Original Article

Spectrophotometric methods for the simultaneous estimation of losartan potassium and hydrochlorothiazide in tablet dosage forms

Abstract

Aim: This work deals with the simultaneous determination of Losartan potassium (LSP) and Hydrochlorothiazide (HZ) in a binary mixture form, without prior separation, by three different techniques. **Materials and Methods:** The present work was carried out on Shimadzu electron UV1800 double beam UV-Visible spectrophotometer. The absorption spectra of reference and test solutions were carried out in 1 cm matched quartz cell over the range of 200-400 nm. Standard gift sample of LSP and HZ were obtained from Torrent pharmaceuticals Ltd, Baddi, Himachal Pradesh. Combined LSP and HZ tablets were purchased from local market. Methanol from Merck Ltd. and distilled water are used as solvent. **Results:** The first method is the application of simultaneous equation. Where the linearity ranges for LSP and HZ were 5–25 µg/ml and 1–20 µg/ml, respectively. The second method is the determination of ratio of absorbance at 272 nm, the maximum absorption of HZ and isosbestic wavelength 266.5nm, the linearity ranges for LSP and HZ were 5-80µg/ml and 1-25µg/ml respectively. The third method is the first order derivative method, where the linearity ranges for LSP and HZ were 1-30 µg/ml and 1-40 µg/ml respectively. The proposed procedures were successfully applied for the simultaneous determination of both the drugs in commercial tablet preparation. The validity of the proposed methods was assessed by applying the standard addition technique where the percentage recovery of the added standard was found to be 99.06±1.210 and 99.30±1.159 using the simultaneous equation method, 99.66±0.573 and 99.95±0.272 using the graphical absorbance ratio method and 99.64±0.301 and 99.91±0.614 using first derivative method, for LSP and HZ respectively. **Conclusions:** The proposed procedures are rapid, simple, require no preliminary separation steps and can be used for routine analysis of both drugs in quality control laboratories.

Key words:
First derivative method, hydrochlorothiazide, losartan potassium, Q-Analysis

Introduction

Losartan potassium (LSP) is an angiotensin II receptor antagonist and chemically it is 2-n-butyl-4-chloro-5-hydroxymethyl-1-[2'-(1*H*-tetrazol-5-yl)(biphenyl-4-yl) methyl]imidazole, a strong antihypertensive agent. Losartan was developed by DuPont-Merck laboratories as a potent non-peptide angiotensin II receptor (type AT1) antagonist for hypertension treatment.[1] It is administered in its active form and is partially converted into an active metabolite, which is responsible for the drug's prolonged pharmacological effect. The therapeutic efficacy of losartan, as well as its renal and antihypertensive effects, seems to be similar to those of angiotensin converting enzyme (ACE) inhibitors. Hydrochlorothiazide (HZ) is chemically 6-chloro-3, 4-dihydro-2H-1, 2, 4-benzothiadiazine-7-sulfonamide1,1-dioxide. It is the prototype of the thiazide group and antihypertensive drug.[2]

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Kareti Srinivasa Rao, Minakshi Panda, Nargesh Kumar Keshar

Departments of Pharmaceutical Analysis and Quality Assurance, Roland Institute of Pharmaceutical Sciences, Berhampur, Orissa, India

Address for correspondence:
Dr. Kareti Srinivasa Rao
Department of Pharmaceutical Analysis and Quality Assurance,
Roland Institute of Pharmaceutical Sciences,
Berhampur, Orissa - 760 010, India.
E-mail: ksrao108@gmail.com

Literature survey reveals that LSP was determined by several methods including Spectrophotometric,[3-6] high performance liquid chromatography (HPLC)[6-9] and liquid chromatography, capillary electrophoresis and super-critical fluid chromatography.[10] HZ was determined by capillary electrophoresis[11] and electrochemical study[12] and by spectrophotometrically,[13-17] reverse phase-HPLC (RP-HPLC).[18-20] Literature survey revealed that spectrophotometric[21,22] and HPLC[23] methods have been reported for the estimation of LSP and HZ in combination with the other drugs. Few HPLC[24-30] methods are available for the simultaneous estimation of LSP and HZ in pharmaceutical formulations. However, there were two spectrophotometric methods for simultaneous estimation of LSP and HZ reported. First one[31] describes simultaneous estimation of LSP and HZ by simultaneous equation method using methanol as a solvent throughout the method. The second one[32] describes two methods namely simultaneous equation method and dual wavelength method for simultaneous estimation of LSP and HZ in tablets using 0.1M hydrochloric acid (HCL) for both the methods. Nevertheless, the methods we developed involve methanol for the preparation of standard stock solution and water for further dilution in all the three developed methods namely simultaneous equation method, Q-analysis method and derivative spectrophotometry method. Later two methods (Q-analysis method and derivative spectrophotometry method) were developed for the first time. The aim of this paper was to explore the possibility of using techniques of simultaneous equation, the absorbance ratio (Q-analysis) and first derivative method for quantifying LSP and HZ simultaneously in their mixture forms. The proposed methods are simple, convenient, precise, accurate and economical than the reported method.

