10th Brazilian Conference on Natural Products
XXXVI RESEM
4-7 November 2025, Belo Horizonte, MG, Brazil

Section: S4

DEVELOPMENT AND VALIDATION OF A UV-VIS SPECTROPHOTOMETRIC METHOD FOR QUERCETIN QUANTIFICATION IN NANOSTRUCTURED SYSTEMS

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Quercetin, a flavonoid found in various foods, exhibits well-known antioxidant and anti-inflammatory properties. However, its therapeutic and cosmetic applications are limited by low solubility, instability, and low oral bioavailability. Nanostructured systems, such as microemulsions and lipid nanoparticles, have been explored to overcome these limitations. This study aimed to develop and validate a UV-Vis spectrophotometric method for the quantification of quercetin incorporated into nanostructured systems, optimizing sample preparation and evaluating essential analytical parameters. Different extraction solvents (methanol and methanol acidified with hydrochloric acid (HCl)) were tested in microemulsified quercetin samples (5 mg/mL), as well as various extraction techniques (centrifugation, ultrasound, and magnetic stirring). The optimized protocol consisted of ultrasonic bath (15 min) followed by centrifugation at 3200 rpm for 20 min. Spectrophotometric scanning (200–800 nm) identified maximum absorption at 370 nm, attributed to the molecule's conjugated electronic system. The calibration curve was prepared from a quercetin standard solution (100 mg/mL) diluted in methanol acidified with 0.01% HCl, at concentrations ranging from 3–7 µg/mL, showing excellent linearity (R^2 = 0.999) and reproducibility (standard deviation < 0.2). ANOVA indicated no significant differences ($p > 0.05$) between the solvents tested, allowing flexibility in solvent choice. Methanol acidified with 0.01% HCl was selected for the calibration curve due to its good compatibility with UV-Vis spectrophotometry. Preliminary results indicate the method's potential for reliable quercetin quantification in complex matrices, with full robustness, precision, and accuracy assessments currently in progress. The working range of 3–7 µg/mL was found to be optimal for ensuring sensitivity and reliability. In conclusion, the proposed protocol is simple, cost-effective, and suitable for quality control and pharmaceutical studies involving quercetin in nanostructured systems. Future work will include complete validation following official guidelines.

Keywords: *quercetin, UV-Vis spectrophotometry, method validation, nanostructured systems, microemulsions.*