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Gravimetric and Sim-Headspace GC-MS For Residual Organic Solvents Detection in Halal and Wholesomeness Food Analysis

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Abstract

The demand for halal foods and beverages is increasing globally. While most halal analysis focuses on porcine, this study focuses on assessing residual organic solvents to ensure their halal compliance and wholesomeness, following several Malaysian standards and guidelines. A significant challenge in this study was the volatility of the residual solvents during the preparation of standards and quality control. To address this issue, a gravimetric technique was employed and effectively minimized the difference between theoretical (1,000 ppm) and actual (710 – 892 ppm) concentrations of the residual organic

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standard stock solution, except for acetone (588 ppm). The aim of this study was to establish a validated, reliable, and accurate method using SIM-headspace GC-MS to identify and quantify residual organic solvents for halal and wholesomeness analysis. Confirmation of each residual organic solvent was achieved by comparing the obtained spectra with the NIST 11 spectral database, containing 70,832 compounds, with similarity ranging from 80.9% to 96.6%, except for acetonitrile at 52.2%. The validation parameters were carried out according to ISO 17025:2017, the Center for Drug Evaluation and Research, and the European Guidelines. The parameters included recovery ranging from 95.65% to 95.68%, precision from 10.08% to 19.65% RSD, linearity between 0.996 to 0.999, limit of detection from 0.01 to 0.08 ppm, and limit of quantification from 0.02 to 0.24 ppm. Uncertainty considerations were limited to recovery, precision, and linearity, as other uncertainties were negligible based on the bottom-up approach using in-house validation data. This combination of gravimetric and SIM-headspace GC-MS techniques has provided valuable insights for discussions and collaborations among halal authorities worldwide to establish a consensus analytical methodology for halal and wholesomeness assessment. © 2024 Malaysian Society of Applied Biology.

Author keywords

Food safety; GC-MS; halal; method validation; residual organic solvent; wholesomeness

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