

The influence of pre- and postharvest 1-MCP application and oxygen regimes on textural properties, cell wall metabolism, and physiological disorders of late-harvest ‘Bartlett’ pears

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Abstract

Late-harvest (LH) pears are prone to postharvest disorders and eating-quality deterioration in storage and retailing. The purpose of this work was to evaluate the effects of pre- and post-harvest 1-methylcyclopropene (1-MCP, Harvista (H) and SmartFresh (SF)) on LH ‘Bartlett’ pears under the various O₂ regimes. Spraying 320 μL L⁻¹ H delayed fruit maturation and suppressed ethylene production rate (EPR) when pears were harvested at 70.51 N (LH, whereas commercial harvest (CH) at 75.04 N). However, the H-treated LH fruit had 100 % decay after 5 months of regular-air (RA) storage. The 0.15 μL L⁻¹ SF and SF + 160 μL L⁻¹ H extended melting texture life of LH fruit to 5 months with high levels of water-soluble polyuronides (WSP) and CDTA-soluble polyuronides (CSP) and activities of pectin methylesterase (PME), pectate lyase (PL), and α-arabinofuranosidase (α-ARF). Raising H application concentration from 160 to 320 μL L⁻¹ in H + SF treatments resulted in blockage of ripening capacity. Decreasing O₂ concentration from 2 to 1 % did not impact LH pears’ ripening, but effectively curtailed the development of melting texture in H-treated LH fruit by suppressing EPR, degradation of pectin polyuronides, and activities of PL and β-galactosidase (β-GAL). Furthermore, applying SF in H-treated LH pears stored in 1 or 2 % O₂ resulted in the loss of ripening capacity. Results indicated that 160 μL L⁻¹ H + SF and H at 160–320 μL L⁻¹ extended the melting period and controlled physiological disorders in LH ‘Bartlett’ pears for 5 and 7 months of storage in RA and 2 % O₂, respectively.