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# Emulsification-assisted spectroscopic analysis of black seed oil in alginate beads: method development and validation

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## Abstract

This study aimed to develop and validate an ultrasonication-aided UV-Vis spectroscopy method for quantifying black seed oil (BSO) in alginate beads. The method utilized sonication at 10% power rate for 120 seconds to stabilize the emulsion droplet size of 10 mL of the emulsion diluents derived from breaking BSO-alginate beads in phosphate buffer. Absorbance measurements were taken at 400 nm, which was found to be the optimal wavelength for measuring the absorbance of turbid emulsion diluents. The method showed excellent linearity between 0.8 - 5 mg/mL ( $R^2 = 0.9977$ ), with Limit of Detection (LOD) and Limit of Quantification (LOQ) values of 0.082 and 0.249 mg/mL, respectively. The method also exhibited good accuracy and precision, with recovery percentages ranging from 98.02 - 101.9% (RSD = 0.15 - 1.24%) and intra-day/inter-day precision with RSD less than 2%. These findings suggest that the ultrasonication-aided spectroscopy method is a quick, accurate, and precise way to quantify encapsulated oils and could be useful for oils analysis during R&D, In Process Quality Control (IPQC), and Quality Control (QC) tests, as well as in other applications such as industrial manufacturing and academic research. © 2023 Har Krishan Bhalla & Sons.

## Author keywords

Black seed oil; Emulsification; Turbidity; Ultrasonication; UV-Vis spectrophotometer

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