Supplementing food antimicrobials in commercial edible coatings to enhance the safety and extend the shelf-life of stone fruits

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Summary

Edible coatings can preserve stone fruits but are not effective against foodborne pathogens. The project aims to supplement food antimicrobials in commercial stone-fruit coatings to enhance the safety of stone fruits. Lauric arginate (LAE) and sorbic acid, with synergistic antimicrobial activity, were incorporated in #7037 commercial coating to reduce *Listeria monocytogenes* and *Salmonella* counts on fresh peaches. Native fungi and fruit quality were also assessed. For both pathogens, there was no significant difference ($p < 0.05$) between coating treatments with and without antimicrobials during storage at 0 or 21°C. Coated peaches without antimicrobials had the highest native fungi population. Excess weight loss was observed, and the quality parameters were comparable across treatments. Future experiments will explore other antimicrobials and/or commercial coatings for improved pathogen reduction.

Objectives

1. Characterize physical, mechanical, and antimicrobial properties of films casted from commercial stone-fruit coatings supplemented with food antimicrobials.
2. Evaluate the reduction of inoculated pathogens, native yeasts, and molds/fungi, as well as the quality of stone fruits after coating and during storage.

Methods

Figure 1 describes the coating process. Washed peaches were inoculated with cocktails of *L. monocytogenes* Scott A, Mack FSL X1-0001, FSL F6-0367, and 4B (FSL R2-0574, FSL F2-501), or *Salmonella* Enteritidis (FSL S5-371, ATCC H4267), *S.* Javiana (FSL S5-406), and *S.* Typhimurium (FSL A4-737, FSL S5-370). The #7037 coating, previously adjusted to pH 6 and incorporated with LAE (500 and 1,000 ppm) and sorbic acid (5,000 and 10,000 ppm), was sprayed on the peaches. The coated fruits were dried and stored at 0°C for 20 days or 21°C for 5 days. Spread plating was performed to determine pathogen counts during storage. Native fungi, weight loss, color, pH, titratable acidity, and total soluble solids were measured. Coated peaches without antimicrobials and uncoated peaches were also evaluated.

Results to Date

Antimicrobials in the coating did not show apparent impact on the pathogens on peaches (**Figures 2 and 3**). For the coating supplemented with 1,000 ppm LAE and 10,000 ppm sorbic acid, reductions of 2.49 ± 0.34 log CFU/fruit and 2.26 ± 0.39 log CFU/fruit were obtained for *L. monocytogenes* and *Salmonella*, respectively, after 20 days of storage at 0°C. The uncoated control showed the highest log reductions. The population of native fungi was the highest in coated fruits without antimicrobials (**Figure 4**). Severe weight loss was observed (**Figure 5**). There was no significant difference in color, pH, titratable acidity, and total soluble solids (TSS), except for a higher TSS for the uncoated peaches at the end of storage. Similar trends were observed for all parameters at both storage temperatures.

Benefits to the Industry

The project benefits the produce industry by improving safety and extending the shelf life of stone fruits, thereby reducing the risk of contamination and possible product recall. The results of this study can be adopted by the stone fruit industry and can be extended to other fresh produce. Therefore, the findings are valuable for the safety and sustainability of agricultural products susceptible to foodborne outbreaks.

