

SPECTROPHOTOMETRIC ESTIMATION OF ERDOSTEINE IN PHARMACEUTICAL DOSAGE FORM

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ABSTRACT : Three simple, precise and economical UV methods have been developed for the estimation of Erdosteine in pharmaceutical dosage form. Erdosteine has the absorbance maxima at 235.0 nm (Method A), and in the first order derivative spectra, showed sharp peak at 227.5 nm (Method B). Method C applied was area under curve (AUC), in the wavelength range of 240.0-230.0 nm. Linearity for detector response was observed in the concentration range of 10-50 µg/ml for all three methods. The proposed methods were successfully applied for the simultaneous determination of Erdosteine in commercial pharmaceutical preparation. The results of the capsule analysis were validated statistically and by recovery studies and were found to be satisfactory.

Keywords: Erdosteine; Absorbance maxima; Derivative spectroscopy; Area under curve.

INTRODUCTION

Chemically, Erdosteine (ERD) is a mucolytic agent, chemically, it is (+)-1S-(2-[N-3-(2-oxotetrahydrothienyl)-acetamido]thioglycolic acid, a thiol derivative developed for the treatment of chronic obstructive bronchitis, including acute infective exacerbation of chronic bronchitis¹. Capsules containing 300 mg ERD are available in the market. Literature survey revealed that it is estimated individually by HPLC²⁻³, HPTLC⁴ and LC-MS/MS⁵. No UV spectrophotometric methods have been reported for estimation of ERD in single component formulation. Hence, an attempt has been made to develop new UV methods for its estimation in pharmaceutical formulations with good accuracy, simplicity and precision.

EXPERIMENTAL

Instrument A double-beam Shimadzu UV-Visible spectrophotometer, with spectral bandwidth of 2 nm, wavelength accuracy ± 0.5 nm and a pair of 1-cm matched quartz cells was used to measure absorbance of the resulting solution.

Materials Standard gift sample of Erdosteine was provided by Glenmark Pharmaceuticals Ltd., Nashik. Erdosteine capsules were purchased from local market.

Solvent Methanol was used as a solvent.

Stock solution: Standard stock solution of ERD (100 µg/ml) was prepared and used for the analysis.

Procedure

Method A: Absorption Maxima Method

For the selection of analytical wavelength, 20 µg/ml solution of ERD was prepared by appropriate dilution of standard stock solution and scanned in the spectrum mode from 400 nm to 200 nm. From the spectra of drug (Fig. 1), λ_{max} of ERD, 235.0 nm was selected for the analysis. The calibration curve was prepared in the concentration range of 10-50 µg/ml at 235.0 nm. By using the calibration curve, the concentration of the sample solution can be determined.

Method B: First Order Derivative Spectroscopy

In this method, 20 µg/ml solution of ERD was prepared by appropriate dilution of standard stock solution and scanned in the spectrum mode from 400 nm to 200 nm. The absorption spectra thus obtained were derivatized from first to fourth order. First order derivative spectra were selected for analysis of drug. First order derivative spectra of drug (Fig. 2), showed a sharp peak at 227.5 nm, which was selected for its quantitation. The calibration curves for ERD was plotted in the concentration range of 10-50 µg/ml at wavelength 227.5 nm. The concentration of the drug present in the mixture was determined against the calibration curve in quantitation mode.

Method C: Area Under Curve Method

For the selection of analytical wavelength, 20 µg/ml solution of ERD was prepared by appropriate dilution of standard stock solution and scanned in the spectrum mode

from 400 nm to 200 nm. From the spectra of drug, area under the curve in the range of 240.0-230.0 nm was selected for the analysis. The calibration curve was prepared in the concentration range of 10-50 µg/ml at their respective AUC range. By using the calibration curve, the concentration of the sample solution can be determined.

Application of the proposed method for the determination of ERD in capsules

For the estimation of drugs in the commercial formulations, capsule powder equivalent to 50 mg ERD was transferred to 100.0 ml volumetric flask, ultrasonicated for 10 minutes and volume was made up to the mark with Methanol. The solution was then filtered through a Whatmann filter paper (No. 41). The filtrate was appropriately diluted with Methanol to obtain 10 µg/ml of ERD. In Method-A, the concentration of ERD was determined by measuring the absorbance of the sample at 235.0 nm in zero order spectrum mode. By using the calibration curve, the concentration of the sample solution can be determined. Method-B, the concentration of ERD was determined by measuring the absorbance of the sample at 227.5 nm, in first order derivative mode. The results of the capsule analysis were calculated against the calibration curve in quantitation mode. For Method-C, the concentration of ERD was determined by measuring area under curve in the range of 240.0-230.0 nm. By using the calibration curve, the concentration of the sample solution can be determined.

Results of capsule analysis are shown in Table No. 1.

Validation

The methods were validated with respect to linearity, accuracy, precision and selectivity.

Accuracy: To ascertain the accuracy of proposed methods, recovery studies were carried out by standard addition method at three different levels (80%, 100% & 120%). Percent recovery for ERD, by all three methods, was found in the range of 98.55 % to 100.77 %.

Linearity: The linearity of measurement was evaluated by analyzing different concentration of the standard solution

of ERD. Beer-Lambert's concentration range was found to be 10-50 µg/ml for all three methods.

