Digital phenotyping of Wheat (*Triticum aestivum* L.) canopy architectural and stomatal traits for drought and heat tolerance

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Abstract

Wheat (*Triticum aestivum* L.) is one of the key staple crops worldwide. Even though future demand for wheat is estimated to increase by 6% by 2050, wheat production might drop by 30% due to climate change. The purpose of this research is to identify canopy architecture (light capture) and anatomical (stomatal) traits that significantly increase radiation use efficiency (RUE; dry weight biomass produced per unit radiation intercepted) and improve yield under high temperature and drought stress conditions due to the growing concern over food security. This research was conducted with five contrasting wheat genotypes in a new field-based high tunnel system with 4 treatments and three replications (control, heat stress, drought stress and heat x drought stress with 3 replications = 12 tunnels) in a randomized completed block design with stress applied at the heading stage. Canopy architecture was graded according to the visual scoring scale concerning UPOV and RUE was calculated in three growth stages. New techniques of high throughput imaging of stomatal number and size using a handheld digital microscope will also be presented.

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