Integrated multi-omics analysis uncovers roles of mdm-miR164b-MdORE1 in strigolactone mediated inhibition of adventitious root formation in apple

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October 14, 2021

Abstract

Adventitious root (AR) formation is important for the vegetative propagation. The effects of strigolactones (SLs) on AR formation have been rarely reported, especially in woody plants. In this study, we first verified the inhibitory effects of SLs on AR formation in apple materials. Transcriptome analysis identified 12,051 differentially expressed genes over the course of AR formation, with functions related to organogenesis, cell wall biogenesis or plant senescence. WGCNA suggests SLs might inhibit AR formation through repressing the expression of two core hub genes, *MdLAC3* and *MdORE1*. We further verified that enhanced cell wall formation and accelerated senescence were involved in the AR inhibition caused by SLs. Combining small RNA and degradome sequencing, as well as a dual-luciferase sensor system, we identified and validated three negatively correlated miRNA–mRNA pairs, including mdm-miR397–*MdLAC3* involved in secondary cell wall formation, and mdm-miR164a/b–*MdORE1* involved in senescence. Finally, we have experimentally demonstrated the role of mdm-miR164b–*MdORE1* in SLs-mediated inhibition of AR formation. Overall, our findings not only propose a comprehensive regulatory network for the function of SLs on AR formation, but also provide novel candidate genes for the potential genetic improvement of AR formation in woody plants using transgenic or CRISPR technology.

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