Spectrophotometric Estimation of Olmesartan medoxomil and Hydrochlorthiazide from a Binary Mixture by Simultaneous Equation and Dual Wavelength Method

Singh Gurvinder*1, Goyal Anju[2]
[1]Anand college of Pharmacy,Keetham, Agra
[2]B.N. Girl's College of Pharmacy, Udaipur (Rajasthan), 313001

Two simple, accurate, economical and reproducible spectrophotometric methods for simultaneous estimation of two-component drug mixture of Olmesartan medoxomil and Hydrochlorthiazide in combined tablet dosage form have been developed. The first developed method involves formation and solving of simultaneous equation using 250.0 nm and 273.0 nm as two wavelengths. Second developed method is based on two wavelength calculation. Two wavelengths selected for estimation of Olmesartan medoxomil were 266.95 nm and 278.96 nm while that for Hydrochlorthiazide were 236.89 nm and 253.04 nm. Both the developed methods obey Beer's law in the concentration ranges employed for the respective methods. The results of analysis were validated statistically and by recovery studies.

Keywords: *Olmesartan medoxomil, Hydrochlorthiazide, simultaneous analysis, two wavelength calculation method, simultaneous equation method*

Introduction

Olmesartanmedoxomil[1] is 4-(1-Hydroxy-1-methylethyl)-2-propyl-1-[2'-(1H-5-tetrazolyl) biphenyl-4-ylmethyl] imidazole-5-carboxylic acid 5-methyl-2-oxo-1, 3-dioxol-4-ylmethyl ester and is used as an antihypertensive agent. This drug is not official in any pharmacopoeia. Literature survey reveals that one HPTLC method [2], one CZE method[3]and one HPLC-MS/MS[4] methods are reported for the estimation of OLM from pharmaceutical formulations.

Address for Correspondence:
gurvinderpharmacy@yahoo.in

Hydrochlorthiazide (HCZ) is 6-chloro-1,1-dioxo-3,4-dihydro-2*H*-1,2,4-benzothiadiazine-7-sulfonamide and is used as diuretic agent. The drug is official in British Pharmacopoeia[5] Indian Pharmacopoeia [6] and US Pharmacopoeia[7]. Literature survey reveals that one RP-HPLC[8] and two HPLC[9, 10] methods have been reported for the estimation of HCZ from pharmaceutical formulations. Developed spectrophotometric methods were found to be simple, rapid, accurate, reproducible and economical in comparison to routine extractive or colorimetric methods used for analysis

of single drug and have been used successfully for determination of two components from combined tablet dosage form.

Materials and methods

A PC based Systronic, UV/Vis double beam spectrophotometer (model No. 1700) with spectral bandwidth of 1 nm and wavelength accuracy ±0.3 nm (with automatic wavelength correction) and wavelength readability 0.1 nm increment was employed for all measurements using a matched pair of 10 mm quartz cells.

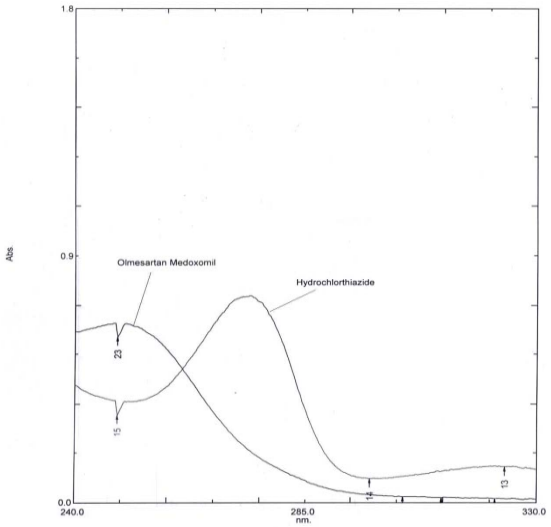

Figure1: Overlain spectra of Olmesartan Medoxomil and Hydrochlorthiazide using 0.1 N NaOH solution

Standard bulk drug samples of OLM and HCZ were provided by Torrent Pharmaceutical Ltd., Ahmedabad. 0.1 N NaOH was used as solvent for the preparation of stock solution and for further dilutions. The tablet samples of combined dosage form of OLM and HCZ [Olmesar-H (Macleods Pharmaceuticals Ltd., Mumbai) and Olsar-H (Unichem Laboratories Ltd., Mumbai)] were procured from the local pharmacy.

