



Advanced Oxidation Process (Clean Flow) as a Risk Prevention Control Step for Microbiological and Chemical Hazards Encountered on Fresh Produce and Food Contact Surfaces

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Abstract

Fresh produce remains a significant food safety issue associated with foodborne illness outbreaks and an established vehicle for pesticides. The post-harvest wash step designed to remove contamination has been found to spread both microbial and chemical hazards across batches. Consequently, there is a need for technologies that can act as firewall between the field and consumer to address food safety issues. To this end, a decontamination technology based on Advanced Oxidation Process (AOP) has been developed and validated. AOP generates reactive, but short-lived, free-radicals that inactivate microbes (viral, bacterial and fungal) and degrades pesticides. The most common AOP format is through the generation of hydroxyl radicals by the UV-C mediated decomposition of ozone and hydrogen peroxide, although other radical sources such as hypochlorous acid can be applied. The AOP process is performed by passing the produce to be decontaminated through a hydrogen peroxide mist then into a chamber housing UV-C (254 nm) and ozone (174 nm) lamps. Validation trials applied Response Surface Modelling (RSM) to optimize the treatment to ensure optimal microbial reduction without changing the quality attributes of the produce being treated. To date a diverse range of produce types from grapes, apples, cantaloupe, lettuce amongst others. The operating parameters to decontaminate produce was product specific. For example, a 5 log reduction of *Listeria monocytogenes* on and within apples, was achieved through applying 3.0 % v/v hydrogen peroxide, 1.6 mg ozone and 54 mJ/cm² UV-C. The same log reduction of *Listeria* on lemons was achieved using 1.8% v/v hydrogen peroxide, 2.2 mg ozone and 68 mJ/cm². AOP treatment was found to degrade the pesticide chlorpyrifos on apples by 1.68 ppm (1680 ppb) and could also be applied to disinfect surfaces such as encountered on reusable plastic crates.

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