Improving embelin's drug potential: Synthesis and determination of conjugation ratio of starch aldehyde-embelin conjugate

Hikmah Mohamad Idi[1], Muhammad Syafiq Iman Sudin[1], Shazalyana Azman[1], Mahendran Sekar[2], Seow Lay Jing[1]

[1]Faculty of Pharmacy and Health Sciences, Universiti Kuala Lumpur, Royal College of Medicine Perak, Ipoh, Perak, [2]School of Pharmacy, Monash University Malaysia, Subang Jaya, Selangor

ABSTRACT

Introduction: The starch aldehyde-embelin conjugate (SAEC) presents a novel approach to enhancing the pharmacological properties of embelin, a natural compound with limited solubility and bioavailability. **Objective:** This study aimed to synthesize the starch aldehyde-embelin conjugate (SAEC) and determine its conjugation ratio through Fourier transform infrared (FTIR) spectroscopy. **Materials and Method:** Embelin was conjugated with starch aldehyde using an acid-catalyzed condensation reaction, and the conjugation ratio was determined using Ultraviolet-Visible UV-Vis spectroscopy. FTIR analysis was performed to confirm the conjugation by detecting characteristic functional groups, including the expansion of the O-H bond, which indicates new bond formation between embelin and starch aldehyde. **Results:** The conjugation ratio of 100 mgEE/g was achieved, indicating successful conjugation. FTIR analysis further validated this by showing an expansion of the O-H stretching peak at 3400 cm^{-1}, suggesting increased hydrogen bonding due to new bond formation. Additionally, the shift in the C=O stretching peak from 1730 cm^{-1} to 1720 cm^{-1} confirmed the participation of aldehyde groups in the reaction. The formation of new bonds was confirmed by new ether (C-O) signal at 1050 cm^{-1}. UV-Vis spectroscopy showed absorbance changes indicating alterations in embelin's electronic environment caused by conjugation. **Conclusion:** The synthesized SAEC exhibited improved stability and a high conjugation ratio, suggesting its potential for enhanced therapeutic applications. Future research should focus on optimizing the conjugation ratio, assessing in vivo stability, and exploring embelin's full pharmaceutical potential.