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Spectrophotometric method for estimation of cefpodoxime proxetil and ofloxacin in tablet dosage form by simultaneous equation method

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Abstract

A simple, rapid, accurate and precise spectrophotometric method has been developed for simultaneous estimation of cefpodoxime proxetil and ofloxacin from tablet dosage form. Proposed method involves formation of 'simultaneous equations' at 235 nm and 298 nm, using methanol: water (70:30), as a solvent. The linearity was observed in the concentration range of 4 - 24 µg/ml for cefpodoxime proxetil and 4 - 20 µg/ml for ofloxacin. The results of analysis have been validated statistically and by recovery studies.

Key-Words: Cefpodoxime Proxetil, Ofloxacin, Spectrophotometry

Introduction

Cefpodoxime proxetil (CEF) is a oral third generation cephalosporin antibiotic used to treat a variety of bacterial infections. Chemically it is (6R, 7R)-7-{[(2Z)-2-(2-amino-1, 3-thiazol-4-yl)-2-methoxyimino acetyl] amino}-3-(methoxymethyl)-8-oxo-5-thia-1-azabicyclo [4.2.0] oct-2-ene-2-carboxylic acid. Cefpodoxime proxetil is indicated for the treatment of patients with mild to moderate infections caused by susceptible strains of the designated microorganisms[1].

Ofloxacin (OFL) is a fluoroquinolone derivative. Chemically, it is (±)-9-fluoro-2, 3-dihydro-3-methyl-10- (4-methyl-1 piperazinyl)-7-oxo-7H-pyrido-[1, 2, 3-de]- 1, 4-benzoxazine -6-carboxylic acid[1].

Literature survey revealed that visible spectrophotometric[2], HPLC[2] methods are available for estimation of CEF in combination with drugs from pharmaceutical formulations, spectrophotometric[3], RP-HPLC[4], methods for estimation of OFL in combination with drugs from pharmaceutical formulations. So here an attempt has been made to develop simple, accurate, sensitive, rapid and economic method for simultaneous estimation of Cefpodoxime Proxetil and Ofloxacin from tablet dosage forms using UV – Visible spectroscopy.

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Material and Methods

Reagents and Chemicals

AR- grade methanol: water (70:30) was used as solvent which was purchased from Loba Chem Pvt Ltd, Mumbai. Analytical pure standard sample of CEF and OFL were supplied as gift sample by Vapicare Pharma pvt ltd, Vapi, Gujarat and used without further purification. The pharmaceutical dosage form used in study was MACPOD-O (label claim CEF 200 mg, OFL 200 mg) manufactured in India by Macloeds Pharma. India.

Instrumentation

The instrument used for the entire analysis was SIMADZU UV 1700 UV-VIS recording spectrophotometer. It is a double beam high speed scanning spectrophotometer with advanced quantitative software and provides full facilities for monochromators, a CRT display and a parallel head printer.

Preparation of standard stock solution

100 mg of Cefpodoxime proxetil (CEF) and 100 mg of Ofloxacin (OFL) were weighed separately and transferred to two separate 100 ml volumetric flasks. Each drug was dissolved in 70 ml of methanol and shaken gently for 10 min. The volume was made up to the mark with water and the final strength obtained was 1000 µg/ml.

Methods

Method: Simultaneous Equation Method[5]

In simultaneous equation method, when no region can be found free from overlapping spectra of two chromophores, it is still possible to device a method

based on measurements at two wavelengths. Two dissimilar chromophores must necessary have different powers of light absorption at some point or in linear absorption spectra.

If samples contain two absorbing drugs (**X** and **Y**), each of which absorbs at the **λmax** of the other, it may be possible to determine both drugs by the technique of simultaneous equations.

From overlain spectra (Fig 1.) 235 nm λmax for Cefpodoxime Proxetil and 298 nm λmax for Ofloxacin were selected for formation of simultaneous equation of two drugs. The absorbance at 235 nm and 298 nm for CEF and OFL were measured. The absorptivity values of each drug at both wavelengths were determined. The absorbance and absorptivity at this wavelength were substituted in following equations to obtain the concentration of both drugs.

$$Cx = \frac{A2ay1 - A1ay2}{ax2ay1 - ax1\,ay2} \quad \text{---I}$$

$$Cy = \frac{A1ax2 - A2ax1}{ax2ay1 - ax1\,ay2} \quad \text{---II}$$

Where, A1 and A2 were absorbance of sample at 235 nm and 298 nm respectively, ax1 and ax2 are absorptivity of Cefpodoxime Proxetil at 235 nm and 298 nm, ay1 and ay2 are absorptivity of Ofloxacin at 235 nm and 298 nm.

