Title Influence of calcium on fruit firmness and cell wall degrading enzyme activity in 'Elstar' apples during storage

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Abstract

Softening processes in apples during storage and shelf-life are related to cell wall degrading enzymes involved in hydrolysis of cell wall components. Calcium also has a role in cell wall stability as calcium treatments can extend storage life, increase firmness, and reduce both respiration and ethylene production. Our experiment investigates the influence of calcium in combination with different storage treatments on the softening behaviour of apples. We measured the activity of the cell wall degrading enzymes (β-Xylosidase.; β-Galactosidase; Endoglucanase; Polygalacturonase; Pectatelyase; Pectinmethylesterase) to explain differences in fruit softening rates. 'Elstar' apples were treated with 1-MCP 1 d after harvest or not treated and kept at 1°C in air. In addition apples were vacuum infiltrated with mannitol only or in combination with $CaCl_2$. and stored at 1°C in either air (RA) or controlled atmosphere (CA) for 4 months followed by 10 d shelf-life at 20°C. Fruit firmness and enzyme activity was measured: at-harvest, after storage and after shelf-life. The calcium content in Ca- infiltrated apples was about 100% higher than those infiltrated with mannitol only. Apples held in air, with Ca-infiltration, but without I-MCP treatment were fumer and softened slower than untreated (without Ca) while 1-MCP gave no additional increase in firmness. In CA, there was no impact of Ca-infiltration on fruit firmness. 1-MCP treated apples showed higher firmness values than those without 1-MCP, both under RA and CA and especially during shelf-life. The cell wall degrading enzymes (EGase, PG, PL, PME) showed a clear influence of Ca-treatment, 1-MCP, and storage condition. In RA and also in CA fruit with the lowest firmness values also showed the lowest enzymatic activity, both after storage and after shelf- life.