

Title Morphological and ultrastructural changes in peel of 'Navelate' oranges in relation to variations in relative humidity during postharvest storage and development of peel pitting

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Citation Postharvest Biology and Technology, Volume 56, Issue 2, May 2010, Pages 163-170

Keywords Citrus; Peel pitting; Scanning electron microscopy; Relative humidity; Water potential

Abstract

'Navelate' orange fruit are prone to develop postharvest peel pitting at non-chilling temperatures, also referred to as rind breakdown, a blemish seriously affecting external fruit quality. Changes in the storage relative humidity (RH), in particular transfer of dehydrated fruit to high RH, have been shown to induce and aggravate peel pitting. In this study, we have examined morphological and structural changes, and its relation to water potential (Ψ_w), in flavedo and albedo of 'Navelate' fruit exposed to postharvest storage conditions inducing rind breakdown. Cryo-scanning electron microscopy (SEM) observations revealed no signs of cell disruption or collapse in epidermal and flavedo cells from fruit stored up to 1 month at 95% RH. Under low RH, flavedo became less compacted and outer layers were translucent. Albedo cells dehydrated by storage at 45% RH became progressively compacted, forming clusters of amorphous and flattered cells, in which the typical spongy structure of the albedo was gradually lost. After prolonged dehydration, cracks and fractures in the wall of albedo cells were evident. Normal structure and morphology of albedo cells were not recovered after fruit transfer from low to high RH, even after prolonged storage at high RH. Injuries in albedo cells and the connecting arms were detected soon after the shift in postharvest RH and progressively increased in number and length. Associated with these morphological alterations, important changes in water potential of flavedo and albedo cells were also noted, that were more pronounced in flavedo than in albedo. Collectively, the results suggest that changes in postharvest RH produced water content adjustment and water movement within the peel tissue that may underlie the morphological and structural alterations accompanying postharvest rind breakdown in 'Navelate' orange fruit.