

Enhancing the safety and quality of blueberry juice by thermosonication



CATOLICA

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Background

According to consumers' newest preferences, the juice segment is expanding in the market, especially using novel high technologies for processing. Ultrasound is an up-and-coming technology increasingly being applied in the food field since it can minimize the undesirable effects of thermal processing.

Blueberry fruit was chosen since it is recognized as a superfruit due to its high content of health-promoting compounds.

Objectives

The aim of this study was to evaluate the impact of thermosonication and traditional pasteurization processes on blueberry juice, assessing:

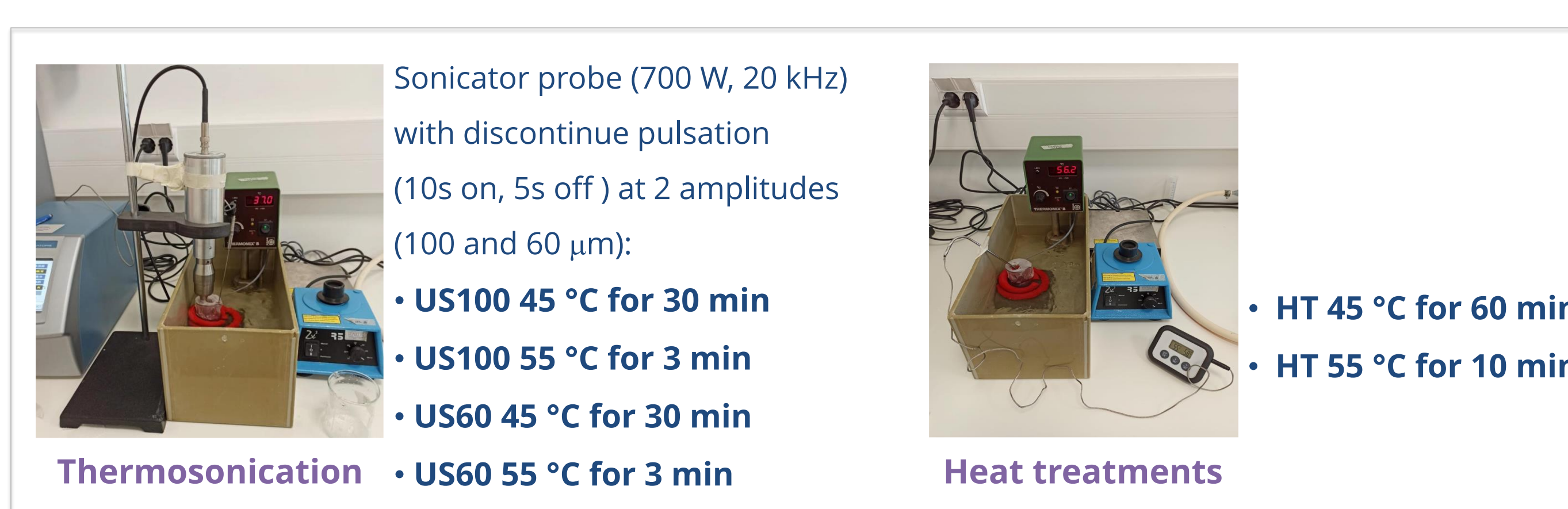
- Inactivation kinetics of *L. innocua* 2030c, a non-pathogenic surrogate of *L. monocytogenes*, in both treatments;
- Effect of both processes on some physicochemical attributes of the juice (pH, SSC, water activity, and color).

