Article ID: SIMM0444 Popular Article

INSIGHT OF NOVEL PROCESSING TECHNOLOGIES AND THEIR MAJOR ROLE IN FOOD PRESERVATION

Nandhana Lal R, Sahaya Preethi S and Vaisshali Prakash Arul Prakasam*
Tamil Nadu Dr. J. Jayalalithaa Fisheries University, Tamil Nadu, India

How to Cite this article
Nandhana et al 2024. INSIGHT OF NOVEL PROCESSING TECHNOLOGIES AND THEIR MAJOR ROLE IN FOOD PRESERVATION. *Sabujeema-An International Multidisciplinary e-Magazine.* 4(9): 19-23

Open Access

Abstract

The novel food processing technologies a non-thermal food processing technologies designed to ensure the safety of the food. The texture, taste, appearance, and nutritive content of the food product depend on the way it's reused. Thermal processing similar to pasteurization, drying, dulling, etc. causes nutrition loss in food products. Consumer demand was eventually aimed at food safety and preference for good quality food, this enabled the emergence of new food processing technologies. HPP (High-High-pressure processing), PEF (Pulsed Electric Field), CP (Cold Processing), Supercritical fluid extraction (SCFEX), Ultrasound, and Ozone processing, are some of the popular new food processing technologies. This composition gives an introductory understanding of the new-thermal food processing and its significance in food safety operations for consumer preference.

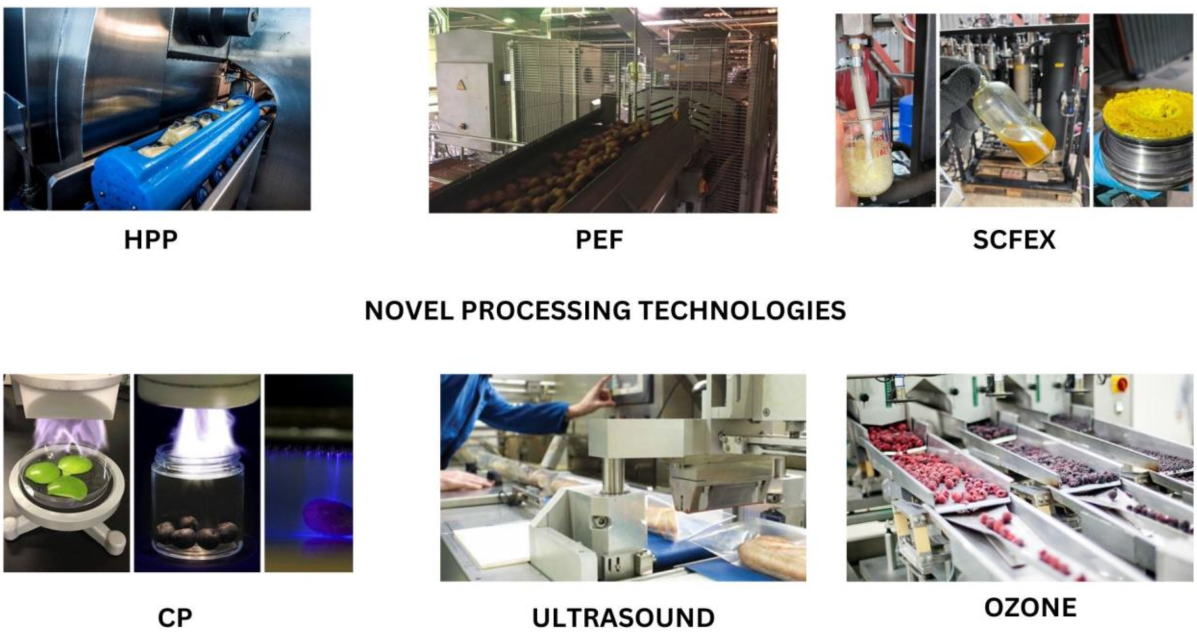
Keywords: Cell hybridization, Hydrostatic pressure processing, Supercritical, Ultrasound, decontamination.

