Ethylene response factors regulate ethylene biosynthesis and cell wall modification in persimmon (*Diospyros kaki* L.) fruit during ripening

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Abstract

Ethylene plays an essential role in climacteric fruit ripening via the ethylene signaling pathway. Ethylene response factor (ERF) is a critical downstream component of the ethylene signaling pathway. However, the transcriptional regulatory mechanism underlying ERF in persimmon fruit ripening remains poorly understood. Here, we explored the role of *DkERF8/16/18* in regulating persimmon fruit ripening. Transmission electron microscopy showed that persimmon fruit softening was associated with middle lamella degradation and cell wall swelling and distortion. The expression of five ERF genes (*DkERF8/16/18/19/24*), twelve cell-wall-modifying genes (*DkPG1*, *DkPL1*, *DkPE1/2*, *Dkβ-GAL1*, *DkEGase1*, *DkXTH2/9/10/11*, *DkMAN1*, *DkEXP4*) and four ethylene biosynthesis genes (*DkACS1/2*, *DkACO1/2*) was induced by ethylene and suppressed by 1-MCP during persimmon fruit storage. Dual luciferase assays, site mutations and electrophoretic mobility shift assays indicated that DkERF8 and DkERF16 activate *DkXTH11* and *DkEXP4*, respectively, by binding to their promoters. DkERF18 binds to the *DkACS2* promoter, increasing its activity. Transient overexpression of *DkERF8* promotes the conversion of acid soluble pectin to water soluble pectin in persimmon fruit. Moreover, transient overexpression of *DkERF18* resulted in increased ethylene production. These results suggest that *DkERF8/16/18* may be involved in persimmon fruit ripening by promoting cell wall modification and ethylene biosynthesis.