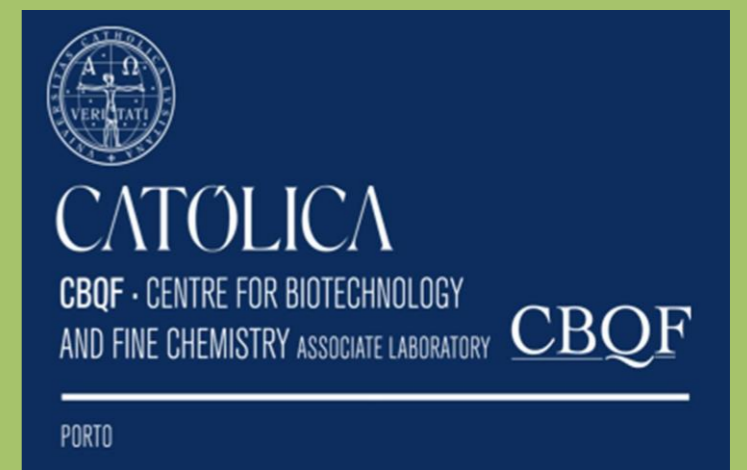


# Impact of thermosonication on kiwi juice quality

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## Introduction

- Traditional heat treatments such as pasteurization are usually used in fruit juice preservation, however they induce undesirable quality changes.
- Industries are looking for alternative processing technologies that can retain fruit juice's quality.
- Thermosonication (TS) has been found to have a great potential in quality retention of fruit juices.

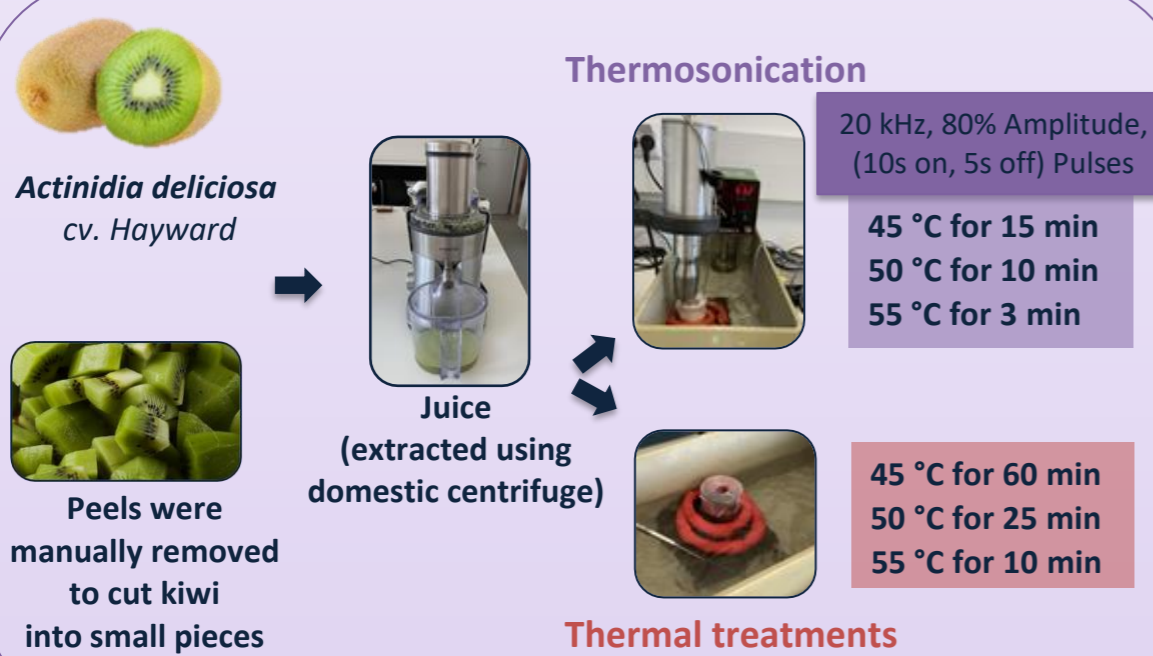
## Objectives

To develop a high quality and safe-to-drink kiwi juice through the application of thermosonication treatment.

