

New protective packaging for conservation of **Pistachio**



Conservation issues

Like most nuts, pistachios are sensitive to rancidity, due to oxidation of (lipid) fats and oils, and limits shelf-life in traditional bulk size packaging. Even more problematic is the extreme susceptibility of pistachio to aflatoxins, threatening the export of major pistachio producing countries to important markets like EU or US. In addition, insect infestations, like in most food commodities, pose a major challenge during storage & internation trade of pistachios.

*Aflatoxins (AFs) are fungal subsidiary products that are predominantly generated by *Aspergillus flavus* and *Aspergillus parasiticus* strains on cereals, nuts, dried fruits and dairy products under warm and humid conditions. Harmful fungi cause spoilage in agricultural crops, and mycotoxins exert harmful effects on humans and livestock. Pistachios (*Pistachio vera* L) are from among the most well-known nut trees extremely susceptible to contamination by aflatoxins and the major contributors to dietary aflatoxins.*

Quote by Milad Ashrafizadeh from study "Antifungal nanoparticles reduce aflatoxin contamination in pistachio".

CO2 to inhibit development of aflatoxin

The modified atmosphere system of vQm, allows you to pack pistachio under low oxygen and/or increase CO2 level, inside a fully hermetic & high barrier packaging. By doing so, the quality of the nuts can be preserved over an extended period of time, after harvest, and allows you to suppress the

*The results of the current study showed that the saturated concentration of CO2 is efficient enough to control the growth of *A. flavus* isolates and their aflatoxin production. But, increasing oxygen concentration increased the level of aflatoxin production. Therefore, aflatoxin production can be reduced by decreasing the concentration of oxygen and/or increasing the CO2 concentration. This study also showed that vacuum condition inhibited the growth and aflatoxin production by both isolates of *A. flavus*.*

*Quote by Zohre Mahbobinejad and others in research article "Reduction of aflatoxin production by exposing *Aspergillus flavus* to CO2".*

development of fungi. This allows you to keep the level of mycotoxins within safe levels during a prolonged period, in the full supply chain, until the bags are opened again. There are ample scientific studies that prove the effectiveness of elevated CO₂ and/or reduced oxygen to suppress or even inhibit the development of mycotoxins and aflatoxin in particular.

At the same time, it is important to note that modified atmosphere is not a cure to the presence of fungi. The development of mycotoxins is instigated by high temperatures in combination with high humidity, and can already develop in the orchard, e.g. due to excessive irrigation, delayed harvest or direct contact with soil. Packing the nuts after harvest can control the risk of aflatoxin, and prevent infected pistachios to contaminate uninfected nuts.

MAP to eradicate infestations

Apart from suppressing the development of mycotoxins, elevated CO₂ (in hermetic, high barrier packaging) can also eradicate insect infestations in all development stages (from eggs to adults). Prolonged CO₂ exposure (with a minimum product temperatures of 18 degrees) can guarantee full mortality of all stages. Since no chemicals are needed, this is also suitable for organic nuts.

Only the size is new!

The advantages of modified atmosphere or vacuum, are already well known and commonly applied for consumer packaging. With vQm, the same benefits can be achieved for bulk-size packaging. The smart, patented two-way valve system allows for an extreme fast manner to modify the gas conditions inside pallet-size packagings, including big bags. Our small, 230V machine will do the job within minutes. Let us impress you with an online demonstration!

Summary benefits:

- **Suppress development of aflatoxins** with elevated CO₂, reduced oxygen or vacuum.
- **Maintain the optimum moisture content** of your product during the complete supply chain.
- **Eradicate insects in all life stages** by using elevated CO₂. Since the packaging is hermetic, **no re-infestation** can occur as long as it remains intact.
- **No expensive, climate controlled warehousing** needed to preserve the product quality
- by reducing the oxygen inside the packaging, **oxidation, thus rancidity, can be minimized.**
- **Preservation of taste and aromas.** Quote from a Greek pistachio farmer, Milonas, who made a trial with vQm and kept one pallet of pistachio under deep vacuum: *"I opened the bag after 1,5 years and it was smelling & tasting like the first day I put them inside. It's like time stops! I owe you all this, and all I need are more bags for the new season"*.