Drought Stress Effects on Physiological Mechanisms of Peanut Genotypes

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Drought is one of the main abiotic stresses affecting plant growth and ultimately yield. Efforts have been made to identify traits in cultivated peanut plants or wild species that could benefit the plant with higher tolerance to drought without decreasing yield. Breeding programs generally use selection methods for improved drought tolerance based on yield. In addition to yield, physiological mechanisms may serve as components of drought tolerance for selection of new genotypes. Identification of these mechanisms associated with drought tolerance in peanut plants could potentially contribute to developing peanut cultivars with enhanced drought tolerance.

To this end, ten peanut genotypes, including commonly grown cultivars in Georgia and lines selected at the ARS/USDA and the University of Georgia that vary in drought tolerance, were planted under field conditions at the Gibbs Farm, University of Georgia, Tifton Campus in 2017. The irrigation treatments consisted of a well-watered control and water-deficit stress imposed at early season (30-70 days after planting). A rainout shelter was used to prevent rain/irrigation on the plants for the water-deficit stressed plots. Leaf samples were collected to assess pigment concentrations and thermal tolerance of photosystem II (the temperature to reach 15% decline in the photosynthetic efficiency of PSII). After the end of the stress period, all plants (including stressed plants) were irrigated as needed. Pod weights within each genotype and water regime were obtained at the end of the season.

Overall pigment concentrations increased with progress of drought followed by a decrease after recovery. Drought resulted in higher concentrations of chlorophylls *a* and *b* and carotenoids than those in well-watered plants. Seven days after all plants were well irrigated, pigment concentrations did not significantly differ between plants from drought and well-watered treatments. In addition, T_{15} was affected by the water regime × genotype interaction. Drought generally increased thermotolerance of PSII. The highest T_{15} was observed for the genotype C431-1-1 grown under early drought stress. Pod weight was decreased by early drought. Variation in drought and heat tolerance exists among the genotypes; however, further studies are required to clarify and validate the contribution of physiological mechanisms to drought tolerance in peanuts.