

Kinetics studies on effects of extraction techniques on bioactive compounds from *Vernonia cinerea* leaf

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Abstract Recently, unconventional methods especially microwave-assisted hydrodistillation extraction (MAHE) is being used as an alternative technique for extracting bioactive compounds from plant materials due to its advantages over conventional methods such as Soxhlet extraction (SE). In this study, bioactive compounds were extracted from *Vernonia cinerea* leaf using both MAHE and SE methods. In addition, the kinetic study of MAHE and SE methods were carried out using first- and second-order kinetic models. The results obtained showed that MAHE can extract higher yield of bioactive compounds from *V. cinerea* leaf in a shorter time and reduced used of extracting solvent compared with SE method. Based on the results obtained, second-order kinetic models can actually describe the extraction of bioactive compounds from *V. cinerea* leaf through MAHE with extraction rate coefficient of 0.1172 L/gmin and extraction capacity of 1.0547 L/g as compared to SE with 0.0157 L/gmin and 1.1626 L/g of extraction rate coefficient and extraction capacity, respectively. The gas chromatography–mass spectrometry analysis of the oil showed the presence of numerous heavy fractions in the oil obtained through MAHE as compared with the SE method. Moreover, the electric consumption and environmental impacts analysis of the oil suggested that MAHE can be a suitable green technique for extracting bioactive compounds from *V. cinerea* leaf.

Keywords Microwave-assisted hydrodistillation · Bioactive compounds · Soxhlet · Kinetic model · Extraction capacity · Extraction coefficient