

Solubility of Rosmarinic Acid in Supercritical Carbon Dioxide Extraction from *Orthosiphon stamineus* Leaves

ABSTRACT

Rosmarinic acid (RA) is present in a broad variety of plants, including those in the Lamiaceae family, and has a wide range of pharmacological effects, particularly antioxidant activity. To extract RA from *Orthosiphon stamineus* (OS) leaves, a Lamiaceae plant, a suitable extraction process is necessary. The present study used a green extraction method of supercritical carbon dioxide (SCCO₂) extraction with the addition of ethanol as a modifier to objectively measure and correlate the solubility of RA from OS leaves. The solubility of RA in SCCO₂ was determined using a dynamic extraction approach, and the solubility data were correlated using three density-based semi-empirical models developed by Chrastil, del Valle-Aguilera, and Gonzalez. Temperatures of 40, 60, and 80 °C and pressures of 10, 20, and 30 MPa were used in the experiments. The maximum RA solubility was found at 80 °C and 10 MPa with 2.004 mg of rosmarinic acid/L solvent. The RA solubility data correlated strongly with the three semi-empirical models with less than 10% AARD. Furthermore, the fastest RA extraction rate of 0.0061 mg/g min⁻¹ was recorded at 80 °C and 10 MPa, and the correlation using the Patricelli model was in strong agreement with experimental results with less than 15% AARD.