Using Multispectral Drone Camera to Differentiate Drought Tolerant Recombinant Inbred Lines of Peanut Grown under Rainout Shelters

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Peanut (*Arachis hypogaea*, L.) yield and quality are limited by drought worldwide. Peanuts require a minimum of 600 mm of water regularly distributed throughout the growing season. The summer months often lead to precipitation deficits, with recurrent drought events leading to limited availability of water that may impact pod yield. Producers are supplementing water through irrigation but, with only 35 % of the peanut acreage in the U.S. equipped of such systems, most of the fields are rainfed. Therefore, peanut producers will need to adopt drought tolerant cultivars improved in yield and quality, to maintain the competitiveness of the U.S. peanut stakeholders in the marketplace. To achieve this, phenotyping is generally used to screen lines within the breeding pipeline, resulting in the development of new cultivars. However, manual ground measurement of the field traits is laborious, time-consuming and sometime subjective. Unmanned aerial vehicles (UAV), equipped with sensors, are fast development technologies, and can acquire data quickly, repeatedly, with increased resolution and reliability. In this study, 56 recombinant inbred lines (RIL) were selected from a population of 340 [developed from the cross of N08086olJCT: a large seeded Virginia-type and high yielding line and ICGV 86015: an early-maturing drought tolerant Spanish-type line coming from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)]. They were grown at the Tidewater AREC in Virginia under rainout exclusion shelters to mimic drought as well as in irrigated field plots. Regularly throughout the growing season, aerial data were collected using a multispectral camera to more reliably differentiate and identify drought tolerant RILs. Drought tolerant RILs would be defined as not displaying a loss of growth and yield caused by the use of the shelters and also a fast recovery once the shelters were removed. This first-year experiment has shown an existing variability between RILs among the different traits analyzed.