



Effects of Pyruvic Acid, Succinic Acid, and Oregano Essential Oil on *Salmonella*, Natural Microflora, and Quality of Raw Ground Chicken

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Objectives

The growing stringency of regulations related to pathogens in raw poultry and increasing consumer demand for more natural food ingredients makes it imperative to explore alternative antimicrobial agents. The aim of this study was to assess the anti-*Salmonella* effect of combinations of succinate or pyruvic acid with oregano essential oil in raw ground chicken. Additionally, their effect on natural microflora and quality of ground chicken over simulated retail display was evaluated.

Materials and Methods

Nalidixic acid (NA) adapted *Salmonella* Typhimurium was inoculated on skin-on broiler breast meat pieces. The antimicrobial treatments given to meat were 2 and 3% pyruvic acid (PA) or monosodium succinate (SA) in combination with 0.5% essential oil (EO). Agar at the concentration of 0.05% was added to water used to prepare antimicrobial solutions to disperse the essential oil. Mode of antimicrobial treatment was 30 s dip. The meat was then ground and evaluated for pathogen reduction. Data were analyzed using 1-way ANOVA. Surviving *Salmonella* were recovered on XLT-4 with 50 ppm NA. Non-inoculated meat was similarly treated with antimicrobial dip and ground. Ground chicken was packaged in foam trays with PVC overwrap, and evaluated for mesophilic aerobic plate count (APC), psychrotrophic count (PC), pH, instru-

mental color (*CIE L**, *a**, and *b**), and expressible moisture over 8 d of simulated retail display. A factorial design was assigned to the experiment with antimicrobial treatments and display days as the fixed effect factors. Data were analyzed using a mixed general linear model that considered replicates as a random effect in addition to the mentioned fixed effects. All trials were conducted in three replicates.

Results

Maximum reduction obtained in *Salmonella* counts from ground chicken was 1.52 log CFU/g and 0.98 log CFU/g, resulting from 3% SA + 0.5% EO, and 3% PA + 0.5% EO, respectively. Three percent SA + 0.5% EO treatment resulted in ground chicken with approximately 1.2 log CFU/g lower APC on Day 8 that was significantly lower ($P < 0.05$) than all other treatments. This treatment also resulted in less pH variation over the entire shelf life duration and lighter color of ground meat on Day 8.

Conclusion

These results indicate that combination of monosodium succinate and oregano essential oil provides effective reduction of *Salmonella* and improved raw quality of ground chicken. This antimicrobial combination can be employed as a clean label ingredient for raw chicken applications.