Validity of above framed equation was checked by using mixed standard of pure drug sample of two drugs, measuring their absorbance at respective wavelength and calculating concentration of two components. Results of which are reported in Table.1.

Assay of tablet formulation

Twenty tablets were weighed and crushed to obtain a fine powder. An accurately weighed sample equivalent to 100 mg of CEF and 100 mg of OFL was taken in a stoppered volumetric flask (100.0ml); 70ml of Methanol was added and sonicated for 10 min. The solution was filtered through Whatmann filter paper (No 41) and the volume was made up to the mark with the water. The aliquot portions of above solutions were further diluted with solvent to get final concentration of about 6 µg/ml CEF and 6 µg/ml of OFL, respectively and absorbances were measured at 235.0 nm and 298.0 nm against blank. The concentrations of two drugs in sample were determined by using equations 1 and 2. The results are reported in the Table 2.

Recovery studies

The accuracy of the proposed method was checked by recovery studies, by addition of standard drug solution to pre analyzed sample solution at three different concentration levels (80%, 100%, and 120%) within range of linearity for both the drugs. Results are reported in table 3.

Results and Discussion

Method: Simultaneous Equation Method

UV-spectrophotometric method using simultaneous equation was developed. CEF showed absorbance maxima at 235 nm and OFL at 298.0 nm. Linearity was observed in the concentration rage of 4 - 24 µg/ml for CEF and 4 -20 µg/ml for OFL correlation coefficient was found to be 0.9999 and 0.9999 at 235 nm and 298 nm respectively. The proposed method was applied for pharmaceutical formulation and % label claim for CEF and OFL was found to be 99.81 and 103.5, respectively. The method is accurate and precise and can be used for routine pharmaceutical analysis.

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Fig. 1: Overlain spectra of CEF and OFL

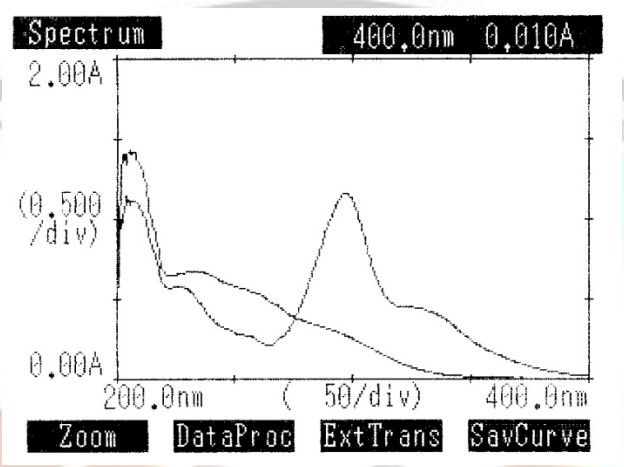

Table 1: Result of analysis of mixed standard

S/No.	Conc Taken µg/ml		Conc Found*µg/ml		Amount found (%)		SD		% RSD	
	CEF	OFL	CEF	OFL	CEF	OFL	CEF	OFL	CEF	OFL
1	4	8	3.97	7.81	99.26	97.70	0.011	0.11	0.27	0.14
2	6	6	5.90	6.22	98.37	103.77	0.012	0.014	0.20	0.22
3	8	4	8.38	4.15	104.8	103.8	0.0 17	0.013	0.20	0.31

Table 2: Result of analysis of tablet formulation

Sample	Label claimed		% Label estimated		± S.D		% R.S.D	
	CEF	OFL	CEF	OFL	CEF	OFL	CEF	OFL
1	200 mg	200 mg	99.81	103.5	0.0016	0.0011	0.17	0.20

Table 3: Result of recovery studies of CEF and OFL

S/No.	Preanalyzed Sample Solution(µg/ml)		Pure Drug Sample Added(µg/ml)		% Recovery ± S.D	
	CEF	OFL	CEF	OFL	CEF	OFL
1	6	6	4.8	4.8	97.22±0.16	101.89±0.16
2	6	6	6.0	6.0	97.16±0.08	101.95±0.16
3	6	6	7.2	7.2	96.68±0.08	102.22±0.08