Extensive In-Silico Analysis of cis-Acting DNA Sequences in 5’ Regulatory Regions of Sucrose Synthase, Cell Wall Invertase and Sucrose Transporter Gene Families

Cis-acting regulatory elements are important molecular switches involved in the temporal and spatial expression of a dynamic network of gene activities. This network control hormone responses, abiotic stress responses and developmental events such as juvenility, floral signal transduction and senescence. In this analysis, a particular emphasis was placed on cis-acting regulatory elements present within the 5’ regulatory region of sucrose synthase (SuSy), cell wall invertase (CWI) and sucrose transporter (SUT) gene families in Arabidopsis thaliana and Oryza sativa. The potential cis-acting regulatory elements were predicted by scanning 1.5 kbp of 5’ regulatory regions of the SUT, CWI and SuSy genes translational start sites, using various resources for cis-element bioinformatics. Cis-elements associated with phytohormone responsiveness, light responsiveness, elicitor responsiveness and abiotic stress were predicted in varying frequencies within the 1.5 kbp of 5’ regulatory sequences. In addition, cis-elements involved in sugar repression, mineral responses, and cold- and light-inducible gene expression were also identified. Some of the predicted cis-elements have experimental precedent, but many are novel and encourage further exploration. This analysis provides a basis for elucidating transcription regulatory interactions of SUT, CWI and SUSY gene families during development or under abiotic stress conditions.

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