Precision: The reproducibility of the proposed method was determined by performing capsule assay at different time intervals (morning, afternoon and evening) on same day (Intra-day assay precision) and on three different days (Inter-day precision). Result of intra-day and inter-day precision is expressed in % RSD. Percent RSD for Intraday assay precision was found to be 0.3830, 0.6439 and 0.4470 for Method A, B and C, respectively. Inter-day assay precision was found to be 0.3973, 0.6463 and 0.1705 for Method A, B and C, respectively.

RESULTS AND DISCUSSION

The methods discussed in the present work provide a convenient and accurate way for simultaneous analysis of Erdosteine in its pharmaceutical dosage form. Absorbance maxima of Erdosteine at 235.0 nm (Method A); in the first order derivative spectra, sharp peak at 227.5 nm (Method B) and area under curve in range of 240.0-230.0 nm (Method C) were selected for the analysis. Linearity for detector response was observed in the concentration range of 10-50 µg/ml for all three methods. Percent label claim for ERD in capsule analysis, by all the methods, was found in the range of 98.72 % to 101.11 %. Standard deviation and coefficient of variance for six determinations of capsule sample, by all the methods, was found to be less than ± 2.0 indicating the precision of the methods. Accuracy of proposed methods was ascertained by recovery studies and the results are expressed as % recovery. Percent recovery for ERD, by all the methods, was found in the range of 98.55 % to 100.77 % values of standard deviation and coefficient of variation was satisfactorily low indicating the accuracy of all the methods. Based on the results obtained, it is found that the proposed methods are accurate, precise, reproducible & economical and can be employed for routine quality control of Erdosteine in its pharmaceutical dosage form.

Table No. 1: Results of Analysis of Capsule Formulation

Method	Label Claim mg	Amount of drug estimated (mg/capsule)	% Label Claim* ± S.D.	% Recovery*
A	300	298.90	99.63 ± 0.7542	99.45 ± 0.4496
B	300	298.89	99.63 ± 0.9072	99.60 ± 0.8915
C	300	298.76	99.59 ± 0.4452	100.03 ± 0.2566

* indicates mean of six determinations.

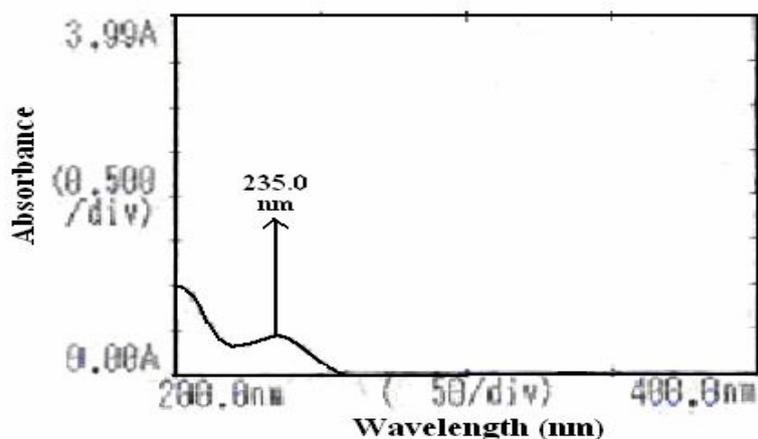


Fig. 1: Zero order spectra of Erdosteine

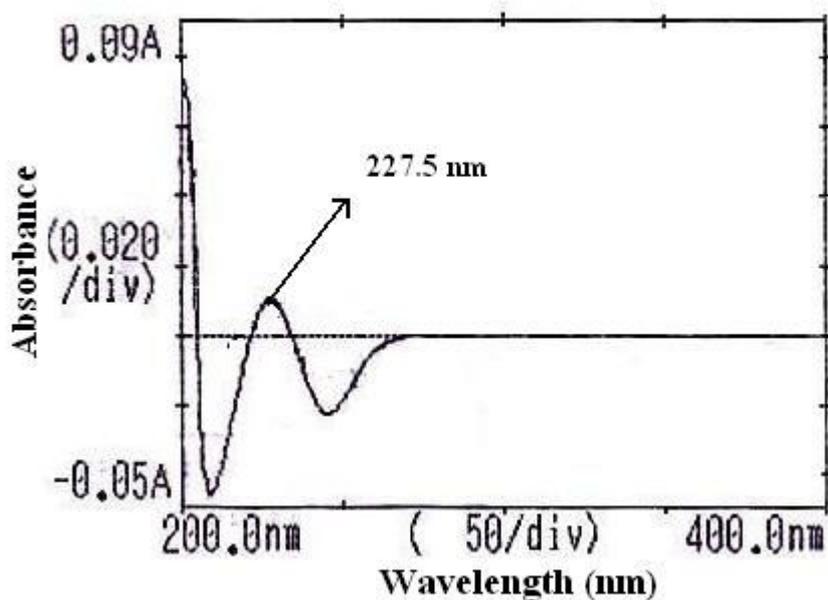


Fig. 2: First order derivative Spectra of Erdosteine

ACKNOWLEDGEMENTS

The authors are very thankful to Dr. Avinash D. Deshpande, Director of Pharmacy, Pad. Dr. D. Y. Patil Institute of Pharmaceutical Sciences and Research, Pimpri, Pune for providing necessary facilities. The authors are also thankful to Glenmark Pharmaceuticals Ltd, Nashik for providing gift samples of Erdosteine.

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