

Title Cold storage duration affects litchifruit quality, membrane permeability, enzyme activities and energy charge during shelf time at ambient temperature

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Citation Postharvest Biology and Technology, Volume 60, Issue 1, April 2011, Pages 24-30

Keywords Quality; Cold storage; Energy; Litchi; Membrane; Shelf time; Enzyme

Abstract

Storage and transport of litchifruit at low temperature is widely practiced commercially. In this study, no pericarp browning was evident at out-turn on litchifruit stored for 10 and 20 days at cold temperature of 3–5 °C, but fruit stored for 10 days at 3–5 °C gradually browned after 12 h of shelf time at ambient temperature of 25 °C, with the browning index (BI) being elevated to 2.5 at 24 h of shelf life. Furthermore, fruit stored for 30 days began to rot and had a decay incidence of about 30% after 24 h on the shelf. The temperature increment from 3–5 to 25 °C induced marked increases in activities of lipase, phospholipase D (PLD) and lipoxygenase (LOX). Litchifruit stored for 10 days at 3–5 °C followed by the shelf time at 25 °C had lower activities of lipase, PLD and LOX, and also lower levels of membrane permeability, than did fruit stored for 20 and 30 days. Energy level of the pericarp tissue of cold-stored litchifruit was similarly dependent on storage time at 3–5 °C plus shelf time at 25 °C. Adenosine triphosphate (ATP) content and adenylate energy charge (AEC) level in pericarp tissues decreased as cold storage progressed. However, ATP and adenosine diphosphate (ADP) contents, and the AEC levels, in cold-stored litchifruit increased during shelf time at 25 °C, reaching a peak after 6 h, and then decreasing. Fruit stored for 30 days at 3–5 °C had much lower ATP content and AEC level than fruit stored for 10 and 20 days. Increased activities of lipase, PLD and LOX, and energy shortage in cold-stored pericarp tissues during subsequent shelf time at 25 °C suggest that the deterioration of membrane integrity and loss of compartmentation gives rise to accelerated browning and fruit quality deterioration.