Ethanol vapor delays softening of postharvest blueberry by retarding cell wall degradation during cold storage and shelf life

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Abstract

Blueberry fruit were treated with 500 μL L^{-1} ethanol for 18 h and then stored at 0 ± 0.5 ℃ with 90% relative humidity (RH) for 40 d. The firmness, contents of cell wall polysaccharides, activities of cell wall-degrading enzymes (CWDEs), and cell wall ultrastructure in the blueberry fruit were determined during storage. The results showed that the decline in firmness of blueberries was delayed by ethanol vapor treatment during cold storage and shelf life, compared to the control. The contents of water-soluble pectin (WSP) and 4% KOH-soluble fraction (4KSF) in ethanol-treated blueberries were reduced compared to those in the control. The contents of EDTA-soluble pectin (ESP), Na_2CO_3-soluble pectin (SCSP), 24% KOH-soluble fraction (24KSF), and cellulose in ethanol-treated blueberries were higher than the control. The activities of pectin methylesterase (PME), polygalacturonase (PG), carboxymethyl cellulase (CMCase), ***β***-glucosidase (***β***-Glu), ***β***-galactosidase (***β***-Gal), ***α***-galactosidase (***α***-Gal), and ***α***-mannosidase (***α***-Man) in blueberries were suppressed by ethanol vapor treatment. However, there was no significant difference in the activity of ***α***-arabinofuranosidase (***α***-Af) between ethanol-treated blueberries and the control. Moreover, ethanol vapor treatment delayed the destruction of the cell wall structure of the blueberry fruit via ultrastructural observations. Ethanol vapor treatment can retard the disassembly of cell wall polysaccharides by inhibiting CWDEs activities, thereby delaying blueberry softening.