

**GENETIC VARIATION FOR STOMATAL
CONDUCTANCE
IN AN INTERSPECIFIC COTTON POPULATION**

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Abstract

Lint yield of cotton, particularly Pima (*Gossypium barbadense*) can be reduced by high temperatures during peak flowering periods in irrigated Southwestern conditions. High stomatal conductance (G_s) may confer adaptive advantage to genotypes that experience supra-optimum temperatures by its association with elevated leaf cooling to reduce canopy temperatures (1). Interspecific differences for G_s has been well established. The objective of this research was to practice divergent selection for G_s in a population derived from *G. hirsutum* X *G. barbadense* introgression (TM1 X NM24016). TM1 is a typical *G. hirsutum* and NM24016 (2) is a introgressed line derived from *G. hirsutum* X *G. barbadense* hybridization program. Divergent selection for G_s was practiced on the $F_{2,3}$ generation in Maricopa, AZ in 1996. DNA was isolated from all 118 F_2 plants in 1995 for genetic mapping experiments and QTL analysis of G_s . Replicated field experiments of selected $F_{2,4}$ progeny (10 high G_s and 10 low G_s) were grown in Maricopa, AZ and Las Cruces, NM in 1997. G_s was measured at both locations at peak flowering as described by Radin et al. (3). Based on F_3 and F_4 data the realized H for G_s was estimated to be 0.41 in Maricopa. This is reflected in the significant difference between the mean of the high G_s $F_{2,4}$ lines ($n=10$) $552 \text{ mmol m}^{-2} \text{ s}^{-1}$ and the low G_s lines ($n=10$) $457 \text{ mmol m}^{-2} \text{ s}^{-1}$ at Maricopa in 1997. The difference at Las Cruces was non-significant (314 for high G_s vs 282 for low G_s). The absence of supraoptimum temperature at Las Cruces relative to Maricopa probably explains this difference. Correlated response in lint yield was observed in Maricopa but not Las Cruces. The high G_s lines were significantly higher yielding than the low G_s lines at Maricopa even though the only selection has been for G_s . Composite Interval Analysis was conducted on the $F_{2,3}$ progeny in Maricopa utilizing DNA markers (RAPDs and SSRs). Two QTLs (LOD = 2.0 and 3.8) were detected for G_s at Maricopa. These QTLs explained about 12% of the variation in the trait. Both intervals were from NM24016 and negatively affected G_s . It is suspected, but not yet verified, that these regions are

derived from *G. barbadense*. This is one of the first physiological traits that have been subjected to QTL analysis. G_s is a heritable trait and seems to be significantly associated with lint yield in heat stress environments.

References

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