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# SIMULTANEOUS SPECTROPHOTOMETRIC ESTIMATION OF CEFIXIME AND ORNIDAZOLE IN TABLET DOSAGE FORM

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**ABSTRACT :** Two accurate, precise, rapid and economical methods were developed for the estimation of Cefixime and Ornidazole in tablet dosage form. First method is based on the simultaneous equations and wavelengths selected for analysis were 290.0 nm (λmax of Cefixime) and 312.0 nm (λmax of Ornidazole) respectively, in methanol. Second method is Q-analysis method based on absorbance ratio at two selected wavelengths 303.0 nm (iso-absorptive point) and 312.0 nm (λmax of Ornidazole). The linearity was obtained in the concentration range of 10-50 for both Cefixime and Ornidazole. The proposed procedures were successfully applied for the simultaneous determination of both drugs in commercial tablet preparation. The results of the analysis have been validated statistically and by recovery studies.
**Keywords** Cefixime; Ornidazole; Simultaneous equations; Absorbance ratio.

## INTRODUCTION

Cefixime (CEF) is an oral third generation cephalosporin antibiotic. Chemically, it is (6*R*,7*R*)-7-{[2-(2-amino-1,3-thiazol-4-yl)-2-(carboxymethoxyimino)acetyl]amino}-3-ethenyl-8-oxo-5-thia-1-azabicyclo-[4.2.0]oct-2-ene-2-carboxylic acid, clinically used in the treatment of susceptible infections including gonorrhoea, otitis media, pharyngitis, lower respiratory-tract infections such as bronchitis, and urinary-tract infections[1]. Ornidazole (ORD), chemically 1-chloro-3-(2-methyl-5-nitro-imidazol-1-yl) propan-2-ol, is an antimicrobial agent used in treatment of susceptible protozoal infections and anaerobic bacterial infection[2]. Both the drugs are marketed as combined dose tablet formulation in the ratio of 200:500 mg CEF: ORD. Literature survey reveals that cefixime can be estimated by spectrophotometrically[3], HPLC4[4-8] and by HPTLC[9] individually or with other drugs in bulk drugs and in human plasma, while ornidazole can be estimated by spectrophotometrically[10-11], HPLC4[12-13] in combination with other drugs. However, there is no analytical method reported for the estimation of CEF and ORD in a combined dosage formulation. Present work describes two methods for simultaneous estimation of CEF and ORD in tablet formulation.

## 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 Cefixime provided by Glenmark Pharmaceuticals Ltd, Nashik and Ornidazole by Aristo Pharmaceuticals Pvt. Ltd., Mumbai. Combined dose Cefixime and Ornidazole tablets were purchased from local market.

**Solvent:** Methanol (AR Grade) was used as solvent, procured from Universal Laboratories Private limited, Mumbai.

**Stock solution** Standard stock solutions of CEF (100 µg/ml) and ORD (100 µg/ml) were prepared in methanol and used for the analysis.

**Procedure**

**Spectral characteristics of CEF and ORD**

Solutions of CEF and ORD (20 µg/ml, each), were prepared separately by appropriate dilution of standard stock solution. Both the solutions were scanned in the spectrum mode from 400 nm to 200 nm. Overlay absoption spectra were recorded (Fig. 1).

**Preparation of calibration curves**

Appropriate dilutions of the standard stock solution were done separately to get 10, 20, 30, 40 and 50 µg/ml of CEF and ORD, respectively. The absorption spectra of all solutions were recorded between 200-400 nm. The absorbances were measured at 290.0 nm (λmax of CEF), 312.0 nm (λmax of ORD) and 303.0 nm (iso-absorptive point). Beer's lamberts range for CEF and ORD were selected and working calibration curves of both the drugs were plotted separately.

**Determiantion of Absorptivity Value of CEF and ORD**

Appropriate dilutions of the standard stock solution were done to get 20 µg/ml of each CEF and ORD, respectively. The absorbances were measured for CEF and ORD at 290.0 nm (λmax of CEF), 312.0 nm (λmax of ORD) and 303.0 nm (iso-absorptive point). The absorptivity values of the drugs were determined at the selected wavelengths. These absorptrivity values are the mean of six determinations.

**Application of the proposed method for the determination of CEF and ORD in tablets**

Twenty tablets were weighed and average weight was calculated. The tablets were crushed to obtain fine powder. Tablet powder equivalent to 40 mg of CEF was transferred to 100.0 ml volumetric flask, methanol added, ultrasonicated for 10 minutes and volume was made-up to the mark with methanol and. The solution was then filtered through a Whatmann filter paper (No. 41). The filtrate was further diluted with methanol to obtain 8 µg/ml of CEF and 20 µg/ml of ORD. The concentration of both CEF and ORD were determined by measuring the absorbance of the sample at 290.0 nm, 312.0 nm (method A, simultaneous equation method) and at 303.0 nm and 312.0 nm (method B, absorbance ratio method). Concentration of sample solution was determined by using following equations:

**Method A- Vierodt's Method of Simultaneous Equation**

A set of two simultaneous equations obtained by using mean absorptivity values are given below

A1 = 46.50 CCEF + 27.69 CORD……

------- (λmax at 290.0 nm)

A2 = 23.02 CCEF + 42.24 CORD ------

------- (λmax at 312.0 nm)

Where A1 and A2 are absorbance of the sample at 290.0 nm and 312.0 nm respectively, 46.50 and 23.02 are the absorptivity values of CEF at 290.0 nm and 312.0 nm respectively. Similarly 27.69 and 42.24 are the absorptivity value of ORD at 290.0 and 312.0 nm respectively. CCEF is the concentration of CEF and CORD is the concentration of the ORD.

