

A Novel Molecular Imprint Polymer Synthesis for Solid Phase Extraction of Andrographolide

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Abstract: The use of molecularly imprinted polymers for solid phase micro-extraction (SPME) of bioactive compounds are getting popularity. The interest on efficient extraction process of andrographolide from the plant is increasing due to their vast therapeutic applications. In this study, andrographolide imprinted MIP was prepared by precipitation polymerization method using the non-covalent technique to use as sorbent materials for solid phase extraction of the bioactive compound. HyperChem 8.0.10 software was used to investigate and optimize the template and functional monomer ratio in the pre-polymerization system to synthesize the imprinted polymers. Molecular modeling gives information about molecular interactions and the Gibbs free energies of the pre-polymerization complex. Based on the computational study, andrographolide, methacrylic acid (MAA) and ethylene glycol dimethacrylate (EGDMA) were used as the template, functional monomer, and cross-linker, respectively at the 1:3:20 ratios. The MIPs were characterized by kinetic study and imprinting factor. The binding parameters for the recognition of andrographolide were studied using Langmuir, Freundlich and Langmuir-Freundlich adsorption isotherm models. Andrographolide MIP contains the maximum number of binding sites with the adsorption capacity of 149.59 µg/g. The SPME experimental data best fit with Langmuir-Freundlich isotherm model with the R² value of 0.997. This research shows that the MIPs prepared by precipitation polymerization gives a good extraction capability using SPME method.

Keywords: andrographolide; molecularly imprinted polymer; precipitation polymerization; adsorption isotherm

■ INTRODUCTION

Andrographis paniculata is a popular medicinal plant locally known as “Hempedu Bumi” in Malaysia. *A. paniculata* extracts are widely used in China, India, Thailand and other Southeast Asian countries [1] which exerted varieties of medicinal effects, including anti-

inflammatory [2-3], anticancer [4] and anti-oxidative [5]. A number of bioactive compounds are reported from the plant, which mainly includes diterpenoid lactones, flavonoids and polyphenols [6]. Andrographolide (Fig. 1) is among the most promising bioactive diterpenoid lactone in *A. paniculata*, which mainly contained in the leaves [7]. Recently researchers