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6th International ISEKI-Food Conference

"Sustainable Development Goals in Food Systems:
Challenges and Opportunities for the Future"

BOOK OF ABSTRACTS

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Sustainable Development Goals in Food Systems: Challenges and Opportunities for the Future

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#277: Thermal and non-thermal orange juice pasteurization: The impact of ultrasound, thermosonication and heat treatment on S. aureus kinetic inactivation behaviour

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Staphylococcus aureus survival is a serious issue in the food field, which has pushed researchers to develop safe inactivation processes and, at the same time, not affect the food product's nutritional value. All of this to meet the increasing consumer demand for safe and quality food. One of the non-thermal preservation methods that is used as a powerful disinfection technology is sonication. It is considered an efficient process since it satisfies the Food and Drug Administration requirements for a 5-log reduction of microbial cells in fruit juices.

This study was designed to investigate *S. aureus*'s kinetic inactivation behaviour when subjected to the combination of ultrasound and temperature (thermosonication) and heat treatment alone. Commercial pasteurized orange juice was inoculated with *S. aureus* ATCC 29213 to attain an inoculated juice with a final concentration of approximately 10^{12} CFU/mL. Cells were heat-treated and processed by ultrasound at 20 kHz at 20, 30, 40, 50, and 60 °C. For heat processing, the treatment times were 90, 60, 60, 60 and 35 min, while for ultrasound treatments, the times were 90, 60, 60, 35 and 30 min, respectively. *S. aureus* cell viability and sublethal injury were evaluated using two different platting media. SEM analyses were applied to identify the morphological appearance of *S. aureus* cells.

Results showed that ultrasounds at 20, 30 and 40°C reduced the viable bacterium counts by approximately four log cycles at the end of treatment. On the opposing, sublethal temperatures without sonication did not affect *S. aureus* survival. Microscopic images exposed that cells undergo membrane damage during sonication. Thermosonication treatments at 50 and 60 °C were the most effective ones resulting in higher *S. aureus* inactivation rates and lesser treatment times than the heat treatments alone. This was proved by the higher presence of single-pore and flatted cells in thermosonicated samples at these temperature ranges. Hence, a synergistic effect was observed between thermal and ultrasound treatments, noted by increased cells susceptibility to cavitation effects. Therefore, thermosonication can be a promising processing technology for orange juice pasteurization.

Keywords

S. aureus, heat treatment, thermosonication, inactivation behaviour, orange juice

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