Trends in Food Processing and Preservation

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Introduction

A vital step in the food manufacturing process that turns raw materials into edible goods is food processing. For ages, people have used traditional food processing processes, which include heating, pickling, fermenting, and drying. Although these techniques have proven successful in food preservation, they frequently have drawbacks, especially when it comes to the retention of vital nutrients and bioactive substances. Innovative food processing technologies that overcome these constraints are becoming more and more necessary as customer tastes move towards better and more nutritious food alternatives. Efficient food preservation and long-term food safety have been greatly aided by the use of conventional food processing techniques. Nevertheless, these techniques may result in the loss of valuable nutrients and bioactive substances. For example, heat-sensitive vitamins and antioxidants may degrade as a result of heat processing methods like boiling and canning. Furthermore, the emergence of harmful eating patterns, such as increased sodium and sugar intake, might be attributed to the overuse of salt, sugar, and other preservatives in conventional processing.

A number of recently developed food processing technologies seek to improve upon the drawbacks of conventional techniques while preserving the nutritious content of food. Utilizing cutting-edge processing technology is in line with consumers' increasing need for more nutrient-dense and healthful food alternatives. Through the preservation of food's nutritious value, these methods assist the creation of goods with improved health advantages. Foods may now be created by manufacturers that not only satisfy safety and shelf-life regulations but also enhance the general health of customers.

High pressure processing

High pressure processing, or high hydrostatic pressure processing, or HPP, subjects' liquid and solid food items, whether or not they are packaged, to pressures ranging from 100 to 1000 MPa. The pressure treatment process involves process temperatures ranging from 0°C to 100°C, and the commercial exposure periods vary from a millisecond pulse to more than 20 minutes. The temperature throughout the procedure and the length of time the food is treated will usually determine the resulting chemical changes in the meal.

Yeast, molds, and the majority of vegetative bacteria—including the majority of infectious food-borne pathogens—can all be rendered inactive by HHP while tiny molecules like vitamins and many flavoring chemicals remain intact. Numerous studies exist on the use of HHP treatments to inactivate bacterial spores, including Clostridium botulinum. However, as some C. botulinum spore types may survive even at the highest pressures and temperatures employed in HHP, this method has not yet been resolved by using this technique for food preservation.

Because the implementation of HHP is costly, its application is restricted to high-end items. Nonetheless, several food industries are employing this new technique to preserve guacamole, pasteurize milk, and handle fruit juices and jams.

Pulsed Electric Fields

High intensity pulsed electric field (PEF) processing applies high voltage pulses (usually 20–80 kV/cm) to fluid meals that are positioned between two electrodes for brief intervals of time (less than one second). Inactivation of microorganisms and certain enzymes is accomplished during this procedure, which also minimizes food heating and minimizes harmful alterations to the food's sensory and physical qualities. The production of high electric field intensities, the construction of chambers that treat food uniformly while requiring the least amount of temperature increase, and the design of electrodes that reduce the impact of electrolysis are some crucial factors to take into account in PEF technology.

Pulsed and UV Light

Pulsed light is a food preservation technique that uses brief, strong bursts of "white light," or wavelengths ranging from ultraviolet to near infrared. For the majority of applications, a high degree of microbial inactivation may be achieved with a few flashes administered in a split second. Utilizing radiation from the ultraviolet portion of the electromagnetic spectrum is known as ultraviolet processing. UVC 200–280 nm radiation's germicidal effects are caused by DNA mutations brought on by the UV light's absorption by DNA.

A newly patented method for sanitizing fresh food and beverage goods involved many exposure stages at various UV, near-IR, and infrared light wavelengths. This patent describes the use of UV radiation at germicidal wavelengths to inactivate unwanted bacteria on food or beverage products. Moreover, the food or beverage may be subjected to an IR light source before the microbes are inactivated to deactivate the enzymes that break down the substance.

Ultrasound

High-intensity ultrasound has recently attracted more attention as a potential preregistration technique. The energy produced by sound waves that have 20,000 or more vibrations per second and may pass through solid, liquid, and gaseous objects is known as ultrasound. High intensity ultrasonic therapy results in both physical and chemical changes to the food being processed. It is characterized by high power levels (10–1000 W cm^{-2}) and relatively low frequencies (<0.1 MHz). The amplitude of the ultrasonic waves, the length of time the microorganisms are exposed to or in touch with them, the kind of microbe, the volume of food to be processed, its composition, and the treatment temperature are thought to be critical processing parameters. Studies are being conducted on ultrasound technology either by itself or in conjunction with other preservation techniques like pressure and heat. Temperature and ultrasound have been used in tandem to inactivate microorganisms and enzymes in raw milk. Important research has also been done on the simultaneous application of pressure, temperature, and ultrasound during the "Mano thermo sonication" process. This method has effectively resulted in the inactivation of enzymes and bacteria in milk and fruit juices.

Reference

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