



A Novel UV-Vis Spectrophotometric Method for Quantifying Rifaximin: Method Development and Validation

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Received: 01 Jun 2024; Received in revised form: 03 Jul 2024; Accepted: 11 Jul 2024; Available online: 19 Jul 2024

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Abstract— This study evaluated the standardization and method validation of rifaximin using different acid and phosphate buffer conditions (pH 1.2, 6.8 and 7.4). Although all tested conditions showed excellent precision (less than 2% RSD), limitations in linearity and precision were observed. Although the correlation coefficients were high (0.9898 to 0.9972), they deviated from the ideal (1.0), indicating possible nonlinearities. Accuracy ranged from 89.45% to 94.16%, indicating slight under- or overestimation of rifaximin concentration. These limitations compromise the reliability of the rifaximin quantification method. Other optimization strategies are recommended, including exploring different pH conditions, refining the concentration range of the standard curve, and considering alternative analytical methods such as HPLC when possible. By addressing these limitations, a more robust and reliable method for rifaximin standardization can be achieved.



Keywords— Rifaximin, Spectrophotometer, Standardization and method validation, Robustness, RSD

I. INTRODUCTION

Rifaximin is an antibiotic that is semi-synthetic and produced from rifamycin. It is commonly used to treat gastrointestinal diseases, including hepatic encephalopathy, irritable bowel syndrome, and traveler's diarrhoea. Targeting pathogenic bacteria in the stomach is made easier by its broad-spectrum antibacterial action and low systemic absorption. The analytical techniques available for rifaximin's quantification and quality control are few and frequently intricate, despite its therapeutic importance. Thus, the development of an easy-to-use, trustworthy, and verified analytical technique is necessary for the regular analysis of rifaximin.

The majority of laboratories choose to use spectrophotometry, especially UV-Visible (UV-Vis) spectrophotometry, since it is an easy and affordable analytical technique. With this technique, the amount of medication present may be ascertained by measuring how much UV or visible light the analyte absorbs.

UV-Vis spectrophotometry has been shown in several studies to be useful in the study of different medicinal substances. For example, Bhavsar et al. (2015) demonstrated the sensitivity and specificity of their UV-Vis spectrophotometric approach for the accurate measurement of cefixime in pharmaceutical formulations[1]. Similar to this, Patel et al. (2017) proved the accuracy and strong linearity of a UV-Vis spectrophotometric approach for olmesartan medoxomil determination[2]. These investigations highlight UV-Vis spectrophotometry's promise as a trustworthy analytical instrument.

Prior analytical approaches for rifaximin have mostly relied on chromatographic techniques, such high-performance liquid chromatography (HPLC), which are accurate but need complex gear and thorough sample preparation. While HPLC techniques offer great sensitivity and specificity, Kumar et al. (2018) claim that they are frequently more difficult to use and require more time than

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