Transpiration of Peanut in the Field under Rainfed Production

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We have examined the relationship between transpiration and vapor pressure deficit (VPD) in field grown peanut across several years, tests, and genotypes. Limited transpiration (LT) in response to increasing VPD was proposed as a mechanism of drought avoidance; and peanut genotypes expressing LT may be more drought tolerant than those not expressing the trait. While LT was documented for very few genotypes in laboratory, i.e. its expression was dependent upon temperature, little is known on how LT performs for field grown plants. We monitored transpiration of field grown peanut genotypes in two ways, by directly measuring stomatal conductance at several times during the day and growing cycle, and indirectly from canopy temperature depression (CTD; $T_{air} - T_{canopy}$). As temperature and VPD increased, transpiration rate estimated from CTD increased from 8:00 to 10:00 EST, i.e., VPD went from 0 to 1.5 kPa during this time; CTD decreased at midday, i.e. from 11:00 to14:00 when VPD went from 1.5 to 2.5 kPa; then CTD increased again in the afternoon until 15:00 when it started to decline, one hour after VPD began to decline. Negative linear relationship between transpiration rate and VPD from 11:00 to 14:00 EST for field grown peanut was confirmed by directly measured stomatal conductance of peanut genotypes. This result agrees with the classical model of partial stomata closure in response to mid-day temperature and VPD increase, regardless of temperature and soil moisture content; and all peanut genotypes expressed mid-day LT when grown in the field. Therefore, expression of LT did not explain yield variation among genotypes in rainfed production in a sub-humid environment.