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Combined use of Pulsed light (PL) and High Intensity Ultrasound (US) technologies to preserve apple juice: Study of microbial inactivation and induced damage

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The application of non-thermal emerging preservation technologies in the food industry has received increasing attention as traditional thermal processing may have undesirable effects over fruit juices. PL is actually limited to treatments of transparent liquid foods or surfaces, though it can be combined with other hurdles to increase its effectiveness. This study was aimed to evaluate the single and combined effects of static PL (Xenon lamp; 3 pulses/s; 10 cm; 71.6 J/cm²; 44-56°C) and US (600 W, 20 kHz, 95.2 µm; 10-30 min; 44°C) applied to commercial (CAJ, pH:3.5; 12.5°Brix) and natural (NAJ, pH:3.4; 12.6°Brix) apple juices. When some indicator microorganisms were inoculated, US+PL led up to 5.8-6.4 log reductions in NAJ and CAJ respectively, whilst single PL provoked only 2-3 log reductions. Induced damage was evaluated by detecting through flow cytometry, membrane integrity and esterase activity on inoculated and labeled *Saccharomyces cerevisiae* KE162 cells. Cells shown permeabilized membrane when 10 min-US+PL, 30 min-US and 30 min-US+PL was applied (91.6-99.0%). Sub-lethal damage was observed after exposure to single PL in NAJ as ~18% of cells were double stained. Additionally, damage of US+PL treated *S. cerevisiae* cells and *Alicyclobacillus acidoterrestris* ATCC49025 spores was evaluated by transmission electron microscopy (TEM). Treated yeast cells revealed altered or destroyed plasma membrane and cell wall with coagulated inner content while treated *A. acidoterrestris* spores exhibited induced coagulation of inner content with no possibility of distinguish any structure. This study contributed to a better understanding on the microbial damage caused by PL combined with US treatment applied to apple juice.

Biography

Sandra N Guerrero obtained her PhD in Chemistry at Buenos Aires University (UBA), Argentina in 1993. She is permanent Professor of Food Engineering and Food Science in the Industry Department of Natural and Exact Sciences School at the same University Professor Guerrero, she is also Head Investigator in the Research Laboratory of Emerging Technologies in the same Department. She serves as an Independent Researcher of the Argentine Council for Scientific and Technological Research (CONICET). Her research is concerned with innovative preservation technologies applied to fruit and dairy products in the hurdle technology context. She has recently received the Certified Food Scientist (CFS) credential given by the International Food Science Certification Commission (IFSCC). She is the Coauthor of 1 book edited by FAO and has published over 190 communications in scientific events and 50 peer-reviewed papers and 16 chapters in journals and books edited by reputed international editorials.

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