QTL Analysis of Stomatal Conductance and Relationship to Lint Yield in an Interspecific Cotton

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Extended periods of high temperature can reduce cotton (*Gossypium hirsutum* L. and *G. barbadense* L.) lint yield, even under adequate irrigation. High stomatal conductance may confer some adaptive advantage to genotypes that experience supra-optimum temperatures. The primary objective of this research was to practice divergent selection for stomatal conductance in a segregating population (n = 118 $F_{2.3}$ progenies) derived from the cross NM24016/TM1. Divergent selection for high and low stomatal conductance was practiced in Maricopa, AZ, in 1996. DNA was isolated from all 118 F_2 plants in 1995 and a linkage map produced with 199 random amplified polymorphic (RAPD) and simple sequence repeat (SSR) DNA markers. Genetic analysis of the replicated F_3 families in 1996 at Maricopa permitted identification of quantitative trait loci (QTL) influencing stomatal conductance. Replicated experiments of 20 selected $F_{2.4}$ progeny (10 with high, 10 with low stomatal conductance) were grown in Maricopa and Las Cruces in 1997. The 10 families selected for high stomatal conductance in 1996 averaged 542.6 mmol H_2O m^{-2} s^{-1} at Maricopa in 1997 and were significantly (P = 0.0001) different from the mean of the low families (472 mmol H2O m^{-2} s^{-1}). The two selected groups were not significantly different for stomatal conductance at Las Cruces (P = 0.0631). Lint yield was significantly (P = 0.0027) affected by selection for stomatal conductance in Maricopa. The $F_{3.4}$ family group with high stomatal conductance produced the highest cotton lint yield averaging 1842 g $plot^{-1}$ while the family with low stomatal conductance averaged 1655 g $plot^{-1}$. Two putative QTLs for stomatal conductance were identified on two cotton linkage groups.