UNIVERSITÀ DEGLI STUDI DI UDINE
hic sunt futura

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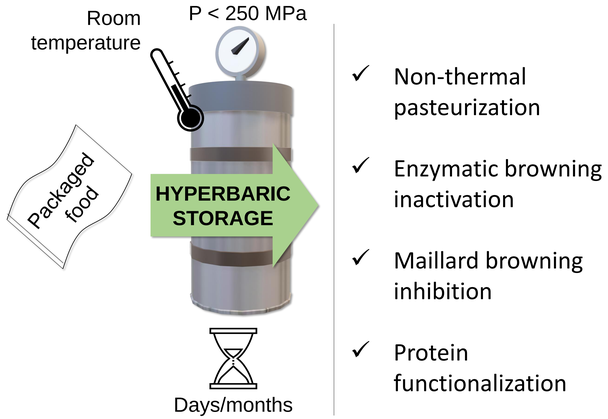
ALIMENTI E SALUTE UMANA

Hyperbaric Storage as an innovative technology to extend stability and functionality of food

In this Thesis, moderate hydrostatic pressure was used to concomitantly stabilize and functionalize food during storage at room temperature



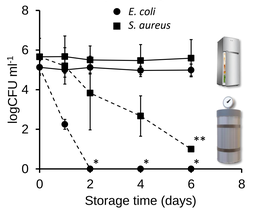
- ✓ Non-thermal pasteurization
- ✓ Enzymatic browning inactivation
- ✓ Maillard browning inhibition
- ✓ Protein functionalization

AIMS: This Ph.D Thesis was structured as a multi-aspect study on hyperbaric storage (HS). The attention was focused on: (i) the identification of packaging solutions feasible for HS; (ii) the capability of HS to obtain microbiological, enzymatic and chemical stabilization of food; (iii) the modification of the structure of proteins by HS to improve the technological functionality of food.

APPLICATIONS: The results achieved in this Thesis demonstrate the multi-tasking character of HS, which is concomitantly capable to stabilize and improve techno-functionality of food. The technology has thus the potential to evolve from storage technology solely to a non-conventional treatment improving food quality in a number of different ways. However, several gaps need to be filled to make HS viable for industry, with particular reference to the development of economically sustainable working units.

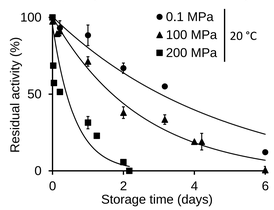
RESULTS: In the first part of the Thesis, the feasibility of food packaging materials for HS was tested considering single-layer (PET, PLA) and multi-layer (PA/PE, PP/EVOH/PE) solutions. Multi-layer films resulted adequate for HS and were thus used in the subsequent experiments. In the second part, the capability of HS to microbiologically, enzymatically and chemically stabilize food was demonstrated by achieving raw skim milk pasteurization, apple juice polyphenoloxidase (PPO) inactivation, and glucose-glycine Maillard reaction inhibition, respectively. The third and last part of the work was focused on the use of HS to steer food techno-functionality. By modifying protein structure, HS was capable to improve milk and egg white foaming and egg yolk rheological properties.

Raw milk pathogens load



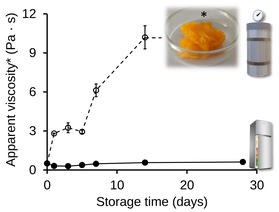
*L.o.D. = 0 logCFU mL^{-1}
**L.o.D. = 1 logCFU mL^{-1}

Apple juice PPO activity



(—) First-order kinetic models used to fit PPO inactivation data.

Egg yolk viscosity



* Viscosity not determined due to the sample being completely gelled.