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

E-ISSN 2637-0689
Vol 42 2024

Colloquium on Applied Sciences 2024
19-21 January 2024, Faculty of Applied Sciences, UiTM Shah Alam, Malaysia

Effect of Natural Colourant (Anthocyanin) on Physicochemical Characteristics of Chitosan Film

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Structured Abstract

Background: In contemporary times, a growing need for edible films has emerged owing to their efficacy in prolonging the shelf life of food products. The utilization of chitosan and anthocyanin as primary constituents in these films demonstrates a notable film-forming capability coupled with inherent antimicrobial properties. Furthermore, anthocyanin contributes not only to the coloration of the film but also imparts health benefits, including antimicrobial effects. The present study was conducted to investigate the impact of the natural colorant, anthocyanin, on the physicochemical attributes of chitosan film.

Methods: The film was fabricated through a casting method utilizing chitosan, glycerol, beeswax, and anthocyanin. Various concentrations of anthocyanin were incorporated into the chitosan film, specifically at levels of 20% (CSANT20), 60% (CSANT60), and 80% (CSANT80).

Results: This study reveals that the thickness of the chitosan anthocyanin films ranged from 0.21 to 0.22 mm ($p>0.05$). Significant increases in opacity (from 0.94 to 1.65 mm^-1), elongation at break (from 13.61% to 19.67%), and crystallinity index (from 6.75% to 8.65%) were observed upon the addition of anthocyanin ($p<0.05$). However, the tensile strength of the film significantly decreased from 6.1 to 3.4 MPa after the incorporation of anthocyanin ($p<0.05$). The CSANT exhibited a darker color compared to the control chitosan film, as indicated by a decrease in the lightness value ($p<0.05$). CSANT demonstrated lower water solubility values in both heated and unheated water compared to the control chitosan film ($p<0.05$). The surface of the CSANT film appeared rough with a limited number of spores when examined using a scanning electron microscope, in contrast to the smooth surface of the control chitosan film. CSANT also exhibited greater pH sensitivity, suggesting slight color changes at different pH levels. Among the films, CSANT80 emerged as the superior film due to its highest opacity value (1.652%), crystallinity value (8.65%), and elongation at break value (19.6%) compared to CSANT60 and CSANT20. CSANT80 displayed a slightly darker color than the other films (L*:36.14, a*: -0.14, b*:1.46) and achieved the lowest percentage of water solubility in both heated (52.49%) and unheated (50.35%) conditions.

Conclusion: In conclusion, this study successfully elucidated the physicochemical properties of chitosan films incorporated with anthocyanin. The varying concentrations of anthocyanin in the film materials exerted distinct effects on specific properties of the chitosan films. Notably, CSANT80 emerged as the optimal concentration of anthocyanin, demonstrating the most favorable enhancements in the properties of the chitosan film.

Keywords: Edible film, Anthocyanin, Chitosan

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