- Safety indicator - *Listeria innocua*, a non-pathogenic surrogate of *Listeria monocytogenes*.
- Quality indicators - pH, SSC, colour, cloud value, total phenolics, chlorophylls and minerals.

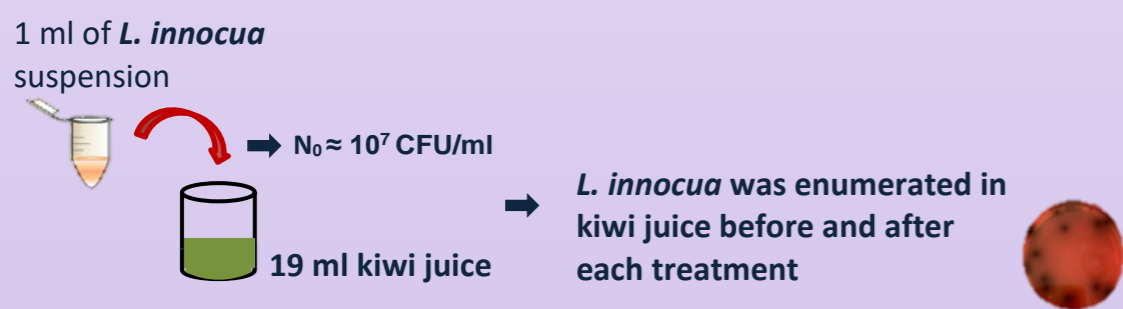
## Materials & Methods

### 1 - Sample Preparation and Treatments



### 2 - Microbiological Analysis

- Juice samples were inoculated with *L. innocua* before treatments



### 3 - Quality Analysis

- pH
  - SSC
  - Colour
  - Cloud value
  - Minerals (Microwave digestion)
- Extraction with 100% methanol
- Spectrophotometer
- Chlorophylls  $\lambda = 652.4$  nm &  $665.2$  nm
  - Total phenolics (Folin-Ciocalteu method)  $\lambda = 750$  nm

### 4 - Statistical Analysis

One-way ANOVA + Post-Hoc tests | Three replicates were performed

## Conclusions

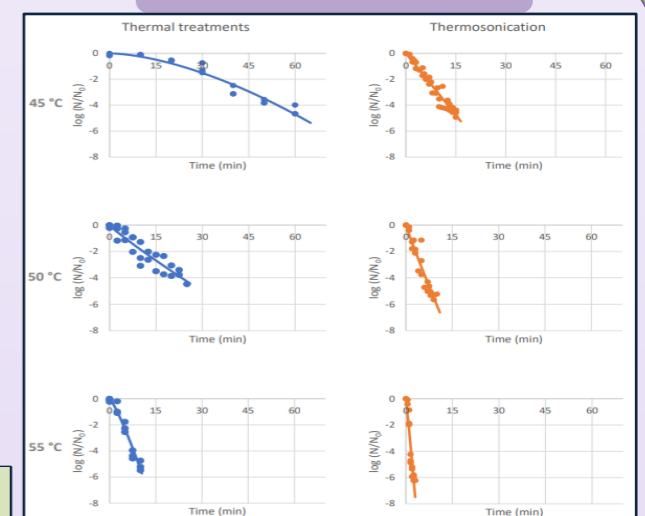
- Thermosonication was efficient in microbial inactivation and allowed retention of the overall kiwi juice quality.
- It can be considered a successful alternative to conventional heat treatment.

## Results

Coupling temperature with ultrasound showed a synergistic effect in *L. innocua* inactivation

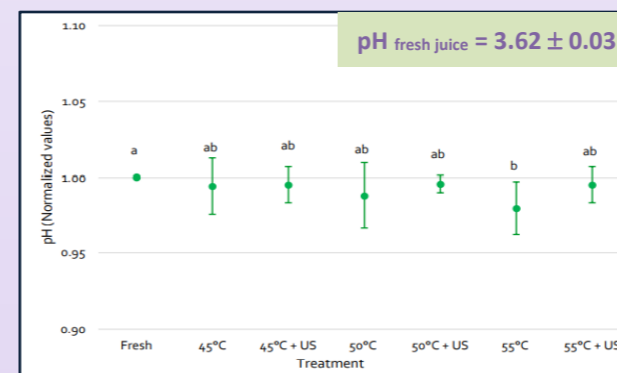
~ 5 log-cycle reduction at all temperatures with shorter treatment times

