

# Screening of factors influencing the yield of *Citrus hystrix* leaves essential oil extracted via pressurized hot water extraction based on resolution V fractional factorial design

## Abstract

Pressurized hot water extraction (PHWE) could be a better alternative in enhancing the yield of valuable *Citrus hystrix* leaves essential oil. Thus, the fractional factorial design based on resolution V was used to assess the crucial factors that affect the essential oil yield (%Y) extracted from *Citrus hystrix* leaves through a PHWE. A maximum Y% of 1.63% was successfully isolated at conditions involving 0.08% moisture content, 1 mm particle size, 1:0.2 ml/g solvent-to-sample ratio, 30 min extraction time, and 120°C extraction temperature. Moisture content and particle size were the main effects that significantly affect the %Y, while the extraction time and solvent-to-sample ratio exhibited a moderate effect on %Y, followed by extraction temperature that showed the least effect on %Y. A developed regression model has shown good correlation and adequacy on %Y. Based on the compositional analysis, neoisopulegol hydrate appears to be the main constituents of the oil obtained. Practical applications: *C. hystrix* leaves could be a promising alternative commodity to citrus peels in fulfilling the increasing market demand for the natural citrus essential oils. However, the conventional essential oil extraction technique such as hydrodistillation is generally time and energy-consuming and yields low production. Thus, an innovative technology involving a pressurized hot water extraction technique was employed to improve the efficiency of the extraction. A fractional factorial design approach was used to assist the optimization process with consideration on more factors with reduced experimental trials that can economically identify the significance of factors influencing the yield of essential oil. The use of resolution V design has enhanced the accuracy of the statistical analysis since the individual effects and the interaction effects of the factors studied were not aliased.