Isolation of Cotton for Seed Increase

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UPLAND cotton (Gossypium hirsutum L.) has complete flowers with many anthers borne on a staminal column adnate to the pistil. The nature of the pollen is such that wind is not an agent in pollen dispersal; therefore any crossing that might occur results from insect activity. The flowers are large and conspicuous and are attractive to insects. Numerous reports in the literature show a wide variation in the extent of crossing occurring in different areas. The differences reported may be presumed to reflect differences in insect population and abundance of cotton in the area, these two factors being interrelated.

The production of seed in areas using more than one variety is complicated by natural crossing, and the handling of several different strains on a breeding farm presents a problem. This paper contains data on the extent of natural crossing occurring in cotton in Oklahoma, and recommendations for the handling of breeding material and for seed production.

REVIEW OF LITERATURE

Many reports of natural crossing in cotton appear in the literature. Only a few authors have made definite recommendations on the distance needed to prevent crossing between different strains. Webber (5) states that 5 to 10 miles isolation would be required to prevent all natural crossing, but that practical isolation could be obtained by isolation distances of ¼ to ½ mile. Collings and Wallace (3) concluded that 40 feet was adequate for isolation. They took seed samples from a field of green leaf cotton grown adjacent to red leaf cotton. While their data support the conclusion reached, the fact that seedling counts were made in a germinator might leave the data open to question. In some red cotton, sun red pigments apparently are important, and these would not be evident in the absence of sunlight.

Pope et al. (4) studied the effectiveness of distance in reducing crossing by planting small blocks of red leaf cotton at distances varying from 700 to 4,200 feet from green leaf cotton and found natural crossing at distances up to 0.8 mile. They state that distances of 1 mile or more would be necessary to prevent crossing under conditions prevailing in their study. They also studied the effectiveness of corn barriers in guarding against crossing. They found less than 1% crossing in rows 2 through 8, and no crossing in rows 9 through 27. They found 14.8% crossing in the row adjacent to a field of red cotton, and 0.6% crossing in the row adjacent to red cotton on row 5, 1.9 on row 10, 0.6 on row 16, and 0.06 on row 114. There were 119 rows in the field. Brown experimented with various levels of hybridization and found that the percentage of hybrids in the second year as a result of the larger planting of red-leaf cotton. These results were from Stoneville, Miss., in 1918 and 1919. Brown noted that positive correlation exists between the percentage of hybrids and stock and rows farther away were studied.

It seems apparent from the above reports that there is a relationship between the distance to which crossing can occur and the intensity of crossing that occurred. Unpublished data compiled by D. M. Simpson (U.S. Cotton Field Station, Tuscaloosa, Ala.) from a regional crossing study indicate that natural crossing throughout the United States Cotton Belt in 1950 was 1.9%. It is estimated that there were certain areas where observed insect visitation was much less frequent. Natural crossing occurring on green plants in a ratio of 1:9 exceeded 40% at Stillwater, Okla., Sacramento, Ariz., (1st picking), and Greenville, Tex. (2nd picking); was between 20% at Sacaton, Ariz. (2nd picking), Athens, Ga., Auburn, Ala., (1st picking), Experiment, Ga., and Tipton, Okla.; and 10% at Stoneville, Miss., Hartselle, S. C., Stoneville, Miss., and Greenville, Tex. (final picking). College Station, Tex. College Station had the highest natural crossing, averaging 6.6% for 1949 and 1950.

EXPERIMENTAL PROCEDURE

In 1951 a test was planted to determine the effect of border rows on contamination from a source of hybrid cotton. A block of De Ridder Red cotton consisting of