



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

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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 rifampycin. 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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Frontier Technology for Water Treatment and Pollutant Removal Puangrat Kajitvichyanukul, Charongpun Musikavong, Tanapon Phenrat, 2019-11-15 Frontier technology in water treatment and pollutant removal is needed not only for maximizing water reuse but also for the rapid detection of contaminants in the recycled water The UN announced the years 2018 to 2028 as the International Decade for Action Water for Sustainable Development To realize this mission innovative and frontier technologies for water treatment and pollutant removal are important components This book aims to serve as a platform for updating the scientific community with recent progress in this area covering frontier technologies in analytical technique physicochemical treatment chemical treatment and biological treatment In Focus a book series that showcases the latest accomplishments in water research Each book focuses on a specialist area with papers from top experts in the field It aims to be a vehicle for in depth understanding and inspire further conversations in the sector **Analytical Procedure Development by Quality by Design** Galla Rajitha, V. Ramalinga Swamy, Gireesh Kumar Eri, 2025-12-01 The Analytical Procedure Development by Quality by Design is an essential resource for anyone navigating the complex world of analytical chemistry This comprehensive guide not only covers the fundamentals of analytical procedure development but also introduces the innovative principles of Quality by Design QbD revolutionizing the field From classical to advanced techniques this book explores a wide range of methodologies providing readers with a thorough understanding of the subject It delves into both Minimal and Enhanced approaches giving readers insight into different strategies for analytical procedure development One of the standout features of this book is its in depth analysis of AQbD components principles and regulatory perspectives With a chapter dedicated to Design of Experiments DoE readers will gain practical insights into how to effectively implement this method in their work Furthermore this book offers a detailed roadmap for QbD principles and analytical development making it an invaluable resource for those looking to apply these concepts in their own research and projects The book also includes practical examples in UV Visible spectrophotometric HPLC GC HPTLC and bioanalytical methods allowing readers to see these principles in action With its reader friendly elements this book caters to a diverse audience including students researchers and professionals in analytical chemistry It provides comprehensive guidance and serves as a reliable companion for analytical procedure development and QbD understanding In summary the Analytical Procedure Development by Quality by Design is a must have for anyone seeking to excel in the field of analytical chemistry Its comprehensive coverage of analytical procedure development and QbD principles coupled with practical examples and clear explanations make it an indispensable resource

- 1 Analytical Procedure Development
- 2 Analytical Quality by Design AQbD
- 3 Design of Experiments DoE
- 4 Implementation of QbD in Analytical Procedure Development
- 5 AQbD for UV Visible spectrophotometric method development
- 6 AQbD for HPLC Method Development
- 7 AQbD for GC Method Development
- 8 AQbD for HPTLC Method Development
- 9 QbD for Bio analytical Method Development

Nutritional analysis of different

plant parts among black pepper (Piper nigrum) varieties in Kerala: an overview Prem Jose Vazhacharickal, K.R Anilakumar, Deepthi James, 2017-11-21 Black pepper Piper nigrum the flowering vine belongs to the family piperaceae cultivated for its fruit which is usually dried and used as spice and seasoning The black pepper high variability was also noticed for yield contributing characters like runner shoot production holding capacity adventitious root production lateral branch habit spike length number of spikes per lateral branch fruit set dry weight Pharmacological toxicological clinical applications and general uses of pepper are bioavailability enhancement carminative anti cancer natural antioxidant black pepper as an anti Inflammatory drug cholesterol lowering and Immune enhancer anti pyretic anti periodic and rubefacient black pepper Improves digestion and promotes intestinal health preservation of the flavour content Four different pepper varieties in Kerala were selected based on a baseline survey The proximate composition includes estimation of dry matter and moisture content estimation of crude protein estimation of crude fibre estimation of crude ash and insoluble ash ether extract determination of dietary fibre gross energy analysis of component of different varieties of Piper nigrum were determined The sample Munthirimunda fruit has high moisture content The sample Chengannor leaf has high dry matter content The sample Chengannor leaf has high crude protein content The sample Panniyor leaf has high crude fibre content Ether Extract is high in sample Chengannor leaf The sample Munthirimunda leaf has high comparatively high Total Ash content Gross Energy is high in sample Panniyor fruit A wide gap in the nutritional properties of Piper nigrum varieties exist in Kerala which could be further explored

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Development and Validation of Differential Spectrophotometric Method for Assay of Enrofloxacin in Bulk and Tablet Formulation M. Patel,2023-12-12 Research Paper postgraduate from the year 2019 in the subject Medicine Pharmacology Pharmacy course M pharmacy language English abstract A simple precise and accurate spectrophotometric method have been developed and validated for the estimation of Enrofloxacin in bulk as well as tablet formulation The UV spectra of Enrofloxacin was obtained in 0.1N HCl and 0.1N NaOH and the overlain spectra showed maximum absorbance at 271.0 nm maxima and 276.5 nm minima in 0.1N NaOH and HCl respectively The drug follows linearity in the range of 5-30 µg/ml R² 0.988 Both intra and inter day precision showed % RSD 2 while LOD and LOQ were 0.320 and 0.971 respectively The method was validated as per ICH guidelines Enrofloxacin or 1-cyclopropyl-6-fluoro-7-(4-ethyl-1-piperazinyl)-1,4-dihydro-4-oxo-3-quinoline-carboxylic acid The chemical structure of the drug is given in It is a synthetic antibacterial agent from the class of the fluoroquinolone carboxylic acid derivatives It has antibacterial activity against a broad spectrum of Gram negative and Gram positive bacteria Enrofloxacin is used for the treatment of individual pets and domestic animals Literature survey shows that several analytical methods for the determination of Enrofloxacin include RP-HPLC HPLC RP-LC LC and dissolution study have been reported Many pharmaceutical products have been assayed by this method But Differential UV spectrophotometric method of Enrofloxacin was not reported as so far So an attempt was made to develop a novel simple accurate spectrophotometric method for the determination of Enrofloxacin in tablet formulation **The Journal of**

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