

Microbiological Safety and Shelf-Life Extension of Minimally Processed Mango Using Natural Preservatives

Althea Ramos Cruz*

Department of Food Science and Technology, University of the Philippines Los Baños, Laguna, Philippines

DESCRIPTION

Minimally processed mangoes offer convenience and freshness, but their removal of natural protective skin makes them highly vulnerable to microbial contamination and spoilage. In tropical countries like the Philippines, where temperatures are high and refrigeration is limited in many settings, this issue poses a significant food safety concern. This study examined the potential of natural preservatives aloe vera gel, lemon juice, and cinnamon essential oil to enhance microbiological safety and extend the shelf life of sliced mangoes stored under refrigeration.

Ripe 'Carabao' mangoes were washed, peeled, sliced, and divided into four treatment groups: 10% aloe vera gel, 5% lemon juice, 0.2% cinnamon essential oil, and a control group dipped in sterile distilled water. Treated samples were stored at 4°C for up to 14 days and evaluated at intervals for Total Viable Counts (TVC), yeast and mold, *E. coli*, and *S. aureus*. Physicochemical properties such as pH, Total Soluble Solids (TSS), and color changes were also recorded. A sensory evaluation was conducted to assess consumer acceptability during storage.

Cinnamon essential oil displayed the highest antimicrobial efficacy, maintaining low TVC and completely inhibiting pathogenic bacteria through day 14. Aloe vera gel offered moderate antimicrobial protection and helped retain moisture and texture. Lemon juice delayed spoilage up to day 7 but led to a sour flavor and slight bleaching of mango color. The control group showed significant microbial growth and visible spoilage by day 5, confirming the importance of treatment.

By day 7, control mango slices exceeded microbial safety limits, while treated samples remained within acceptable thresholds. Cinnamon oil-treated slices showed minimal spoilage even by day 14. Aloe vera also effectively preserved texture and appearance, while lemon juice-treated mangoes began to show changes in taste and color around day 10. The treated groups exhibited slower microbial growth and better sensory scores than the control, particularly for appearance and texture.

Sensory panelists rated aloe vera-treated slices highest in texture and visual appeal. Cinnamon oil-treated mangoes were noted for their extended shelf life and mild spiced aroma that complemented the fruit's sweetness. Lemon juice-treated samples had acceptable appearance but received mixed reactions due to the altered taste. All treated mangoes remained acceptable to consumers for at least 7 to 10 days.

Physicochemical analysis showed slight changes in pH and soluble solids across all samples, with better stability observed in cinnamon and aloe vera treatments. These preservatives also slowed oxidation and maintained mango color more effectively than the control. Aloe vera's gel coating delayed moisture loss and helped retain a firm, juicy texture, which was reflected in the high sensory scores.

The results support the use of plant-based preservatives as viable, low-cost alternatives to synthetic additives for prolonging the shelf life of minimally processed fruits. Cinnamon essential oil proved most effective in controlling microbial growth over two weeks, while aloe vera provided a good balance between microbial inhibition and textural quality. Lemon juice, although useful in the short term, was less favorable for long-term storage due to its impact on flavor and appearance.

In conclusion, natural preservatives such as cinnamon essential oil, aloe vera gel, and lemon juice are effective in improving the microbiological safety and shelf life of minimally processed mangoes. Among them, cinnamon oil had the highest antimicrobial efficacy, aloe vera enhanced moisture retention and texture and lemon juice offered temporary protection with slight sensory drawbacks. These findings are highly relevant for small-scale fruit vendors and processors in the Philippines, providing them with practical options to extend product shelf life and improve food safety without relying on synthetic chemicals. Incorporating these natural agents into mango processing and packaging could significantly reduce postharvest losses, enhance product quality, and meet consumer demand for clean-label, fresh fruit products.

Correspondence to: Department of Food Science and Technology, University of the Philippines Los Baños, Laguna, Philippines, E-mail: althea.cruz@uplbfood.ph

Received: 03-Mar-2025, Manuscript No. JFMSH-25-37793; **Editor assigned:** 06-Mar-2025, PreQC No. JFMSH-25-37793 (PQ); **Reviewed:** 20-Mar-2025, QC No. JFMSH-25-37793; **Revised:** 27-Mar-2025, Manuscript No. JFMSH-25-37793 (R); **Published:** 03-Apr-2025. DOI: 10.35841/2476-2059.25.10.342.

Citation: Cruz AR (2025). Microbiological Safety and Shelf-Life Extension of Minimally Processed Mango Using Natural Preservatives. J Food Microbiol Saf Hyg.10:342.

Copyright: © 2025 Cruz AR. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.