Inactivation of *Salmonella enterica*, *Listeria monocytogenes* and murine norovirus (MNV-1) on fresh strawberries by conventional and water-assisted ultraviolet light (UV-C)

J. Ortiz-Solà, I. Abadias, P. Colàs-Medà, M. Anguera and I. Viñas

Postharvest Biology and Technology, Volume 174, April 2021, 111447

Abstract

The efficacy of the water-assisted ultraviolet-C light (WUVC) strategy was evaluated as an alternative to chlorine sanitization and compared to 'conventional' dry technology (DUVC) for the inactivation of *Salmonella enterica, Listeria monocytogenes* and murine norovirus (MNV-1) on strawberries. Strawberries were washed in a laboratory scale prototype (LAB-UVC-Gama) consisting of a tank filled with water, equipped with 4 UV-C lamps emitting a dose of 0.6, 1.3, 3.2 and 6.3 kJ m^{-2}. For DUVC, the same doses were used. Moreover, trials with the 4 lamps off with water, or with a chlorine solution (200 ppm, pH 6.5), were carried out as a control treatment. Reductions of artificially inoculated *L. monocytogenes* and *S. enterica,* and the infectivity of MNV-1 after WUVC treatments were comparable to those obtained with chlorine-wash, which were equivalent with all irradiation doses tested for all microorganisms studied ($P < 0.05$). The implementation of the WUVC strategy improved the DUVC system after 2-min exposure (1.3 kJ m^{-2}), by 1.2 and 1.6 log for *S. enterica* and *L. monocytogenes*, respectively. At 3.2 kJ m^{-2} dose (5 min), WUVC enhanced the inactivation of *S. enterica* compared with control washing treatment by 1.5 log. After 10 min, pathogenic bacteria were reduced by > 4 log by WUVC treatment and chlorine sanitization. For MNV-1 reductions, we reported > 1.4 log $TCID_{50}$ with 95 % certainty with the different treatments and exposure times after decontamination procedures. For MNV-1, the increase in the irradiation dose (kJ m^{-2}) applied did not affect their reduction on strawberries. Moreover, WUVC light was effective at significantly reducing the microorganisms in wash water, avoiding cross-contamination and thus, allowing water recirculation. The results obtained in the present study provide new tools to ensure the safety of strawberries intended to be processed, contributing to affording a more innovative and sustainable future for the food industry. However, industry operation studies are needed to conclude that the treatments tested in the present study are a good alternative to chlorine.