

# MaRTH1 suppression of ethylene response during banana fruit ripening and is controlled by MaXB3-MaNAC2 regulatory module

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## Abstract

RTE1 (Reversion to Ethylene Sensitivity 1) and its homolog RTH play important role in ethylene response through mediating the receptor signaling output, but their role in climacteric fruit ripening is not clear. In this study, we found two *RTE1/RTH* genes *MaRTH1* and *MaRTH2* in banana genome. *MaRTH1* expression was inhibited by ethylene and down-regulated during ripening, whereas *MaRTH2* expression showed no significant changes during the whole ripening process. Transient over-expression of *MaRTH1* in bananas inhibited the effect of exogenous ethylene on endogenous ethylene production, thereby delayed fruit ripening. Using *MaRTH1* promoter as a target, we performed yeast one-hybrid screening and isolated the NAC transcription factor MaNAC2, a banana ripening-associated transcriptional repressor degraded by an E3 ligase MaXB3 through ubiquitination. DNA-protein binding assays further confirmed that MaNAC2 repressed the expression of *MaRTH1* by directly targeting its promoter. Moreover, the MaNAC2 transcriptional repression to *MaRTH1* was inhibited by MaXB3, and this inhibitory action was attenuated by the proteasome inhibitor MG132. Collectively, these findings reveal that *MaRTH1*, which is modulated by MaXB3-MaNAC2 regulatory module, functions as a negative regulator of ethylene response during banana ripening.