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Use of hydrolytic enzymes as green and effective extraction agents for ultrasound assisted-enzyme based hydrolytic water phase microextraction of arsenic in food samples

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Abstract

In order to contribute to the development and improvement of green sample preparation techniques, a new special approach combining the principles and advantages of microextraction techniques, hydrolytic enzymes and ultrasonic radiation power is presented. This new approach is called as ultrasound assisted-enzyme based hydrolytic water phase microextraction method (UA-EH-WPME). In this study, We developed and used a solvent-free UA-EH-WPME method as innovative, green and simple sample preparation method for the extraction of arsenic (As) in rice and flour samples prior to Inductively Coupled Plasma–Mass Spectrometer (ICP-MS) determination. The UA-EH-WPME method based on the extraction of total As in 10.0 mg of food samples to 300 μ L of pH 7.0 aqueous phase with the help of the 3.0 mg of α -amylase in as little as 5 minutes. In this method, α -amylase acts as a bond breaker agent to break down certain bonds of bio-molecules in food matrix, which lead to extraction of As from food matrix to aqueous phase. 1568A Rice Flour certified reference material was used to optimize the important analytical parameters, which were type of hydrolytic enzyme, pH, volume of aqueous phase, amount of enzyme, temperature of extraction medium and time of ultrasonic radiation, for the quantitative extraction of As from food matrix to aqueous phase. This innovative solvent-free method leads to emerge new ideas in the sample preparation field, by using the benefits of microextraction techniques, hydrolytic enzymes and ultrasonic radiation power, such as elimination of the toxic solvent usage, necessity of mg level of enzyme and food samples, very short and simple extraction process. The LOD, inter-day RSD and intra-day RSD values for the developed UA-EH-WPME/ICP-MS procedure were found as 27.3 μ g kg⁻¹, 4.27 % and 6.13 %, respectively.

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