INTRODUCTION:

The food assiduity's need for new processing technologies stems directly from consumer demand for high-quality, fresh, and healthy goods devoid of chemical preservatives. These slice-edge processing ways bettered the bioactivity of functional factors, food safety, feasibility, and quality. The primary target organisms for food deterioration are microorganisms. Assiduity-standard food processing ways either calculate on microbial inactivation or microbial growth inhibition. Traditional heat-dependent ways of reducing pathogens are similar to pasteurization and thermization. This system causes unintended differences in the sensitive rates of the food (by overheating) or low nutritive value food products. There has been a lot of interest in indispensable styles to the conventional thermal processing of food, and multitudinous slice-edge styles, dubbed" novel" or" arising," have been created. The two most delved of these slice-edge technologies are palpitated electric fields (PEF) and high hydrostatic pressure (HHP) (Stoica et al., 2013; Hameed et al., 2018).

NOVEL FOOD PROCESSING TECHNOLOGIES:

ultra high pressure processing (UHP) is also referred to as high-pressure processing. Uses pressures between 100 and 800 MPa (Balasubramaniam et al., 2018). Mechanical pressure creation often occurs through a fluid (water), which is then transferred to the final product. Since bacterial spores are very resistant to high hydrostatic pressures, a combination of heat (90–120°C) and pressure (400–600MPa) is frequently needed for mold sterilization.



HIGH PRESSURE PROCESSING (HPP):

High pressure processing is a non-thermal food preservation method that uses pressure instead of heat to inactivate dangerous pathogen vegetative spoilage bacteria (Muntean et al., 2016). High hydrostatic pressure processing (HHP) or

One major benefit of HPP is that food can be high-pressure processed either with or without packaging (Stoica et al., 2013; Hameed et al., 2018).

PULSED ELECTRIC FIELD (PEF):

The electromechanical instability of the cell membrane is linked to the inactivation of microorganisms exposed to high-voltage PEFs. In the fields of genetic engineering and biotechnology, PEFs are utilized for cell hybridization and electrofusion. The approach is also applied to the inactivation of bacteria, whereby the cell membrane is irreversibly broken down by extending or intensifying the treatment. PEF often supports the food industry's financial gain while advancing sustainable food processing without sacrificing product safety or quality (Arshad et al., 2021). Food products are treated using pulsed electric field (PEF) technology, which applies high-voltage electric fields with brief bursts. The electric field's voltage can vary from 100–300 V/cm to 20–80 kV/cm, and the pulses' duration can range from milliseconds to microseconds. The PEF method renders microorganisms inactive, preserving the food's fresh flavor and aroma while having little to no impact on its qualitative attributes.

SUPERCRITICAL FLUID EXTRACTION (SCFEX):

Supercritical CO_2 has been employed for the extraction and isolation of important chemicals from natural products for the past thirty years. Supercritical carbon dioxide technology, or SC-CO_2 technology, uses carbon dioxide and pressure to kill bacteria without compromising their nutritional value. Supercritical fluid (SF) can be created by applying pressure and temperature above a compound, combination, or element's critical point. The solvating properties of SF serve as the foundation for SFE. SFE systems can typically function at pressures of up to 300 bar and temperatures of up to 60°C. Carbon dioxide (CO_2), the most often employed solvent in SFE, has a comparatively low critical point of 31°C and 73 atm. Certain components are extracted selectively using the features of supercritical fluids (Ahmad et al., 2019). Two crucial steps make up the SFE process: extraction and separation. Batchwise extraction of solid materials and continuous extraction of liquid materials are both possible.

COLD PLASMA TECHNOLOGY (CP):

Cold Plasma is an ionized gas that can be utilized in procedures where high temperatures are not advised. It contains a wide variety of species, including electrons, positive and negative ions, free radicals, electrons and gas atoms, and photons. The germs on the surface of both fresh and processed foods could be inactivated with CP (Thirumdas et al., 2015). Changes brought about by reactive oxygen species and nitrogen species oxidizing lipids, amino acids, and nucleic acids result in microbial mortality or harm. The role of the aforementioned mechanisms is based on the nature and properties of the plasma of microbes. Some drawbacks of plasma processing include increased lipid oxidation, color loss, fruit firmness loss, and increased acidity, among other things.

