Spectrophotometric Determination of Nitazoxanide and Ofloxacin in Combined Dosage Form

Sherje AP1,*, Chokshi J2, Satam CA2, Chaudhary D3, Vanshiv SD2
1School of Pharmacy & Technology Management, SVKM’s NMIMS Deemed University, Vile Parle (W), Mumbai- 400 056 (M.S.) India
2STES’s Sinhgad Institute of Pharmacy, Narhe, Pune- 411 041 (M.S.) India

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ABSTRACT

The present investigation illustrates the simultaneous determination of nitazoxanide and ofloxacin using two simple, accurate and precise spectrophotometric methods. First method is based on the formation and solving of simultaneous equations, wherein, 340.0nm (λmax of nitazoxanide) and 300.0nm (λmax of ofloxacin) were used as the wavelengths of determination in acetonitrile. Second method is Q-analysis method, based on absorbance ratio at two selected wavelengths, 312.0 nm (iso-absorptive point) and 340.0 nm (λmax of nitazoxanide). Both the methods were validated statistically and recovery studies were carried out. The Beer’s law limits for each drug individually and in mixture was within the concentration range of 5-40 µg/ml. Linearity of nitazoxanide and ofloxacin were in the range of 80-120% of the label claim. The proposed methods have been applied successfully to the analysis of the cited drugs either in pure form or in pharmaceutical formulations with good accuracy and precision. The method herein described can be employed for quality control and routine analysis of drugs in pharmaceutical formulations.

Keywords: Nitazoxanide, Ofloxacin, Spectrophotometry, Simultaneous estimation, Q-analysis

INTRODUCTION

Nitazoxanide (NTZ), chemically 1[2-[(5-nitro-1,3-thiazol-2-yl) carbamoyl]phenyl] acetate is an antiprotozoal drug. It has been determined in pharmaceutical formulations by different methods like UV-Visible spectrophotometry[1], HPTLC[2], HPLC[3-5], UPLC[6]. Ofloxacin (OFLOX) chemically (±)-9-fluoro-2,3-dihydro-3-methyl-10-(4-methyl-1-piperazinyl)-7-oxo-7H-pyridol[1,2,3-de]-1,4benzoxazine-6-carboxylic acid is a fluoroquinolone antibiotic and is used in the treatment for gonorrhea[7-8]. Several methods such as spectrophotometry[9], HPTLC[10], spectrofluorometry[11], HPLC[12] are reported in literature for determination of ofloxacin in dosage form and in biological samples. A fixed dose combination containing NTZ and OFLOX is available commercially in the market as tablet dosage form. Literature survey revealed that no spectrophotometric method is reported for simultaneous estimation of these drugs in combined dosage form. Hence, an attempt has been made to develop two simple spectrophotometric methods for simultaneous estimation of these drugs from their combined formulation.

MATERIALS AND METHODS

Reference standard of NTZ was obtained from Ind-Swift Laboratories Ltd, Parimoo (H.P.), India and OFLOX was obtained from Aventis Ltd, Baroda, India. All the solutions were freshly prepared in acetonitrile. Spectral and absorbance measurements were made with Jasco V-630 double beam spectrophotometer with 1 cm matched quartz cell.

Preparation of standard solutions and study of spectra

NTZ and OFLOX, 100 mg each, were accurately weighed and dissolved separately in 100 ml of acetonitrile. The stock solutions were further diluted to get standard solutions of NTZ and OFLOX of the concentration 10µg/ml and 4µg/ml, respectively. The resulting solutions were scanned in the range of 600-200 nm. The UV absorption overlain zero order spectrum for NTZ and OFLOX is depicted in Fig.1. Nitazoxanide showed λmax at 340.0nm and Ofloxacin at 300.0nm. Hence, 340.0nm and 300.0nm were used as the wavelengths for formation of the simultaneous equations. Whereas, 312.0 nm (iso-absorptive point) and 340.0 nm (λmax of nitazoxanide) were selected as the wavelengths of determination for NTZ and OFLOX using Q-analysis method.

*Corresponding author.

