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Optimization of Ultrasound Assisted Extraction of Polysaccharides from Plant Waste Materials: Selected Model Material is Hazelnut Skin

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Abstract : In this study, optimization of ultrasound assisted extraction (UAE) of hemicellulose based polysaccharides from plant waste material has been studied. Selected material is hazelnut skin. Extraction variables for the operation are extraction time, amplitude and application temperature. Optimum conditions have been evaluated depending on responses such as amount of wet crude polysaccharide, total carbohydrate content and dried sample. Pretreated hazelnut skin powders were used for the experiments. 10 grams of samples were suspended in 100 ml water in a jacketed vessel with additional magnetic stirring. Mixture was sonicated by immersing ultrasonic probe processor. After the extraction procedures, ethanol soluble and insoluble sides were separated for further examinations. The obtained experimental data were analyzed by analysis of variance (ANOVA). Second order polynomial models were developed using multiple regression analysis. The individual and interactive effects of applied variables were evaluated by Box Behnken Design. The models developed from the experimental design were predictive and good fit with the experimental data with high correlation coefficient value (R2 more than 0.95). Extracted polysaccharides from hazelnut skin are assumed to be pectic polysaccharides according to the literature survey of Fourier Transform Spectrometry (FTIR) analysis results. No more change can be observed between spectrums of different sonication times. Application of UAE at optimized condition has an important effect on extraction of hemicellulose from plant material by satisfying partial hydrolysis to break the bounds with other components in plant cell wall material. This effect can be summarized by varied intensity of microjets and microstreaming at varied sonication conditions.

Keywords : hazelnut skin, optimization, polysaccharide, ultrasound assisted extraction
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