Exogenous methyl jasmonate regulates sucrose metabolism in tomato during postharvest ripening

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Abstract

Sucrose metabolism is a fundamental process during tomato ripening. Studies have shown the role of the phytohormone methyl jasmonate (MeJA) in tomato fruit ripening. However, the role of MeJA in regulating sucrose metabolism in tomato is still unclear. In this study, mature green cherry tomato fruit were infiltrated with MeJA (0.5 mM) or sterile deionized water (control). The changes in color, firmness, and ethylene production in fruit, the contents of sucrose, glucose and fructose, and the enzymatic activities and the expression levels of key genes associated with sucrose metabolism were determined periodically during a storage period of 16 d. MeJA-treated fruit showed a significant acceleration in ripening, with higher a* value and ethylene production and lower firmness. MeJA treatment enhanced sucrose phosphate synthase (SPS) activity, whereas it inhibited acid invertase (AI) and neutral invertase (NI) activities. These changes in enzyme activities together resulted in a significantly higher sucrose content and lower glucose and fructose contents. Furthermore, exogenous MeJA upregulated the gene expression levels of sucrose-phosphate synthase1–4 (*SPS1-4*) and sucrose-phosphate phosphatase2 (*SPP2*), which were associated with sucrose biosynthesis, and downregulated those related to sucrose degradation, except for sucrose synthase2 (*SUS2*) and *SUS3*. The findings indicated that exogenous MeJA might alter sucrose metabolism during tomato ripening by regulating the enzymatic activities and gene expression levels. This research provides valuable information to elucidate the mechanisms via which MeJA regulates tomato sucrose metabolism.