Title	Evaluation of an Ozonated Water System and a Steam Pasteurization System for Controlling *Listeria monocytogenes* and *Salmonella* spp. on Raw Whole Shelled Almonds
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Keyword	almond; ozonated water; Salmonella

Abstract

The objective of this study was to validate 20, 60 and 120 s exposure to 2 ppm ozonated water applied with an ozone system, and to validate 8, 20 and 30 s steam pasteurization applied using a commercial steam pasteurization system for reducing *Listeria monocytogenes* and *Salmonella* spp. populations on raw whole shelled almonds. After exposure to ozonated water, 1.1, 1.4 and 1.8 log CFU/g reductions of *Salmonella* spp. and 0.3, 0.3 and 0.2 log CFU/g reductions of *L. monocytogenes* were recorded after 20, 60 and 120 s, respectively. All of these reductions were similar to those obtained with a water-only control treatment; thus using 2 ppm ozonated water was not an effective antimicrobial process as applied in this study. An average of 2.2 and 2.6 log reductions for low inoculum levels and 3.2 and 3.6 log reductions for high inoculum levels were achieved for *L. mncytogenes* and *Salmonella* spp., respectively, after 8 s exposure to steam pasteurization. *L. monocytogenes* or *Salmonella* spp. populations were not recovered by direct plating procedures after 20 or 30 s seam exposure (detection limit: 0.5 log CFU/g). Steam pasteurization, as applied in this study, provided a high level of control for both pathogens and appears to be a very practical application for raw almonds. Initial appearances indicated little effect on raw nut quality; however, more formal evaluation of almonds for shelf life and organoleptic quality is suggested.