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Effect of Curcumin on the Physicochemical Characteristics of Chitosan Film

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Structured Abstract

Background: Packaging is an important component that protects the product and ensures food safety during the storage. However, due to non-biodegradability, the conventional film packaging materials have become concern in sustainability. The study aims to investigate the effects of curcumin on the physicochemical characteristics of chitosan film.

Methods: : Chitosan film was fabricated through a casting method involving chitosan, beeswax, acetic acid, and glycerol. Different concentration of curcumin into chitosan films 20% (CSCU20), 60% in CSCU60, and 80% (CSCU80).

Results: The study reveals that the thickness of chitosan curcumin films ranges from 0.1967 to 0.2430mm ($p>0.05$) The water solubility of film also shown no significant difference ($p>0.5$). There is significant increase opacity from 0.6977 to 1.626 A/mm which corresponding with colour parameters in the decrease in lightness and increase in redness and yellowness value($p>0.5$) which ($L^*=24.5133$, $a^*=2.6433$, $b^*=11.9667$ by CSCU80. It can be attributed to higher phenol moieties that responsible for absorbing UV-visible light. The crystallinity of chitosan decreased significantly with higher curcumin concentrations ($p>0.05$) recording the lowest value (6.65%) at 80% curcumin compared to films without curcumin and CSCU20 and CSCU60 formulations. The surface of CSCU films appeared to be rougher with the formation of smaller but compact crystallites compare to the smooth surface of control chitosan film when examined using a scanning electron microscopy (FeSEM)These findings were further supported by attenuated total reflectance (ATR) spectra, showing C-H stretching vibration at 2931-2933 cm^{-1}, with major peaks recorded at 2919.7 nm for CSCU80. Under the extreme pH conditions ($pH<3$ and $pH>9$), the film's color intensity varied, decreasing under higher acidic conditions, and increased under higher basic conditions, owing to the keto and enol properties of curcumin. The color intensity pH response for chitosan films at basic pH lasted longer. The CSCU80 retained color response changes for an extended duration, suggesting its suitability as a pH sensor.

Conclusion: In conclusion, this study successfully elucidated the physicochemical properties of chitosan film incorporated with anthocyanin. The varying concentration of curcumin in the materials exerted distinct effects on specific properties of chitosan films Notably, CSCU demonstrating the most favorable enhancement in the of chitosan film.

Keywords: Chitosan, Curcumin, Edible Film, pH sensor

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