190-5 Phenotyping Drought Tolerance in Wheat Using Thermal Imaging.

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Canopy temperature measurements are widely used by breeders to rank genotypes for drought and heat tolerance especially for wheat (Triticum aestivum L.). These measurements, made with traditional infrared thermometers (IRTs), are time-consuming thereby limiting the number of plants and genotypes that can be assessed. Thermal imaging can measure canopy temperatures for hundreds of plants instantaneously and has the potential to replace IRTs. The objective was to compare IRT and thermal camera (TCAM) measurements of ten wheat genotypes under irrigated and rainfed conditions. Three replications of ten wheat genotypes were grown in irrigated and rainfed water regimes at the Texas Agricultural Experiment Station in Bushland, Texas. Thermal images were taken with a FLIR ThermaCam (model HS45S) from a 30 m boom lift approximately 9 m above the plots and IRT measurements were taken on the ground at eye level with an Telatemp Infrared Thermometer (model AG-42 D) at anthesis. The thermal images were post-processed to filter out background soil and to produce mean canopy temperatures for each plot. The TCAM means were highly correlated with the IRT measurements with a Pearson correlation of 0.853 and 0.824 for irrigated and rainfed water regimes, respectively. There were no significant differences in IRT canopy temperatures by genotype in either regime. However, TCAM canopy temperatures of genotypes TAM 112 and TX86A8072 were significantly hotter than all others in the rainfed regime. Both genotypes are known to be very drought tolerant which suggests that the hotter temperatures could be the result of transpiration reduction due to stomatal closure. The high correlation between the traditional IRT and the TCAM and the ability of the TCAM to detect significant differences between genotypes when the IRT could not suggests that the TCAM may improve breeders' accuracy in ranking genotypes.

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