

Title Anatomical and physiological evidence of white blush on baby carrot surfaces

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Citation Postharvest Biology and Technology, Volume 55, Issue 1, January 2010, Pages 45-52

Keywords *Daucus carota*; Minimally processed; Cell structure; White blush; Dehydration; Lignification; Suberization

Abstract

This study characterizes dehydration and white blush processes, structural alterations and synthesis of phenolic compounds (lignin and suberin), in relation to development of white blush on baby carrot surfaces. Carrots were minimally processed as baby carrots and kept on polypropylene trays with or without polyvinyl chloride (PVC) film at 5 ± 2 °C, $90 \pm 5\%$ RH. During storage, baby carrots that were not wrapped with PVC film were rehydrated 1, 1.5, 15 and 17 h after minimal processing. Fresh-cut baby carrots were evaluated for white blush index, sensory analysis (visual scores), fresh matter loss, phenylalanine ammonia-lyase (PAL) activity and structural and histochemical changes. Increases in white blush index and subjective visual scores on the carrot surface occurred in the first hours, when the material was kept on trays without PVC film and after 3 and 6 d, when stored on trays covered with PVC film. Visual assessment of white blush resulted in a more accurate assessment than instrumental evaluation because it allowed the perception of minor differences between distinct white blush levels, especially at the tips. Hydrating baby carrot surfaces for 1 and 1.5 h after processing allowed partial absorption of water by tissues and the orange color was reestablished on the surface. Fifteen hours after processing, even after rehydration, the color did not return to the original orange standard. The rapid increase in PAL activity in the secondary phloem of baby carrots, compared to that of whole carrots, suggested a physiological response as a result of abrasion. Dehydration and structural alterations of the more superficial cell layers were the main causes of white blush in baby carrots that was not related to lignin accumulation, but rather to synthesis of non-structural phenolic compounds.