

A light-regulated transcription factor can regulate *lycopene* accumulation in tomato fruit

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Understanding of the lycopene accumulation in the fruit of *Solanum lycopersicum* (tomato) has been intensively studied. To dissect the molecular mechanism underlying the lycopene accumulation in tomato fruit, we utilized a suppression subtractive hybridization (SSH) method to isolate the genes that are regulated by blue light and participate in the regulation of lycopene accumulation. A MADS-box transcription factor *TDR4* gene was isolated from heat-tolerant tomato line CL5915 and shown to be induced by blue light. Further, virus-induced gene silencing assays revealed that silencing of *TDR4* reduced the lycopene levels in tomato fruit. Stable transgenic tomato lines containing reduced levels of the *TDR4* transcripts showed great reduction of lycopene levels, reflecting with decreased expression of the key enzyme *PSY* gene in transgenic tomato fruit, which suggests that *PSY* may be a target of *TDR4* for lycopene accumulation. Further electrophoretic mobility shift assays and yeast one-hybrid studies indicated that *TDR4* could directly bind to the conserved cis-element CArG motifs in the promoter of the *PSY* gene. Moreover, chromatin immunoprecipitation studies further revealed that *TDR4* could bind to other regulators of lycopene accumulation such as RIN and CNR, as well as ethylene-related ripening genes, including *ACS4* and *PG2a*. Ectopic expression of *TDR4* resulted in a significant increase of lycopene levels in transgenic tomato lines, in which the expression levels of these genes mentioned above were substantially increased. Taken together, these data indicate that *TDR4* may play a vital role to regulate lycopene accumulation via ethylene-independent or -dependent pathways in tomato fruit.

Biography

Hsu-Liang Hsieh is a Professor at Institute of Plant Biology, National Taiwan University (NTU), Taiwan. He completed his BSc and MSc in Plant Molecular Biology at Department of Agronomy, NTU, and PhD in Biological Sciences at University of Texas at Austin, USA. In 1996, he worked as a Post-doctoral Fellow at Yale University, with Prof. Xing-Wang Deng. In 2001, he became an Assistant Professor in the Department of Botany, NTU, and then Professor in 2013. His research mainly focuses on "The integration of light and jasmonate signaling pathways".

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