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RADIO FREQUENCY ASSISTED EXTRACTION OF NUTRACEUTICAL COMPOUNDS

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ABSTRACT Radio frequency (RF) technology has been used widely in many areas encompassing telecommunication, medicine, textile, wood and agri-food processing. Recently, its application has been extended to the extraction of nutraceutical compounds due to its promising advantages such as shorter extraction time, lower solvent utilization, uniform heating and mild thermal effect on extracts as compared to conventional extraction methods. In evaluating its potential as an extractor, a study on RF extraction of secoisolariciresinol diglucoside (SDG) was performed. SDG, a flaxseed lignans, has been selected as the targeted compound because of its anti-cancer characteristics and other health benefits. By incorporating extracted SDG into processed foods, it could enhance their nutritional and health promoting quality. The RF extraction study was performed by exposing a mixture of defatted flaxseed meal (DFM) with 10% ethanol and 0.1 M sodium hydroxide (NaOH) to an RF energy field for a short time and the extracted SDG amount was quantified by high performance liquid chromatography (HPLC). The efficiency of this process was compared with thermal conventional and non-thermal base hydrolysis methods. Initial results showed that the non-optimised horizontal parallel plates of RF extraction system were able to recover 81.45% of SDG within 25% shorter extraction time as compared to the thermal conventional method (22.37 mg SDG/g DFM for 1 hour) and 25 times more recovery than non-thermal base hydrolysis method (0.73 mg SDG/ g DFM for 1 hour). However, inconsistency in heating rate and moderately high energy loss was observed in the system due to incompatible applicator design. Thus, a new design of RF applicator is proposed in this paper. Simulation study of the new vertical parallel plates RF applicator system showed that this design has better heating properties and this may help in increasing recovery of SDG. In conclusion, RF has an excellent development potential as a new extraction method and more studies are required to fully understand the extraction mechanisms and to fully optimize them.

Keywords: Radio frequency, extraction, nutraceutical, secoisolariciresinol diglucoside (SDG)