Genetic Variances and Combining Ability of Crosses of American Cultivars, Australian Cultivars, and Wild Cottons

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Genes for improved yield and fiber quality are available in Australian cultivars and wild accessions of cotton (*Gossypium hirsutum* L.); however, their combining ability with U.S. cultivars is unknown. We evaluated combining ability and inheritance of yield and fiber traits among nine diverse cotton lines: two cultivars developed in Australia, two experimental lines from wild accessions, and five U.S. cultivars. Parents and F_2's from a half-diallel cross were grown in Leeper silty clay loam and Marietta sandy clay loam in 1999 and 2000. F_2 hybrids had higher lint yield, heavier bolls and longer fibers than parents. Variance components and genetic effects were calculated utilizing an extended additive dominance model with genotype by environment interaction effects using a mixed norm quadratic unbiased estimation analysis. Parents varied in genetic combining ability (GCA). 'Fibermax 832', developed in Australia, was the best in GCA for yield and fiber quality. 'Stoneville 474' was the best in GCA for yield. Experimental line, B 1388, was good in GCA for fiber strength, although other properties suffered. 'Paymaster 1560' exhibited good GCA ability for yield and fiber length. 'Fibermax 975' exhibited good GCA for fiber length. Lint yield, boll size, and fiber elongation had approximately equal additive and dominance genetic effects. Lint percentage and fiber strength exhibited primarily additive genetic effects. Micronaire and length exhibited primarily dominance genetic effects. A significant residual component of the phenotypic variance was present for each trait except lint percentage. The Australian cultivars and wild accessions can combine with cultivars from U.S. breeding programs to provide genes for fiber and/or yield improvement.

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