Procedure for preparation of calibration curve

In the first method, pure drug sample of OLM and HCZ were dissolved separately in 0.1 NaOH so as to give several dilutions of standard in concentration range of 4-30 µg/ml of each drug. From the overlain spectra of two drugs present in figure 1, wavelengths for the simultaneous analysis of two drugs were selected and Calibration curve was plotted between concentration and measured absorbance values for both the drugs as shown in figure2Two wavelengths selected for formation and solving of simultaneous equation were 250.0 nm and

273.0 nm.All dilutions were scanned in wavelength range of 250.0 & 273.0 nm Absorptivity coefficient of both the drugs was determined at selected wavelengths. Absorptivity coefficient for OLM at 250.0 nm and 273.0 nm were 46.79 cm^{-1} g^{-1} l and 14.72 cm^{-1} g^{-1} l while respective values for HCZ were 19.24 cm^{-1} g^{-1} l and 38.32 cm^{-1} g^{-1} l.

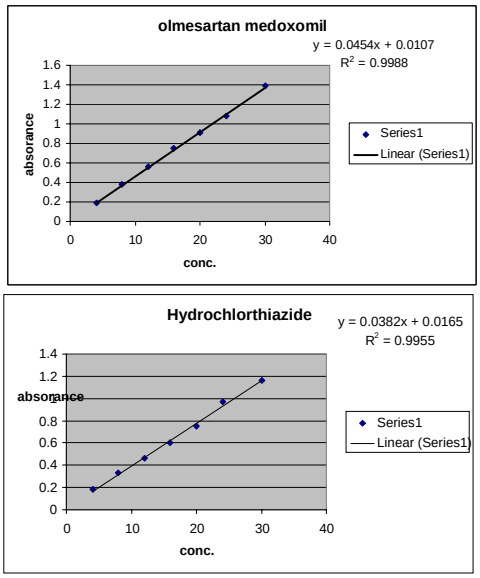

Figure2: Calibration curve of Olmesartan Medoxomil and Hydrochlorthiazide (Using simultaneous Equation method)

Set of two simultaneous equations thus framed were,

$A_1 = 46.79 \times Cx + 19.24 \times Cy$ and

$A_2 = 14.72 \times Cx + 38.32 \times Cy$,

where A_1 and A_2 are absorbance of sample solution at 250.0 nm and 273.0 nm, respectively. C x and C y are concentration of OLM and HCZ, respectively in sample solution in g/100ml. Validity of above framed equation was checked by preparing five mixed standards using pure sample of two drugs, measuring their absorbance at respective wavelengths and calculating concentration of two components. The result of validation studies was found satisfactory.

For method II, set of two wavelengths λ_1 (266.95 nm) and λ_2 (278.96 nm) for estimation of OLM and λ_3 (236.89 nm) and λ_4 (253.04 nm) for estimation of HCZ were selected on basis of the principle that absorbance difference between two points on a mixture spectra is directly proportional to concentration of component of interest and independent of interfering component. Five mixed standards of pure drugs containing different concentration of OLM and HCZ were prepared in 0.1 NaOH . All standards were scanned at respective set of selected wavelengths. Absorbance

Table – 1: Result of analysis of commercial formulations

Method	Brand Name	Label Claim (mg/Tablet.)		% Label Claim Estimated		Standard Deviation		% Recovery	
		OLM	HCZ	OLM	HCZ	OLM	HCZ	OLM	HCZ
Method I	Olmesar-H	20	12.5	99.48	99.99	0.551	0.411	99.32	98.51
	Olsar-H	20	12.5	99.93	99.98	0.355	0.726	99.55	99.36
Method II	Olmesar-H	20	12.5	99.72	100.12	0.208	0.152	99.16	99.45
	Olsar-H	20	12.5	100.09	99.18	0.458	0.416	99.77	99.34

difference was measured and respective calibration curve was plotted.

Procedure for analysis of tablet formulation

Twenty tablets were accurately weighed and average weight per tablet was determined. tablets were grounded to fine powder and tablet powder equivalent to 100 mg OLM & HCZ was weighed and extracted four times with 50 ml portions of 0.1 NaOH solution and filtered through Whatman filter paper no. 41 into a 100 ml volumetric flask. Washed residue with 0.1 N NaOH solutionand added washings to filtrate; volume of filtrate was made to 100 ml mark with 0.1 NaOH solution. From above filtrate 10 ml was diluted to 100 ml with 0.1 NaOH solution.

For method I, 1 ml of the above prepared stock solution was further diluted to 10 ml with 0.1 NaOH solution. Absorbance of this final dilution was measured at 250.0 nm and 273.0 nm, respectively, and concentration of two drugs in the sample was calculated using above framed simultaneous equations-I and II. Results of analysis of tablet formulation are

reported in Table-1.

