



Authentication of Non-thermal Processing Techniques in Food Safety

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DESCRIPTION

Non-thermal innovation technologies have become quite popular in the food processing industry because they extend the shelf life of goods and preserve their quality, including their nutritional value, freshness, and sensory components. The most major energy-consuming processes in the food industry are those that use traditional thermal processing procedures including evaporation, pasteurisation, drying, sterilising, chilling (cold storage), and freezing (less than -18°C). These traditional methods are in line with one of the primary concerns, namely, food safety, which includes inhibition of spoilage enzymes such as Polyphenol Oxidase (PPO), Pectin Methyl Esterase (PME), Lipo-Oxygenase (LO), and Peroxidase (PO). This reduces microbial growth, thereby improving the shelf life and safety of food products. In thermal processing, food is kept fresh by being heated to a very high temperature, which reduces microbial growth or contamination from food but also has some negative effects on the food product, such as the loss of some heat-sensitive nutritional components, textural changes in food, changes in rheological characteristics, and changes in sensory attributes of food, such as the increased concentration of starch in horchata (a Spanish beverage), heating at high temperature microbial growth or contamination from food.

Pomegranate juice's nutritional and aesthetic qualities may be significantly impacted by both LTLT and HTST (thermal processing). Additionally, thermal processing causes food items to lose moisture, modify the composition of their fatty acids, oxidise their lipids, etc. When meat is barbecued, its juices are lost, saturated fatty acids are reduced, and the amount of Polyunsaturated Fatty Acids (PUFA) in the finished product increases. Due to the presence of Polyunsaturated Fatty Acids (PUFA), the product is more susceptible to lipid oxidation and loss of final product quality, such as off flavour and diminished taste. Consumers nowadays are more concerned about the safety of their food than ever before, and they seek nutritious foods with high nutritional profiles, no microbial load, and exceptional taste. In order to produce high-quality food with a low microbial load, it was necessary to look for better

alternatives, such as emerging non-thermal technologies like Ultrasound (US), Pulsed Light (PL), Ultraviolet Radiation (UV), ozone, High Hydrostatic Pressure (HHP), Supercritical Carbon Dioxide (SC-CO_2), and Atmospheric Cold Plasma (ACP). Before using these technologies, several factors such as the kind of food, processing duration, circumstances, and intensity must be taken into account. By modifying the physical, chemical, and biological properties of food, recovering bioactive compounds from marine by products, enhancing health-related compounds in minimally processed fruits and vegetables, such as UV-light can induce the synthesis of anthocyanins, vitamins, stilbenoids, carotenoids, polyphenols, and flavonoids, and ultimately improving the quality, safety, and safety of food are all possible outcomes of these novel technologies. Furthermore, depending on the processing circumstances, non-thermal technologies can have a beneficial or detrimental impact on the structural and functional features of muscle proteins, including their ability to be digested. While marination and drying can cause undesirable changes like protein aggregation, enhanced disulfide bonds, and severe cross linking that reduce proteolysis, mincing and ageing can promote the favourable muscle protein modifications such as partial unfolding or the exposing of cleavage sites. Digestive enzymes can also increase the susceptibility to hydrolysis. Non-thermal processing techniques are less detrimental to food quality because they typically affect the non-covalent bonds of the food molecules, such as hydrophobic, hydrogen, electrovalent, and ionic bonds, to denature, inhibit, and gelatinize the protein, enzymes, and starch as well as to destroy the microorganisms and pathogenic bacteria in the food. Foods that are natural and fresh are in high demand since they don't include any chemical additions. In order to reduce the use of chemical additives while maintaining quality and natural tastes and to further the development of new and upcoming non-thermal approaches, scientists are eager to create the necessary technologies. Non-thermal processing methods have been widely used to improve food safety while having less of an impact on the nutritional value of food products than conventional heat treatment methods. For example, in fruit juices, it helps in retaining the maximum concentration of bioactive compounds from animal and plant sources with nutraceutical applications,

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Received: 02-Jan-2023, Manuscript No. JFPT-23-19732; **Editor assigned:** 05-Jan-2023, PreQC No. JFPT-23-19732 (PQ); **Reviewed:** 19-Jan-2023, QC No. JFPT-23-19732; **Revised:** 26-Jan-2023, Manuscript No. JFPT-23-19732 (R); **Published:** 02-Feb-2023, DOI: 10.35248/2157-7110.23.14.973

Citation: Cheng D (2023) Authentication of Non-thermal Processing Techniques in Food Safety.14:973

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used to reduce the microbial load that infects fresh produce during the pre and post-harvest stage, dehydration, for increasing the shelf-life of fresh produce. Although infrared, microwave, and radio frequency heating are considered

moderate utilizing heat compared to traditional thermal processing techniques that can damage volatile oil, colour, taste, and other components, they can nevertheless create heat as a result of the release of internal energy.