Focused–type ultrasound extraction of phenolic acids from *Q.Infectoria* galls : process modelling and sequential optimization

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ABSTRACT
Phenolic acids from *Q.Infectoria* (QI) galls were extracted using focused–type ultrasound extraction method and further optimized using sequential optimization by response surface methodology (RSM). Different independent variables of sonication time, *A* (6–10 h), solvent concentration, *B* (0.05–0.15 M), ratio, *C* (1:05–1:15), duty cycle, *D* (30–50 %) and temperature, *E* (60–80 °C) were first screened via full factorial design (FFD) and the obtained results indicated that sonication time, ratio and temperature were the most significant variables in attaining higher yields. The significant curvature from focused–type ultrasound performance provides insights to a subsequent optimization of the factorial model via face–centred central composite design (FCCCD). The later results revealed that temperature highly impacted the yield with highest contribution percentage of 56.76 %. Notably, maximum extraction yield of 4119.77 mg/g was achieved at optimum condition of 9 h sonication time, ratio of 1:6 and temperature of 75 °C. Besides, Fick's model successfully promotes diffusivity and appropriately foreseen that temperature factor governed the extraction process from QI galls. Relevant activation energy of 83.39 J/mol, along with the thermodynamic factors which include activation enthalpy (ΔH*) and activation Gibbs free energy (ΔG*), affirmed the extraction process was endothermic and non-spontaneous in identity.

KEYWORDS
Weld penetration estimation; Pulse mode laser welding; Sound signal; Multi-lag phase space; Artificial neural network

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