

Title Effect of heat or 1-methylcyclopropene on antioxidative enzyme activities and antioxidants in apples in relation to superficial scald development.

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Abstract

'Granny Smith' apples were harvested in 2000 and 2001 and stored at 0 deg C air storage with no pretreatment (control), after heating for 4 days at 38 deg C, or after treating for 16 hours at 20 deg C with 1 micro litre 1-methylcyclopropene (1-MCP)/litre. The effects of the two treatments on superficial scald development were consistent over both seasons. Scald began to appear after 8 weeks in control fruit, after 16 weeks in heated fruit but not on 1-MCP treated fruit. alpha -Farnesene accumulation and oxidation were slower in the skin of heated than in the control fruit, and almost entirely absent in 1-MCP treated fruit. The activities of five antioxidant enzymes, ascorbate peroxidase, catalase, glutathione reductase, peroxidase and superoxide dismutase, were measured at two-week intervals in the apple peel, quantitatively as total activity and qualitatively by isoenzyme analysis. The enzyme activities either increased or remained stable during 16 weeks of storage, except for superoxide dismutase activity, which decreased. Ascorbate oxidase activity was higher in the heated than the control apples and there was an additional peroxidase isoenzyme present in activity gels. The activities of antioxidant enzymes were lower in 1-MCP treated fruit except for catalase during the first month of storage. Lipid soluble antioxidant activity was higher in 1-MCP treated fruit than the fruit of the other treatments, and water soluble antioxidant activity was higher in both treatments than in the control fruit during scald development in the control apples. Both the free and total phenol contents in the peel fluctuated during storage but no consistent trend was detected. The differences in enzyme activity and antioxidant content of the peel of 1-MCP and heated apples may play a role in preventing or delaying the appearance of superficial scald.