Materials and Methods

Instrument

The present work was carried out on Shimadzu electron UV1800 double beam UV-visible spectrophotometer. The absorption spectra of reference and test solutions were carried out in 1 cm matched quartz cell over the range of 200–400 nm.

Materials

Standard gift sample of Losartan potassium and Hydrochlorothiazide were obtained from Torrent pharmaceuticals Ltd, Baddi, Himachal Pradesh. Combined LSP and HZ tablets were purchased from the local market.

Solvent used

Methanol (MERCK Ltd.), Distilled water.

Procedure

Simultaneous equation method (Method-I)

Standard stock solutions (1 mg/ml) of LSP and HZ were prepared by dissolving 100 mg of each in 20 ml methanol in a 100 ml volumetric flask and diluted to 100 ml with distilled water. From this suitable aliquots are taken and diluted with distilled water to get 20 µg/ml of LSP and 5 µg/ml of HZ. The absorption spectra of all the solutions were recorded between 200–400 nm. The absorbance were measured for LSP and HZ at 218 nm (λ_1) (maximum absorbance of LSP), 272 nm (λ_2) (maximum absorbance of HZ) and 266.5 nm (isosbestic point). Wavelengths 218 nm and 272 nm were selected for the formation of simultaneous equation [Figure 1]. The absorbances were measured at the selected wavelengths. The molar absorptivity values were 112 at λ_1 and 418.4 at λ_2 for LSP and 118 at λ_1 and 419.6 at λ_2 for HZ. The absorbance and absorptivity values were substituted in the following equation to obtain the concentrations:

$$Cx = A_2ay_1 - A_1ay_2 / ax_2ay_1 - ax_1ay_2$$
$$Cy = A_1ax_2 - A_2ax_1 / ay_1ax_2 - ay_2ax_1$$

Where A_1 and A_2 are absorbances of the mixture at λ_1 and λ_2 respectively, ax_1 and ax_2 are absorptivity of X at λ_1 and λ_2 respectively, ay_1 and ay_2 denotes absorptivity of Y at λ_1 and λ_2, respectively, Cx and Cy are concentrations of LSP and HZ, respectively.

The graphical absorbance ratio method (Q-analysis method) (Method-II)

In the quantitative assay of two components by Q-analysis method, absorbances were measured at two wavelength, one being the isosbestic wavelength and the other being wavelength of maximum absorption of one of the two components. From overlain spectra of LSP and HZ, absorbances were measured at the selected wavelength, i.e., 266.5 nm (isosbestic wavelength) and 272 nm (wavelength of maximum absorption of HZ) [Figure 2]. The concentration of each component can be calculated by mathematical treatment of the following mentioned equation.

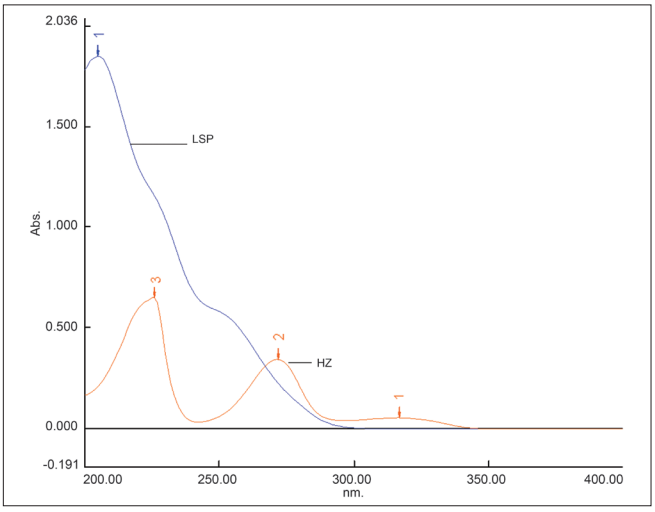

Figure 1: Overlain spectra of LSP (20 µg/ml) and HZ (5 µg/ml) for simultaneous equation method

