BNL-83319-2000

CRADA No. BNL-C-97-10 between BNL and Cotton, Inc.

FINAL ABSTRACT AND FINAL REPORT

ABSTRACT

The objectives of this work were to determine if the number of fiber cell initials varied genetically and to compare the number of initials with that of mature fibers obtained at harvest time. The method used to count the number of fiber cell initials is direct, simple, quick and done while the plant is growing. In contrast, the currently used commercial process is indirect and needs large amount mature fibers gathered at harvest time. However, all current work on cotton yield is based on fiber numbers obtained by the indirect commercial process. Consequently, it was necessary to compare results obtained from the two methods using the same plants as the source of material. The results show that the number of fiber initials per ovule differed significantly ($P>0.05$) for seven cultivars in 1995 and 1996. Also, a 1997 study shows the number of fiber initials varied by 15% over boll positions and environments, with rankings among cultivars generally consistent across boll positions and sampling times. Finally, although there were differences among cultivars for initial fiber cell number, all cultivars had nearly the same number of mature lint fibers per seed. This last finding is significant. It indicates that the rate of fiber cell initiation varies among cultivars; the lower the rate, the greater the difference between the number of initials and the number of mature fiber cells. If the rate of fiber initiation is relatively high, the number of initials and mature fibers differs by about 11%; if it is low, the difference is as high as 31%. Cotton breeders may be able to use genetic differences for the number of fiber initials and/or the rate of fiber cell initiation in crop improvement programs.

SIGNIFICANT ACCOMPLISHMENTS:

1) The finding fiber cell initiation varies among cultivars when plants are grown under field conditions. Hence, the rate of fiber initiation may depend on genetic factors.

2) The number of fiber cell initials varies among cultivars indicating that the number is controlled genetically.

SIGNIFICANT PROBLEMS: Since the means of estimating the number of mature fibers is indirect, the contribution of broken fibers is an important unknown. If 5% are broken, the estimated number of mature fibers is increased 5%.

INDUSTRIAL BENEFITS REALIZED: Provided insight into the dynamics of fiber cell initiation and revealed a biological factor previously unknown

LABORATORY BENEFITS REALIZED: Established a program in cotton cell biology that contributed to the strength of the plant sciences in the Biology Department. Utilized certain unique facilities within the Department (Controlled Environmental Radiation Facility) and yielded patent number 5801151: Estimation of ovular fiber production in cotton.

RECOMMENDED FOLLOW-ON WORK: Test the hypothesis that the rate of fiber cell initiation varies among cotton cultivars grown under identical conditions in the field. This can be done by counting fibers on ovules sampled daily over a span of three to four days. (We know that when grown under optimum conditions in growth chambers most, if not all, fibers initiate growth within a day. We also know that when grown under sub-optimal conditions and additional day is required for fibers to begin growth. Consequently, the rate of fiber cell initiation is responsive to environmental conditions but the degree to which a given cultivar is sensitive to sub-optimal growth conditions is unknown.)

POTENTIAL BENEFITS FROM PURSUING FOLLOW-ON WORK: The more known about fiber cell initiation, the greater the probability of designing experiments to increase fiber yield.

DISCLAIMER