COMBINING ABILITY FOR PLANT SHAPE

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Abstract

A number of successful cultivars have been developed for the Midsouth cotton growing region which have a genotype adapted for the Southwest in the pedigree. Southwest adapted cottons are often characterized as close-fruiting, compact, and highly determinate, whereas Midsouth type cottons are often characterized as larger, less determinate, and less compact than Southwest cottons. With growing interest in narrow-row cotton production in the Midsouth, compact type cottons offer a source of germplasm for use in developing cultivars which may be better adapted to narrow rows than currently available cultivars. Of interest to the cotton breeder, is what can be expected in the offspring in terms of plant structure when these two plant types are hybridized.

An extensive plant mapping study was undertaken to compare the F1 hybrids from crosses of genotypes developed for the Midsouth with genotypes adapted to the Southwest. A half-diallel crossing scheme involving two Southwest genotypes and four Midsouth genotypes was initiated to produce 15 F1 hybrids. The 15 entries were planted in the field in a randomized complete block design with four blocks. A 1 X 1 skip row pattern and thinning reduced individual plant competition. Nodes above white bloom were recorded at four dates during the season, and at the end of the growing season, plant structure variables were recorded and analyzed. Means for ten plants from each plot were evaluated using Griffing's Model I Method 4 combining ability analysis.

Analysis of variance indicated significance for years and a year by entry interaction. Therefore, Griffing's diallel analysis was performed on data from individual years only. In 1991, for each measurement found to be significant, significant general combining ability was observed. For 1991, this included fruiting node height (FNHT), plant height (PLHT), number of monopodia (MB), fruiting node (FN), nodes above white bloom (NAWB), fruiting branch length at nodes 4-6 expressed as a percentage of total branch length (L46), number of fruiting sites on fruiting branches 10-12 (S1012), and the number of bolls on fruiting branches 7-9 (B79). Specific combining ability was observed for B79 in 1991. The significance of measurements and associated combining abilities were less consistent in 1993. General combining ability was found to be significant for FN, SB, NAWB, L13, L1012, L1315, S1315, S1618, and B1315. When sympodial branch length (expressed as a percentage of total branch length) was examined, entries were remarkably proportionate in the distribution of branch length despite significant differences in actual branch length. Specific combining ability was also observed in 1993 for length, sites, and boll measurements. This information should prove useful in developing cottons adapted to narrow rows.

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