The Shape Of Stress Resilience: Progress On Identifying Genetic Components Of Abiotic Stress Through Plant Architecture

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Plants are possibly the best system to study the integration of environmental and developmental signals, as their architecture develops after the embryonic phase and shows high levels of phenotypic plasticity in response to the environment. Plants sense their environment and translate observed changes into altered cell division, expansion, and meristem differentiation. Investment in new tissues increases plant productivity over the long term by adding new source tissues, such as leaves or roots. Plant architecture is even more critical under adverse environmental conditions. From the abiotic inputs, water availability is the dominant factor shaping the evolution of plant form. Water stress encompasses drought and salt stress, major threats to agricultural productivity. Indigenous crops and wild crop relatives are a great resource for stress-resilience mechanisms that can be leveraged to future-proof our agricultural systems. In Julkowska lab, we hypothesize that stress-induced plant architecture changes significantly contribute to abiotic stress resilience. To learn more about these contributions, we developed diversity panels of stress-resilient species, spanning wild tomatoes, cowpea, and tepary beans. Furthermore, we developed new methods for high-throughput phenotyping to summarize functional changes in plant architecture by describing biomass allocation to individual organ types using dynamic functions and network optimality measures. The genes and metabolites associated with stress resilience are currently being evaluated for their molecular context in Arabidopsis. Ultimately, identified plant architecture components across taxonomic groups will advance the understanding of evolutionary relationships between form, function, and stress resilience.