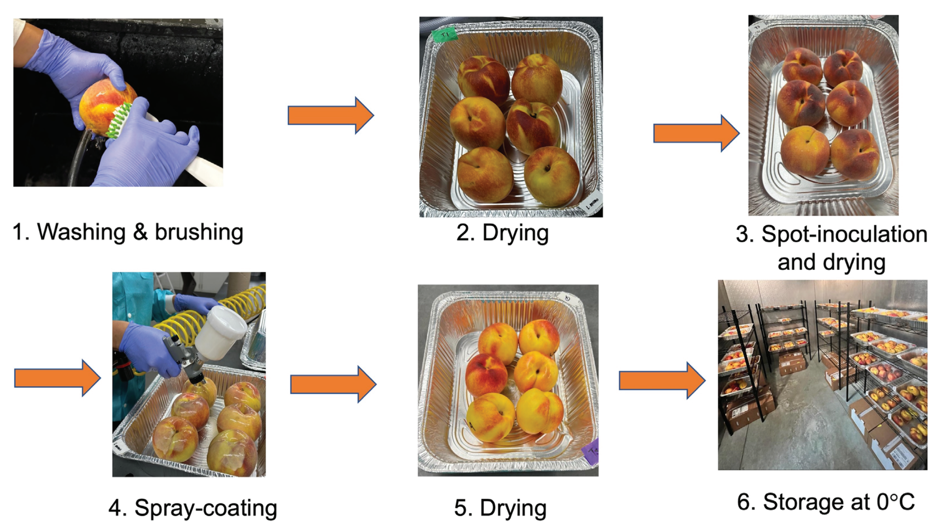

Figure 1. Treatment and storage of coated peaches.

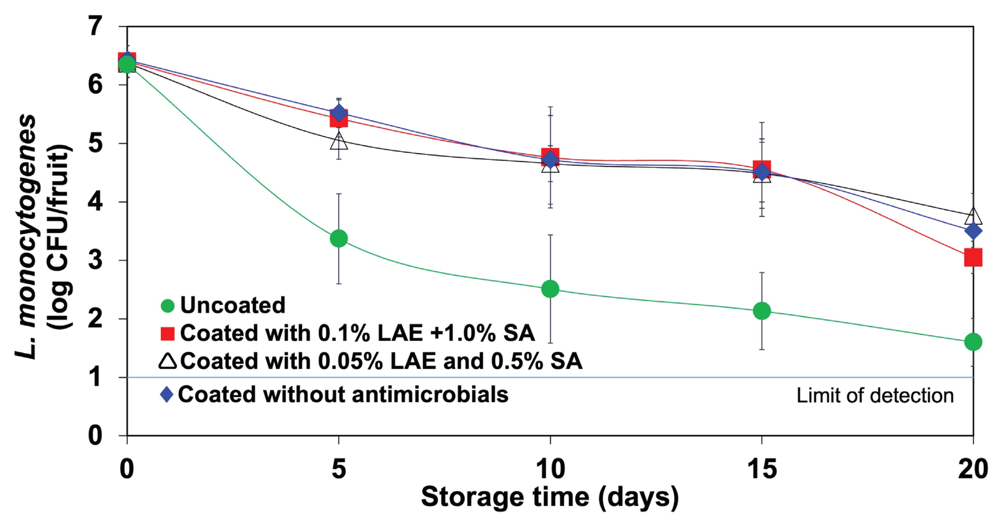

Figure 2. Reduction of *L. monocytogenes* cocktail on peaches during 20 days of storage at 0°C.

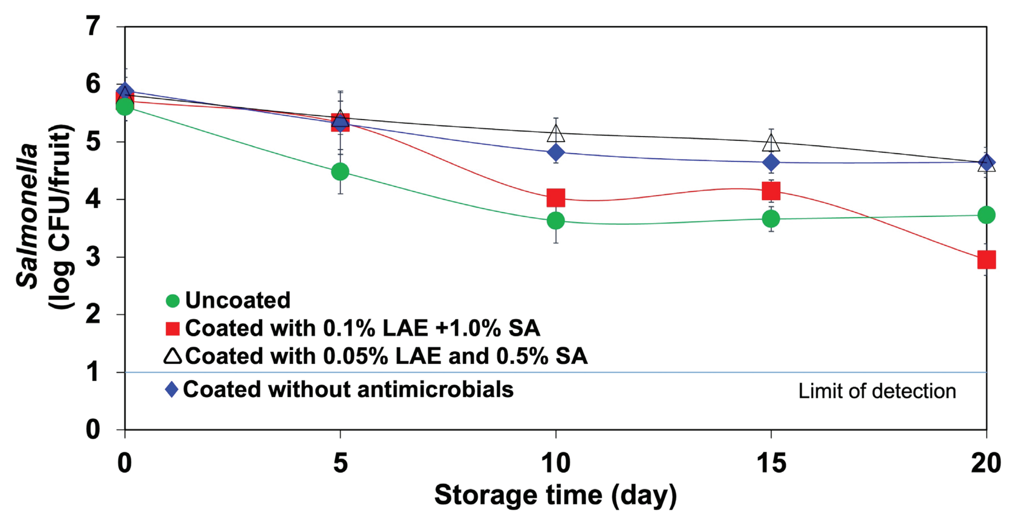

Figure 3. Reduction of *Salmonella* cocktail on peaches during 20 days of storage at 0°C.

