

Title Developmentally dependent responses of detached cucumber (*Cucumis sativus* L.) fruit to exogenous ethylene

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Citation Postharvest Biology and Technology, Volume 52, Issue 2, May 2009, Pages 207-215

Keywords Senescence; Ripening; Color; Chlorophyll; Carotenoid; Watersoaking

Abstract

Previous studies of the postharvest physiological and developmental behavior of cucumber (*Cucumis sativus* L.) fruit have examined fruit at a single developmental stage corresponding to commercial harvest maturity. The present study investigated the postharvest storage and ethylene responses of cucumber fruit at defined developmental stages based on growth and surface color parameters. Plants of a greenhouse cucumber (cv. Manar) were grown using current commercial practices. Fruit size and surface color were monitored during fruit development. Fruit were harvested at four stages of development: Immature (4–8 d after anthesis (DAA), commercial harvest maturity), Mature (10–14 DAA), Breaker (16–20 DAA) and Yellow (35–40 DAA). Fruit were stored in air or in either $10 \mu\text{L L}^{-1}$ ethylene or $1300 \mu\text{L L}^{-1}$ propylene for 12 d at 15°C . The data indicate that cucumber fruit undergo marked changes in ethylene responses during development. Ethylene-treated Immature fruit exhibited mesocarp watersoaking and epidermal sloughing, slight degreening, and declines in mesocarp pH and firmness compared with air-stored fruit after 6 d of storage. Mature fruit behaved similarly to Immature fruit, but exhibited a lower incidence of watersoaking and greater fruit degreening. In sharp contrast, Breaker and Yellow fruit rapidly degreened and became orange due to chlorophyll degradation and β -carotene accumulation, softened, and produced ‘fruity’ aromatic compounds after 9 d of ethylene exposure. Ethylene increased respiration in fruit of all stages of development; however, ethylene production was detectable only in decaying fruit. The data indicate that the postharvest response of mini-cucumber fruit to ethylene is highly developmentally dependent, with older fruit exhibiting climacteric-like responses and younger fruit exhibiting tissue watersoaking and general fruit deterioration.