

MODELLING OF SUPERCRITICAL CARBON DIOXIDE EXTRACTION OF ANDROGRAPHOLIDE FROM *ANDROGRAPHIS PANICULATA* LEAVES BY EMPLOYING INTEGRAL DESORPTION CONCEPT

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ABSTRACT

Mathematical formulation is necessary for the optimisation and scale-up of a separation unit such as the extraction of biomolecules from their natural resources. The objective of this work is to obtain a quantitative description of the supercritical carbon dioxide extraction (SCDE) of andrographolide from *Andrographis paniculata* leaves. This work presents the development of a mathematical model based on first order desorption rate of solute into supercritical fluid to describe the SCDE of andrographolide from *Andrographis paniculata* leaves. Numerical calculation was carried out using a commercial algebraic optimisation code, namely the MATLAB software. In this work, calculation was accomplished to obtain the adjustable parameter of the model using experimental data obtained from the SCDE of andrographolide at different operating temperature and pressure. The calculation results show that this model agrees very well with the experimental data. Therefore, this model is capable for the modelling of SCDE of andrographolide from *Andrographis paniculata* leaves.

Keywords: modelling, supercritical carbon dioxide extraction, andrographolide, *Andrographis paniculata*, MATLAB

INTRODUCTION

Andrographis paniculata NEES, locally known as Hempedu Bumi and commonly called as King of Bitter grows widely in the tropical area of South East Asia, India and China with annual growth having 30 – 70 cm height. In Malaysia, this plant has been extensively used for traditional medicine and help against fever, dysentery, diarrhoea, inflammation, and sore throat. Furthermore, it is a promising new way for the treatment of many diseases, including HIV, AIDS, and numerous symptoms associated with immune disorders [1].

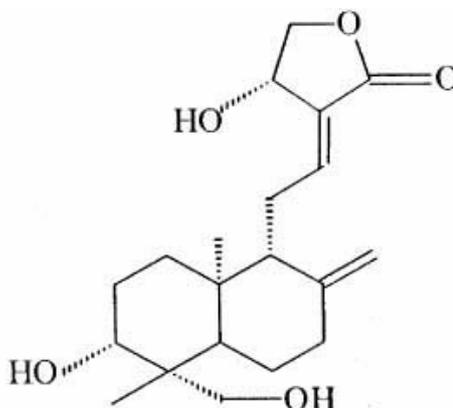


Figure 1: Molecular structure of andrographolide [3]

Three main diterpenoid lactones identified in the *Andrographis paniculata* leaves were andrographolide, neo-andrographolide and deoxyandrographolide [2, 3, 4]. Andrographolide, which is grouped as an unsaturated trihydroxy lactone has molecular formula of $C_{20}H_{30}O_5$. The molecular structure of andrographolide is shown in Figure 1. Andrographolide can be easily dissolved in methanol, ethanol, pyridine, acetic acid and acetone, but