Methods

1. Sample preparation

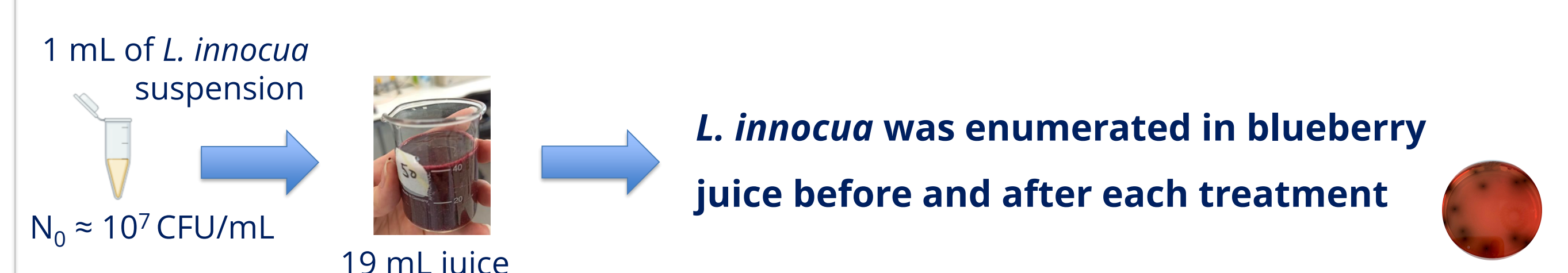


2. Treatments

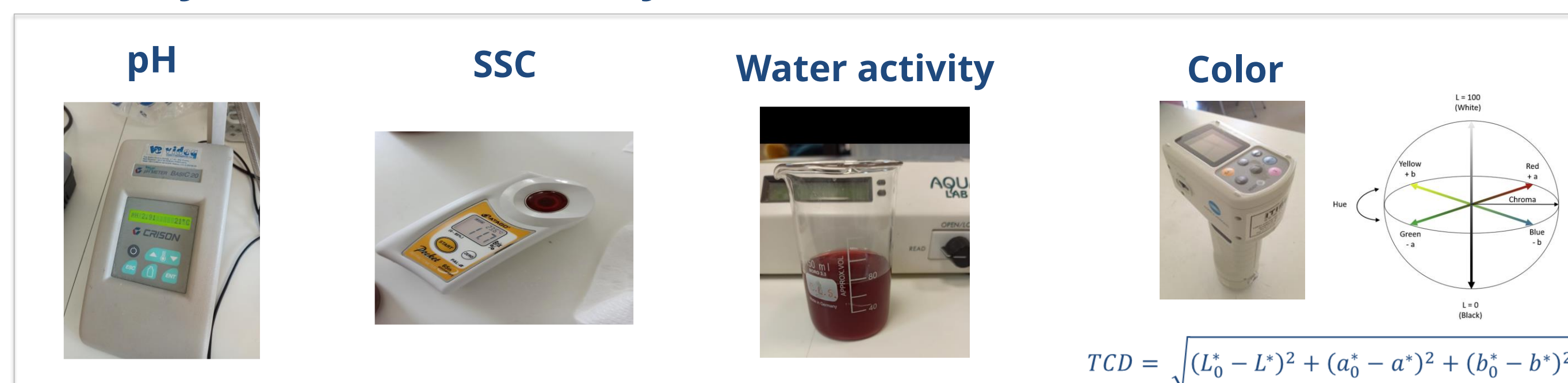


3. Microbiological analysis

Juice samples were artificially inoculated with *L. innocua* before the treatments



4. Physicochemical analysis



5. Data analysis

Three replicates were performed

Weibull model was used to fit all *L. innocua* log-survival data, based on regression analysis

$$\log\left(\frac{N}{N_0}\right) = -\left(\frac{t}{\delta}\right)^n$$

N = microbial load
N₀ = initial microbial load
t = time
δ = first decimal reduction time
n = shape parameter

