

Characterization of SHOU4's Role in Regulating Cellulose Synthase Exocytosis

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Land plants adapt to fluctuating environmental conditions in part through morphological changes driven by directional growth. This growth is accomplished through irreversible expansion of the cell wall, which defines cell shape and binds cells into cohesive tissues. Load-bearing cellulose microfibrils within the cell wall effect growth anisotropy by constraining cell expansion in specific dimensions. Membrane-integrated Cellulose Synthases (CESA), which multimerize to form Cellulose Synthase Complexes (CSC), extrude cellulose into the cell wall in layered patterns determined by the underlying cortical microtubule array. Our lab previously showed that the integral membrane protein SHOU4 and its paralog SHOU4L (SHOU4/4L) negatively regulate CSC delivery to the cell surface in the model plant *Arabidopsis thaliana*. Recent biochemical experiments have demonstrated direct interactions between the intrinsically disordered domain of SHOU4 and microtubules. We hypothesize that SHOU4/4L integrate developmental and environmental signals to control cellulose biosynthesis by regulating the number of CSCs at the plasma membrane through inhibition of CSC insertion at cortical microtubules. To elucidate the molecular mechanisms by which SHOU4/4L regulate CSC exocytosis, we are investigating *shou4shou4l* mutant response to environmental stressors, SHOU4/4L protein interactors, characterizing the effects of phosphorylation on SHOU4/4L activity, and interrogating the cortical microtubule array's role in SHOU4/4L's function.