For LSP
C_1 = Qm – Qy / Qx – Qy. A_1 / a

For HZ
C_2 = Qm – Qx / Qy – Qx. A_1 / a
Where, C_1= concentration of LSP
C_2= concentration of HZ
A_1= absorbance of sample at isosbestic wavelength (266.5 nm)
a = Absorptivity of LSP and HZ at isosbestic wavelength (266.5 nm)
Qx = Absorptivity of LSP at 272 nm / Absorptivity of LSP at 266.5 nm
Qy = Absorptivity of HZ at 272 nm / Absorptivity of HZ at 266.5 nm
Qm = Absorptivity of sample solution at 272 nm / Absorptivity of sample solution at 266.5 nm.

First order derivative method (Method III)
Solutions of 10µg/ml of LSP and HZ were prepared separately. Both the solutions were scanned in the spectrum mode from 200 to 400 nm. The absorption spectra thus obtained were derivatized from first to fourth order. First order derivative (*n*=1) was selected for analysis of both the drugs. The zero crossing wavelengths, 222 nm and 332 nm were selected for HZ and LSP, respectively [Figure 3].

Preparation of calibration curve
Six mixed standards having concentration 1, 5, 10, 15, 20, 25, 30 µg/ml of LSP and 1, 5, 10, 20, 30, 40 µg/ml of HZ, respectively, were prepared and scanned in the spectrum mode from 200 nm to 400 nm. The absorption spectra so obtained were derivatized to obtain first derivative order spectra. The absorbances of LSP and HZ were measured at 332 nm and 222 nm, respectively, and calibration curve of both the drugs were plotted separately. The concentration of individual drug present in the mixture was determined against calibration curve in quantitation mode.

Application of the proposed procedure for the determination of Losartan potassium and Hydrochlorothiazide in tablets
Twenty tablets were weighed and average weight was calculated. The tablets were crushed to fine powder. The powder equivalent to 100 mg of LSP and 25 mg of HZ was transferred to 100 ml volumetric flask. The powder was dissolved in 20 ml of methanol by intermittent shaking followed by sonication for 15 min and then the volume was made up to 100 ml with distilled water. The solution was then filtered through a Whatmann filter paper (No. 41). The solution was diluted further with distilled water to obtain 20 µg/ml of LSP and 5 µg/ml of HZ. The concentration of both LSP and HZ were determined by measuring the absorbance of the samples at 218nm (λ_{max} for LSP), 272 nm (λ_{max} for HZ) and 266.5 nm (isosbestic point). The recorded data was then substituted in the equation and results obtained are summarized in [Table 1]. The analysis procedure was repeated three times. The selectivity of the proposed procedure was examined by determining the recovery of the two drugs by standard addition method [Table 2].

Results and Discussion

The proposed methods were found to be simple, accurate, economic, and rapid for routine simultaneous estimation of two drugs. The values of relative standard deviation are satisfactorily low and recovery was closed to 100%, indicating reproducibility and accuracy of all methods. These methods also gave excellent result and can be employed for routine analysis of these two drugs in combined dosage form.

In simultaneous equation method, the overlay spectra of LSP and HZ shows overlap, that prevents the use of

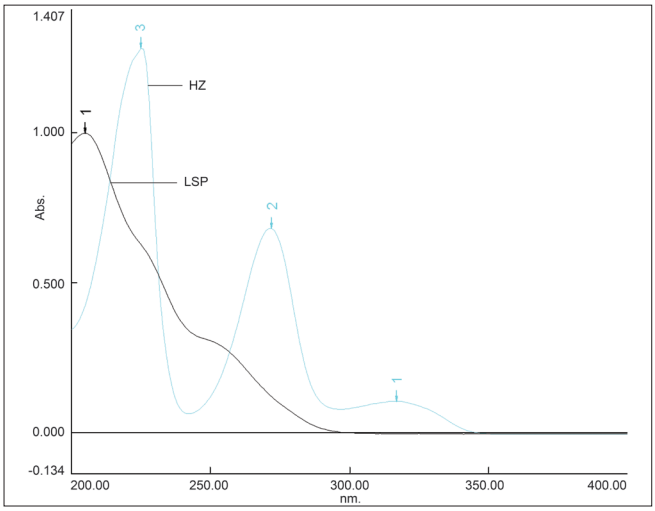

Figure 2: Overlain spectra of LSP (10 µg/ml) and HZ (10 µg/ml) for Q-analysis: Graphical absorbance ratio method

