine, or a microtubule stabilizer, paclitaxel, to cultures of cotton ovules generated at 10 am, 2 pm, and 6 pm on 0 DPA or 1 DPA. Only bolls of flowers that had opened by 9 am were used for ovule dissection in order to allow interpretation of the experiments in terms of‘ hours post anthesis (HPA) at the time of treatment, with 8 am as the estimated time of anthesis. Fiber tip morphology was evaluated at the starting times (2, 6, 10, 26, 30, and 34 HPA) and 48 hours later on 2 DPA or 3 DPA. The results provide evidence about a critical microtubule-dependent time for establishing the variable fiber diameters and, conversely, for a critical time after which microtubules are not essential for continued polar elongation of young cotton fibers. We thank: Cotton Incorporated, Cary, NC for research support and Ben Graham for teaching techniques.