

Title Effect of organic acids, hydrogen peroxide and mild heat on inactivation of *Escherichia coli* O157:H7 on baby spinach

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Abstract

Minimally processed baby spinach contaminated with *Escherichia coli* O157:H7 has been associated with multiple outbreaks of foodborne illnesses recently. Chlorinated water is widely used to wash vegetables commercially, but this washing procedure has limited efficacy and can lead to the formation of carcinogenic substances. This study was conducted to determine the effects of organic acids and hydrogen peroxide alone and in binary combinations with or without mild heat (40 and 50 °C) on the inactivation of *Escherichia coli* O157:H7 on baby spinach. Baby spinach leaves were dip-inoculated with *E. coli* O157:H7 to a level of 6 log CFU/g and stored at 4 °C for 24 h before treatment. Individual washing solutions (1% and 2% lactic acid [LA], citric acid [CA], malic acid [MA], tartaric acid [TA], acetic acid [AA], hydrogen peroxide [H₂O₂] as well as binary combinations of LA, CA, MA and H₂O₂ at final concentrations of 1% were used to decontaminate spinach leaves at 22, 40 or 50 °C for 2–5 min to test their efficacy in reducing *E. coli* O157:H7. Chlorinated water (200 ppm free chlorine) decreased the population of *E. coli* O157:H7 on baby spinach by only 1.2–1.6 log CFU/g, which was not significantly different from DI water washing. Washing with 1% LA at 40 °C for 5 min was the most effective treatment achieving a 2.7 log reduction of *E. coli* O157:H7 which is significantly higher than chlorine washing. Washing with LA + CA or LA + HP at 40 °C for 5 min was equally effective against *E. coli* O157:H7, resulting in a 2.7 log reduction of *E. coli* O157:H7. The application of mild heat significantly enhanced the efficacy of washing solutions on the inactivation of *E. coli* O157:H7. There was, however, no significant difference between treatments at 40 °C for 5 min and 50 °C for 2 min. The results suggested that the use of organic acids in combination with mild heat can be a potential intervention to control *E. coli* O157:H7 on spinach.