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Simultaneous UV spectrophotometric determination of Atorvastatin calcium and Telmisartan in tablet dosage form

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ABSTRACT

Two accurate, precise, sensitve and economical procedures for simultaneous estimation of *atorvastatin* calcium and *telmisartan* in tablet dosage forms have been developed. First method employs formation and solving of simultaneous equations using 219 nm and 257nm as two analytical wavelengths for both drugs in 0.1 N NaOH. The second method is Q- analysis based on measurement of absorptivity at 240nm (as isobestic point) and 257nm (λmax of ATV). *Atorvastatin* calcium and *telmisartan* at their respective λmax 257 nm and 219 nm and at 240 (isobestic point) shows linearity in a concentration range of 50-150 mcg/ml and 10-50 mcg/mL respectively. The recovery studies confirmed accuracy of the proposed methods and low values of standard deviation confirmed precision of the methods. The methods were validated as per ICH guidelines.

Key words: Atorvastatin calcium, telmisartan, simultaneous-equations method, Q-analysis.

INTRODUCTION

Atorvastatin calcium (ATV), (βR, dR)-2-(4-fluorophenyl)-β, d-dihydroxy- 5-(1-methyl ethyl)-3-phenyl-4-[(phenylamino) carbonyl]-1H-pyrrole-1-heptanoic acid, calcium salt, is a synthetic cholesterol–lowering agent[1].Many analytical methods like spectrophotophotometry[2-5]and HPTLC[6-7]have been reported for the determination of ATV alone and in combination with other antihypertensive and lipid lowering drugs.

Telmisartan(TLN) is described chemically as 4[(1,4-dimethyl-2-propyl(2,6-bi-1H-benzimidazol] -1-yl)methyl][1,1-biphenyl]-2-carboxylic acid[8]. TLN is useful in the treatment of mild to moderate hypertension. Few spectrophotometric [9-11],HPLC[12-16], HPTLC[17] and Polarographic[18] methods have been reported for the estimation of TLN in pharmaceutical dosage form in single or in combination with other drugs. The aim of this work is to develop new UV spectrophotometric methods using simultaneous equations and Q-analysis methods.

EXPERIMENTAL

Instrument

Elico UV-Visible spectrophotometer (SL 164) was used for spectral measurements with 1cm matched quartz cells.

Method 1

Employing Simultaneous Equations Using Crammer's Rule

Pure drug samples of Atorvastatin calcium and telmisartan were dissolved separately in 0.1N NaOH so as to give several dilutions of standard in the concentration range of 50 to 150 mcg/ml and

10 to 50 mcg/ml for ATV and TLN respectively. All dilutions were scanned in the wavelength range of 200-375 nm.

Two wavelengths selected for the formation of simultaneous equations were 219nm (ëmax of TLN)and 257nm(ëmax of ATV). Similarly, mixed standard solutions were also used and the drugs showed linearity in the range of 50-150mcg/ml(ATV) and 10-50mcg/ml(TLN). The absorptivities for the two drugs were presented in the table 1. Figure 1 represents the overlain spectra of both drugs.

The method employs solving of simultaneous equations using crammer's rule and matrices. The simultaneous equations formed were

$$A_1 = 115 \times C_1 + 60.14 \times C_2 \quad \ldots (1)$$

$$A_2 = 103.4 \times C_1 + 29.64 \times C_2 \quad \ldots (2)$$

Where A_1 and A_2 are absorbances of sample solution at 219nm and 257nm respectively. C_1 and C_2 are the concentrations of TLN and ATV respectively in sample solution. By substituting the value of C_1 from equation(1) into equation (2), the value of C_1 can be obtained. Similarly C_2 can also be obtained.

Procedure for Analysis of Tablet Formulation

The average weight of twenty tablets were determined and then ground to a fine powder. A quantity equivalent to 100mg of TLN and 50 mg of ATV were transferred to a 100 ml volumetric flask. The contents were dissolved by using 50 ml of 0.1N NaOH, filtered and made upto volume with the same. The solutions were further diluted with 0.1 N NaOH to give concentrations of 10mcg/ml and 50mcg/ ml of TLN and ATV respectively. Absorbances of these solutions were measured at 219nm and 257nm as A1 and A2 respectively and concentrations of these two drugs in the sample were calculated using equation(1) and equation(2). Results of the analysis of the tablet formulations were reported in Table 2.The recovery studies were depicted in Table 3.

Method 2

Absorbance Ratio or Q-Analysis Method

From the overlain spectrum of TLN and ATV, two wavelengths were selected, one at 240nm, isobestic point for both the drugs and the other at 257nm(λmax of ATV).The absorbances of the standard and sample solutions were prepared in the same manner as in the previous method. The absorptivities for both drugs at the selected wavelength were presented in Table 1. The method employs Q values; the concentrations of drugs in sample solution were determined by using the following formula. Results of the analysis of the tablet formulations were reported in Table 2. The recovery studies were depicted in Table 3.

