

Non-thermal technologies for *Alicyclobacillus acidoterrestris* inactivation in apple juice



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Objective

Study the influence of **UV-C radiation**,
ultrasounds and **combinations** of both
treatments on *A. acidoterrestris* inactivation
in apple juices.



Relevance

A. acidoterrestris

- Thermo-acidophilic bacteria.
- Survives to pasteurization processes.
- Suggested as the target to be used in the design of adequate pasteurization processes.

Non-thermal technologies

- Potential for inactivating spoilage and pathogenic microorganisms.
- Minimizing quality losses in terms of flavour, colour and nutritional compounds.

Heat processing

- Adverse effects on sensory and nutritional characteristics of foods.

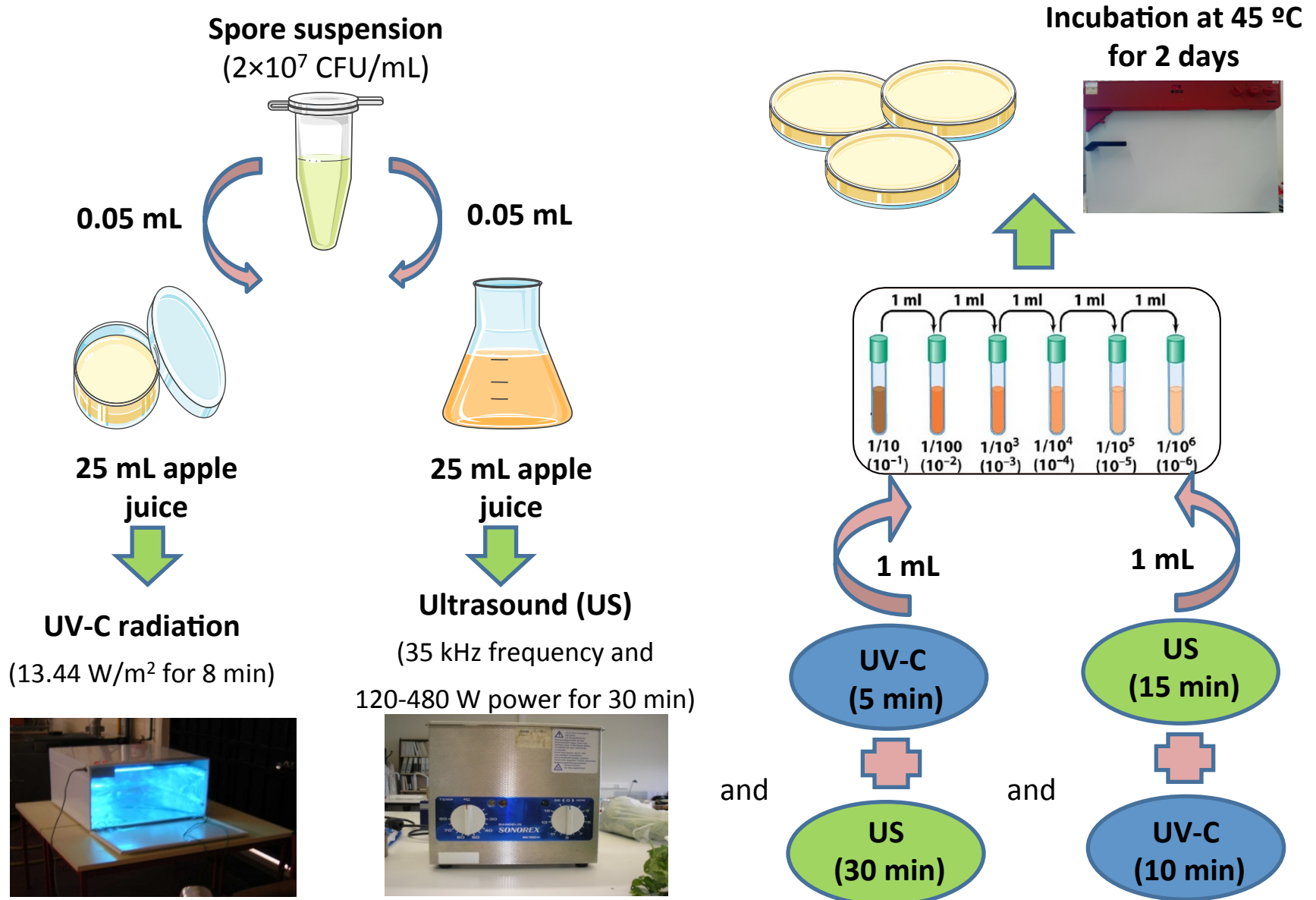
Ultraviolet radiation (UV-C)

Microorganisms that are exposed to UV-C light are affected at DNA (deoxyribonucleic acid) level, which compromises their survival.

