Pulsed light can be effective in making fresh fruit juices safer and longer-lasting

Overview

Researchers at the University of Salerno in Italy and UCD Dublin investigated the effects of Pulsed Light (PL) treatments on microbial inactivation in two popular fruit juices: apple and orange. Experiments used a XENON Corp. laboratory-scale system to inoculate the juices with varying bacterial strains.

Researchers examined parameters such as energy dose, light spectrum composition, distance from the light source, and product characteristics. They sought to determine the optimal conditions for microbial inactivation while minimizing sublethal damage. Overall, the study found PL treatments were effective in microbial inactivation in fruit juices. The energy dose and absorption properties of the juices played a significant role in the effectiveness of the treatment, highlighting the fact that expertise is critical when implementing Pulsed Light systems.

Markets/Applications

- Fruit Juice: Enhance food safety and extend the shelf life of freshly squeezed fruit juices.
- Food Preservation: Milder and more eco-friendly alternative to traditional preservation methods.
- Food Safety Regulation: Aligns with FDA guidelines, which encourage implementing 5 Log pathogen reduction processes in fruit and vegetable juices.
- Food Processing Equipment: Pulsed Light has potential in various food processing systems.

Highlights

- Effective preservation techniques are needed to maintain product quality and safety in fruit juices.
- Outbreaks involving pathogens like E. coli O157:H7 and Salmonella in unpasteurized fruit juices and cider have raised health concerns worldwide.
- Pulsed Light can be an effective and eco-friendly microbial inactivation method in apple and orange juices
- E. coli cells displayed greater susceptibility to light pulses than L. innocua in both apple and orange juices.
- Effectiveness depends on energy dose absorbed by microorganisms and their sensitivity to light pulses.

"Microbial inactivation experiments demonstrated that PL treatment can be successfully applied to obtain high levels of destruction with respect to the selected foodborne pathogens."

The information in this report was prepared by XENON and does not contain the complete research conducted by *Pataro* et al. A full version of the research paper is available at https://www.sciencedirect.com/science/article/abs/pii/S0963996911002833

Summary of Research

Bacterial inactivation in fruit juices using a continuous flow Pulsed Light (PL) system

Original research by G. Pataro, A. Muñoz, I. Palgan, F. Noci, G. Ferrari, J.G. Lyng

Objective: Investigate the effects of Pulsed Light treatment on Listeria innocua and Escherichia coli in apple and orange juices.

Methodology: The study used two types of bacteria, Listeria innocua and Escherichia coli, to investigate the effects of Pulsed Light (PL) treatment on them. The bacteria were grown in a lab and then suspended in apple and orange juices. The juices were pumped through a XENON Corporation Pulsed Light system emitting pulses of light in a specific range of wavelengths.

Researchers adjusted the flow rate of the juice to control the amount of light energy it received. They also measured the temperature of the juice and the surrounding air during the treatment. Additionally, they analyzed the properties of the juices, such as their absorption coefficients, sweetness (°Bx), and acidity (pH).

The study counted the number of viable and injured bacteria before and after the PL treatment. They spread the bacteria on different types of agar plates and incubated them to see how many colonies grew. By comparing the counts on different plates, they could estimate the number of bacteria injured but still alive.

The experiments were repeated multiple times, and the results were presented as averages with error bars to show the variability. Overall, the study aimed to understand how Pulsed Light affects bacteria in fruit juices and provide insights into its potential for microbial control in the food industry.

Results and Conclusions: The study demonstrated the potential of Pulsed Light treatment for an effective and eco-friendly microbial inactivation method in apple and orange juices. While the research revealed challenges related to heat absorption or sensory changes to the juice products, these findings are encouraging and suggest that Pulsed Light solutions can be developed for microbial inactivation while ensuring the integrity and quality of juice products.

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