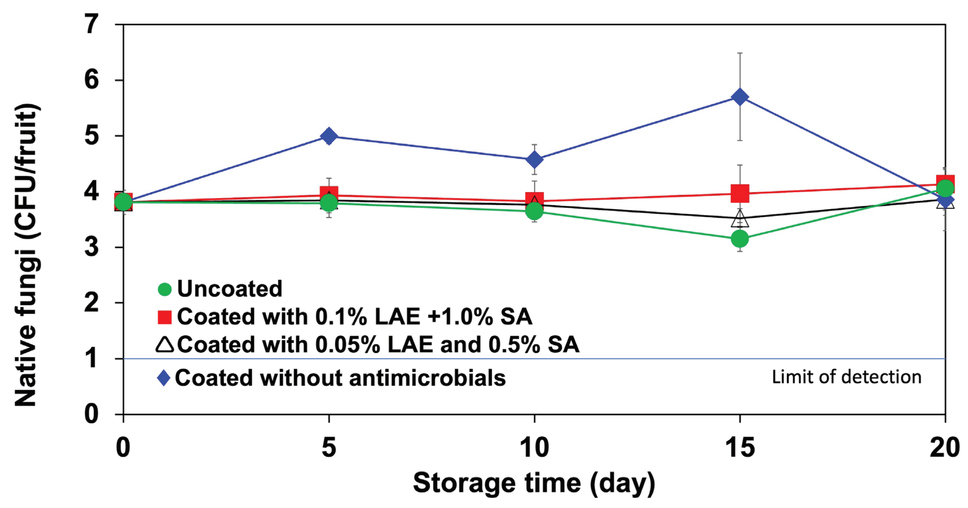

Figure 4. Reduction of native fungi on peaches during 20 days of storage at 0°C.

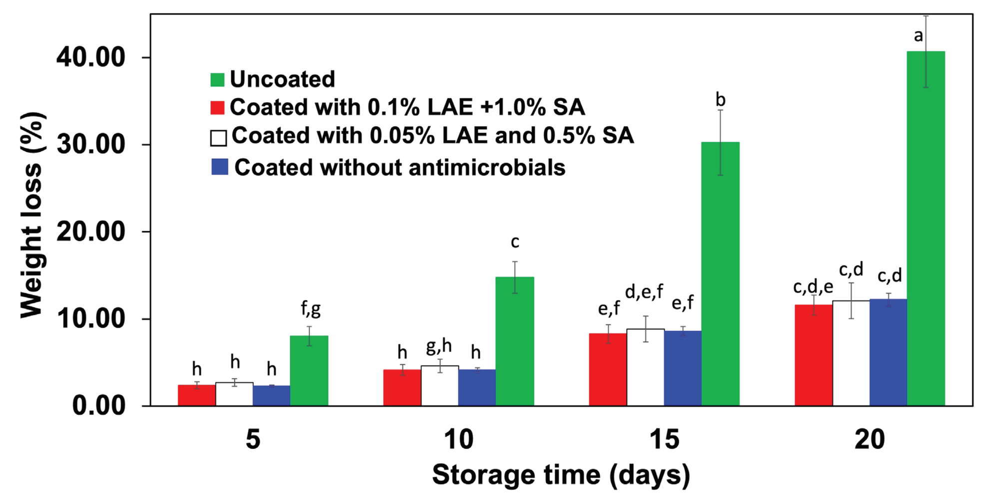

Figure 5. Weight loss of peaches during storage at 0°C.