Title The relationship between antioxidants and postharvest storage quality of fruits and vegetables

Author Hodges, D. Mark; DeLong, John M.

Citation Stewart Postharvest Review, Volume 3, Number 3, June 2007, pp. 1-9(9)

Keyword antioxidants; oxidative stress; postharvest quality; senescence

Abstract

Purpose of review: This review presents a broad overview of the relationship between various enzymic and non-enzymic antioxidants and postharvest storage quality of horticultural commodities.

Findings: The role of oxidative-related senescence in postharvest quality loss is well recognised. The use of storage technology (low temperatures, controlled atmosphere environments) dramatically slows the rate of senescence and reduces cellular oxidative stress. The role of antioxidant molecules and enzyme systems in maintaining postharvest fruit and vegetable quality is equivocal; some studies show quality benefits with high cellular antioxidant titre, while others do not. Quality loss due to accelerated postharvest senescence is not consistently associated with loss of antioxidant concentration or activity, nor is loss of antioxidant capacity always correlated with advancing senescence. Often researchers examining antioxidative content of postharvest products do not address compartmentalisation of antioxidants, as different organelles exhibit varying ability in defending against oxidative senescence. The emerging picture is that the interaction of antioxidant systems and oxidative events affect cellular redox status, which has significant impact on many aspects of plant growth and development, senescence and programmed cell death. Recent work has also shown that antioxidant molecules can also act as cell signalling agents, a role that is more than antioxidative.

Limitations: At the cellular level, achieving superior postharvest fruit and vegetable quality often involves antioxidant molecules and enzymic systems. However, quality is not simply the manifestation of antioxidant capacity. Present knowledge of the manifold functions of antioxidants, which involve redox status and cell signalling roles is limited. Limited also are studies that profile antioxidant concentration and enzyme system activities within multi-factorial storage regimes (temperature, atmosphere and duration combinations) that are commercially employed for each major commodity.

Directions for future research: Studies that document the concentration and activity of antioxidant molecules and enzyme systems, respectively, under storage conditions used

commercially for important fruits and vegetables will be critical for elucidating how overall antioxidant capacity impacts postharvest quality. The continued use of molecular tools, including genetically altered species (eg, *Arabidopsis*), will greatly aid understanding of how specific antioxidants impact growth, development and senescence biochemistry directly or indirectly via influencing other antioxidant molecules or overall redox status. Perhaps in the future, postharvest physiology research can determine ideal storage regimes guided by in-depth knowledge of how cellular antioxidant chemistry can be beneficially altered by combinations of storage protocols.