

Microwave-assisted extraction of phenolics from *Hibiscus sabdariffa* calyces: Kinetic modelling and process intensification

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ABSTRACT

Hibiscus sabdariffa is a multi-cropping system endowed with wide ranges of benefits to humans. Being a plant rich in phenolic compounds, the process intensification of extraction method used for recovering the phenolic compounds from this essential plant is inevitable to easily proffer keen information on the extraction behaviours. Thus, the process intensification and kinetic behaviour of microwave-assisted extraction (MAE) for recuperating total phenolics (TP) content from *H. sabdariffa* calyces were investigated. The impacts of MAE factors such as solid/sample ratio, microwave power and temperature at varied irradiation time were studied. The effective diffusivity was also estimated. In addition, the extract was characterized to tentatively assign the phenolics using Liquid chromatography tandem mass spectrometry of quadrupole time-of-flight (LC-ESI-MS-MS). The achieved results clearly indicated that the MAE process intensification was achieved with TP content of 70.53 mg GAE/g extract in 3 min at solvent/sample ratio of 14:1 mL/g, microwave power of 500 W and 60 °C of temperature where the highest effective diffusivity coefficient was obtained. Out of the two considered kinetic models (second-order rate and power law), the second-order rate model best describes the MAE process intensification with higher coefficients of determination ($R^2 > 0.99$). Moreover, an aggregate of 77 phenolic compounds was assigned in the extract of *H. sabdariffa* calyx; signifying the wider potentials of the extract industrially. Thus, this study clearly outlined that *H. sabdariffa* calyx is an embodiment of diverse phenolic compounds; indicating its potential in pharmaceutical and food industries.

KEYWORDS

Microwave-assisted extraction; *Hibiscus sabdariffa*; Second-order rate law; Effective diffusivity; Power law; LC-ESI-MS-MS

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