

Title Molecular mechanism of distinct ripening profiles in ‘Fuji’ apple fruit and its early maturing sports

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Abstract

Apple fruit (*Malus × domestica* Borkh.) ‘Hirosaki Fuji’, a sport of ‘Fuji’ that matures about 40 d earlier, produced almost the same amount of ethylene as ‘Fuji’ during ripening, but rapidly lost flesh firmness, unlike ‘Fuji’, which has a long shelf-life. Expression profiling of genes encoding ethylene biosynthesis enzymes (*MdACS1*, *MdACO1*), ethylene receptor proteins (*MdETR1*, *MdERS1*, *MdERS2*) and a cell wall degradation enzyme (*MdPG1*) in ‘Hirosaki Fuji’ fruit gave significantly different results from those of ‘Fuji’. *MdERS1* was more abundant during ripening in ‘Fuji’. Profiles of ‘Fuji’ fruit from two other localities with different ambient temperatures revealed that the more southerly the trees were grown, the more strongly they expressed the ripening-related genes. The gene for a small heat shock protein (*MdHSP17.5*) homologous to a strawberry fruit ripening-related HSP was expressed in ‘Hirosaki Fuji’ from before harvest on the tree, but was expressed in ‘Fuji’ only after harvest. The molecular mechanisms explaining these distinct ripening responses are discussed.