STUDY OF THE EFFECT OF NON-THERMAL TREATMENTS ON THE SAFETY OF SOME FRUITS AND VEGETABLES

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Thermal treatments, when conveniently applied, are efficient in reducing microbial load of fruits and vegetables. However, the negative impact of heat, especially at food texture level, makes non-thermal treatments promising technologies as minimal food processes.
The objective of this work was to study the effect ultrasonication, and its combination with a milder heat treatment (thermosonication), UV-C radiation, and ozonation, on the safety of strawberries (*Fragaria anannassa*), watercress (*Nasturtium officinale*) and red bell peppers (*Capsicum annuum*, L.).

Thermosonication treatments were performed in an ultrasound equipment (at 32 kHz; Bandelin Sonorex RK 100H) at 15 ºC (ultrasonication) and at 50-65 ºC (thermosonication). Control water washings at the same temperatures were also performed.
Ultraviolet radiation treatments were done in an UV-C chamber, with 4 germicide lamps (average intensity of 12.36 Wm^{-2}; TUV G30T9, 16 W, Philips).
Ozone treatments were carried out in aqueous solution, using a pilot equipment with continuous ozone production (~0.2 ppm; OZ5, Sociedade Portuguesa de Ozono).
Samples were cut in small portions and submitted to the treatments. Contact times were 2 minutes (4 replicates).
For strawberries and watercress, safety was assessed in terms of total mesophiles and coliforms, respectively (endogenous flora). In red bell peppers, *Listeria innocua* was enumerated (artificial inoculation).

Results showed that UV-C radiation was less efficient than water-washings at 15 ºC, for all microorganisms/products tested.
Ozone allowed, in average, 1 log-cycle reduction for mesophiles and coliforms, and 2 log-cycles reduction for *Listeria innocua* (higher than the values obtained by water-washings at 15 ºC).
Ultrasonication treatments were equivalent to water-washings at the same temperatures. The temperature has the major effect. For 50 ºC, 2 and 3 log-reductions were observed, respectively, for *Listeria innocua*/red bell pepper and coliforms/watercress. For 65 ºC, reductions achieved 6 to 7 log-cycles. Mesophiles/strawberries were more heat resistant (2 log-reductions were obtained at 65 ºC).

Keywords: fruits and vegetables, safety, non-thermal treatments