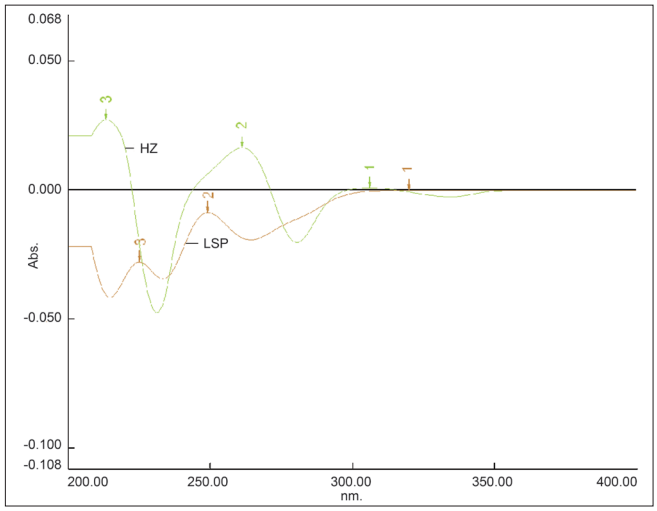

Figure 3: Overlain first derivative spectra of LSP (20 µg/ml) and HZ (5 µg/ml)

direct absorbance measurement for determination of both the drugs in their mixture. The Figure 1 represents that the λ_{max} for LSP at 218 nm and for HZ at 272 nm. The absorbance curve at the selected wavelengths were found to be proportional to the corresponding concentration of the two drugs in the range of 5–25 μg/ml for LSP and 1–20 μg/ml for HZ as shown by the small intercept and correlation coefficient approaching unity in the regression equation [Table 3]. The absorptivity values of the drugs were determined at selected wavelength. The absorptivity is the ratio of mean absorbance of the drug at selected wavelength with the concentration of component in mg/ml. These absorptivity values were the mean of six independent determinations. A set of two simultaneous equations obtained by using mean absorptivity values are given below:

$A_1 = 112\ C_{LSP} + 118\ C_{HZ}$ ---------- (at λ_{218})
$A_2 = 418.4\ C_{LSP} + 419.6\ C_{HZ}$ ---------- (at λ_{272})

Where A_1 and A_2 are absorbances of the sample at 218 nm and 272 nm, respectively. Here, 112 and 418.4 are the absorptivity values of LSP at 218 nm and 272 nm, respectively; 118 and 419.6 are the absorptivity values of HZ at 218 nm and 272 nm, respectively. C_{LSP} is the concentration of the LSP and C_{HZ} is the concentration of HZ in mg/ml.

The proposed Q analysis method is also a simple method. In this method, the absorbances of the sample solution at the two selected wavelengths were measured and few calculations were done.

The first derivative spectrophotometry method requires spectral data processing and hence can be applied only on recording spectrophotometers with such facilities. This method was employed to totally eliminate the spectral interference from one of two drugs while eliminating the other drug. This was achieved by selecting the zero crossing point on the derivative spectra of one drug as the wavelength for the estimation of other drug. First derivative method is simple, less time consuming, no manual calculation, and gives marginally better result than Q analysis method.

Validation of methods

The methods were validated with respects to linearity, limit of detection (LOD), limit of quantification, precision, accuracy, and selectivity/sensitivity.

For linearity, the calibration plots for each method were constructed after analysis of different concentration and each concentration was measured for six times. The regression equation and correlation coefficients of the mean of six consecutive calibration curves are given in [Table 3].

LOD (k = 3.3) and Limit of quantitation (LOQ) (k = 10) of the methods were established according to ICH definitions ($C_1 = k\ S_0/s$), where C_1 is LOD or LOQ, S_0 is the standard error of blank determination, s is the slope of the standard curve and k is the constant related to the confidence interval). The LOD, LOQ, and standard error of the methods are given in [Table 3].

