

**PROPERTIES AND CHARACTERISTICS OF ACTIVE FISH GELATIN-
CARRAGEENAN BLENDED FILM INCORPORATED WITH *Etilingera*
elatior INFLORESCENCE CARBON DOTS**

Abstract

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Bio-based active packaging has been demanded for replacing the petroleum plastics and extended shelf-life of perishable food. In this study, fish gelatin/carrageenan (GC) blended films were incorporated with torch ginger (*Etilingera elatior*) inflorescence carbon dots (TGCDs) at varying concentrations (1–5%, w/w based on polymers). Physicochemical properties and characteristics of resulting films were investigated. In addition of TGCDs, the film appearance became more yellow ($+b^*$) with decreased lightness (L^*) and increased redness ($+a^*$). Thickness of all films was in the range of 0.031 – 0.039 nm. TGCDs addition at 3% significantly increased elongation at break (EAB) ($P < 0.05$) while maintaining adequate tensile strength (TS) and Young's modulus (YM). Lower water vapor permeability (WVP) was observed in film containing 3% TGCDs compared to the control film. Fourier transform infrared (FT-IR) spectroscopy indicated that higher TGCDs concentrations ($\geq 3\%$) intensified interaction via hydrogen bonding and molecular interactions in film matrix. The incorporation of TGCDs enhanced the film antioxidants and UV-blocking properties in a dose-dependent manner. The GC-3%TGCDs film showed a smooth surface with a rough cross-sectional structure. TGCDs therefore enhanced the mechanical and functional properties of fish gelatin/carrageenan blended films, promising active packaging for food applications.

Keywords: Nanoparticles, torch ginger inflorescence, anti-UV, hydrothermal.