Genotypic Variability Based on Physiological Traits of Peanuts Under Drought Stress

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In breeding programs, one of the most common methods of selection for improved drought tolerance is based on yield. In addition to yield, physiological and metabolic mechanisms could be identified as components for selection and development of peanut cultivars with enhanced drought tolerance. The objective of this study was to identify physiological mechanisms as relevant components of genetic diversity among peanut genotypes grown under drought conditions, which could potentially be used as selection tools for cultivars with improved drought tolerance. Ten runner-type peanut genotypes were planted under field conditions at the University of Georgia, Tifton Campus in 2018. The genotypes included commercially-available cultivars and lines from USDA-ARS. Irrigation treatments consisted of a well-watered control and drought stress levels imposed at two different developmental stages of the plants, onset of flowering [34 days after planting (DAP)] and peak flowering (76 DAP). Water was withheld for 40 and 21 days for the first and second stress levels, respectively. Drought stressed plots were covered with a rainout shelter to prevent rain/irrigation on stressed plants. Measurements of gas exchange and chlorophyll *a* fluorescence were performed at the last day of stress periods and leaf samples were collected for analysis of pigments and enzymatic antioxidants from the defense system pathway. Among the 19 traits evaluated, chlorophyll *a* content as well as fluxes, quantum yields and efficiencies of the transient rise of chlorophyll *a* fluorescence induction were the traits with higher contribution to the genotypic diversity within the environments studied. The genotypes were ranked according to their responses to 13 and 10 most relevant traits under stressed and irrigated conditions, respectively. Under stressed environment, Florida-07 stood out by its improved photosynthetic efficient, whereas under irrigated environment, A100 indicated higher efficiency. Further investigation is ongoing to validate the contribution of these traits to genotypic diversity of peanuts under drought stress.