Accuracy was investigated by analyzing three different

Table 1: Determination of LSP and HZ in tablet using the proposed methods

	Simultaneous equation method Recovery (%)±SD (*n*=3)		Graphical absorbance ratio method Recovery (%)±SD (*n*=3)		First derivative method Recovery (%)±SD (*n*=3)	
	LSP	HZ	LSP	HZ	LSP	HZ
Losar-h tablets	98.95±1.216	99.95±1.154	98.8±0.257	99.6±0.577	99.91±0.624	99.63±0.305
RSD %	1.228	1.154	0.260	0.579	0.69	0.307

S.D. – Standard deviation, RSD – Relative standard deviation; LSP – Losartan potassium; HZ – Hydrochlorothiazide

Table 2: Results of the application of the standard addition technique to the simultaneous determination of LSP and HZ in tablet by the proposed method (*n*=3)

Claimed amount taken (μg/ml)		% Level	Standard added (μg/ml)		Recovery of added standard (%)±SD					
					LSP			HZ		
LSP	HZ		LSP	HZ	SEM	Q- analysis	First derivative	SEM	Q- analysis	First derivative
20	5	80	12	3.2	99.01±1.216	99.91±0.577	99.98±0.305	99.62±1.154	99.88±0.257	99.93±0.624
20	5	100	15	4	99.09±1.116	99.23±0.567	99.46±0.3	98.99±1.16	99.99±0.307	99.89±0.62
20	5	120	18	4.8	99.08±1.3	99.86±0.577	99.49±0.299	99±1.164	99.98±0.254	99.92±0.6
			Mean (3x3)			99.66	99.64	99.30	99.95	99.91
			SD (3x3)			0.573	0.301	1.159	0.272	0.614

S.D. – Standard deviation, SEM – Simultaneous equation method, Q analysis – Graphical absorbance ratio method; LSP – Losartan potassium; HZ – Hydrochlorothiazide

Table 3: Data for calibration graph for LSP and HZ using simultaneous equation, graphical absorbance ratio method and first derivative method

	Simultaneous equation method	Graphical absorbance ratio method	First derivative method
LSP			
Slope	0.0698	0.0114	–0.0146
Intercept	0.0046	0.003	0.0127
Correlation coefficient	0.9999	0.9995	0.9992
Linearity range (μg/ml)	5–25	5–80	1–30
LOD (μg/ml)	0.38	0.5	0.1
LOQ (μg/ml)	1.2	1.6	0.3
HZ			
Slope	0.1056	0.0703	–0.001
Intercept	0.0177	0.0062	0.000
Correlation coefficient	0.9996	0.9996	0.9995
Linearity range (μg/ml)	1–20	1–25	1–40
LOD (μg/ml)	1.1	1.7	0.3
LOQ (μg/ml)	3.6	5.2	1

LSP – Losartan potassium; HZ – Hydrochlorothiazide; LOD – Limit of detection; LOQ – Limit of quantification

Table 4: Precision and accuracy of spectrophotometric method developed for analysis of tablet (n=6)

	Simultaneous equation method	Graphical absorbance ratio method	First derivative method
LSP			
Amount found (Mean % ± S.D.)	98.95 ± 1.216	98.8 ± 0.257	99.91 ± 0.624
Accuracy, Bias (%)	-1.0	-0.16	-0.08
Precision, RSD (%)	0.29	0.35	0.81
HZ			
Amount found (Mean % ± S.D.)	99.95 ± 1.154	99.6 ± 0.577	99.63 ± 0.305
Accuracy, Bias (%)	-0.6	-0.3	-0.3
Precision, RSD (%)	0.08	0.24	1.19

S.D. – Standard deviation, % Bias = [100(found-added)/added], RSD – Relative standard deviation; LSP – Losartan potassium; HZ – Hydrochlorothiazide

concentration of binary mixture of LSP and HZ in linear range in six independent replicates. The data evaluated using equations are summarized in [Table 4]. Accuracy was expressed as bias (%). The bias values were close to zero [Table 4]. The relative standard deviation (RSD) values and also the low RSD values obtained from the analysis of pharmaceutical formulations indicated that the intermediate precision of the method was good.

Conclusion

The proposed method based on simultaneous equation, graphical absorbance ratio and first order derivative methods can be used for the simultaneous determination of LSP and HZ either in their binary mixture form or alone in their tablet preparation. The proposed methods are precise, accurate, and simple to perform. Also, no separation step is required. Hence the proposed methods can be used for the routine analysis of LSP and HZ.

