



Innovative Nonthermal Technologies: A Revolution in Sustainable Food Processing

Yeliz Flynn*

Department of Food Processing, University of Bristol, Bristol, United Kingdom

DESCRIPTION

The modern food processing industry uses various techniques to preserve food for extended shelf life, many of which are energy-intensive and produce a lot of waste. This has not been sustainable in the long run. In the effort for sustainability, in the technologies are becoming increasingly popular. These processes use minimal or no heat to preserve food, resulting in reduced energy consumption, improved nutrition retention, and reduced production. Non thermal technologies include High Pressure Processing (HPP), Pulsed Electric Field (PEF) processing, Ultraviolet Light (UV-C) irradiation, Ultra Sonication, and Microwave Assisted Thermal Sterilization (MATS). These technologies present immense potential for sustainable food processing as they reduce waste generation and energy consumption while providing better preservation of food quality.

High Pressure Processing is a process that involves subjecting food products to high hydrostatic pressures of up to 600 MPa. This extreme pressure destroys microorganisms such as bacteria, while preserving nutrients and flavor. HPP can be used for both liquid and solid foods including meat products, fruits and vegetables, juices and beverages, dairy products etc. It can also be used for pasteurization or sterilization purposes.

Pulsed Electric Field (PEF) processing is a nonthermal technology that uses electrical pulses to create transient pores in cell membranes of microorganisms such as bacteria. This leads to their death or destruction, thus preserving the quality of the product. While PEF technology can be used for liquid foods like juices and beverages, it is particularly useful for sterility assurance in low acid foods such as processed meats.

Ultraviolet light irradiation is a non-thermal process that utilizes UV light energy at specific wavelengths to destroy microorganisms such as bacteria without affecting the food's nutritional content or flavor properties. It can be used on both liquid and solid foods including vegetables and fruits, juices and beverages etc., making it ideal for extending shelf life of these

products.

Ultra sonication utilizes high frequency sound waves to physically disrupt microbial cells without significantly altering the characteristics of the product itself. Its main advantage over the other nonthermal processes lies in its ability to reduce microbial load with minimal effect on nutritional content.

Food processing has been revolutionized by the emergence of innovative nonthermal technologies. These new technologies have enabled food processors to produce processed foods with improved shelf life, flavor, and nutrition while achieving greater sustainable production methods. However, there are several challenges that must be addressed before these nonthermal technologies can be adopted on a wider scale. The most prominent of these challenges is the cost of new equipment and processes. Nonthermal food processing technologies tend to require more advanced equipment than traditional thermal methods, and this increased cost can be a significant barrier to adoption. Another challenge is the complexity of nonthermal processing techniques, which can be difficult for small-scale processors to understand and implement. Additionally, there may be regulatory barriers that make it difficult for small-scale processors to take advantage of these new technologies. Finally, there are issues related to consumer acceptance: many consumers are wary of foods that have been processed using nonthermal methods, as they may perceive them as being less safe or less natural than their thermally-processed counterparts. The increasing demand for sustainably-produced foods has led many food processors to actively seek out innovative solutions such as nonthermal technologies to reduce their environmental impact and increase efficiency. Despite the challenges mentioned above, nonthermal technologies offer an immense potential for transforming food processing and providing more sustainable solutions for producing safe and healthy food products. By continuing to invest in research and development into nonthermal technologies, we can ensure that these innovative solutions continue to evolve and become more accessible in order to benefit all stakeholders involved in the food industry.

Correspondence to: Yeliz Flynn, Department of Food Processing, University of Bristol, Bristol, United Kingdom, E-mail: flynn67@gmail.com

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