The Arabidopsis transcription factor bZIP11 reprograms sugar metabolism

Jingkun Ma, Micha Hanssen, Krister Lundgren, Lázaro Hernández, Thierry Delatte, Andrea Ehlert, Chun-Ming Liu, Henriette Schluepmann, Wolfgang Dröge-Laser, Thomas Moritz, Sjef Smeekens and Johannes Hanson

The Arabidopsis transcription factor bZIP11 severely inhibits growth when over expressed. bZIP11 is likely involved in sugar status sensing processes, as sucrose specifically represses its translation. Besides, bZIP11 is known to act downstream of SnRK1 kinase, regulating amino acid metabolism. Furthermore, it is suggested that bZIP11 has a broader regulatory effect in metabolism. Here, we employed large-scale metabolomic and transcriptomic approaches to analyze the regulatory effects of bZIP11 by using bZIP11 dexamethasone nuclear translocation inducible lines. Upon induction, bZIP11 reprograms sugar metabolism rapidly. Moreover, we identified that bZIP11 regulates trehalose metabolism likely via transcriptional activation on several corresponding metabolic genes, TRE1, TPP5 and TPP6. Over-expression of bZIP11 rescues the growth inhibition caused by exogenously applied trehalose, partly due to the induced expression of trehalose (TRE1). Importantly, bZIP11 induction lowered the contents of trehalose 6-phosphate, which has been proposed as signaling molecule. These findings indicate a possible interaction between two sugar status sensing systems which involve trehalose 6-phosphate and SnRK1 respectively.