

Title Quality evaluation of raw ground almond kernels (*Prunus dulcis*): Effect of active and modified atmosphere packaging, container oxygen barrier and storage conditions

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Abstract

The present study investigated the effect of active and modified atmosphere packaging, container oxygen barrier and storage conditions on quality retention of raw ground almonds. Ground almond kernels were packaged in: a) polyethylene terephthalate//low density polyethylene (PET//LDPE), and b) low density polyethylene/ethylene vinyl alcohol/low density polyethylene (LDPE/EVOH/LDPE), under N₂ or with an oxygen absorber and stored either under fluorescent light or in the dark at 4 or 20 °C for a period of 12 months. Quality parameters monitored were: peroxide value (PV), hexanal content, color, fatty acid composition and volatile compounds. Of the sensory attributes color, texture, odor and taste were evaluated. PV ranged between 0.26 for fresh almonds and 19.98 meq O₂/kg oil for almonds packaged in PET//LDPE pouches under N₂ exposed to light at 20 °C after 12 months of storage. Respective values for hexanal were < 28.5 µg/kg and 9.38 mg/kg. Polyunsaturated fatty acids (PUFA) and saturated fatty acids (SFA) increased with a parallel decrease of monounsaturated fatty acids (MFA) after 12 months of storage in samples stored with the oxygen absorber while in samples packaged in PET//LDPE under N₂, a decrease in PUFA and MUFA with a parallel increase in SFA was recorded. Likewise, volatile compounds such as aldehydes, ketones, alcohols, acids, alkanes and aromatic hydrocarbons increased during storage indicating enhanced lipid oxidation. Color parameters L*, a* and b* remained unaffected in all treatments including the oxygen absorber while under a N₂ atmosphere L* parameter showed a small but statistically significant ($p < 0.05$) decrease with a parallel increase ($p < 0.05$) of a* and b* values after 12 months of storage. The most pronounced color changes occurred for samples in PET//LDPE pouches irrespective of lighting conditions at 20 °C. Raw ground almonds retained acceptable quality for ca. 6–7 months packaged in PET//LDPE and ca. 8 months packaged in LDPE/EVOH/LDPE pouches under N₂ irrespective of lighting conditions at 20 °C while at 4 °C shelf life was extended by an additional month as compared to storage at 20 °C. Use of the oxygen absorber provided a shelf life of at least 12 months for all samples irrespective of container oxygen barrier, lighting conditions and storage temperature.