Synergistic Effects of Combination Treatments of Essential Oils and a Plant Extract Against Multi–drug Resistant *Salmonella* Newport on Organic Leafy Greens

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In the processing of organic fresh produce, there are limited treatments available to prevent the spread of foodborne pathogens, and outbreaks associated with such pathogens continue to occur. Alternative sanitization methods to reduce the microbial load on fresh produce are needed. Plant-based compounds are well known for their antimicrobial activity; however, research on their applications on/in foods is limited. Essential oils and plant extracts in wash water were tested on fresh organic leafy greens for their antimicrobial properties against *Salmonella enterica* serovar Newport. Organic iceberg and romaine lettuces and mature and baby spinach were inoculated with antibiotic-resistant *S.* Newport and dip treated in phosphate buffered saline (PBS) control, 3% hydrogen peroxide, an essential oil and a plant extract combination (A) or another essential oil and the plant extract combination (B) treatments. Baby spinach exhibited 3.5 and 4.0 log CFU/g reductions in *Salmonella* populations on day 3 for the combination A and B treatments, respectively. Mature spinach resulted in a 3.0 log CFU/g *Salmonella* reduction for both combination treatments. For romaine lettuce, there were 3.0 and 4.0 log CFU/g reductions for the combination A and B treatments, respectively. The combination A and B treatments yielded a 2.75 and 3.5 log CFU/g reductions, respectively, in *Salmonella* population on iceberg lettuce. Our results showed that combination treatments are effective against *S.* Newport, are better than controls and individual treatments previously investigated in our lab (Tables 1 & 2), and therefore, may be an alternative sanitizer option for the organic leafy green industry.