



Effects of Plant Age and Wood Formation on Drought Tolerance in Tomato

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As the human population grows and droughts become more frequent and intense, identifying drought-responsive anatomical and ecophysiological traits in crops is critical to safeguard food production in a world that is becoming more demanding for plant growth. *Solanum lycopersicum* (tomato) is a major herbaceous crop species in which stem woodiness increases with age, especially in the basal stem regions, providing an opportunity to investigate how developmental changes in stem structure influence plant-water relations under drought. In this study, we investigated a 2-month and a 4-month old batch of two woody knockout mutant genotypes (double SOC1-like, quadruple FUL SOC1-like), as well as the wild type *Solanum lycopersicum* var. Moneyberg, to assess how differences in stem woodiness from genetic modification and plant age influence total plant drought tolerance. Therefore, we quantified a suite of drought-responsive anatomical traits and monitored ecophysiological traits from stems and/or leaves under well-watered and/or drought conditions. These traits included stem lignification, intervessel pit membrane thickness, stomatal traits, plant water potential dynamics, and resistance to drought-induced embolism. Overall, our results show that drought tolerance increases with plant age, primarily through enhanced resistance to drought-induced embolism in the stem, which correlates with increasing stem lignification at the basal stem. Stomata control plays a minor role, as resistance to drought-induced embolism drives major differences in the stomatal safety margin. When comparing developmental stages, variation in embolism resistance and woodiness in stems explains drought tolerance differences within genotypes, whereas intervessel pit membrane thickness is the primary driver of drought tolerance differences among genotypes. These findings demonstrate the dynamic role of drought-associated plant traits at the species level, highlighting once again the remarkable ability of plants to adapt to their environmental conditions.