COTTON FLOWERS: POLLEN AND PETAL HUMIDITY SENSITIVITIES DETERMINE REPRODUCTIVE COMPETITIVENESS IN DIVERSE ENVIRONMENTS

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Abstract

This study investigated the abiotic stress tolerance of mature cotton [*Gossypium hirsutum* (L.)] pollen and identified genetic variability among the six cotton lines studied. Genetic diversity in pollen viability was observed following a 6.5 h exposure to 25% relative humidity (RH). Cultivars NM67, DP565, and SG248 exhibited less inhibition of pollen germination than STV474, Acala maxxa (AM), and PHY72. Similar pollen water contents were observed for all lines, suggesting differences in the ability of the pollen grains to retain moisture in dry environments. Genetic diversity in pollen tube length development at 25% RH compared with 80% RH was observed. Acala maxxa and PHY72 pollen produced tube lengths of 35-40% of controls at 80% RH, while STV474, SG248, DP565, and NM67 exhibited tube lengths 50-60% of controls. Pollen water uptake studies showed faster uptake in PHY72 and AM than the other lines. Movement of pollen within 5 meters of the six test lines into the glandless Gregg 65 variety was greatest adjacent to NM67 and the lowest adjacent to PHY72. These findings show genetic differences in cotton pollen sensitivities to water uptake, water loss, and gene flow under irrigated and dryland environments. Analysis of flowers of F1 plants from bi-directional crosses showed diversity in the inheritance of flower shape (cupped or open petals) and pollen rupturing in response to incubation in 0.8 M sucrose. Our findings provide breeders with a previously unexplored reservoir of genetic diversity associated with reproductive abiotic stress tolerance.