Ultrasound (US)

Power ultrasound is capable of inducing cavitation to inactivate microorganisms in foods.

Materials & Methods



Results & Discussion

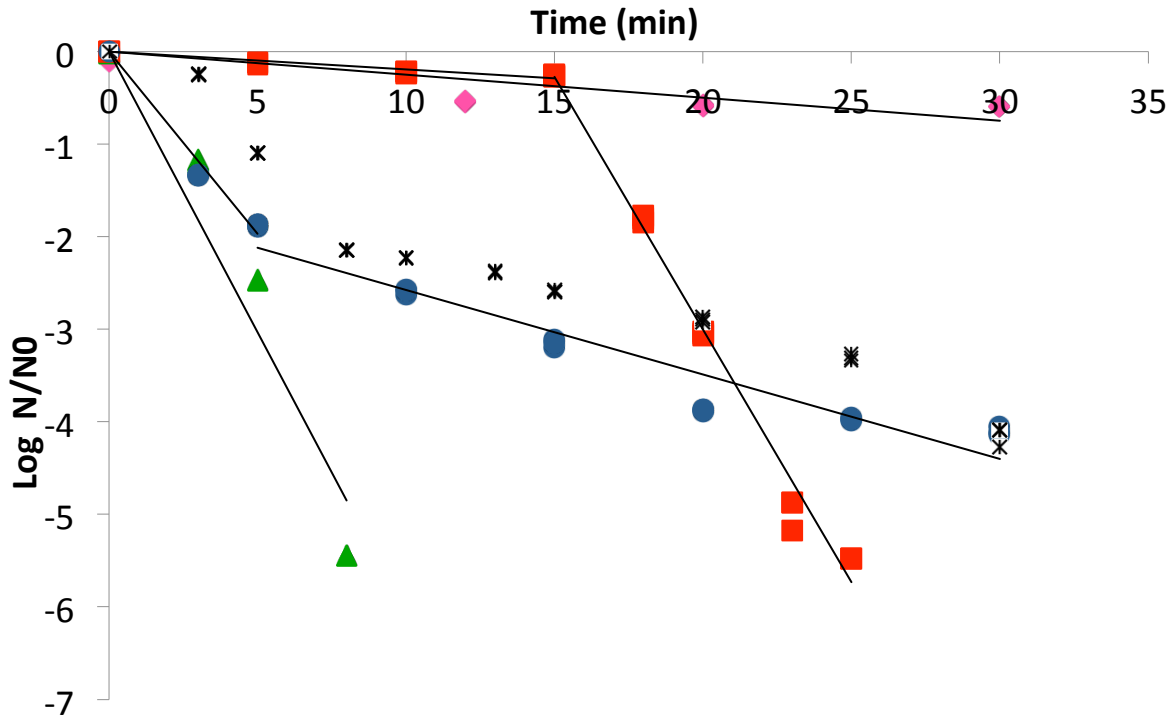


Figure 1. *A. acidoterrestris* inactivation in apple juice applying different treatments:
 (▲) UV-C
 (◆) US
 (■) US+UV-C
 (●) UV-C+US
 (x) 95 °C

Table 1. Inactivation rates of *A. acidoterrestris* spores in apple juices obtained for each non-thermal treatment; confidence intervals at 95% (CI_{95%}) and correlation coefficients (R) are included

Treatment	First treatment		Second treatment	
	k(min ⁻¹) ± CI _{95%} /2	R	k(min ⁻¹) ± CI _{95%} /2	R
UV-C	0.606±0.069	0.97	-	-
US	0.025±0.005	0.76	-	-
UV-C+US	0.393±0.025	0.99	0.091±0.014	0.96
US+UV-C	0.019±0.002	0.96	0.546±0.035	0.99

Results & Discussion

- ✓ US → minor effect on *A. acidoterrestris* inactivation, reducing only 0.6-log after 30 minutes of treatment.
- ✓ UV-C radiation → decreased drastically the number of spores (around 5-log reduction, which attains FDA requirements) after 8 min of treatment.
- ✓ Combined treatment US + UV-C → resulted in higher inactivation (around 6-log reduction) after 25 min of exposure.
- ✓ UV-C + US → decrease approximately 4-log of initial microbial load after 30 minutes of treatment. These results are similar to the ones obtained with a thermal treatment at 95 °C.
- ✓ It can be concluded that **UV-C radiation and combined treatments of UV-C followed by US are promising treatments**, with a drastic impact on the loads of *A. acidoterrestris* in apple juices.