Results

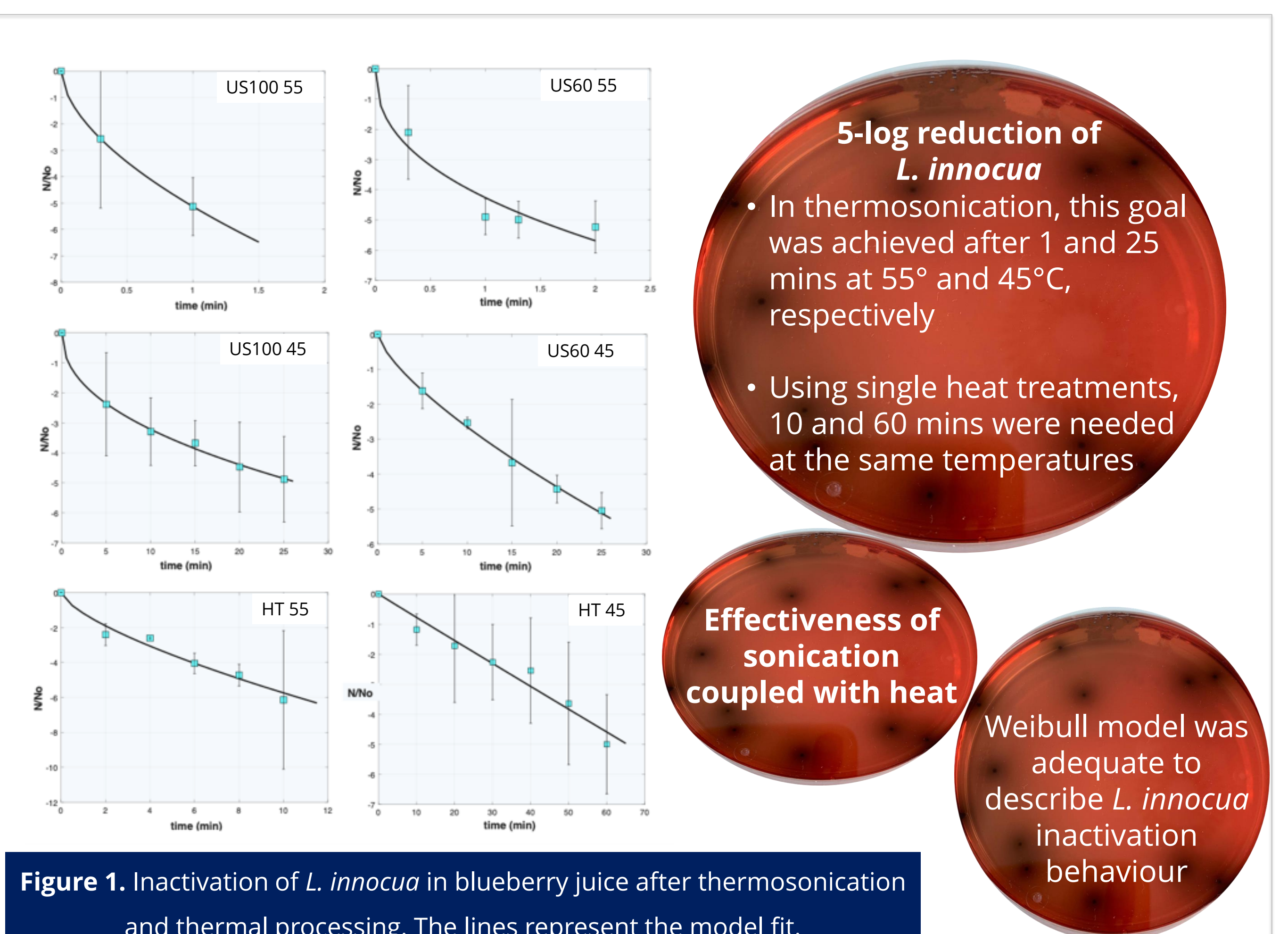


Figure 1. Inactivation of *L. innocua* in blueberry juice after thermosonication and thermal processing. The lines represent the model fit.

Table 1. Weibull model parameters (δ and n) and coefficient of determination R² for the different treatments applied on blueberry juice.

