Identification of Virginia-type Peanut Genotypes for Water-Deficit Conditions Based on Early Stomatal Closure with Soil Drying

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Early closure of stomata as soil progressively dries allows water conservation for sustained crop physiological activity as the water deficit deepens. Studies with maize and soybean have shown this to be an advantageous trait to increase yields in water-deficit environments. For peanut, which is often grown on sandy soil, the possibility of water deficit can be a frequent occurrence. This study was undertaken to identify genotypes that express this water conservation trait and to determine if it confers a yield advantage. Three approaches were taken. (1) Twenty-two elite breeding lines were tested in controlled environments for the response of transpiration rate during progressive soil drying. These lines were characterized for the fraction of transpirable soil water remaining in the soil at the initiation of transpiration rate decrease associated with stomatal closure. Significant differences were found among lines, with three lines having especially high thresholds for decrease in transpiration rate. (2) The lines identified as having early stomatal closure with soil drying were observed under rain shelters and in the field for wilting with progressive soil drying. There were differences in the onset of wilting, and those genotypes shown to have early stomatal closure expressed delayed wilting. (3) Yield trail data were examined to identify those lines that consistently had higher yields than a standard reference (cv. Bailey) at low yield levels that are commonly associated with drier conditions. When expressing total seed yield in monetary return, four lines had yields that were consistently superior to Bailey below the threshold return of $800 per acre. Thus far, all tests demonstrated that N12006ol was a superior genotype for water-deficit conditions.