### *L. innocua* inactivation



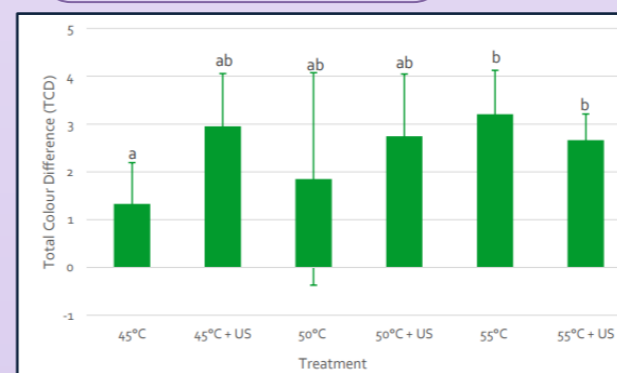
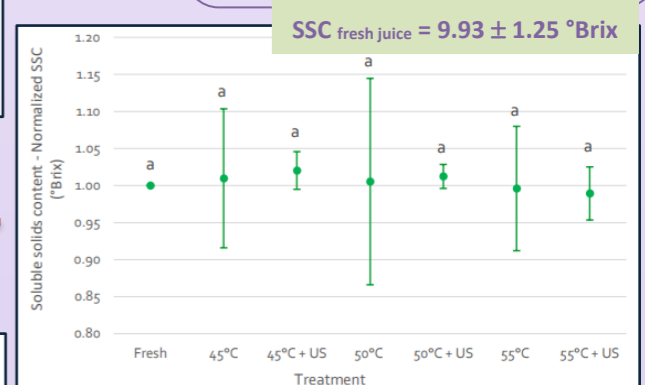
### pH

All treated juice samples were not significantly affected by any treatment, with pH values equivalent to fresh juice



SSC values were not significantly affected by any treatment compared to fresh juice

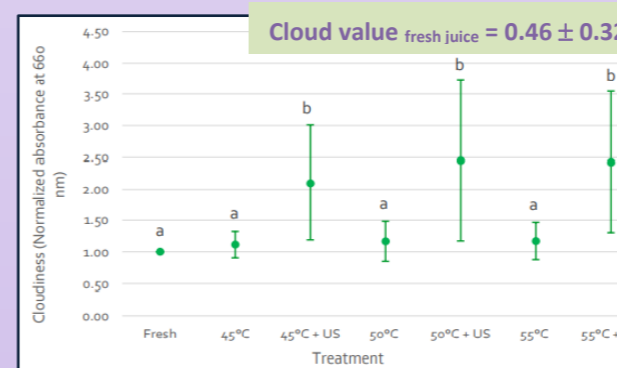
### SSC



Colour differences were detected between fresh juice and after both treatments

### Colour

Treatment	Colour Parameters		
	L*	a*	b*
Fresh	1.00 <sup>a</sup>	1.00 <sup>ab</sup>	1.00 <sup>ab</sup>
45°C	1.03 ± 0.07 <sup>a</sup>	0.72 ± 0.49 <sup>a</sup>	0.95 ± 0.20 <sup>ab</sup>
50°C	1.06 ± 0.16 <sup>ab</sup>	0.84 ± 0.35 <sup>ab</sup>	0.97 ± 0.34 <sup>ab</sup>
55°C	1.13 ± 0.03 <sup>c</sup>	1.16 ± 0.06 <sup>b</sup>	1.12 ± 0.19 <sup>b</sup>
45°C + US	1.12 ± 0.05 <sup>bc</sup>	1.07 ± 0.40 <sup>ab</sup>	1.01 ± 0.36 <sup>ab</sup>
50°C + US	1.10 ± 0.08 <sup>bc</sup>	1.03 ± 0.47 <sup>ab</sup>	0.92 ± 0.33 <sup>ab</sup>
55°C + US	1.09 ± 0.04 <sup>bc</sup>	0.92 ± 0.28 <sup>ab</sup>	0.80 ± 0.28 <sup>a</sup>



