MULTI-LOCATION ASSESSMENT OF HEAT TOLERANCE IN SIX COMMERCIALLY-AVAILABLE COTTON CULTIVARS

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Abstract

Chlorophyll fluorescence provides a rapid measure of photosystem II efficiency. Leaf samples can be collected in the field and chlorophyll fluorescence assessed under a range of temperatures to define heat tolerance for a given variety or environment. Heat tolerance assessments at statewide variety testing sites should provide a robust indication of cultivar differences in heat tolerance plasticity to environment. In the current study we assessed heat tolerance for six cultivars (CG3787, DP1555, PHY333, PHY499, ST6182, ST6448) at three official variety trial locations, under two different irrigation regimes, and on three different sample dates throughout the 2015 growing season for a total of 18 different heat tolerance environments. The temperature at which photosystem II maximum quantum yield (F_v/F_m) declined 15% from the optimum temperature served as a standardized measure of heat tolerance. Photosystem II heat tolerance was exceptionally responsive to environment, where T_{15} values ranged from 41°C to 44.9°C across the 18 heat tolerance environments evaluated in the current study. Cultivar differences in heat tolerance were observed but only in two environments, indicating that the cultivar differences in heat tolerance may be governed by local conditions preceding each heat tolerance assessment. Previous work has indicated that heat tolerance may be influenced by plant water status and ambient temperature conditions. These data were collected in each of the heat tolerance environments noted here and their impact on heat tolerance will be assessed in future work.