For method II Tablet samples were prepared in a similar manner as for method I. Final dilution was analyzed by scanning at respective set of wavelength and absorbance difference values were noted and concentration of OLM and HCZ was calculated from the respective calibration curve. Results of analysis are reported in Table-1

Recovery studies

To study the accuracy, reproducibility and precision for both the developed methods recovery studies were carried out by the addition of standard drug solution to pre-analyzed tablet sample with proper dilutions at three different concentration levels with in the range of linearity for both the drugs. Results of recovery studies were found to be satisfactory and are reported inTable-1. The proposed methods for simultaneous estimation of OLM and HCZ in combined tablet dosage form were found to be simple, accurate, rapid and economical. The values of recovery were close to 100% indicating reproducibility of the method.

First developed method involving formation and solving of simultaneous equation based on accurate determination of absorptivity coefficient of two drugs at two selected wavelengths. Once the equation is framed then it is just required to measure the absorbance of sample solution at selected wavelengths and few calculations that can be manually done. Framed equations were validated using laboratory prepared mixed standards of two drugs which gave satisfactory results.

Second developed method for simultaneous analysis of OLM and HCZ from combined dosage form make use of two wavelength calculation so as to remove interference between two components. Proper selection of two wavelengths for estimation of a component is critical.

Result and discussion The results of analysis of two drugs from tablet formulation using both the developed methods were found close to 100 percent for both OLM and HCZ, standard deviation was satisfactorily low indicating accuracy and reproducibility of the methods. Recovery studies were

satisfactory which shows that there is no interference of excipients. The developed methods were found to be simple, rapid, and accurate and can be used for routine estimation of two drugs from tablet formulations.

Conclusion

Proposed methods were found to be precise and accurate. The methods can be used for the routine simultaneous analysis of OLM and HCZ in pharmaceutical preparation.

In spite of the low concentration of HCZ, method was successfully used to estimate the amount of OLM and HCZ present in the tablet without the need for addition of internal standard or prior separation. Moreover, the proposed method has the advantages of simplicity, convenience and quantification of OLM and HCZ in combination and can be used for the assay of their dosage form

Acknowledgement

Authors would like to acknowledge Torrent Pharmaceutical Ltd. Ahmedabad, India for providing pure drug samples of OLM and HCZ.

References:

1.Whittaker A., A Review of Olmesartan medoxomil, A New Angiotensin II Receptor Blocker, British Journal of Cardiology, 2005, 12, 125-129.

2. ShahN.J., Suhagia B.N., Shah R.R. and PatelN.M., Development and validation of a simultaneous HPTLC method for the estimation of olmesartan medoxomil and hydrochlorothiazide in tablet dosage form, Indian Journal of Pharmaceutical Sciences, 2007, 69, 834-386.

3. Valente B., Renato P. and Segatto M., Development of A Capillary Zone Electrophoresis Method For The Indirect Determination of Olmesartan Medoxomil and Determination of Hydrochlorothiazide in Synthetic Tablets,Chromatographia,2007,27,119-130.

4. Liu D., Hu P., Matsushima N., Li X. and Jiang J., Quantitative determination of olmesartan in human plasma and urine by liquid chromatography coupled to tandem mass spectrometry, Journal of Chromatography, 2007, 856, 190-197.

5.British Pharmacopoeia, Vol. I. United Kingdom: The Stationary office on the behalf of MHRA; 2007. p. 1036.

6.Indian Pharmacopoeia, Vol. II. Ghaziabad: The Indian Pharmacopoeial Commission; 2007. p.1194.

7.United States Pharmacopoeia, Vol. II. RockvilleMD: The United States Pharmacopoeial Convention; 2008. p.2334

8.Tagliari M.P., Stulzer H.K., Murakami F.S. and Kuminek G., Development and Validation of a Stability-Indicating LC Method to Quantify Hydrochlorothiazide in Oral Suspension for Pediatric Use, Chromatographia, 2008, 67, 647-652.

9. Sultana N., Saeed A.M., Shahid A. S. and Shahnawaz S., Simultaneous determination of olmesartan medoxomil and irbesartan and hydrochlorothiazide in pharmaceutical formulations and human serum using high performance liquid chromatography, Chromatographia, 2008,55, 91-95.

10.Pathade P. A., Bhatia N. M. and Deshmane S. J., RP-HPLC Method for

Simultaneous Estimation of Amlodipine besylate and Hydrochlorthiazide from Tablet Formulation, Plasma and Urine, Journal of Pharmaceutical and Biomedical Analysis, 2005, 21,257-265.