impressed by vQm

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## New protective packaging for conservation of

# Hazelnuts

**Conservation issues**

Due to the oxidation of (lipid) fats and oils, hazelnuts are sensitive for rancidity and limits shelf-life in traditional bulk size packaging. With the introduction of fully hermetic, protective packaging with aluminum barrier film and the possibility to create & maintain modified gas conditions inside bulk-size packaging, long-term storage of hazelnuts is now possible. Lipid oxidation is effectively prevented by anoxic conditions and by excluding light.

> *"Hazelnut quality was studied after storage in selected modified atmosphere conditions. Hazelnuts of the Negret cultivar collected in Tarragona, Spain, were used in the experiments. The shelled and unshelled hazelnuts were stored with different oxygen concentrations (1%, 5%, 10% and 20% $O_2$) at two different temperatures (7C and 25C). The quality of the hazelnuts during storage was monitored by determining the peroxide value, acid value, $K_{232}$ and $K_{270}$ indices, percentage of unsaturated fatty acids and sensory analysis of the hazelnuts. It was observed that after one year storage period, none of the storage modes had given rise to significant rancidity. It was also confirmed that the shell protected the hazelnut from oxidative deterioration. Nevertheless, storage in atmospheres with oxygen levels lower than 10%, autoxidation was significantly reduced and the low temperature delayed lipid rancidity."*
>
> *Quote from study "Effect of modified atmosphere storage on hazelnut quality", by María Begoña San Martín, Teresa Fernández-García, Antonio Romero and Antonio López*

Infestation problems with e.g. the hazelnut weevil, can be eradicated and new infestations avoided during storage and the full supply chain, by creating appropriate MAP conditions (e.g. extreme low oxygen, high CO2 and/or vacuum).

For small size packaging of (shelled) hazelnuts, the advantages of vacuum are well known and commonly applied. With vQm, the same benefits can achieve for bulk-size packaging.
Another common issue is aflatoxin development on sterile hazelnuts. Water activity ($a_w$), storage temperature, headspace oxygen and carbon dioxide concentrations influence the growth of, and aflatoxin production by *Aspergillus flavus* on sterile hazelnuts. Anoxic or vacuum conditions inside packaging can inhibit aflatoxin production.

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*"This study has shown that A. flavus can grow and produce aflatoxin in carbon dioxide enriched atmospheres in the presence of oxygen. It also emphasizes the combined effect of several 'barriers' to inhibit and reduce aflatoxin in MAP products containing various levels of residual oxygen."*

*Quote from study "Growth of and aflatoxin production by Aspergillus flavus in peanuts stored under modified atmosphere packaging (MAP) conditions", Williams O.Ellis[a], James P.Smith, Benjamin K.Simpson, Hosahalli Ramaswamy, GillesDoyon[b]*

**Optimum conservation conditions**

The combination of the vQm valve, sealed inside a vacuum-proof, high-barrier liner, along with the vQm vacuum unit allows you to:

- ***Vacuum pack*** your hazelnuts on pallet size: in a FIBC with vacuum-liner or smaller bags inside a wrapping liner

- Create ***modified atmosphere (MAP), anoxic conditions***: by connecting an external nitrogen (or CO2) supply, the vQm unit can be easily programmed for multiple cycles of vacuum followed by injection of nitrogen. By doing so, an increased nitrogen concentration can be achieved with every cycle, reducing the residual oxygen concentration inside the packaging. By doing so an anoxic environment can be created that effectively minimizes the oxidation/rancidity . When the vQm protocol "MAP vacuum" is selected, the packaging remains under vacuum, while the protocol "MAP no vacuum" will leave the packaging at (ambient) pressure once the last cycle of gas injection has been completed.

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**For what food applications the vQm used in general?**

- The high barrier properties of the film that is used for the liner, in combination with the hermetic closure, allows you to ***maintain the moisture content*** of your product during the complete supply chain, from the moment of packaging. Minimize external influences on you product due to high humidity, condensation or direct water contact. If packed under vacuum, no condensation will occur on the inside of the packaging.
- By creating MAP conditions of extreme low oxygen or high CO2 concentration or by maintaining vacuum over an extended period of time, ***all insects in all life stages can be eradicated***. Most quick and easy is high CO2, if the product can endure these conditions. Otherwise low-oxygen in combination with vacuum is the most applied alternative. Since the packaging is hermetic, ***no re-infestation*** can occur as long as it remains intact.
- Often, the quality of products is negatively affected by oxidation. By reducing the number of oxygen molecules in the packaging, this ***oxidation can be minimized***. Oxidation of (lipid) fats and oils in e.g. nuts, powders, seed or brown rice is known as *rancidity*. Oxidation is also causing *decolorization* of products, e.g. dried chilies, spices or herbs.
- ***Preservation of taste and aroma's***. Aroma (or smell or odor) is the sensation perceived when volatile compounds are sniffed through the nose and directly impact on the perceived taste. These volatile compounds can best be preserved in hermetic, anoxic or vacuum conditions. Products that can benefit from are e.g. dried spices, dried herbs and tea.
- Other additional benefits could be e.g. ***reduction of breakage*** (nuts), as the product is fixated under vacuum, ***volume reduction*** (fluffy powders, tea, chilies etc), ***reduced temperature fluctuations*** during the supply chain (under vacuum: temperature transfer is inhibited; particularly useful for e.g. green coffee when shipped in containers with big temp fluctuations inside the container (day/sun vs night).