For Telmisartan

$$C_1 = \frac{Q_0 - Q_2}{Q_1 - Q_2} \times \frac{A}{a_1}$$

For Atorvastatin

$$C_2 = \frac{Q_0 - Q_1}{Q_2 - Q_1} \times \frac{A}{a_2}$$

$$Q_0 = \frac{\text{Absorbance of sample at 257 nm}}{\text{Absorbance of sample at 240 nm}}$$

$$Q_1 = \frac{\text{Absorptivity of ATV at 257 nm}}{\text{Absorptivity of ATV at 240 nm}}$$

$$Q_2 = \frac{\text{Absorptivity of TLN at 257 nm}}{\text{Absorptivity of TLN at 240 nm}}$$

A = Absorbance of sample at isobestic point

a_1 and a_2 –absorptivities of ATV and TLN respectively at isobestic point.

RESULTS AND DISCUSSION

The proposed methods for simultaneous estimation of ATN and TLN in combined dosage forms were found to be simple, accurate, economical and rapid. In both the methods, the values of coefficient of variation were satisfactorily low and recovery was close to 100 % for both the drugs.

Table 1: Absorptivity values for *Telmisartan* and *Atorvastatin* calcium

Concentration mcg/ml		Absorptivity at 219 mm		Absorptivity at 257 nm		Absorptivity at 240 nm	
TLN	**ATV**	**TLN**	**ATV**	**TLN**	**ATV**	**TLN**	**ATV**
10	50	116	59.6	104	29.6	141.1	47.2
20	75	114	60.3	104	29.4	141.3	46.9
30	100	114	60.1	103	29.4	140.8	47
40	125	115	60.4	103	30.0	141.1	47.1
50	150	116	60.3	103	29.8	141.4	47.2
mean	mean	115	60.14	103.4	29.64	141.14	47.08

Table 2: Results of commercial formulation analysis

Method	Label Claim(mg/TAB)	%Label Claim estimated*(Mean±S.D)	% R.S.D
I	ATV-10	100.03±0.550	0.850
	TEL-20	99.92±0.650	0.845
II	ATV-10	99.69±0.850	0.967
	TEL-20	99.58±0.750	0.958
III	ATV-10	99.97±0.467	0.855
	TEL-20	99.83±0.364	0.863

*Mean of six determinations, R.S.D. is relative standard deviation

Table 3: Recovery studies of TEL and ATV

Drug	Conc. of drug added		% Recovery* ((Mean±S.D)	
ATV	**µg/ml**	**% level**	**Method I**	**Method II**
	5	50	99.55±0.561	99.00±0.380
	10	100	99.80±0.489	99.64±1.001
	15	150	99.61±0.450	99.98±0.897
TEL	5	50	100.09±0.651	100.38±0.644
	10	100	101.57±0.126	99.74±0.932
	15	150	100.62±0.345	100.54±0.659

*Avg. of three determinations

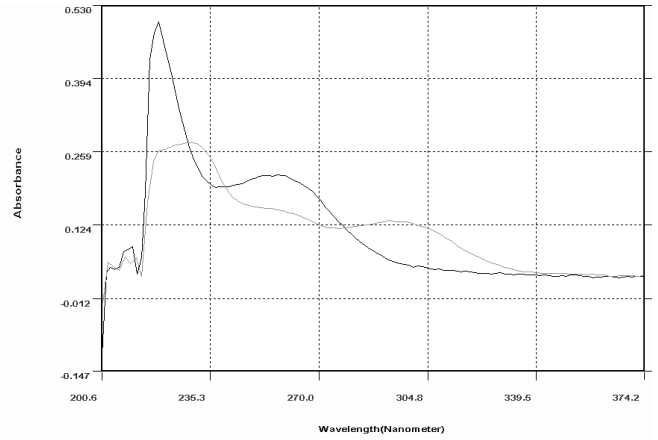

Fig. 1: Zero order overlain spectra of TLN (10 mcg/ml) and ATV (50mcg/ml)

CONCLUSION

The proposed methods are simple, precise, accurate and rapid for the determination of ATN and TLN in combined tablet dosage forms. These methods can be adopted as an alternative to the existing spetrophotometric methods. Analysis of authentic samples containing ATV and TLN showed no interference from the common additives and excipients. Hence, recommended procedure is well suited for the assay and evaluation of drugs in pharmaceutical preparations. It can be easily and conveniently adopted for routine quality control analysis.

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