### Cloud value

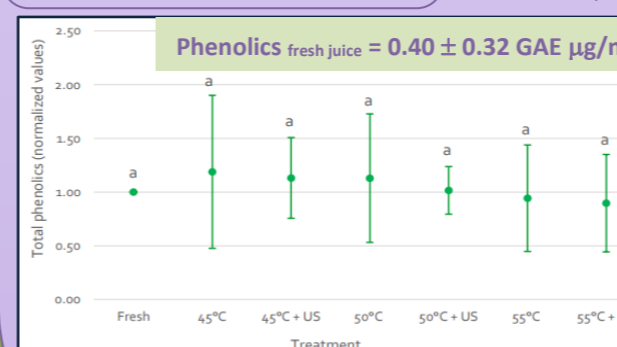
TS enhanced cloud values of kiwi juice as compared to fresh and thermal treatment

Treatment	Normalized mineral composition				
	Phosphorus	Magnesium	Calcium	Sodium	Potassium
Fresh	1.00 <sup>a</sup>	1.00 <sup>a</sup>	1.00 <sup>ab</sup>	1.00 <sup>b</sup>	1.00 <sup>b</sup>
45°C	1.00 ± 0.73 <sup>a</sup>	1.13 ± 0.11 <sup>b</sup>	0.92 ± 1.05 <sup>a</sup>	0.99 ± 0.10 <sup>ab</sup>	0.91 ± 0.05 <sup>a</sup>
50°C	1.18 ± 0.13 <sup>b</sup>	1.16 ± 0.33 <sup>b</sup>	1.10 ± 0.34 <sup>b</sup>	1.01 ± 0.05 <sup>b</sup>	0.94 ± 0.13 <sup>ab</sup>
55°C	1.17 ± 0.69 <sup>b</sup>	1.16 ± 0.06 <sup>b</sup>	1.10 ± 0.69 <sup>b</sup>	1.01 ± 0.10 <sup>b</sup>	0.95 ± 0.39 <sup>ab</sup>
45°C + US	1.03 ± 0.74 <sup>ab</sup>	1.00 ± 0.14 <sup>a</sup>	0.87 ± 0.31 <sup>a</sup>	1.00 ± 0.01 <sup>b</sup>	1.00 ± 0.05 <sup>b</sup>
50°C + US	1.12 ± 0.43 <sup>ab</sup>	1.15 ± 0.29 <sup>b</sup>	0.94 ± 0.51 <sup>a</sup>	0.99 ± 0.12 <sup>ab</sup>	0.92 ± 0.40 <sup>a</sup>
55°C + US	1.12 ± 0.83 <sup>ab</sup>	1.15 ± 0.16 <sup>b</sup>	0.95 ± 0.06 <sup>a</sup>	0.97 ± 0.13 <sup>a</sup>	0.94 ± 0.04 <sup>ab</sup>

TS and thermal treatments enhanced concentrations of P and Mg at all temperatures

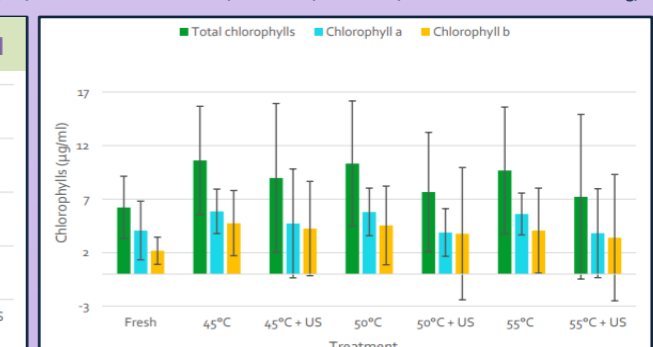
### Minerals

Fresh values for P, Mg, Ca, Na and K were 1.01±0.46, 0.34±0.08, 0.36±0.08, 1.48±4.75 and 18.33±4.68 mg/ml



### Total phenolics

Total phenolics and Chlorophylls were retained after thermosonication and thermal treatments compared to fresh kiwi juice



### Chlorophylls