Thesis Title	Encapsulation of Ferulic Acid with Hydroxypropyl Methylcellulose and Xanthan Gum Biopolymeric Systems
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ABSTRACT

Ferulic acid (FA) is a phenolic antioxidant widely used in cosmetics due to its pharmacological properties. Nonetheless, its stability detriments its applications abided by the formulating practices and its bioavailability. This study aimed to develop biopolymeric walls using hydroxypropyl methylcellulose (HPMC) and xanthan gum (XG) for FA encapsulation. The biopolymeric walls with HPMC and XG (50:1 to 250:1 w/w) afforded the amorphous particles with pore sizes of 37-51 μm as demonstrated with SEM and ImageJ calculation and showed moderate lightness (44.26-46.25), a* (0.08-0.16), and b* (5.24-6.43). FTIR confirmed the bonding between HPMC and XG through characteristic O–H, C=O, and C–O–C bands. DSC and XRD improved thermal behavior and amorphous structure. FA was loaded (1.22–1.23% w/w) with the encapsulation efficiencies of 71.26–80.52%. Encapsulation reduced yellowness (b*) from 15.80 ± 0.07 to 9.23 ± 0.09, while SEM, FTIR, DSC, and XRD further confirmed FA encapsulation. Physicochemical properties showed the water solubility increasing from 30–38% to 34–40%, the water absorption rate from 16–18% to 17–25%, and the swelling capacity from 4×10^{-3} to 7×10^{-3} %. Controlled release showed an initial slow FA release of 14.66–25.31% in the first 6 h reaching 37.97–49.07% at 72 h. Under accelerated stability testing (40°C and 75 % RH), encapsulation efficiency dropped to 48.82–62.88% with increased b* 10.27 ± 0.06 to 28.6 ± 0.01, while the formulation containing 0.05 g XG and FA added before hydration proved superior in FA retention.

Keywords: Ferulic Acid, Biopolymeric Walls, Encapsulation, Cosmetics