Mathematical Modelling of Extraction Yield, Glycosaponin and Eurycomanone Content from Eurycoma longifolia Roots

ABSTRACT

Aim: The technique of modeling was used to predict the performance of herbal extraction. Background: Eurycoma longifolia is a traditional herb that is widely used to promote overall well-being by local folks in South East Asia. Objective: The objective of this study was to model the extraction yield, glycosaponin and eurycomanone content from the roots of E. longifolia in a reflux system. Methods: The effects of processing parameters (extraction temperature and particle size) were investigated using a factorial experimental design. The experiments were carried out for 60 min using three categories of particle sizes: S1 (0.50 - 0.99 mm), S2 (1.00 - 1.99 mm), and S3 (2.00 - 2.80 mm) at 70, 80, and 90 °C. The extraction was carried out using the water to solid ratio of 10:1 in a reflux system. Results: A quadratic model is well-fitted to the yield of extraction, while a linear model is proposed for the extraction of eurycomanone, which is significantly affected by temperature. The single step of the reflux process revealed that glycosaponin extraction behaves linearly with temperature and particle size but in an inverse direction. However, further reflux process using crude extract prior to gravimetric precipitation could produce higher content of glycosaponin, which can be explained using a quadratic model. Conclusion: The extraction of eurycomanone was faster than glycosaponin because the mass transfer and diffusion coefficients of eurycomanone were about two times larger than glycosaponin .Other: This could be due to the larger molecular size of glycosaponin, and thus higher mass transfer is a limitation when diffusing plant cells into the solvent during extraction.