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Comparative Efficacy of Gas Phase Sanitizers for Inactivating Salmonella, Escherichia coli O157:H7 and Listeria monocytogenes on Intact Lettuce Heads

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Abstract : Introduction: It is now acknowledged that control of human pathogens associated with fresh produce requires an integrated approach of several interventions as opposed to relying on post-harvest washes to remove field acquired contamination. To this end, current research is directed towards identifying such interventions that can be applied at different points in leafy green processing. Purpose: In the following the efficacy of different gas phase treatments to decontaminate whole lettuce heads during pre-processing storage were evaluated. Methods: Whole Cos lettuce heads were spot inoculated with L. monocytogenes, E. coli O157:H7 or Salmonella spp. The inoculated lettuce heads were then placed in a treatment chamber and exposed to ozone, chlorine dioxide or hydroxyl radicals at different time periods under a range of relative humidity. Survivors of the treatments were enumerated along with sensory analysis performed on the treated lettuce. Results: Ozone gas reduced L. monocytogenes by 2-log10 after ten-minutes of exposure with Salmonella and E. coli O157:H7 being decreased by 0.66 and 0.56-log cfu respectively. Chlorine dioxide gas treatment reduced L. monocytogenes and Salmonella on lettuce heads by 4 log cfu but only supported a 0.8 log cfu reduction in E. coli O157:H7 numbers. In comparison, hydroxyl radicals supported a 2.9 – 4.8 log cfu reduction of model human pathogens inoculated onto lettuce heads but required extended exposure times and relative humidity < 0.8. Significance: From the gas phase sanitizers tested, chlorine dioxide and hydroxyl radicals are the most effective. The latter process holds most promise based on the ease of delivery, worker safety and preservation of lettuce sensory characteristics. Although expose times for hydroxyl radicles was relatively long (24h) this should not be considered a limitation given the intervention is applied in store rooms or in transport containers during transit.

Keywords : gas phase sanitizers, iceberg lettuce heads, leafy green processing
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