Title 1-MCP application suppresses ethylene biosynthesis and retards fruit softening during cold storage of 'Tegan Blue' Japanese plum

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Abstract

Plum is a highly perishable fruit and postharvest fruit softening limits its cold storage life. To investigate the role of 1-methylcyclopropene (1-MCP) in ethylene biosynthesis and fruit softening during cold storage, Japanese plum (*Prunus salicina* Lindl. cv. Tegan Blue) as harvested at commercial fruit maturity and exposed to 1-MCP (0.0, 0.5, 1.0 and 2.0 μL L^{-1}) at 20 ± 1 °C for 24 h. Following 1-MCP treatments, fruit were stored at 0 ± 1 °C and 90 ± 5% RH for 0, 3 and 6 weeks. 1-MCP treatments significantly reduced endogenous ethylene production in plum fruit after 3 and 6 weeks of cold storage when compared to untreated fruit. Fruit treated with 1-MCP (1.0 and 2.0 μL L^{-1}) were more firm (31% and 33.5% respectively) when compared untreated fruit. Activities of 1-aminocyclopropane-1-carboxylic acid synthase (ACS) and 1-aminocyclopropane-1-carboxylic acid oxidase (ACO) enzymes during cold storage also decreased in 1-MCP-treated fruit skin and pulp tissues and 1-aminocyclopropane-1-carboxylic acid (ACC) content was not detected in the skin and pulp tissues of fruit treated with 1.0 and 2.0 μL L^{-1} 1-MCP. Activities of exo-polygalacturonase (exo-PG) and endo-polygalacturonase (endo-PG) enzymes in the fruit skin tissues were not affected by 1-MCP whereas activities of exo-PG and endo-PG enzymes in fruit pulp tissues, and activities of pectin esterase (PE) and endo-1,4-β-D-glucanase (EGase) enzymes in both fruit skin and pulp tissues were significantly reduced during cold storage. Activities of ethylene biosynthesis and fruit softening enzymes were concentration dependent, and both were reduced with increased concentrations of 1-MCP. In conclusion, 1-MCP application extends cold storage life of 'Tegan Blue' plum by suppressing ethylene biosynthesis and reducing fruit softening.