

Solution enhanced dispersion by supercritical fluids (SEDS): an approach in particle engineering to modify aqueous solubility of andrographolide from *Andrographis paniculata* extract

ABSTRACT

The objective of study is to improve aqueous solubility of andrographolide through particle engineering using Solution Enhanced Dispersion by Supercritical Fluids (SEDS) approach. The precipitation pattern of sticky crude *Andrographis paniculata* extract from CO₂-acetone system and CO₂-acetone:ethanol (v/v) 1:1 system as well as the aqueous solubility of andrographolide precipitated were first studied at different pressure (100, 150 bar) and temperature (40, 50 °C) combination (full factorial design). The modification of aqueous solubility of andrographolide was then attempted by manipulating its precipitation process from CO₂-solvent systems consisting of single solvent and solvent mixture at different proportions (v/v) at the appropriate pressure-temperature combination. *A. paniculata* powder precipitated from CO₂-acetone system at 150 bar, 40 °C was found to be large, irregularly shaped, less crystalline with the highest andrographolide aqueous solubility (twofold increment compared to crude extract) and recovery compared to those precipitated from CO₂-ethanol system and other CO₂-solvent mixture systems. Complete dissolution of andrographolide from *A. paniculata* powder precipitated from CO₂-acetone system had been achieved within 90 min. For SEDS precipitation under solvent mixture system, with increment of proportion of ethanol from 25% to 75%, larger particles and change of powder morphology from stripes into plates were resulted. Based on the higher aqueous solubility and dissolution of andrographolide, recovery as well as a different morphology observed from the less crystalline *A. paniculata* powder precipitated from CO₂-acetone system, less impurities could have co-precipitated with andrographolide.

Keyword: SCFs; SEDS; sc-CO₂; Andrographolide; Aqueous solubility; SEDS precipitated *Andrographis paniculata* powder