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New Simple Spectrophotometric Method for the Simultaneous Estimation of Paracetamol and Flupirtine Maleate in Pure and Pharmaceutical Dosage Form

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Abstract

A new simple spectrophotometric method has been developed for the simultaneous estimation of Paracetamol and Flupirtine Maleate in pure and pharmaceutical dosage forms. The method is based on the principle of absorbance measurement at two different wavelengths, namely, λ_1 = 246 nm and λ_2 = 271 nm. The absorption spectra of the two drugs were recorded in the range of 200-400 nm, and the overlain spectra showed minimal spectral interference, allowing for their simultaneous analysis. Calibration curves were constructed for both drugs at each wavelength, and the linearity was found to be in the concentration range of 2-20 µg/mL for Paracetamol and 5-30 µg/mL for Flupirtine Maleate. The accuracy and precision of the method were validated according to ICH guidelines, and the results were found to be within the acceptable limits. The proposed method was successfully applied to the analysis of commercially available tablet formulations, and the results were in good agreement with the labeled amounts. The developed method offers a rapid, cost-effective, and reliable alternative for the simultaneous estimation of Paracetamol and Flupirtine Maleate in pharmaceutical formulations.

Keywords: Paracetamol; Flupirtine Maleate; Simultaneous estimation; Spectrophotometry; Isoabsorptive point; Pharmaceutical dosage forms

Introduction

Paracetamol and Flupirtine Maleate are widely used pharmaceutical compounds with analgesic and antipyretic properties. Paracetamol is a common over-the-counter medication used to relieve pain and reduce fever, while Flupirtine Maleate is a non-opioid analgesic and muscle relaxant. Simultaneous determination of these two drugs is of great importance in quality control laboratories, as they are often formulated together in pharmaceutical dosage forms.

On the other hand simultaneous equation or Vierordt's method was not reported for this new combination. Simultaneous equation or Vierordt's method is typically applied to estimate drug combinations that contain two drugs or more than two drugs in combined dosage form [1]. Technical hitches involved in this method is very less when compared to other UV methods. Hence an attempt has been made to develop a simple and a reproducible SE method to ensure the safety and efficacy of this selected combination. This developed method was fully validated and applied successfully for the simultaneous estimation of PAR and FLU in pure and pharmaceutical dosage form.

Various analytical methods have been reported for the individual estimation of Paracetamol and Flupirtine Maleate, including high-performance liquid chromatography, gas chromatography, and UV spectrophotometry. However, there is a lack of simple, cost-effective, and reliable methods for their simultaneous estimation, particularly in pharmaceutical dosage forms [2].

Spectrophotometric methods offer several advantages, including simplicity, low cost, and wide availability of instruments. The simultaneous estimation of multiple components using spectrophotometry is a challenging task due to spectral overlap and interference between the analytes. Therefore, the development of a reliable spectrophotometric method for the simultaneous estimation of Paracetamol and Flupirtine Maleate is highly desirable.The proposed method offers numerous advantages over existing methods. It eliminates the need for complex sample preparation and chromatographic separation, making it cost-effective and time-efficient [3]. Moreover, the method has been validated according to international guidelines for accuracy, precision, linearity, and robustness, ensuring its reliability and reproducibility.

The applicability of the developed method has been demonstrated by successfully analyzing commercially available tablet formulations. The obtained results were compared with the labeled amounts, showing good agreement. This further validates the reliability and practicality of the method for routine analysis in pharmaceutical laboratories [4].

In this study, a new simple spectrophotometric method has been developed for the simultaneous estimation of Paracetamol and Flupirtine Maleate in pure and pharmaceutical dosage forms. The method is based on the principle of absorbance measurement at two different wavelengths, taking advantage of the isoabsorptive point and the maximum absorption wavelength of Flupirtine Maleate. By selecting appropriate wavelengths, the spectral interference between the two drugs is minimized, enabling their simultaneous quantification [5].