ULTRASOUND PROCESSING:

Sound waves exceeding the audible frequency range i.e. greater than 20 kHz are termed 'Ultrasound'. When the acoustic waves propagate through a medium, they generate compressions and rarefaction (decompressions) in the medium particles. This, in turn, produces a high amount of energy, due to turbulence, and an increase in mass transfer. Ultrasound applications are based on three different methods: Direct application to the product, Coupling with the device, and Submergence in an ultrasonic bath (Unver, 2016). When heat, pressure, and ultrasound are used together, bacteria and enzymes can be rendered inactive.

OZONE PROCESSING:

Ozone treatment is a chemical process for decontaminating food that entails subjecting tainted foods—such as fruits, vegetables, drinks, meat, fish, spices, and herbs—to ozone in both aqueous and gaseous phases. Alternate for the traditional agent such as chlorine. It has a wide range of antibacterial properties because it is around 50% stronger than chlorine. Ozone causes bacteria to perish by gradually oxidizing essential biological components (Brodowska et al., 2018). There are two main ways that ozone damages target species. The first is that it oxidizes amino acids, sulfhydryl groups, enzymes, peptides, and proteins to shorter peptides. The second process involves the oxidation of polyunsaturated fatty acids to acid peroxides by ozone. Ozone treatment increases the food products' microbiological safety and extends their shelf life without significantly altering their physical, chemical, or nutritional characteristics.

CONCLUSION:

The novel processing techniques are advantageous over thermal processing which leads to undesirable changes in the nutritional and sensorial properties of food. Novel processing is a non-thermal processing of food. Novel processing technologies such as HPP, PEF, CP, SCFEX, Ultrasound, Ozone processing, etc. are emerging technologies for maintaining quality and food safety. HPP and PEF are the commonly used technology. These technologies are difficult to apply as they are expensive and require specialized equipment and trained persons. Moreover, consumer acceptance and safety of the food is high. Hence, novel processing of food with new technologies is still emerging.

REFERENCES:

1. Ahmad, T., Masoodi, F. A., Rather, S. A., Wani, S. M., & Gull, A. (2019). Supercritical fluid extraction: A review. J. Biol. Chem. Chron, 5(1), 114-122. http://dx.doi.org/10.33980/jbcc.2019.v05i01.019
2. Arshad, R. N., Abdul-Malek, Z., Roobab, U., Munir, M. A., Naderipour, A., Qureshi, M. I., ... & Aadil, R. M. (2021). Pulsed electric field: A potential alternative towards a sustainable food processing. Trends in Food Science & Technology, 111, 43-54. https://doi.org/10.1016/j.tifs.2021.02.041
3. Balasubramaniam, V. M., Martinez-Monteagudo, S. I., & Gupta, R. (2015). Principles and application of high pressure–based technologies in the food industry. Annual review of food science and technology, 6(1), 435-462. https://doi.org/10.1146/annurev-food-022814-015539
4. Brodowska, A. J., Nowak, A., & Śmigielski, K. (2018). Ozone in the food industry: Principles of ozone treatment, mechanisms of action, and applications: An overview. Critical reviews in food science and nutrition, 58(13), 2176-2201. http://dx.doi.org/10.1080/10408398.2017.1308313
5. Hameed, F., Ayoub, A., & Gupta, N. (2018). Novel food processing technologies: An overview. IJCS, 6(6), 770-776.
6. Muntean, M. V., Marian, O., Barbieru, V., Cătunescu, G. M., Ranta, O., Drocas, I., & Terhes, S. (2016). High pressure processing in food industry–characteristics and applications. Agriculture and Agricultural Science Procedia, 10, 377-383. https://doi.org/10.1016/j.aaspro.2016.09.077
7. Stoica, M., Mihalcea, L., Borda, D., & Alexe, P. (2013). Non-thermal novel food processing technologies. An overview. Journal of Agroalimentary Processes and Technologies, 19(2), 212-217.
8. Thirumdas, R., Sarangapani, C., & Annapure, U. S. (2015). Cold plasma: a novel non-thermal technology for food processing. Food biophysics, 10, 1-11. https://doi.org/10.1007/s11483-014-9382-z
9. Ünver, A. (2016). Applications of ultrasound in food processing. Green Chemical and Technological Letters, 2(3), 121-126.