Treatment	δ (min ⁻ⁿ)	n	R ²
US100 55	5.13 ± 0.83	0.57 ± 0.30	0.94
US100 45	1.15 ± 0.49	0.45 ± 0.15	0.92
US60 55	4.26 ± 0.36	0.42 ± 0.15	0.94
US60 45	0.51 ± 0.17	0.72 ± 0.11	0.97
HT 55	1.18 ± 0.33	0.69 ± 0.14	0.96
HT 45	0.08 ± 0.09	0.99 ± 0.30	0.87

Different amplitudes did not play a role in the inactivation behaviour of *L. innocua*

pH, SSC and water activity were not significantly affected by the treatments

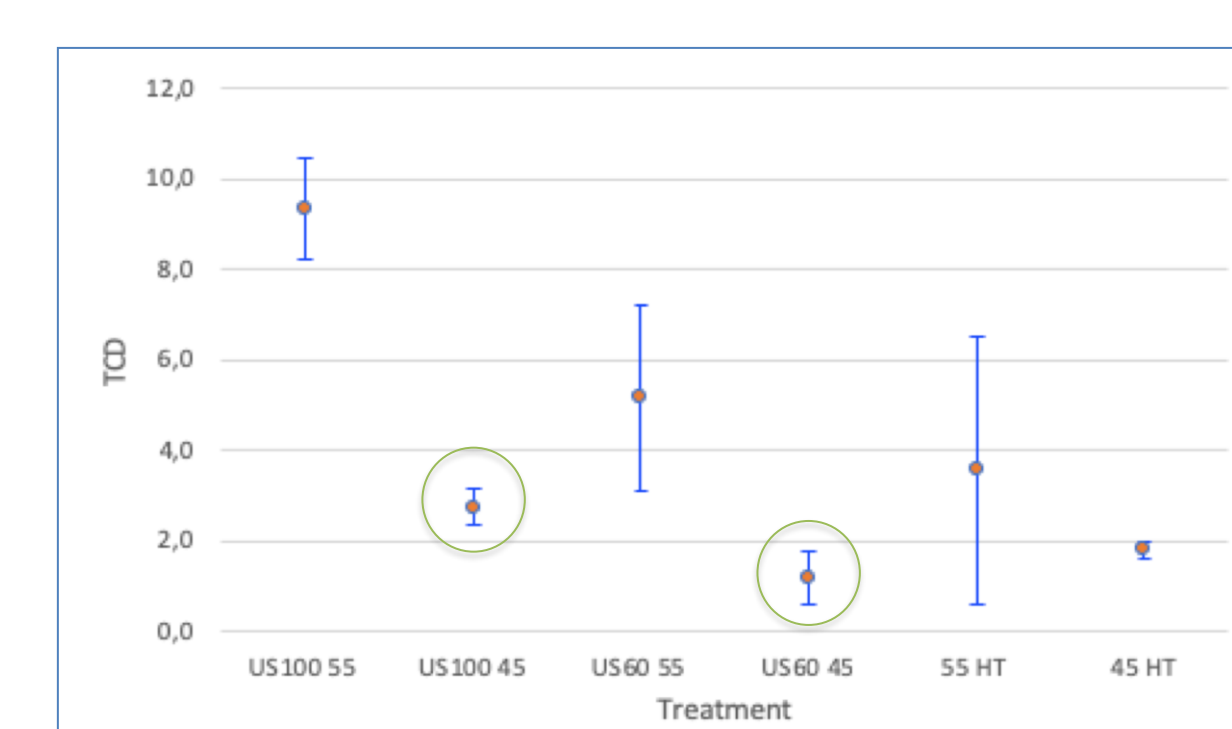


Figure 2. Effect of treatments on the color of blueberry juice.

Color was better retained in samples treated with ultrasound at 45 °C

Conclusion

The best treatment was ultrasonication, regardless of the amplitude, at a milder temperature of 45 °C. The research confirmed the effectiveness of thermosonication on microbial inactivation in blueberry juice. This method was also better at preserving the juice's physicochemical properties when compared to conventional heat treatments.

Acknowledgements

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