

Title: **Plant-based microemulsions inactivate *Escherichia coli* O157:H7 and *Pseudomonas fluorescens* on Iceberg lettuce and improve visual quality during 28-day storage**

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Abstract

Introduction: Current industry practices include the use of chemical-based sanitizers such as chlorine to wash vegetables post-harvest. The occurrence of produce-related outbreaks poses serious concerns on food safety and suggests that better intervention methods need to be implemented. Due to a growing consumer demand for natural products, alternatives for wash sanitizers have been considered.

Purpose: Investigate the antimicrobial activities of plant-based microemulsions in the wash water against *Escherichia coli* O157:H7 and *Pseudomonas fluorescens* on Iceberg lettuce during 28 days of refrigerated storage.

Methods: Wash microemulsions that were evaluated included oregano oil, lemongrass oil, and cinnamon oil along with a plant-based emulsifier for improved solubility of the oil in water. Iceberg lettuce was inoculated with either *E. coli* O157:H7 or *P. fluorescens* (6.0 log CFU/g) and dip treated in a phosphate buffered saline (PBS) control, 50-ppm chlorine, 3% hydrogen peroxide or 0.1%, 0.3%, or 0.5% of one of the antimicrobial microemulsion solutions for 2 min. The treated leaves were stored at 4°C, visually observed, and analyzed for surviving bacterial populations by dilutions and plating on days 0, 3, 7, 10, 14, 21, and 28.

Results: The efficacies of the antimicrobials were concentration- and storage-time dependent. The microemulsions exhibited a 1.95-4.86 log CFU/g reduction in *E. coli* O157:H7 population during the 28 days. The microemulsions were also effective against *P. fluorescens* resulting in a 0.32-2.35 log CFU/g reduction during storage at days 0-28. The visual observation of treated leaves indicated that the 0.3% lemongrass microemulsion showed the best visual appeal in Iceberg leaves inoculated with *E. coli* O157:H7 and 0.1% oregano oil showed improvement in the quality of Iceberg leaves inoculated with *E. coli* O157:H7 and *P. fluorescens*.

Significance: Essential oil microemulsions have the potential to provide natural, eco-friendly, and effective alternatives to chemical sanitizers for leafy green decontamination against *E. coli* O157:H7 and *P. fluorescens*.