OPEN ACCESS Freely available online

ISSN: 2155-9589
Journal of Membrane Science & Technology

Perspective

Conceptual Elements of Revolutionary Nonthermal Food Technologies

Sonia Curcio*

Department of Food Science and Nutrition, University of Campinas (UNICAMP), São Paulo, Brazil

DESCRIPTION

Biotechnology, transdisciplinary sciences, and several other fields of study and application utilize nonthermal methods. They are mostly used for preservation in the treatment of food and wastewaters in the food processing industry. Nonthermal processing is becoming more and more common in the food business due to consumer expectations for minimally processed meals and the detrimental effects of heat on food's nutritious qualities. Food safety is the primary goal of nonthermal processing, and research efforts are concentrated on microbial inactivation, food safety, and preservation while maintaining the quality of the produced goods. This benefit makes nonthermal processing a viable alternative to traditional thermal processing. These processing methods have the potential to reduce treatment time, energy use, and carbon footprint in addition to the food safety and quality aspects.

Depending on the source of energy transfer, nonthermal technologies operate in various ways. They are used to render microorganisms inert through the generation of radicals (plasma, ultrasound, ozonation, UV light, etc.); mechanical action through hydrodynamic effects, shock waves (plasma and ultrasound); electric and magnetic fields (pulsed electric fields, cold plasma, radiofrequency and oscillating magnetic fields, electrohydrodynamic processing, and electron beam processing); or extremely high pressures that cause microorganisms to rupture and burst. Within the framework of the so-called "hurdle" idea, these treatments may be applied singly or in combination. In the food sector, High-Pressure Processing (HPP), supercritical fluid extraction ($scCO_2$), and Pulsed Electric Fields (PEFs) are the most extensively studied methods with conclusive scientific evidence.

Novel nonthermal processing has advantages that can be categorized as "green" procedures for "green" extraction in terms of energy usage. It is crucial to review processing in terms of safety, quality, and environmental concerns in order to improve output goods employing nonthermal processing.

Safety of food processed with nonthermal technologies

Food that has been nonthermally prepared poses some sort of risk because it hasn't been properly preserved. The US Food and Drug Administration (FDA) asked the Institute of Food Technologists (IFT) to submit a study on the efficiency of microbial inactivation of alternative food-processing technologies at the beginning of a substantial research and use of nonthermal food technology.

The IFT published general recommendations for upcoming research on novel techniques based on microbiological requirements back in 2000, including the evaluation of the appropriate linear first-order survivor curve model and launching experimental protocol, identifying inactivation action/mechanism(s) among alternative technologies, and figuring out the synergism or antagonism of one alternative processes. The IFT also stressed the significance of identifying potential hazardous and indigestible by-products of processing as well as the need to provide tools for measuring and keeping track of physical-chemical alterations as they occur. Microbial food safety and chemical food safety are included.

Quality of food processed with nonthermal technologies

Stakeholders, including legislators, retailers, and manufacturers, are interested in what customers think about food produced using cutting-edge technologies. An innovative product that gives consumers the chance to taste and assess it appears to have an impact on how they will react to new technology. It has been suggested that including customers in the evaluation process, that is, by combining the new technology with a favourable sensory experience of the product, can result in the positive consumers' reaction in this still mostly untapped field.

High-Pressure Processing (HPP) may have a major impact on the appearance, taste, and functionality of food, as well as on customer acceptance and sensory perception. HPP helps indirectly to improve the preservation of the quality features

Correspondence to: Sonia Curcio, Department of Food Science and Nutrition, University of Campinas (UNICAMP), São Paulo, Brazil, E-mail: scurcio@unicamp.br

Received: 23-Dec-2022, Manuscript No. JMST-23-19808; **Editor assigned:** 26-Dec-2022, Pre QC No. JMST-23-19808 (PQ); **Reviewed:** 09-Jan-2023, QC No. JMST-23-19808; **Revised:** 16-Jan-2023, Manuscript No. JMST-23-19808 (R); **Published:** 23-Jan-2023, DOI: 10.35248/2155-9589.23.13.318

Citation: Curcio S (2023) Conceptual Elements of Revolutionary Nonthermal Food Technologies. J Membr Sci Technol. 13:318.

and nutritional content over the course of their shelf life by slowing down some biological events, such as Maillard's reactions. The covalent bonds of low-molecular-mass chemicals, such as those in charge of colour, flavour, and health benefits, are also said to be only little impacted by HPP.

For instance, HPP at low and moderate temperatures did not result in any appreciable changes to the pigments that give fruit juices their colour, such as chlorophyll, carotenoids, and anthocyanins. However, due to the insufficient inactivation of enzymes and microorganisms by high pressure, colour compounds may change during storage of HPP-treated products more quickly than in thermally treated ones.

Environmental impacts of nonthermal food technologies

Food processors are becoming increasingly interested in lowering the environmental impact of the goods and the cost of processing in addition to producing safe, high-quality products with nonthermal technologies. However, due to differences in the size of the facilities and food processed, analysis and comparison of the environmental impacts of nonthermal technologies provide a difficulty (meat, egg, fruit, vegetables, liquid food, etc.). These approaches are typically not used in major industrial facilities; instead, they are frequently tested in labs or on small-scale pilot projects without a thorough examination of the entire workflow.

Technologies like pulsed electric field therapy or high-pressure treatment not only achieve microbial inactivation under mild settings or inactivate specific enzymes and prevent undesirable changes in food, but they also shorten processing times and use less energy.

CONCLUSION

Future research on the environmental effects of novel and conventional techniques will need to focus on two things: One is improving the environmental performance of nonthermal technologies in and of themselves, and the other is comparing environmental aspects of nonthermal and conventional technologies while also giving consideration to other factors like the final product's quality or the cost of the investment.