Heat Tolerance in Peanut Genotypes Derived from Wild Species

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Our ability to produce enough food for the increasing global population will require new scientific and technological strategies focusing on crops, land, and the environment. The impacts of climate change cast more doubt on the efforts to achieving food security due to unprecedented events such as heatwaves. The need to grow heat tolerant crops will play a crucial role of stabilizing yields even at higher global temperature.
Peanut, being a crop of global importance, is not exempted when it comes to heat stress. Therefore, the objectives of this research were 1) to screen and identify heat tolerant peanut genotypes that could potentially be used in peanut breeding programs and 2) to use gas exchange and chlorophyll a fluorescence data and develop an automated model that ranks the peanut genotypes based on their photosynthetic thermotolerance capability. This model will help accelerate the selection process of peanut genotypes for improved heat tolerance. This study was conducted at the University of Georgia, Griffin campus. Sixteen peanut genotypes, including wild genotypes possessing a wider genetic pool and commercially available cultivars, were used. The genotypes were grown in growth chambers under controlled conditions. A heat stress of 45 ^{o}C was induced 60 days after planting for seven consecutive days. Photosynthetic measurements of gas exchange and chlorophyll a fluorescence were taken using LI-6800 Portable Photosynthesis System at the last day of heat stress and 7 days after the end of heat stress to assess genotype recovery. Genotypic variability in gas exchange and chlorophyll a fluorescence exists among the peanut lines used in this research as response to heat stress. Some genotypes increase transpiration whereas other genotypes close stomata as a strategy to cope with heat stress. After recovery, little differences in photosynthetic capacity among the genotypes was observed. Data set is currently being used to calculate the T_{15} for each parameter (i.e., the temperature to cause a 15% decline in the given photosynthetic parameter) for the development of the model to rank genotypes according to their thermotolerance.