METHODS AND MATERIALS

The variety 'Coker 100A' was chosen as the tester parent. A group of 22 varieties and strains designated as 'parental varieties' were crossed to this tester. Thirteen of these parents were commercial releases from various public and private breeding agencies in the Southeastern and Delta regions of the cotton belt. The remaining parents were noncommercial strains of diverse origins which had been maintained by bulked self-pollinations at the North Carolina Experiment Station for several years. All crossed seed were produced by hand pollination.

In 1959, the first year of yield tests, 9 parental varieties, their topcross hybrids, and entries of the tester parent were evaluated at 3 locations, Lewiston, Rocky Mount, and Salisbury, North Carolina. In 1960 and 1961 these same 9 sets of material as well as an additional 13 sets were grown at Lewiston and Rocky Mount. Three replications were grown for all tests. A split-plot design was used with each parental variety, the tester variety, and the F1 generation of the respective topcross hybrids making up the sub-plots within each plot. A stand of 3 plants per foot of row were produced by hand pollination.

Data were recorded on lint yield, lint percent, and weight per boll from all plots and all tests. A random sample of 25 bolls was harvested from each plot to measure lint percentage and weight per boll. Lint-yield values were calculated by multiplying the total weight of seed cotton per plot by the lint percentage value for that plot. In 1960 fiber samples were taken from 2 replications of each test and analyzed by the U. S. Department of Agriculture Fiber Laboratory at Knoxville, Tenn. to obtain information on fiber quality. Fiber property measurements were as follows:

- Fiber length, U.H.M. (Upper Half Mean)—Length, in inches, of the half of the fibers, by weight, that contains the longer fibers.
- Fiber length, M (Mean)—Average length, in inches, of all fibers longer than ¾ inch.
- Fiber strength, T, units—Strength of a bundle of fibers measured on the Stelometer with 2 jaws yielding the fiber bundle separated by an ¼-inch space. Strength is expressed in terms of grams per gree.
- Fiber elongation, E, units—Percentage elongation at break of the center ¾ inch of the fiber bundle measured for T strength on the Stelometer.
- Fiber fineness, Micronaire—Fineness of the sample measured by the Micronaire and expressed in standard (curved linear scale) Micronaire units.

Data were summarized and analyzed on the basis of 2 groupings of the material. One grouping included the 9 sets of parents and hybrids common to all 7 tests over the 3-year period. The second grouping included the 22 sets tested at 2 locations each in 1960 and 1961. Analyses of variance were made only for lint yield. In the combined analyses each test was treated as an "environment" with no attempt to separate year and location effects as such.

RESULTS

Average Heterosis for Different Traits

Comparisons of average variety and top-cross performance for various yield and fiber quality traits for the two groupings of the material are presented in Tables 1 and 2. The top-cross hybrids on the average had higher lint yields and larger bolls than the parental varieties. In respect to lint percentage and the various fiber properties, however, average top-cross performance was very similar to that of the mean of the mid-parent values. Data from the individual top crosses and their corresponding parents are in close agreement with the overall average results, i.e., top-cross values deviated substantially from their corresponding midparent value only for lint yield and boll size. The