SlMYC2 targeted regulation of polyamines biosynthesis contributes to methyl jasmonate-induced chilling tolerance in tomato fruit

Dedong Min, Jingxiang Zhou, Jiaozhuo Li, Wen Ai, Zilong Li, Xinhua Zhang, Xiaodong Fu, Xiuming Zhao, Fujun Li, Xiaoan Li and Yanyin Guo

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Abstract

Chilling injury (CI) is a major limiting factor in the retention of the postharvest quality of chilling-sensitive vegetables and fruit stored at low temperatures. The enhanced chilling tolerance induced by methyl jasmonate (MeJA) treatment might be related to the polyamines biosynthesis. However, the molecular mechanism of polyamines biosynthesis induced by MeJA is far from clear. Here, we found that the application of 0.05 mmol L^{-1} MeJA enhanced the activities of arginase, arginine decarboxylase and ornithine decarboxylase, as well as the transcripts of *SlARG1, SlARG2*, *SlADC* and *SlODC*, promoted the accumulations of polyamines and further inhibited CI development. In addition, polyamines induced by MeJA were strongly positively correlated with the *SlMYC2* expression level. Moreover, MeJA-induced polyamines biosynthesis was largely inhibited due to the silencing of *SlMYC2*. The (*SlMYC2*-silenced + MeJA)-treated fruit possessed higher incidence and index of CI than the MeJA-treated fruit. Combining these findings with results of the principal component analysis, we concluded that SlMYC2 is involved in MeJA-induced chilling tolerance in postharvest tomato fruit by regulating polyamines biosynthesis. Furthermore, the electrophoretic mobility shift and dual-luciferase reporter assays indicated that SlMYC2 could activate the transcription of *SlARG1, SlARG2*, *SlADC* and *SlODC* by binding directly to G/E-box elements in their promoters. From the findings, it was revealed that the targeted up-regulation of *SlARG1, SlARG2*, *SlADC* and *SlODC* by SlMYC2 is involved in MeJA-induced polyamines biosynthesis, which enhances chilling tolerance in tomato fruit.