Effects of Sodium Hypochlorite Soaking Time on the Microbiological Quality of Fresh Vegetables Prepared by the Airline Catering

Tirada Maha[1], Pensiri Sriburi[1] and Sathit Tipmongkolchai[2]

[1] Division of Biochemistry and Biochemical Innovation, Department of Chemistry, Faculty of Science, Chiang Mai University

[2] Department of Catering, Thai Airways International Public Company Limited

Abstract

Fresh vegetables are considered high-risk ingredients for microbial contamination due to exposure during cultivation, harvesting, transportation, and trimming processes, which may affect the food safety. This concern is particularly critical in foods prepared by the airline catering, where strict sanitary standards are required. Chlorine-based sanitizers, such as sodium hypochlorite, are therefore commonly used in vegetable washing processes. However, inappropriate soaking times may influence both microbial reduction efficiency and production performance.

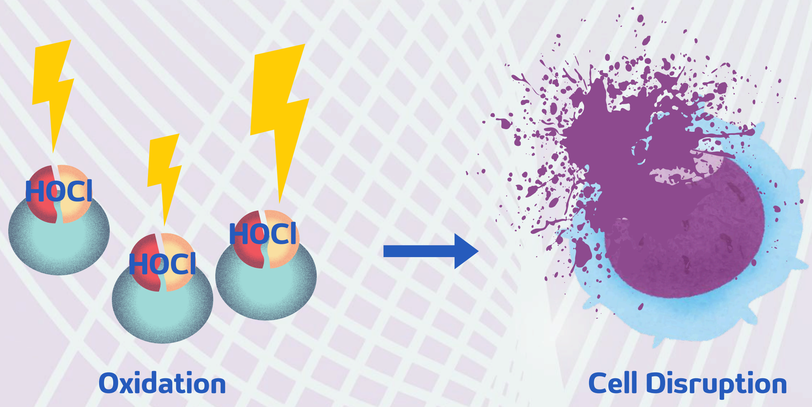
This study investigated the impact of sodium hypochlorite immersion time on the microbiological quality of fresh Bok choy. Samples were assigned to four groups: an untreated control and three treatment groups immersed in 50 ppm sodium hypochlorite for 3, 5, and 7 minutes. After treatment, samples were rinsed with sterile water for 30 seconds. Microbial analysis for *Escherichia coli*, *Salmonella* spp., and *Listeria monocytogenes* was conducted, and results were expressed as CFU/plate.

The results showed that the control group had very high microbial counts for all three microorganisms. Soaking for 3 minutes resulted in *E. coli* counts of 60.33±26.11 CFU/plate, while *Salmonella* spp. and *L. monocytogenes* were not detected in all treated samples. Increasing the soaking time to 5 minutes reduced *E. coli* counts to 2.00±3.46 CFU/plate. Soaking for 7 minutes further reduced *E. coli* counts to 0.33±0.58 CFU/plate, with no detection of *Salmonella* spp. and *L. monocytogenes* in any treated group.

It can be concluded from this study that soaking the fresh Chinese cabbage in 50 ppm sodium hypochlorite solution for 7 minutes revealed the highest efficiency in microbial reduction and is appropriate for controlling microbiological quality of fresh vegetables prepared by the Catering Department of Thai Airways International Public Company Limited.

Introduction

Fresh-cut vegetables used in airline catering are highly susceptible to microbial contamination during production and handling processes. Ensuring microbiological safety is critical due to the large-scale preparation and strict hygiene requirements in airline catering operations. Sodium hypochlorite (NaOCl) is commonly applied as a sanitizing agent in vegetable washing; however, the effectiveness of disinfection depends largely on contact time. Therefore, optimizing soaking time is essential to achieve effective microbial reduction while maintaining operational efficiency.



Oxidation

Cell Disruption

Objectives

1. To investigate the effects of soaking time in 50 ppm NaOCl on microbial reduction in fresh Chinese cabbage.
2. To determine the optimal soaking time for microbiological quality control in airline catering processes.

Methodology



Sample Preparation → Disinfection Treatment → Microbial Analysis

Results & Discussion

Time (min)	*E. coli*			*Salmonella* spp.			*L. monocytogenes*		
	1	2	3	1	2	3	1	2	3
0	TNTC	TNTC	TNTC	+	+	+	TNTC	TNTC	TNTC
3	33	63	85	-	-	-	0	0	0
5	6	0	0	-	-	-	0	0	0
7	1	0	0	-	-	-	0	0	0

Note: 1, 2, and 3 represent the individual replicates of the experiment; TNTC: Too Numerous To Count; (+): Pathogen detected; (-): Pathogen not detected.

The study shows that contact time in sodium hypochlorite significantly affects microbial reduction in Bok choy. While untreated controls showed counts that were Too Numerous To Count (TNTC), soaking in 50 ppm sodium hypochlorite for 7 minutes effectively reduced E. coli from 60.33±26.11 to 0.33±0.58 CFU/plate. Moreover, *Salmonella* spp. and Listeria monocytogenes were not detected. These results align with **Pezzuto et al. (2016)**, demonstrating that hypochlorous acid (HOCl) acts as a potent oxidizing agent that disrupts the cell structures of both Gram-negative and Gram-positive bacteria. Thus, increasing the soaking duration is a critical factor in enhancing the microbiological safety of fresh produce.

Conclusions

- Soaking time has a direct impact on microbial reduction efficiency in fresh vegetables.
- Soaking in 50 ppm NaOCl for 7 minutes is the most effective duration for ensuring food safety standards at Department of Catering.

References

Pezzuto A. et al. Effectiveness of Washing Procedures in Reducing *Salmonella enterica* and *Listeria monocytogenes* on a Raw Leafy Green Vegetable. ***Frontiers in Microbiology***, 2016.

Benitez J.A. et al. Evaluation of the Effectiveness of Aeration and Chlorination during Washing to Reduce *E. coli* O157:H7, *Salmonella enterica*, and ***Listeria innocua in cucumbers and peppers. Foods***, 2024.

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- Division of Biochemistry and Biochemical Innovation, Department of Chemistry, Faculty of Science, Chiang Mai University
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