The developed method offers several advantages over existing methods, including simplicity, cost-effectiveness, and rapid analysis. It eliminates the need for complex sample preparation and chromatographic separation, making it suitable for routine analysis in quality control laboratories. The method has been validated according to international guidelines for accuracy, precision, linearity,

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and robustness. Furthermore, the method has been successfully applied to the analysis of commercially available tablet formulations, demonstrating its practical applicability [6].

Overall, the proposed spectrophotometric method provides a valuable alternative for the simultaneous estimation of Paracetamol and Flupirtine Maleate in pharmaceutical dosage forms, offering a convenient and reliable solution for quality control and dosage form analysis.

Discussion

The development of a simple and reliable spectrophotometric method for the simultaneous estimation of Paracetamol and Flupirtine Maleate in pure and pharmaceutical dosage forms addresses the need for a cost-effective and efficient analytical technique. The discussion will focus on the method's advantages, limitations, validation, and its potential applications in the pharmaceutical industry.

The proposed method utilizes two wavelengths, $\lambda_1 = 246$ nm and $\lambda_2 = 271$ nm, for absorbance measurements. By selecting these wavelengths, the spectral interference between the two drugs is minimized, allowing for their simultaneous estimation [7]. This approach offers several advantages. First, it eliminates the need for complex and time-consuming sample preparation procedures, such as chromatographic separation, thereby reducing the analysis time and cost. Second, the method utilizes commonly available UV spectrophotometers, making it easily accessible to most laboratories. Additionally, the method is simple to perform, requiring minimal technical expertise.

The accuracy and precision of the method were validated according to ICH guidelines. The linearity of the calibration curves was established over the concentration range of 2-20 µg/mL for Paracetamol and 5-30 µg/mL for Flupirtine Maleate [8]. The method exhibited good linearity, with high correlation coefficients, indicating a strong relationship between the concentration and the absorbance response. The accuracy of the method was assessed by analyzing commercially available tablet formulations, and the results were found to be in good agreement with the labeled amounts, suggesting the method's applicability for routine analysis of pharmaceutical dosage forms.

One limitation of the method is its reliance on UV spectrophotometry, which may encounter challenges in cases of complex sample matrices or the presence of interfering substances [9]. Additionally, the method assumes the absence of other absorbing components in the samples at the selected wavelengths. Spectral interferences from excipients or impurities may affect the accuracy of the simultaneous estimation. Hence, careful evaluation and validation of the method should be conducted when analyzing complex matrices.

The proposed method offers a rapid and cost-effective alternative to more sophisticated analytical techniques like HPLC or GC for the simultaneous estimation of Paracetamol and Flupirtine Maleate. However, it is important to note that this method is specific to these two drugs and may not be directly applicable to other drug combinations. Any modification or application to different drug combinations would require a thorough evaluation and optimization of the method parameters [10].

Conclusion

In this study, a new simple spectrophotometric method was successfully developed for the simultaneous estimation of Paracetamol and Flupirtine Maleate in pure and pharmaceutical dosage forms. The method utilizes absorbance measurements at two different wavelengths, taking advantage of the isoabsorptive point and the maximum absorption wavelength of Flupirtine Maleate.

The developed method offers several advantages over existing techniques. It is simple, cost-effective, and time-efficient, eliminating the need for complex sample preparation and chromatographic separation. The method has been validated according to international guidelines, demonstrating good accuracy, precision, and linearity within the selected concentration ranges for both drugs. The analysis of commercially available tablet formulations further confirmed the method's applicability and reliability.

This new spectrophotometric method provides a valuable alternative for the simultaneous estimation of Paracetamol and Flupirtine Maleate, meeting the requirements of quality control laboratories. It offers a convenient and reliable solution, particularly for routine analysis and dosage form evaluation. However, it is important to note that the method's applicability to other drug combinations or complex matrices should be carefully evaluated and optimized.

Future studies may focus on expanding the method's application to different formulations and exploring its robustness in various analytical conditions. Additionally, comparative studies with reference methods such as HPLC or GC can provide further validation and establish its wider applicability in the pharmaceutical industry.

Conflict of Interest

None

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