

Extraction process of ferulic acid from wheat bran with Low eutectic solvent

Qing-Bo Tu ^{1,2}, Tian-Qi Wang ¹, Ping Li ^{1,3}, Wei-Hong Zhou ^{1,3}, Sheng Sheng ^{1,3}, Jun Wang ^{1,3}, Fu-An Wu ^{1,3,*}

¹ School of Biotechnology, Jiangsu University of Science and Technology, 212018 Zhenjiang, China;

² School of Hanlin, Nanjing University of China Medicine, 225300 Taizhou, China;

³ Sericultural Research Institute, Chinese Academy of Agricultural Sciences, 212018 Zhenjiang, China;

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Presenting author email: qingbotu@126.com; fuword@163.com

Wheat is an important staple food crops of the world, according to the Food and Agriculture Organization of the United Nations statistical data, wheat production reached 772 million tons in 2017 and it is expected to increase by 2.5 percent annually. Wheat bran (WB) is a residue of the rolled milled wheat grain (Chalamacharla, 2018). Around 150 million tons of WB are made during year worldwide, and its main application is as a low-worth ingredient in animal feed (Prückler, 2014), a large amount of WB as waste is not utilized, resulting in a great waste of resources. WB is rich in plant phenolic acids such as ferulic acid with multiple pharmacological effects (Takahashi, 2013).

Ferulic acid of wheat bran is mainly crosslinked with polysaccharide through ester bond (Tang, 2020) Ferulic acid is usually extracted by alkali method or enzyme method (Ai, 2020) to interrupt the connection between them, but these methods have the disadvantages of large amount of solvent and long operation time. Low eutectic solvent (DES) is a new green solvent composed of hydrogen bond donors and hydrogen bond receptors. It has the characteristics similar to ionic liquids, low toxicity, degradability and compatibility with many natural compounds (Zhang, 2012). It can be used as an ideal solvent for the extraction of phenolic compounds. However, the high viscosity of DES is the main factor hindering its application. Therefore, it is very important for the utilization of wheat bran to research the extraction process with DES.

Choline chloride and glycerol were used as hydrogen bond acceptors and hydrogen bond donors respectively. Des solvents with different molar ratios were synthesized by stirring at 80 °C for 2 h. Then equal volumes of ethanol and 15 ml/g wheat bran were added and extracted for 30 min. taking the extraction amount of ferulic acid in DES solvent as the index, the des solvent with suitable polarity was selected. The results are shown in the fig 1. When the molar ratio was 1:2, the extraction effect was the best, and the extraction rate was 5.54 mg/g

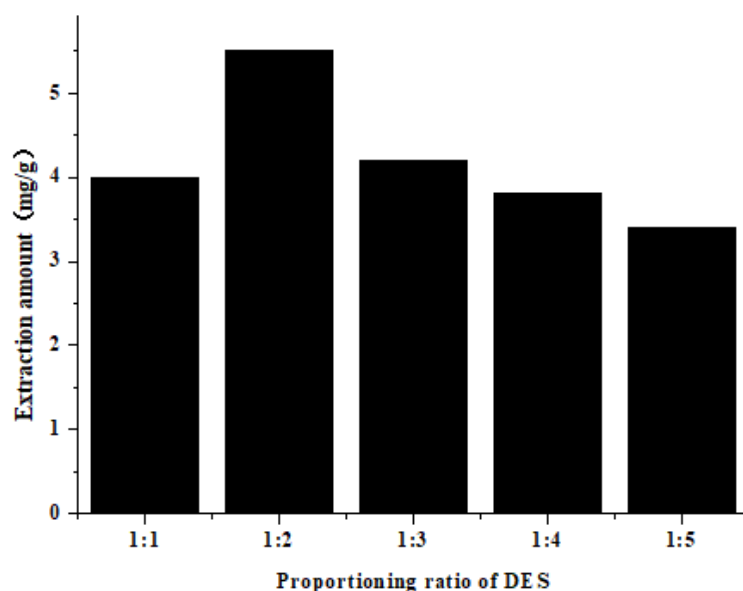


Fig.1 Extraction of the five kinds of DES

In order to further optimize the extraction process, taking the ingredients of DES, the proportion of ethanol and the extraction time as independent variables and the extraction amount of ferulic acid in Des solvent as dependent variables. The results are shown in the Fig.2. the best extraction process is the volume percentage of ethanol is 50%, the material liquid ratio is 15 ml/g, the extraction time is 50 min.

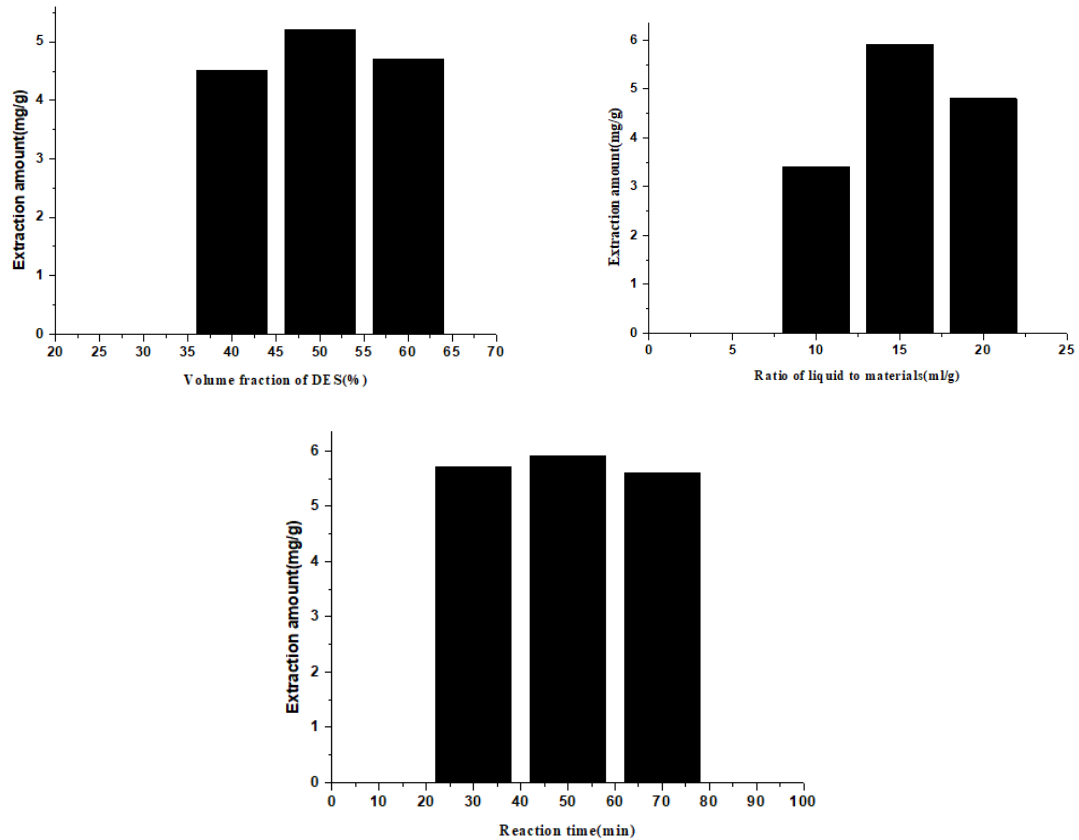


Fig.2 Experiment on extraction process factors

In the future, we will study the antioxidant and antibacterial properties of wheat bran, so as to lay a foundation for the development of high value-added products.

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