Junior Science Communications
Faculty of Applied Sciences, UiTM Shah Alam
https://journal.uitm.edu.my/ojs/index.php/JSC

E-ISSN 2637-0689
Vol 47 2025

Colloquium on Applied Sciences 2 2024
8-14 July 2024, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Physical, Mechanical, and Water Barrier Properties of Chitosan-Papaya Film

Muhammad Hafiy Dhabit Ramizu[a*], Nafisah Musa[a*]

Structured Abstract

Background: Food packaging is essential for preserving quality, facilitating distribution, and ensuring safety. Traditionally, plastic is widely used, but it poses significant environmental issues due to non-biodegradability and the release of harmful substances. To address these concerns, research has focused on biodegradable alternatives like chitosan-based films. Chitosan, derived from chitin, is biodegradable, non-toxic, and possesses excellent film-forming properties. Combining chitosan with natural additives, such as papaya powder and papaya extract oil, may enhance its mechanical and barrier properties, making it a potential substitute for plastic packaging.

Methods: Chitosan-papaya films were prepared using three formulations: a control with only chitosan, glycerol, and Tween 20; one with added papaya powder (CPP); and another with papaya extract oil (CEO). The films were assessed for solubility, grease resistance, colour, crystallinity, tensile strength, elongation at break, tear strength, and water vapor permeability (WVP). Physical properties were measured using standard protocols, while mechanical properties were evaluated using a texture analyser. Water vapor permeability was determined by measuring the rate of vapor transmission through the films.

Results: This study shows that chitosan-papaya films varied in their properties. The CPP formulation exhibited the lowest water solubility and best water vapor resistance but had decreased tear strength. All formulations demonstrated excellent grease resistance. Colour analysis revealed significant differences, with CPP showing the highest redness and yellowness. X-ray diffraction indicated that CEO had the highest crystallinity. Mechanically, the control film had the highest tensile strength, while CPP and CEO had increased elongation at break, indicating higher flexibility. Overall, the addition of papaya improved certain properties but compromised others.

Conclusion: The study successfully produced chitosan-papaya films with enhanced water resistance, indicating their potential as biodegradable food packaging materials. While the CPP formulation showed the best overall performance in terms of water vapor resistance, there was a compromise in mechanical strength. These findings suggest that chitosan-papaya films could serve as sustainable alternatives to traditional plastic packaging, contributing to environmental sustainability by reducing reliance on non-biodegradable materials.

Keywords: Chitosan, Papaya Powder, Papaya Extract Oil, Biodegradable Films, Food Packaging

*Correspondence: nafisahmusa@uitm.edu.my

[a] School of Industrial Technology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia