IDT4-001 | Physiological mechanisms controlling plant water use in maize

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Plants tend to decrease transpiration under water deficit and/or high evaporative demand by closing stomata and reducing leaf growth. Identification of sources of genetic variability for underlying mechanisms is necessary to design genotypes adapted to stressing climatic scenarios. A series of four experiments was performed in the PhenoArch image-based phenotyping platform (M3P, France) with contrasting soil water status and evaporative demand. We used a diversity panel of 255 maize hybrids genotyped with 832K polymorphic SNPs. Equivalent stomatal conductance at plant level was estimated in the studied 1680 x 4 plants by inversion of the Penman Monteith equation. It changed with light intensity and vapor pressure deficit, with different thresholds and slopes between genotypes. Maximum values ranged from 52 to 76 mmol m^{-2} sec^{-1} depending on hybrids. The sensitivity of leaf expansion to soil water potential was calculated over the four experiments as the slope of the relationship of leaf expansion rate to soil water potential. For each hybrid, a common linear relationship applied to the four experiments. The x-intercepts of these relationships, which indicate the driest soil in which a plant still has an appreciable leaf growth, ranged from -0.6 to -1.6 MPa depending on hybrids. A GWAS analysis was performed on all variables presented above, suggesting interesting candidate genes related to hydraulics and other mechanisms. Surprisingly, no co-location was observed between QTLs of stomatal conductance and of sensitivity to soil water deficit, supporting the idea that the controls of stomatal opening/photosynthesis and of leaf expansion are largely independent.

IDT4-002 | Transpiration rate of chickpea wild accessions and cultivars in Turkey

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Chickpea (*Cicer arietinum L.*), like most cultivated crops, has exceedingly narrow genetic and phenotypic diversity. Thus breeding with only cultivated germplasm will have steeply diminishing returns, raising an urgent need for new sources of diversity. The focus of the research was to assess a representative set of newly collected wild accessions of *C. reticulatum* and *C. echinospermum*, for drought adaptation traits, i.e. transpiration rate (TR) response to increasing VPD and to soil drying.
These experiments were conducted during the spring season (18 March to 21 April 2016) at the Dicle University glasshouse. The experimental design was a complete randomised block design with six replications. Measurements were conducted in late April during vegetative growth and VPD changed from 2.13 to 4.35 kPa. To measure TR, potted plants were weighed at regular time intervals over the course of an entire day, and therefore, under increasing VPD. At the end of the experiment total leaf area was destructively measured, along with shoot, root and leaf dry weights. There was a 2.31-fold range of variation in the transpiration response among genotypes. The wild genotypes *Sirnak* and *Deste* had extreme TR values exceeding cultivated check cultivars, and several wild genotypes had only a moderate increase in TR under increasing VPD. These moderate TR responses provide germplasm sources with a potential to limit water losses under high evaporative demand, akin to a protection mechanism, especially under dry environments or in future climates. These screenings, therefore, open an exciting opportunity for breeding cultivars with enhanced performance under harsh climates.