

Development of innovative non-thermal pre-treatments for frozen vegetables: A case of collaborative effort between academic research and food industry

Introduction

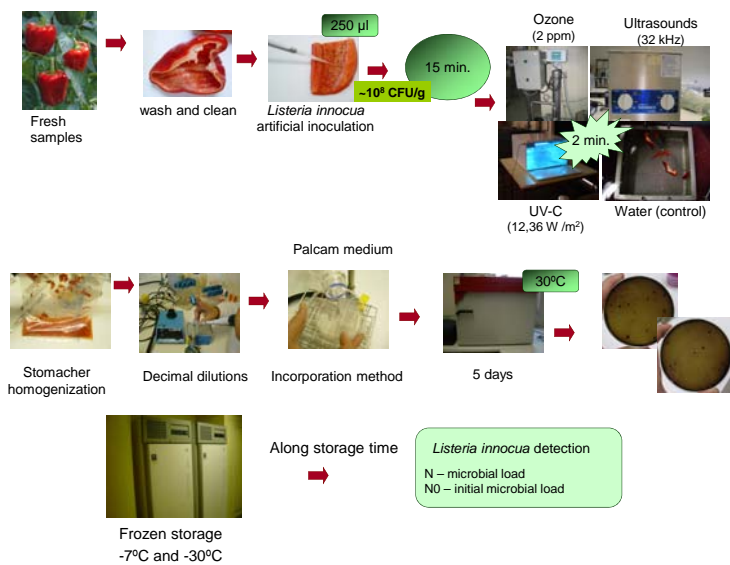
The development of innovative technologies promoting vegetables' safety is an actual concern. In vegetable processing industries, blanching is often used as a treatment applied before freezing. This treatment aims at ensuring products' safety and quality from a microbiological and enzymatic point of view. However, quality is negatively affected by the thermal impact at microstructural level. Recently, innovative techniques such as ultrasonication, ultraviolet radiation and ozone treatments, seem a good solution for safety and quality improvements. However, the effectiveness of these technologies depends on the microbial sensitivity to the treatment used and, consequently, variable results are commonly reported by researchers. These promising and alternative technologies may reduce microbial content, while retaining products' quality standards.

The industrial interest for these treatments made possible one collaborative project between Portuguese academic institutions and a food industry.

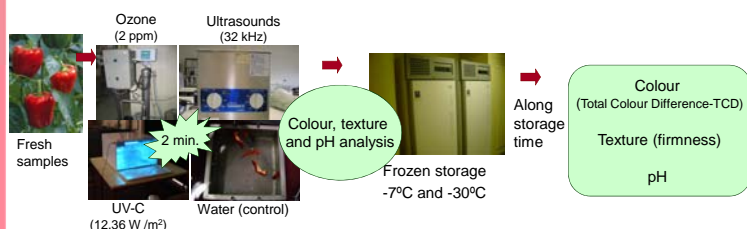
Objectives

The objective of this work was to study the effect of some innovative technologies (ozone in aqueous solution, ultraviolet light and ultrasounds) on safety (evaluated by *Listeria innocua* enumeration) and some quality features (pH, colour and texture) of red bell peppers used as case study, throughout 3 months of storage at -7°C and -30°C.

Experimental description: Safety



Experimental description: Quality



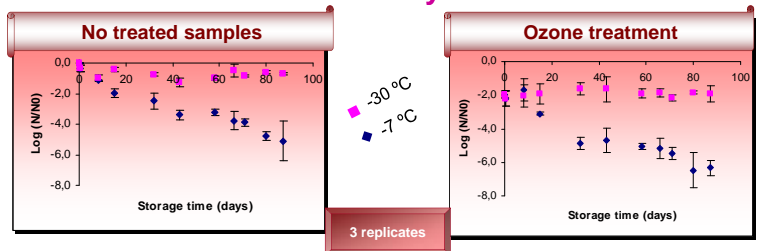
Conclusions

The industrial partner decided to include an ozone treatment in a stage previous to the freezing process of vegetables. It should be remarked that the quality of water (in terms of microbial contamination) used in the treatments was greatly improved.

Acknowledgments

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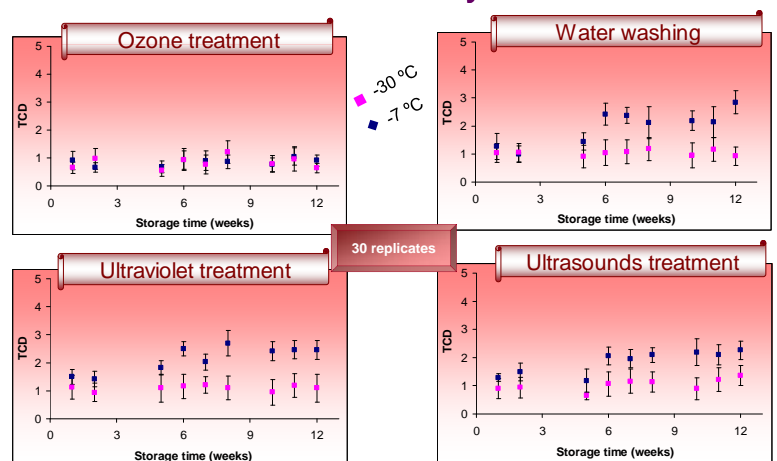
Results and Discussion: Safety



In terms of bacteria reduction, the impact of all tested technologies in red bell peppers storage at -7 and -30 °C was equivalent to a water washing. Ozone results are presented as a representative case.

However, in ozonated water, *Listeria innocua* was completely inactivated in a few seconds.

Results and Discussion: Quality



In terms of quality parameters, colour was better retained during frozen storage when ozone treatment was applied. The other quality parameters analysed (firmness and pH) were not affected by ozone, ultraviolet light and ultrasounds treatments.