

1-Methylcyclopropene (1-MCP) treatment delays modification of cell wall pectin and fruit softening in “Hwangok” and “Picnic” apples during cold storage

Nay Myo Win, Jingi Yoo, Aung Htay Naing, Jung-Geun Kwon and In-Kyu Kang

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Abstract

Despite an increase in the use of 1-methylcyclopropene (1-MCP) to delay fruit softening, the role of 1-MCP in the modification of cell wall pectin to maintain apple fruit firmness during storage is poorly understood. Hence, in this study, we investigated whether 1-MCP treatment delayed fruit softening through pectin modification, in “Hwangok” and “Picnic” apple cultivars, stored up to six months at 0 °C. In both cultivars, 1-MCP-treated apples maintained firmness and exhibited lower internal ethylene concentrations compared with untreated fruit. The depolymerization of pectin in all pectin fractions was attenuated in 1-MCP-treated fruit compared with untreated fruit. In addition, a peak location shift was observed in the molecular mass profile of untreated fruit. Neutral sugar contents (arabinose and galactose), which typically change as fruit ripen, were effectively maintained in 1-MCP-treated fruit. The activity of four important enzymes involved in pectin modification (exo-polygalacturonase, pectin methylesterase, β -galactosidase, and α -L-arabinofuranosidase) was reduced in treated fruit compared to the control. Furthermore, 1-MCP treatment reduced the expression of pectin-degrading candidate genes (*MdPG1*, *MdPME1*, *Md β -GAL1*, *Md β -GAL2*, and *Md α -ARF2*). This study suggests that 1-MCP maintains cell wall pectin and delays the softening of the two apple cultivars by reducing the solubilization of polyuronides and neutral sugars, and limiting the activities of cell wall hydrolysis.