COTTON FIBER CELL DEVELOPMENT: COMPARISON OF PROTEIN PROFILES FROM FIELD AND CULTURE GROWN OVULES

Rickie B. Turley
USDA, ARS, CP&G
Stoneville, MS

Abstract

The use of ovule culture to study fiber in upland cotton (*Gossypium hirsutum* L.) has been a valuable tool in delineating the temporal progression of fiber initiation and development. The use of ovule culture as a model system for fiber development, however, is problematic. In culture, fiber development is accelerated while the fiber usually obtains only ½ the length and approximately 1/4 the bundle strength as their field-grown counterparts. A comparison of field- and culture-grown ovules (6 days postanthesis) was made using 2-D PAGE. Two lines of cotton, DPL 5690 (fiber producing) and SL 1-7-1 (fiberless) were used in these experiments. Seven protein differences were observed between field- and culture-grown ovules. Four of the differences occurred as the culture-grown ovules accumulated small molecular weight proteins, i.e., 14.9, 16.0, 17.3, and 18.6 kDa (pI's 5.40, 4.82, 5.32, and 4.69, respectively). These proteins were barely visible in the 2-D PAGE of field-grown ovules but increased, in most cases, over 10-fold in the culture-grown ovules. The effects of fusicoccin (1.47 μ*M*) and okadaic acid (59 n*M*) on ovules grown in culture was also examined. Fusicoccin, a diterpene glucoside, has been reported to stimulate cell elongation, increase K^+-uptake, and increase the acidification of cytoplasm in plant cells. In ovule culture, fusicoccin inhibited fiber production in DPL 5690. Fusicoccin also affected the growth and expansion of ovules differently, with the the SL 1-7-1 ovules becoming greatly enlarged. The ovules from DPL 5690 grew similarly to ovules from the control cultures. Okadaic acid is a potent inhibitor of phosphatase 1 and phosphatase 2A, and had only minor effects on fiber development. The protein changes, along with fiber length and dry weight data indicate fusicoccin and okadaic acid affect these varieties differently - which may be a key to understanding the chemistry involved in fiber development.

Reprinted from the *Proceedings of the Beltwide Cotton Conference*
Volume 2:1462-1462 (1998)
National Cotton Council, Memphis TN