

Walnut (*Juglans regia* L.) kernel postharvest deterioration as affected by pellicle integrity, cultivar and oxygen concentration

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Abstract

Increased demand for convenient, healthy foods has promoted the commercialization of shelled, more perishable walnut kernels. In this work for two of the major commercial walnut cultivars ('Chandler' and 'Howard') we determined the influence that disruption of the integrity of the seed coat pellicle during shelling operations trigger postharvest deterioration. Commercially mature 'Chandler' and 'Howard' nuts were subjected to Gentle (*GS*, <4% pellicle area damaged per kernel) or Harsh Shelling (*HS*, 20–22% of pellicle area damaged) and stored in air at 25 or 35 °C (accelerated aging) for three or six weeks. During this period, which simulated current marketing and retail display, we evaluated kernel color changes (Dried Fruit Association of California 'DFA' scale, L^* and *Hue*), ethanol-soluble phenolic antioxidants, oil-free fatty acids (FFA), and peroxide value (PV). The kernel color changed from 'light' to 'amber' during storage, as demonstrated by the decrease in extra light and light kernels and by the reduced lightness (L^*) and *Hue* values. Pellicle browning (amber) incidence was common on *HS* kernels, which also lost more phenolic antioxidants during storage. Minimizing pellicle damage by *GS* operations reduced triglyceride hydrolysis and peroxidation. Kernel quality loss was largely dependent on cultivar; browning oxidation, and lipid hydrolysis and oxidation were faster in 'Howard' than in 'Chandler'. Searching for a practical and direct postharvest technology, in absence of proper temperature control, to reduce the rate of kernel deterioration, we tested controlled atmospheres (CA) at different O₂ concentrations (0.0, 3.0, 6.0 or 21.0 kPa) on both cultivars. Overall, commercially shelled 'Howard' and 'Chandler' (kernels) will benefit from retail packaging with oxygen concentrations equal to or lower than 3.0 kPa during warm retail display. This information will be useful for processors, distributors and produce handlers to protect snack-friendly, ready-to-eat walnuts.