Effect of Selecting within Selfed Lines on the Yield and Other Characters of Cotton

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Traditional methods of breeding cotton have been based largely on individual plant selection and plant-to-row-to-field increase of desirable progenies. Such selections have been made within populations already heterozygous or made so by controlled hybridization. Most of the widely grown cotton varieties in the United States have been developed and maintained by individual plant selections within open pollinated populations. Natural cross pollination occurs frequently in cotton, thus, these varieties contain much genetic variability even after many years of development and commercial use. In some breeding projects, emphasis has been placed on selections within self pollinated lines in development and maintenance programs and at least two important commercial varieties (1) (5) are being maintained by selfed line methods.

A common objection to maintenance by selection within selfed lines has been that line breeding narrows the adaptiveness of a variety or strain to a particular locale or environment and, it is reasoned, such cottons perform poorly if subjected to ecological conditions different from those under which the breeding has been done. Some observations have indicated decline in vigor and productivity with prolonged line breeding. Leake and Prasad (9) working with cottons of the Asiatic type obtained evidence that a considerable degree of pollen sterility resulted from self-fertilization repeated through a number of successive generations and concluded that by self-fertilization, some danger is incurred of the loss of vigor and even loss of the race through sterility. Kearney (7), however, found no evidence of deterioration in Pima cotton by selfed line breeding during seven successive generations and assumed that in Pima cotton factors contributing to low fertility had been eliminated during the development of the variety. Brown (2) tested inbred against crossed seed of eight varieties of upland cotton at Baton Rouge, La. He found that the massed inbreds (without selection) produced 9.3% less seed cotton, had 6.2% fewer blooms, and the bolls were 9.3% less in weight than comparative growths from seed.

Harland (4), by selection for a specific index), demonstrated that improvement could be maintained indefinitely, to show whether or not self-fertilization repeated through a number of successive generations. Little experimental data on this subject obtained in studies of cotton at the U. S. Cotton Field Station at Knoxville, Tennessee.

MATERIALS AND METHODS

The planting material used was developed in investigations begun in 1936 and continued until 1945. Selection of 235 seed lots, representing practically all upland varieties being grown at that time, was made by O. A. Pope, Director of the South Carolina Cotton Field Station at Knoxville, Tenn., for the inauguration of a selfed-line breeding project. One hundred and fifty-five additional strains were collected in 1937 and 1938. From the beginning, plants within the progeny rows and selection of the best combinations of desirable properties were selected for continuation more and more as representative of superior progeny on individual plant performance. Although progress was steady, best combinations of desirable properties were selected each year thereafter. Any changes in fiber strength between 1936 and 1942 would be largely fortuitous.

As the breeding project progressed, sibs and remnants continued in each season were held in storage files. Thus, seed propagated by continuous self pollination was available from a large number of varieties. From these reserve seed stocks a selfed strain of each of four varieties to test the effect of prolonged selfing on yield and other properties. The following varieties: Stoneville 3, Stoneville 5, Delfos 719, and Coker 328 were considered to be the best lines after 10 years of selfing and selection. The tests were conducted in separate plots: the 1st, 4th, 7th, and 10th selfed generations of each variety, respectively.