

Title Differential regulation of genes encoding ethylene biosynthesis enzymes and ethylene response sensor ortholog during ripening and in response to wounding in avocados.

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Citation Journal of the American Society for Horticultural Science Vol: 127 (2002); 520-527

### Abstract

We investigated the differential regulation of two 1-aminocyclopropane-1-carboxylate synthase (ACS) genes, one 1-aminocyclopropane-1-carboxylate oxidase (ACO) gene and one ethylene response sensor (ERS1) orthologue during ripening and in response to wounding in avocados (*Persea americana* 'Bacon'). The 1-aminocyclopropane-1-carboxylate (ACC) content, ACS activity and detectable expression of PA-ACS1 mRNA increased and reached a maximum prior to the climacteric peak, whereas ACO activity and the PA-ACO mRNA levels increased significantly only at the upsurge of ripening ethylene. A basal level of PA-ERS1 transcript was detected as from harvest; however, PA-ERS1 transcript was hyper-induced at the climacteric peak of ethylene production. 1-Methylcyclopropene (1-MCP) application at the preclimacteric and the onset of climacteric stages inhibited the ACS and ACO activities, PA-ACS1 transcription, and suppressed PA-ACO and PA-ERS1 mRNAs to trace levels. Discontinuation of 1-MCP treatment led to super induction of PA-ACS1, PA-ACO, and PA-ERS1 transcripts. Wound-induced ethylene biosynthesis and PA-ACS2 mRNA accumulation were enhanced by 1-MCP; whereas, wound-induced PA-ACO mRNA accumulation was unaffected by 1-MCP. These results indicate positive feedback regulation of the PA-ACS1 gene and negative feedback regulation of the PA-ACS2 gene by ethylene, while PA-ACO exhibits positive feedback regulation by ethylene and is also induced by wounding. The hyperinduction of PA-ERS1 mRNA at relatively high concentrations of ethylene may be a mechanism of avocados to regulate the ethylene responsiveness of the tissues by dissipation of the gas. The nucleotide sequence data reported in this paper appear in the EMBL, GenBank and DDBJ Nucleotide sequence databases under the accession numbers AF 500119 (PA-ACS1 cDNA), AF 500120 (PA-ACS2 cDNA) and AF 500121 (PA-ERS1cDNA).