

## Accepted Manuscript

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PII: S1383-5866(18)30527-6  
DOI: <https://doi.org/10.1016/j.seppur.2018.06.038>  
Reference: SEPPUR 14692

To appear in: *Separation and Purification Technology*

Received Date: 11 February 2018  
Revised Date: 24 May 2018  
Accepted Date: 15 June 2018

Please cite this article as: Y. Huang, X. Wu, S. Zhou, Y. Lin, W. Zhang, C. Fu, L. Luo, K. Wang, X. Xie, H. Fan, Biphasic extraction of different polysaccharides from *Radix Sophorae Tonkinensis* by microwave-assisted aqueous two-phase extraction: process optimization, structural characterization and mechanism exploration, *Separation and Purification Technology* (2018), doi: <https://doi.org/10.1016/j.seppur.2018.06.038>

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# Biphasic extraction of different polysaccharides from *Radix Sophorae Tonkinensis* by microwave-assisted aqueous two-phase extraction: process optimization, structural characterization and mechanism exploration

Yuanxiang Huang<sup>1</sup>, Xuehao Wu<sup>1</sup>, Shiyu Zhou<sup>2</sup>, Yuyang Lin<sup>1</sup>, Wei Zhang<sup>2</sup>, Chujun Fu<sup>2</sup>, Laicheng Luo<sup>2\*</sup>, Ke Wang<sup>1</sup>,  
Xiujuan Xie<sup>1</sup>, Huajun Fan<sup>1\*</sup>

<sup>1</sup> School of Pharmacy, Guangdong Pharmaceutical University, Guangzhou 510006, China

<sup>2</sup> School of Basic Courses, Guangdong Pharmaceutical University, Guangzhou 510006, China

**Abstract:** A novel method for biphasic extraction and separation of the different polysaccharides from *Radix Sophorae Tonkinensis* (RST) was developed by microwave-assisted aqueous two-phase extraction (MAATPE) in a one-step procedure. Using ethanol/Na<sub>2</sub>HPO<sub>4</sub> system as a green extractant, the effects of the composition of the aqueous two-phase system (ATPS), extraction temperature and extraction time were investigated by single-factor experiments coupled to response surface methodology (RSM) through UV-vis analysis. Under the optimum conditions, extraction yields of two polysaccharides from top and bottom phases were 8.52±0.21% (w/w) and 2.18±0.08% (w/w), respectively. Compared with heating solvent extraction (HSE) and ultrasonic assisted extraction (UAE), MAATPE exhibited higher extraction efficiency. By means of Fourier transform infrared spectroscopy (FT-IR) and high-performance gel permeation chromatography (HPGPC), two polysaccharides obtained from both phases had the characteristics of homogenous heteropolysaccharides, but there were some differences in chemical structures and the molecular weight from each other. Both polysaccharides could be extracted respectively from RST to the top ethanol-rich phase and the bottom salt-rich phase due to their polarity difference. Furthermore, the chemical compositions of two polysaccharides were confirmed by high-performance liquid chromatography (HPLC) analysis after hydrolysis and derivatization, the molar ratios of monosaccharides were glucose: arabinose: galactose: rhamnose: mannose: glucuronic acid: aminogalactose = 63.70: 18.21: 7.00: 5.10: 3.13: 1.78: 1.07 for the

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