

New protective packaging for conservation of Macadamia nuts



Conservation issues

Moisture content of macadamia nuts is a critical parameter that negatively impacts both quality and shelf life and therefore needs to be carefully controlled during storage. When macadamia nuts absorb moisture, they may lose their characteristic crisp texture, microbial growth (including molds) can occur, and lipid oxidation may accelerate. Conversely, when moisture levels are too low, oxidation processes may also increase, leading to quality deterioration.

Macadamia nuts can either gain or lose moisture depending on their initial moisture content and the surrounding environmental humidity—this phenomenon is known as moisture migration.

Moisture content strongly influences early rancidity in macadamia nuts, and therefore, to retard rancidification and extend shelf-life, shelled nuts should be protected from moisture and oxygen during storage (Wall, 2013). Since the oxidative stability of the kernels is related to their moisture content, this parameter must be monitored to ensure drying to below 1.5% (Borompichaichartkul, Luengsode, Chinprahast, & Devahastin, 2009; Cavaletto, 1981; Silva, Marsaioli, Maximo, Silva, & Goncalves, 2005). At this moisture level the water activity (aw) is equal or less than 0.3, which represents the optimum point for oxidative stability of dehydrated foods (Cavaletto, 1981; Wall, 2013). In addition to this, the maximum stability of macadamia nut corresponds to the minimum integral entropy zone (Domínguez, Azuara, Vernon-Carter, & Beristain, 2007), which corresponds to a range of aw from 0.36 to 0.44 (1.2–1.6% moisture). Therefore, 1.5% moisture content is fundamental to assure the oxidative stability of macadamia nuts.

Quote from LWT – Food Science and Technology: “Non-destructive assessment of the oxidative stability of intact macadamia nuts...” Livia C. Carvalho^a, Marcondes L. Leite, Camilo L.M. Morais, Kássio M.G. Lima d, Gustavo H.A. Teixeira e

Macadamia nuts are particularly rich in unsaturated fats, making them highly susceptible to oxidative rancidity. Exposure to oxygen, elevated temperatures, light, and increased moisture levels significantly reduces shelf life and product quality.

Once macadamia nuts are processed (e.g., cut, roasted, or flavored), the oxidation of lipids becomes more critical. Lipid oxidation leads to rancid flavors and unpleasant odors due to breakdown of fats and oils.

... The most important aspect to preserving the incredible quality of California Almonds is maintaining controlled conditions. Elevated temperatures and moisture can significantly reduce quality and shelf life...

Processing can affect the shelf life of almonds. In general, cutting (dicing, slivering, slicing, grinding) and blanching increases the exposed surface area and begins the oxidative process, which can reduce shelf life. Because both oil and dry roasting subject almonds to higher temperatures, roasted products must be protected from oxygen. In addition, it is good practice to avoid exposure to direct sunlight, which can darken the surface of the nut.

Quote from the website of the Almond Board of California

High-barrier, Oxygen-free, Bulk Packaging

Traditional bulk packaging does not provide sufficient protection for macadamia nuts against environmental factors. With the introduction of fully hermetic, high-barrier protective packaging materials (such as aluminum-based or PA/EVOH multilayer films), long-term bulk storage becomes significantly more effective. So far, this kind of protective modified atmosphere packaging was only possible in smaller bags

With the patented two-way valve system of vQm, extremely low-oxygen conditions can be created inside (form-stable) big bags with a special high barrier liner inside. By doing so, oxidation can be minimized while maintaining optimal moisture levels.

Most commonly used big bag for packaging macadamia nuts under modified atmosphere is our form-stable big bag of 105x105x180cm, with 140my 7-layer EVOH film inside. This bag can hold up to 1200kg of nuts.



EVOH baffle liner

