Optimized supercritical CO2 extraction conditions on yield and quality of torch ginger (Etlingera elatior (Jack) R.M. Smith) inflorescence essential oil

ABSTRACT

Natural preservatives derived from plant sources have been actively studied as an alternative to synthetic materials. Various extraction methods had been done to utilize the torch ginger plant for food, nutraceutical and pharmaceutical applications. Supercritical carbon dioxide (SC−CO2) extraction is a sustainable green technology to extract high-purity oil with high aromatic compound content. This study aims to optimize the SC−CO2 extraction conditions on high yield and strong antioxidant activity of torch ginger (Etlingera elatior) inflorescence essential oil (TGIEO). Response surface methodology in combination with central composite design was employed and two independent variables, pressure (83.6–366.4 bar) and temperature (34.7–57.3 °C) were analysed to optimize the response variables. Pressure was observed as the most significant parameter affecting the yield and antioxidant activity. The optimized SC−CO2 extraction conditions were pressure 286.4 bar and temperature 57.3 °C. The experimental values of response variables at these SC−CO2 extraction conditions match well with the predicted values which confirm the model validity. The TGIEO showed high diphenyl-2-picryl-hydrazyl and 2,2′-azino-bis (3-ethylbenzothiazoline-6-sulfonic acid) diammonium salt radical scavenging activity. Antimicrobial activity screening for TGIEO was done via disc diffusion assay and showed inhibition zone (11.5 ± 0.71 to 22.0 ± 2.83 mm) against six pathogenic bacteria (Bacillus subtilis, Staphylococcus aureus, Listeria monocytogenes, Salmonella typhi, Vibrio species and Escherichia coli). Listeria monocytogenes was observed as the most sensitive microorganism with minimal inhibitory concentration (0.16 mg/mL) and minimal bactericidal concentration (0.63 mg/mL) respectively. Compounds 1-dodecanol and lauryl acetate were identified as major constituent in TGIEO.

Keyword: Etlingera elatior; Supercritical CO2 extraction; Response surface methodology; Antioxidant; Bioactive compound; Antimicrobial