

Title Effects of chlorine dioxide gas treatment on microbial safety and quality of mushrooms
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Abstract

Concerns about minimally processed fruits and vegetables have been raised due to outbreaks caused by bacterial pathogens. Development of highly effective sanitation techniques is needed to reduce pathogens on fruits and vegetables. Our objectives were to: (a) determine the efficacy of chlorine dioxide (ClO₂) gas at reducing levels of *Salmonella* and *E. coli* O157:H7 on mushrooms and (b) evaluate physical and chemical quality characteristics. Mushrooms were spot-inoculated on the top and the underneath side of the cap with 7-8 log cfu/g *Salmonella* or *E. coli* O157:H7, dried for 2 hrs, and treated with 6-1000 ppm ClO₂ gas for 3-17 min, at 22 °C and RH between 90-96%, using a continuous laboratory treatment system. Bacterial populations were enumerated using a membrane-transferring plating method using tryptic soy agar and xylose lysine desoxycholate or macconkey sorbitol agar. For quality, mushrooms were treated with 800 ppm ClO₂ gas for 13.5 min and examined for color (Hunter), residual ClO₂, chlorite, free Cl₂, and chloramines. After 100 ppm ClO₂ gas treatment for 15 min, the log reductions were 2.69 and 1.30 log cfu/g *Salmonella* and 4.22 and 4.08 log cfu/g *E. coli* O157:H7. After 1000 ppm ClO₂, gas treatment for 15 min, both the top and the underside of the cap exhibited reductions of 4.53 and 4.45 log cfu/g *Salmonella* and 4.52 and 4.38 log cfu/g *E. coli* O157:H7. Additionally, efficacy of ClO₂ gas increased with increasing concentrations and treatment times. No significant (P>0.05) difference in color was detected after treatment for L and b Hunter color values, however, a Hunter value differed (P<0.05). Residues ClO₂, free available chlorine, chloramines, and chlorite on treated mushrooms were 0.000 mg/g, 0.000mg/g, 0.000 mg/g, and 0.004 mg/g, respectively. Gaseous ClO₂ is a potential and promising tool which enhances the safety of produce while extending shelf-life and maintaining quality.