Mr. Atul P. Sherje
Department of Quality Assurance, School of Pharmacy & Technology Management, SVKM’s NMIMS University, V. L. Mehta Road, Vile Parle (W), Mumbai- 400 056 (M.S.) India
Tel.: + 91-22- 42332000
Telefax: +91-022-26185422
E-mail: sherje.atul@rediffmail.com
Table 1. Results of Commercial Sample Analysis

Table 2: Optical characteristics & validation of the proposed methods

Table: 100.25 98.78 100.07 98.81

Table: 1.4411 1.8540 0.3565 0.4712

Table: 1.8570 1.4757 0.4415 0.8945

Table: 1.4575 0.4415 0.8945

Table: 1.4785 1.8547 0.3345 0.8978

Table: 1.4757 0.4415 0.8945

RESULT AND DISCUSSION

Simultaneous Equation method (Method A)

The stock standard solutions were diluted to obtain concentration range of 5-40µg/ml for each drug. The absorbances were recorded at selected wavelengths and calibration curves were plotted. Both the drugs obey Beer’s law individually and in laboratory mixture within the concentration range 5-40µg/ml. The absorbivity values (A1%, 1cm) for each drug at both the wavelengths were determined. The quantitative estimation of the drugs were carried out by solving the simultaneous equations -

\[ C_x = \frac{Q_m - Q_y}{A_x} \times A \]

\[ C_y = \frac{Q_m - Q_x}{A_y} \times A \]

Where,

\[ C_x = \text{Concentration of } NTZ \text{ in gm/100ml} \]

\[ C_y = \text{Concentration of } OFLX \text{ in gm/100ml} \]

\[ Q_m = \text{Ratio of absorbance of laboratory mixture at 340.0 and 312.0 nm} \]

\[ Q_x = \text{Ratio of absorptivity of } NTZ \text{ at 312.0 nm and 340.0 nm} \]

\[ Q_y = \text{Ratio of absorptivity of } OFLX \text{ at 312.0 nm and 340.0 nm} \]

\[ A_x = A (1\%, 1 \text{ cm}) \text{ of } NTZ \text{ at 340.0 nm} \]

\[ A_y = A (1\%, 1 \text{ cm}) \text{ of } OFLX \text{ at 340.0 nm} \]

\[ C = C_x \text{ or } C_y = \text{Conc. of } NTZ \text{ or } OFLX \text{ in gm/100ml} \]

Table dosage form analysis

For analysis of commercial formulation twenty tablets were weighed, contents removed and finely powdered. The tablet powder equivalent to 100 mg of NTZ was weighed accurately and taken in a 100ml volumetric flask. The contents were dissolved and volume made up to the mark. It was passed through 0.45µm membrane filter. An aliquot of filtrate was pipetted and diluted appropriately to obtain a final concentration of 10µg/ml of NTZ and 4µg/ml of OFLX. The absorbances of these solutions were measured at 340 nm and 300.0nm for method A, and 312nm and 340.0nm for method B. The absorbance values were substituted in the respective equations to obtain concentration of each drug in tablet formulation.

Validation

The recovery studies were carried out at different levels of concentration by spiking a known concentration of standard drug to the preanalyzed sample and contents were reanalyzed by proposed methods. The results of marketed formulation analysis and recovery studies are depicted in table 1. The methods were validated statistically as per ICH/USP guidelines for parameter like accuracy, preci-
sion, ruggedness, linearity and range. Accuracy was ascertained on the basis of recovery studies. Precision was studied by analyzing five replicates of sample solution and concentrations were calculated. Ruggedness was established by carrying out experiment at different time within a day (intraday), different day (interday) and by different analyst. Linearity and range were determined by analyzing 80-120% of test concentrations of each drug.

CONCLUSION:

The proposed methods were successfully used to estimate NTZ and OFLOX in marketed tablet formulation. The assay value was in good agreements with the corresponding labeled claim. The recovery study shows accuracy of the method. On observing the validation parameters both the methods were found to be accurate, precise and specific. Hence the methods can be employed for routine analysis of tablet containing NTZ and OFLOX.

REFERENCES:


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