

SEMI-THEORETICAL KINETIC MODELS FOR HOT PRESSURIZED FLUID EXTRACTION OF PHYTOCHEMICALS FROM CANADIAN BIOMASS

V.H. Alvarez and M.D.A. Saldaña*

Department of Agricultural, Food and Nutritional Science
Faculty of Agriculture, Life and Environmental Science, University of Alberta
T6G 2P5, Edmonton, AB, CANADA
Phone: (+1) 780 492-8018; Fax: (+1) 780 492-8914

A hot pressurized fluid (HPF) extraction process requires the mathematical representation of the physical phenomena to optimize operating conditions and simulate the global process extraction. Phytochemical extraction of crops by HPF includes the dissolution of the phytochemical from the matrix, diffusion through the matrix and its transport with the HPF. In this study, semi-theoretical kinetic models reported in the literature, such as the thermodynamic distribution coefficient of phytochemicals, one-site kinetic model, two-site kinetic model and external mass transfer resistance model were evaluated. These models were used to provide kinetic data of phytochemicals extraction, such as total carbohydrates and phenolics, from Canadian biomass such as potato peel and barley husk. The kinetic data were obtained at experimental conditions of 1-5 mL/min, 40-110 bar, and 140-240 °C using HPFs (water and aqueous ethanol). Among these models, the thermodynamic partition with external mass transfer resistance model provided better description of the kinetic data extraction with deviations below 10%. Therefore, this semitheoretical kinetic model has potential to model the HPF extraction of crops.

Keywords: carbohydrates, extraction, phenolics, kinetic models.

*Corresponding author: marleny@ualberta.ca