

Sequential ultrasound-microwave assisted extraction of water soluble proteins from *Eurycoma longifolia* roots

H E Abugabr Elhag 1, A Z Sulaiman 2 and A Ajit 1*

1 Faculty of Chemical & Natural Resources Engineering, Universiti Malaysia Pahang, 26300 Gambang, Pahang, Malaysia.

2 Faculty of Bio-Engineering and Technology, Universiti Malaysia Kelantan, Jeli Campus, Locked Bag No. 100 – 17600, Jeli Kelantan.

azilahajit@ump.edu.my , pkc15002@stdmail.ump.edu.my , ziad@umk.edu.my ,
azilahajit@ump.edu.my

Abstract:

Even though *Eurycoma longifolia* was extensively studied, few researches investigated the protein content in its water extracts with the consideration of establishing the most suitable extraction method to increase their yields with high efficiency and less time consumption. The study applied a sequential extraction method to increase the yields of water soluble proteins (WSPs) in *E. longifolia* root extracts by the application of two nonconventional extraction methods, Microwave assisted extraction (MAE) and ultrasound assisted extraction (UAE). The study was established by circumscribed central composite designs (CCCDs) to indicate the optimum extraction conditions and the corresponding maximum WSPs yields for both the methods by investigating the MAE factors which were temperature (T); microwave power (W) and irradiation time (i) and UAE factors temperature (T); ultrasonic intensity (UI); and sonication time (s). The optimum conditions of MAE (T: 54°C, W: 301W and i: 15 min) led to the WSPs yield 23.101±1.647%. The optimum conditions of UAE (T: 46°C; UI: 1.84 W.cm⁻² and s: 24 min) led to 24.181±0.321%. These predicted optimum conditions were then employed for the two proposed sequential extraction method, sequential ultrasound-microwave assisted extraction (SUMAE) and sequential microwave-ultrasound assisted extraction (SMUAE). Results revealed that the highest WSPs yield (27.172±1.086%) was obtained by initiating the sequential extraction with UAE for 10 minutes followed by MAE treatment for 5 minutes was the best extraction process. Therefore, SUMAE illustrated more efficiency than SMUAE. This concluded that the SUMAE is a more efficient extraction process than the one-step nonconventional extraction methods and was nominated for the upscaling of extracting proteins from *E. longifolia* roots in pilot and industrial scales.

Keywords: *Eurycoma Longifolia*; Circumscribed Central Composite Design; Ultrasound Assisted Extraction; Microwave Assisted Extraction; Sequential Extraction

Acknowledgements

We gratefully acknowledge the Ministry of Agriculture (MOA) Malaysia for the financial support (RDU 161601) and Universiti Malaysia Pahang, Doctoral Scheme Scholarship (DSS).