Overcoming stress: new insights in cell wall biosynthesis regulation

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ABSTRACT

In addition to being crucial in plant development and defence, cellulose is the most abundant organic compound of all biomass on Earth[1]. Therefore, it is essential to elucidate the regulation of its biosynthesis to improve crop's tolerance to biotic and abiotic stresses.

We have found the Tetratricopeptide Thioredoxin-Like (TTL)[2] proteins as new players in the regulation of the cellulose synthase complex (CSC), identifying its dynamic association with the CSC under cellulose-deficient conditions[3]. We have found that TTLs are essential to maintain cellulose synthesis under salt stress, mediated by a stress-resilient cortical microtubule array and the stabilization of the CSCs at the plasma membrane. TTLs carry this out by interacting with Cellulose Synthase 1 and promoting the polymerization of microtubules. This dynamic behaviour of TTLs is not specific to salinity stress, and other modifications that cause reduced cellulose content also lead to the re-localization from the cytosol to the CSC. We conclude that TTLs act as intermediates between stress perception and regulation of cellulose biosynthesis to overcome adverse environmental conditions.

All TTL proteins contain an Intrinsic Disordered Region at the end terminus, and we are now investigating how changes in phosphorylation regulate the activity and dynamic localization of these proteins.

References

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