**Heterogeneity in rice cell type responses to water deficit across the root system**

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Plant roots respond dynamically to reduced water availability. These responses include dynamics at the level of the root system, which can accelerate growth to chase water downwards or reduce growth to resist desiccation. Physiological changes within individual roots can include cell type-specific responses, such as the deposition of apoplastic suberin in endodermis and exodermis cells to promote water retention, along with growth control which is dependent on meristematic cell types. Previously, we used cell type specific gene expression profiling to characterize how different cell types of the rice root respond to stress. In this analysis, we identified sets of genes likely responsible for suberin deposition in rice roots under water deficit stress. Through CRISPR-Cas9, we generated loss-of-function mutants for several of these genes, producing genotypes which are deficient in suberin, with pronounced effects under water deficit conditions. With a new whole mount imaging approach, we identified that young, shallow crown roots have the most intense suberization response to a period of water withholding, mirroring the local soil water potential, which decreases faster in the shallow part of the pot. To further explain this phenomenon, we are studying the transcriptomic changes over time in water deficit in shallow versus deep roots and characterizing the physiological impacts of suberin deficiency on the plant's response to water deficit. Understanding this shallow root response to periods of dryness could be critical to promoting plant productivity under drought in rainfed agroecosystems and in novel alternate wetting-drying irrigation regimes developed to reduce rice paddy methane emissions.