**Method B- The Graphical Absorption Ratio Method (Q-Analysis)**

From the following set of equations the concentration of each component in sample can be calculated.

For Cefixime:

$$Cx = \frac{Qm - Qy}{Qx - Qy} \times \frac{A1}{a}$$

For Ornidazole:

$$Cy = \frac{Qm - Qx}{Qy - Qx} \times \frac{A1}{a}$$

Where, Cx = Concentration of Cefixime,

Cy = Concentration of Ornidazole,

A1 = Absobance of sample at iso-absorptive wavelength 303.0 nm,

a = Mean absorptivity of CEF and ORD at iso-absorptive wavelength 303.0 nm,

$$Qm = \frac{\text{Absorbance of sample solution at 312.0 nm}}{\text{Absorbance of sample solution at 303.0 nm}}$$

$$Qx = \frac{\text{Absorptivity of Cefixime at 312.0 nm}}{\text{Absorptivity of Cefixime at 303.0 nm}}$$

$$Qy = \frac{\text{Absorptivity of Ornidazole at 312.0 nm}}{\text{Absorptivity of Ornidazole at 303.0 nm}}$$

**Validation**

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

**Accuracy** To ascertain the accuracy of the proposed methods, recovery studies were carried out by standard addition method at three different levels (80%, 100% & 120%). The mean % recovery being 98.19 %– 100.45 % for both the compounds.

**Linearity** The linearity of measurement was evaluated by analyzing different concentrations of the standard solution of CEF and ORD. For both the methods, the Beer-Lambert's concentration range was found to be from 10-50 µg/ml for both CEF and ORD, respectively.

**Precision** The reproducibility of the proposed method was determined by performing tablet assay at different time intervals (morning, afternoon and evening) on same day (Intraday assay precision) and on three different days (Interday precision). Result of intraday and interday precision is expressed in % RSD. Percent RSD for Intraday assay precision was found to be 0.5054 (for CEF) and 0.1050 (for ORD) in simultaneous equation method; 0.7779 (for CEF) and 0.1616 (for ORD) in absorbance ratio method. Interday assay precision was found to be 0.7252 (for CEF) and 0.2731 (for ORD) in simultaneous equation method; 0.3995 (for CEF) and 0.1968 (for ORD) in absorbance ratio method.

## RESULTS AND DISCUSSION

The methods discussed in the present work provide a convenient and accurate way for simultaneous analysis of CEF and ORD. In simultaneous equation method, wavelengths selected for analysis were 290.0 nm (λmax of Cefixime) and 312.0 nm (λmax of Ornidazole). In Q-analysis method, wavelengths selected were 303.0 nm (iso-absorptive point) and 312.0 nm (λmax of Ornidazole). In both the methods linearity for detector response was observed in the concentration range of 10-50 µg/ml for

both CEF and ORD. Absorptivity coefficient were calculated for both the drugs at selected wavelengths and substituted in equations for determining concentration of CEF and ORD in tablet sample solution. Percent label claim for CEF and ORD in tablet analysis, by both the method was found in the range of 98.54 % to 100.94 %. Standard deviation and coefficient of variance for six determinations of tablet sample, by both the methods, was found to be less than ± 2.0 indicating the precision of both the methods. Accuracy of proposed methods was ascertained by recovery studies. The percent recovery for CEF and ORD, by both the methods, was found in the range of 98.19 % – 100.45 %. The proposed method could be employed for routine quality control of Cefixime and Ornidazole in combined dose tablet formulation.

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**Table 1: Tablet Analysis and Recovery Studies of Cefixime and Ornidazole**

| Method | Label Claim (mg/tab) | | Amount Found* (%) | | Standard Deviation | | % Recovery* | |
|---|---|---|---|---|---|---|---|---|
| | CEF | ORD | CEF | ORD | CEF | ORD | CEF | ORD |
| A | 200 | 500 | 99.90 | 99.96 | ±0.7683 | ±0.1881 | 99.21±0.1735 | 100.09±0.1103 |
| B | 200 | 500 | 99.63 | 100.24 | ±0..6553 | ±0.1491 | 99.23±0.6165 | 100.22±0.1564 |

*denotes n = 6, average of six estimations.

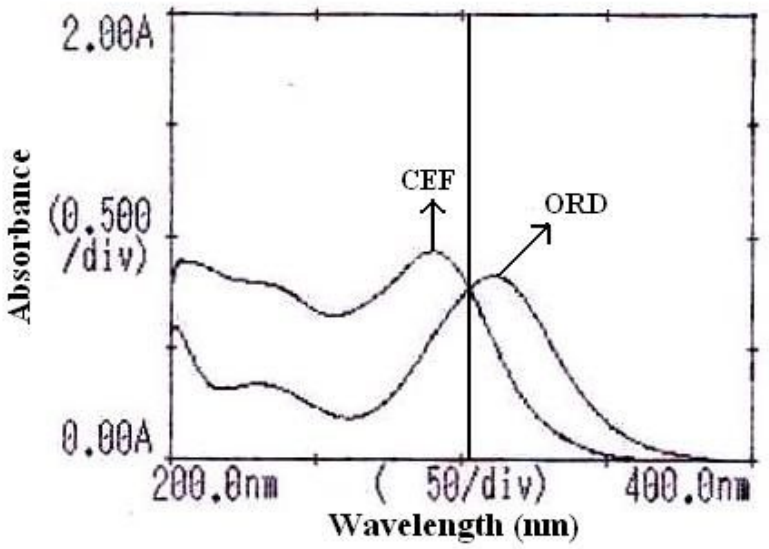


**Fig.-1: Overlain Spectra of Cefixime (CEF) and Ornidazole (ORD)**

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