Variability for Drought Related Traits of Virginia-Type Peanut Cultivars and Advanced Breeding Lines.


We report on variability for physiological traits related to drought tolerance and transpiration efficiency of eighteen virginia-type peanut (Arachis hypogea L.) genotypes grown in the Virginia-Carolina (VC) peanut growing region. The genotypes are cultivars and advanced breeding lines of the Peanut Variety and Quality Evaluation (PVQE) Program. Water deficit, i.e., rainfall amounts and distribution, is increasingly becoming a limiting factor for peanut production in the VC region. Even though extensive research efforts have been made worldwide to improve drought tolerance in peanut, performance of genotypes largely depends upon the environment in which they grow and no such information is available for the VC area. The objective of this study was to determine the variability for gas exchange and leaf characteristics, i.e., CO₂ assimilation rate (A), stomatal conductance to water vapors (gₛ), transpiration efficiency (A:gₛ), specific leaf area (SLA), chlorophyll concentration estimate (SPAD), number of stomata per cm² and leaf, and canopy temperature depression (CTD), of virginia-type genotypes grown under rainfed conditions in southeastern Virginia. The relationship of physiological and agronomic traits, i.e., total plant mass, pod mass, harvest index (HI) and pod yield, were then analyzed. Genotype had a significant effect on gₛ, A:gₛ, SLA, SPAD, number of stomata per cm² and leaf, and CTD in 2009 and on A, gₛ, A:gₛ, SPAD, and number of stomata per cm² and leaf in 2010. Excepting CTD, year had a significant effect on all physiological characteristics. The genotype × year interaction was not significant for A, gₛ, A:gₛ, SPAD, and SLA suggesting dominant controlling factors for these traits. Relationships between gas exchange and leaf characteristics were weak. In 2009, 60% of pod yield variation was explained by A (higher A, higher pod yield) and SPAD (greened leaves, higher pod yield). In 2010, 93% of yield was due to positive effects of A, SPAD, stomata cm⁻², and CTD (cooler leaves, higher yields), and negative effects of A:gₛ (higher A:gₛ, lower yield) and number of stomata leaf⁻¹. These results suggest that development of cultivars with greener leaves and higher A when gₛ is low may ensure better yields under rainfed conditions in the VC region.