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Phosphorylation regulates cellulose biosynthesis regulation

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Plants comprise over 82% of all biomass on Earth, a third of which is cellulose, making it the most abundant organic compound[1]. Cellulose is also essential for plant development and defense against multiple stresses. But, despite its relevance, there remains much to be discovered about its biosynthetic regulation to improve crop's tolerance to biotic and abiotic stresses.

We have described the Tetratricopeptide Thioredoxin-Like (TTL[2] proteins as regulators of the cellulose synthase complex (CSC) under cellulose-deficient conditions[3]. We found that TTLs are required to maintain cellulose synthesis under salt stress by relocalising from the cytosol to the CSCs, promoting the polymerization of microtubules to form a stress-resilient cortical microtubule array, and interacting with the CSCs to stabilize them at the plasma membrane.

We are currently investigating how TTLs are targeted to the CSCs. We have found that TTL3 is a substrate for a kinase that when mutated show cellulose-defective phenotypes under stresses that affect cell wall integrity. We are currently analysing how the CSCs and microtubules behave under abiotic stress in mutants for this kinase. This will provide new insights into how changes in phosphorylation status regulate the activity and dynamic localization of these proteins.

References

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