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MOLECULAR BIOLOGY AND GENE REGULATION

Ethylene-Mediated Posttranscriptional Regulation in Ripening Avocado (Persea americana) Mesocarp Discs

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Discs of avocado (Persea americana) fruit (15 x 3 mm thick) kept in a stream of moist air ripen within 72 h. Following cutting, a modest evolution of wound ethylene that dissipates in 24 h is followed by a burst of autocatalytic ethylene production associated with a respiratory climacteric, much as in the intact fruit. Aminoethoxyvinylglycine (AVG), an inhibitor of ethylene synthesis, and 2,5-norbornadiene (NBD) and Ag+, inhibitors of ethylene action, inhibit disc ripening, as does 2,4-dichlorophenoxyacetic acid (2,4-D), a synthetic auxin. On the other hand, none of the foregoing agents except Ag+, at concentrations that delay or prevent ripening, suppress the induction of four ripening-related genes encoding cellulase, polygalacturonase (PG), cytochrome P-450 oxidase (P-450), and ethylene-forming enzyme (EFE, or 1-aminopropane-1-carboxylic acid oxidase), respectively. Whereas Ag+ fully inhibits the production of cellulase and PG mRNAs, it has little effect on the induction of EFE and P-450 mRNAs. Cellulase and PG enzyme activities are absent in extracts of discs treated with AVG, NBD, or 2,4-D, as are antigenically detectable cellulase and PG proteins. The strong appearance of ripening-related mRNAs in discs inhibited from softening by ethylene antagonists suggests posttranscriptional control by ethylene. Similarly, inhibition of ripening by 2,4-D without suppression of mRNA induction suggests translational control. Whether ethylene inhibits transcription or postttranscriptional events or both depends on its concentration.