Effectiveness of a commercial peracetic acid-based disinfectant to reduce microbial loads in spinach (*Spinacia oleracea*) leaves

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Introduction

The growing consumption trends of healthy and easy to prepare foods have stimulated the minimally processed ready-to-eat (RTE) vegetable market[1]. Besides providing health benefits, the consumption of minimally processed leafy leaves has been associated with the presence of foodborne pathogens, such as *Listeria monocytogenes*[2-4]. Contamination of leafy vegetables can occur at any step through the food chain, and therefore, their washing with sanitizers improves their safety. However, the effectiveness of the process can be influenced by the washing parameters (e.g., water temperature and contact time of vegetables with disinfectant solution), sanitizers used (e.g., chlorine-based or organic acid), vegetables, phyllosphere bacterial community composition on a leafy surface, and also microorganisms' characteristics, such as the target genus and cell attachment (e.g., adhesion to biofilm and plant internalization)[5].

Aims

Validating washing processes, including the type of sanitizers and concentrations applied to specific products, are essential to ensure the microbiological safety of RTE fresh salads. In this way, this study aimed to evaluate the reduction of *L. monocytogenes* and other native microorganisms on spinach leaves by a commercial Peracetic acid (PA)-based sanitizer, Mida Chriox 5.

Methodology

Microbiological analysis of unwashed spinach leaves was performed on day zero and after storage at 4 °C for 8 days. To determine the efficiency of the PA-based sanitizer, samples were artificially contaminated with 4.0 log CFU/g of a *L. monocytogenes* cocktail, washed with PA solutions at different concentrations (5, 40, and 100 mg/L), stored at 4 °C and analyzed at the same days as unwashed samples.

Results

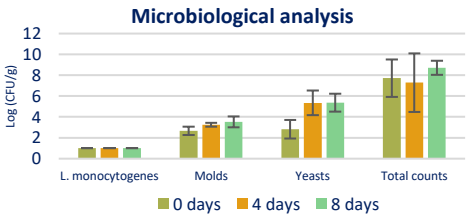

Figure 1. Bacterial counts (log CFU/g) of unwashed spinach tested along the storage period. The results are means based on the data of four independent samples, and standard deviations are indicated by error bars.

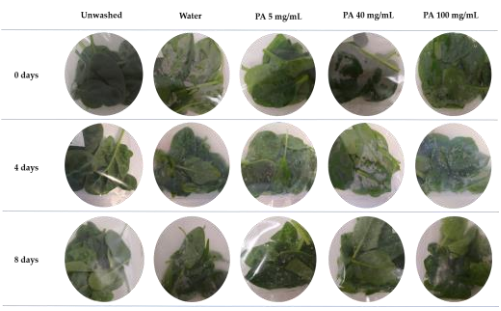

Figure 2. Observation of the physical quality of the spinach samples before and after each treatment

- After contamination of spinach leaves, reductions in the numbers of *L. monocytogenes* were only significant at a PA concentration of 40 mg/L compared to samples washed with water alone.
- Washing with 40 mg/L PA also prevented an increased number of yeasts and molds over storage time.
- However, although washing with PA was more effective in reducing the number of total microbial counts on day zero (between 0.9 - 1.9 log CFU/g reduction), an increase in their numbers was observed for all the conditions throughout storage.
- In some of the samples, the physical quality of the spinach leaves appeared lower after treatment with PA at 100 mg/L than with PA at 40 mg/L (Figure 2).

Conclusion

The bactericidal effect of PA-based sanitizer tested was significantly influenced by its concentration. Further tests should be performed to understand the higher reductions observed at lower PA concentrations.

References

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