Abstract

Potencies of Green Extraction Techniques in the Production of High-Yield Inulin Powder from Jerusalem Artichoke †

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Abstract: Inulin is a polysaccharide rich in dietary fiber and is widely used in functional foods due to its health-promoting properties. It has an important place in the current market, with the increasing demand for innovative formulations in the food and pharmaceutical industries. Jerusalem artichoke (Helianthus tuberosus) tubers are an important source of inulin, and this polysaccharide can be extracted for industrial use. Green solvent extraction systems have been used in recent years due to advantages such as non-toxic and environmentally friendly properties, as well as reducing solvent usage compared to traditional methods. In this study, inulin powder production from Jerusalem artichoke was carried out by conventional (C), hydrotropic solvent (HS) and deep eutectic solvent (DES) extraction methods, according to the experimental plans created by the response surface methodology (RSM). The effects of independent parameters such as temperature, time and solvent ratio on inulin yield were investigated. Also, the combined effects of extraction parameters were examined using three-dimensional response surface plots. The optimum process conditions were determined as 79 °C process temperature, 36 min process time, 78 mL/g solvent ratio for C; 68 °C, 53 min, 59 mL/g for HS; and 79 °C, 51 min, 61 mL/g for DES. Among the extraction methods, HS provided the highest inulin yield (88.9%), followed by C (81.9%) and DES (81.5%). Inulin extracts produced under optimum conditions were purified by an ultrafiltration system and freeze-dried with a lyophilization process to obtain inulin powder. Viscosity and solubility values were also determined for each inulin powder sample. The solubility of inulin powders prepared by C, HS and DES extraction techniques were 91.5, 82.6 and 84.1%, respectively. The viscosity values of inulin powders within aqueous solutions (5 g/100 mL) were found to be 28.2, 17.1 and 8.1 mPa·s for C, HS and DES, respectively. The results depict that the highest inulin yield could be obtained by the hydrotropic solvent extraction system, but the solubility and viscosity values were found to be the highest using the conventional extraction technique.

Keywords: extraction; inulin powder; response surface methodology; hydrotropic solvent; deep eutectic solvent

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