EFFECT OF TEMPERATURE EXTREMES ON GROWTH AND PHOTOSYNTHETIC PERFORMANCE OF DIFFERENT GENOTYPE COTTON SEEDLINGS

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Abstract

Early seedling vigorous crucial for successful crop establishment and can influence yield. Yet cotton is known for poor seedling vigor compared to other major row crops. Growth temperature and genotypes can influence early seedling vigor in cotton. Identifying genotypes that can perform well under different temperature extremes can broaden the range of temperatures over which optimum growth could be obtained. A growth chamber study was conducted at the Georgia Enviroton, Griffin Georgia, University of Georgia, to evaluate the temperature response of advanced breeding lines representing four populations. Growth chambers were set at day/night growth temperature regimes of sub optimal (20/15 °C), optimal (30/20 °C), high (35/25 °C), and extremely high (40/30 °C) temperature conditions. At two weeks after planting, growth analysis, chlorophyll fluorescence, and pigment concentrations were obtained from each experimental unit. For growth analysis, each plant was destructively harvested and analyzed for leaf area and dry weight measurements. For growth analysis data, a significant effect of temperature and genotype was observed, however no significant genotype x temperature interaction was observed. The fluorescence measurements were sub categorized as structural indicators, specific fluxes, quantum efficiencies and performance indices. The photosynthetic performance indices were all significantly affected by early season growth temperatures. However, no effect of any of the treatments was observed for specific fluxes. All the quantum efficiencies were significantly affected by temperature, but each component differed in heat sensitivity. Both seedling dry weight and leaf area had a significant positive association with all three measured quantum efficiencies suggesting OJIP fluorescence can be used as q quick indicator of early season vigor.