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METABOLISM AND ENZYMOLOGY

Polyuronides in Avocado (Persea americana) and Tomato (Lycopersicon esculentum) Fruits Exhibit Markedly Different Patterns of Molecular Weight Downshifts during Ripening

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Avocado (Persea americana) fruit experience a rapid and extensive loss of firmness during ripening. In this study, we examined whether the chelator solubility and molecular weight of avocado polyuronides paralleled the accumulation of polygalacturonase (PG) activity and loss in fruit firmness. Polyuronides were derived from ethanolic precipitates of avocado mesocarp prepared using a procedure to rapidly inactivate endogenous enzymes. During ripening, chelator (cyclohexane-trans-1,2-diamine tetraacetic acid [CDTA])-soluble polyuronides increased from approximately 30 to 40 [mu]g of galacturonic acid equivalents (mg alcohol-insoluble solids)-1 in preripe fruit to 150 to 170 [mu]g mg-1 in postclimacteric fruit. In preripe fruit, chelator-extractable polyuronides were of high molecular weight and were partially excluded from Sepharose CL- 2B-300 gel filtration media. Avocado polyuronides exhibited marked downshifts in molecular weight during ripening. At the postclimacteric stage, nearly all chelator-extractable polyuronides, which constituted from 75 to 90% of total cell wall uronic acid content, eluted near the total volume of the filtration media. Rechromatography of low molecular weight polyuronides on Bio-Gel P-4 disclosed that oligomeric uronic acids are produced in vivo during avocado ripening. The gel filtration behavior and pattern of depolymerization of avocado polyuronides were not influenced by the polyuronide extraction protocol (imidazole versus CDTA) or by chromatographic conditions designed to minimize interpolymeric aggregation. Polyuronides from ripening tomato (Lycopersicon esculentum) fruit extracted and chromatographed under conditions identical with those used for avocado polyuronides exhibited markedly less rapid and less extensive downshifts in molecular weight during the transition from mature-green to fully ripe. Even during a 9-d period beyond the fully ripe stage, tomato fruit polyuronides exhibited limited additional depolymerization and did not include oligomeric species. A comparison of the data for the avocado and tomato fruit indicates that downshifts in polyuronide molecular weight are a prominent feature of avocado ripening and may also explain why molecular down-regulation of PG (EC 3.2.1.15) in tomato fruit has resulted in minimal effects on fruit performance until the terminal stages of ripening.