Title Resistance of *Malus domestica* fruit to *Botrytis cinerea* Depends on endogenous ethylene biosynthesis

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Abstract

The plant hormone ethylene regulates fruit ripening, other developmental processes, and a subset of defense responses. Here, we show that 1-aminocyclopropane-1-carboxylic acid synthase (*ACS*)-silenced apple (*Malus domestica*) fruit that express a sense construct of *ACS* were more susceptible to *Botrytis cinerea* than untransformed apple, demonstrating that ethylene strengthens fruit resistance to *B. cinerea* infection. Because ethylene response factors (ERFs) are known to contribute to resistance against *B. cinerea* via the ethylene-signaling pathway, we cloned four *ERF* cDNAs from fruit of *M. domestica*: *MdERF3, -4, -5*, and *-6*. Expression of all four *MdERF* mRNAs was ethylene dependent and induced by wounding or by *B. cinerea* infection. *B. cinerea* infection suppressed rapid induction of wound-related *MdERF* expression. *MdERF3* was the only mRNA induced by wounding and *B. cinerea* infection in *ACS*-suppressed apple fruit, although its induction was reduced compared with wild-type apple. Promoter regions of all four *MdERF* genes were cloned and putative *cis*-elements were identified in each promoter. Transient expression of *MdERF3* in tobacco increased expression of the GCC-box containing gene *chitinase 48*.