Title

Antioxidant Response Mechanism in Apples during Post-Harvest Storage and Implications for Human Health Benefits

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Abstract

The biochemical factors affecting post-harvest preservation in apples indicated that well-preserved varieties of apples had increased superoxide dismutase (SOD) activity initially and the activity declined during later storage as apples deteriorated. The SOD link to better preservation correlated with higher phenolic content and free-radical scavenging linked antioxidant activity. Well-preserved varieties were able to maintain a more stable pentose phosphate pathway (PPP) (measured by the activity of glucose-6-phosphate dehydrogenase, G6PDH) throughout the storage period. Proline content increased in all varieties with an increase in proline dehydrogenase (PDH) activity in the initial period indicating proline catabolism supporting potential ATP synthesis. During later storage succinate dehydrogenase (SDH) activity increased while PDH activity declined indicating a shift to tricarboxylic acid cycle and likely NADH generation for ATP synthesis. This shift coupled with the declining SOD activity coincides with rapid deterioration. The guaiacol peroxidase activity (GPX) activity generally declined in late stages indicating post-harvest deterioration. Increasing number of studies have shown that regular intake of fruits and vegetables have clear links to reduced risk of chronic diseases like diabetes and cardiovascular disease. The beneficial effects in many cases have been attributed to the phenolic and antioxidant content of the fruits and vegetables. Apples are a major source of fiber and contain good dietary phenolics with antioxidant function. Previous epidemiological studies have indicated that intake of apples reduces the risk of developing Type II diabetes. Our studies indicate that this reduced risk is potentially due to modulation of postprandial glucose increase by phenolics present in apples via inhibition of a-glucosidase. Phenolic content was evaluated during 3 months of post-harvest storage of four varieties of apples and results indicated positive linkage to enhanced post-harvest preservation and a-glucosidase inhibition. These in vitro results along with existing epidemiological studies provide strong biochemical rationale for further animal or human clinical studies.

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