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References

1. Prabhakar AH, Giridhar R. A rapid colorimetric method for the determination of losartan potassium in bulk and in synthetic mixture for solid dosage form. J pharm Biomed Anal 2002;27:861-6.
2. Goodman LS, Gilman A. Diuretics. In: Goodman LS, Hardman JG, Limbird LE, Editors. The pharmacological basis of therapeutics. New York: Mc graw hill; 1986;10;773-84.
3. Lastra OC, Lemus IG, Sanchez HJ, Perez RF. Development and validation of an UV derivative spectrophotometric determination of losartan potassium in tablets. J Pharm Biomed Anal 2003;33:175-80.
4. Kolsure AK, Ingale SS, Abnawe SA, Chabukswar AR, Choudhari VP, Kuchekar BS. Spectrophotometric simultaneous determination of atorvastatin and losartan potassium in combined tablet dosage form by ratio derivative method. J Pharm Res 2010;3:2262-4.
5. Bonfiliol R, Favoretto LB, Pereira GR, Azevedo RC, Araujo MB. Comparative study of analytical methods by direct and first-derivative UV spectrophotometry for evaluation of losartan potassium in capsules. Braz J Pharm Sci 2010;46: 1-17.
6. Ansari M, Kazemipour M, Khosravi F, Badaran M. A comparative study of first-derivative spectrophotometry and high-performance liquid chromatography applied to the determination of losartan potassium in tablets. Chem Pharm Bull (Tokyo) 2004;52:1166-70.
7. Maio VM, Dos P, Dias CL, Bergold AM. Validation of an isocratic HPLC assay of losartan potassium in pharmaceutical formulations and stress test for stability evaluation of drug substance. Acta Farm Bonaer 2005;24:250-5.
8. Bonfilio R, Tarley CR, Pereira GR, Salgado HR, Araujo MB. Multivariate optimization and validation of an analytical methodology by RP-HPLC for the determination of losartan potassium in capsules. Talanta 2009; 80:236-41.
9. Mccarthy KE, Wang Q, Tsai EW, Dominic PI, Brooks MA. Determination of losartan and its degradates in COZAAR® tablets by reversed-phase high-performance thin-layer chromatography. J Pharm Biomed Anal 1998;17:671-7.
10. Williams RC, Alasandro MS, Fasone VL, Boucher RJ, Edwards JF. Comparison of liquid chromatography, capillary electrophoresis and super-critical fluid chromatography in the determination of Losartan potassium drug substance in Cozaar® tablets. J Pharm Biomed Anal 1996;14:1539-46.
11. Hillaert S, Bossche WV. Simultaneous determination of hydrochlorothiazide and several angiotensin-II-receptor antagonists by capillary electrophoresis. J Pharm Biomed Anal 2003;31:329-39.
12. Razak AO. Electrochemical study of hydrochlorothiazide and its determination in urine and tablets. J Pharm Biomed Anal 2004;34:433-40.
13. Atana ES, Altmay SA, Goger NG, Ozkanab SA, Senturk Z. Simultaneous determination of valsartan and hydrochlorothiazide in tablets by first derivative UV spectrophotometry and LC. J Pharm Biomed Anal 2001;25;1009-13.
14. Bhusari KP, Khedekar PB, Dhole S, Banode VS. Derivative and Q-analysis spectrophotometric methods for estimation of hydrochlorothiazide and olmesartan medoxomil in tablets. Indian J Pharm Sci 2009;71:505-8.

15. Erturk S, Cetin SM, Atmaca S. Simultaneous determination of moexipril hydrochloride and hydrochlorothiazide in tablets by derivative spectrophotometric and high-performance liquid chromatographic methods. J Pharm Biomed Anal 2003;33:505-11.
16. Prasad CV, Parihar C, Sunil K, Parimoo P. Simultaneous determination of amiloride HCl, hydrochlorothiazide and atenolol in combined formulations by derivative spectroscopy. J Pharm Biomed Anal 1998;17:877-84.
17. Dinc E, Ustunda O. Spectophotometric quantitative resolution of hydrochlorothiazide and spironolactone in tablets by chemometric analysis methods. Farmaco 2003;58:1151-61.
18. Joshi SJ, Pradnya A, Suvarna K, Bhoir I, Bindu KS, Das C. RP-HPLC method for simultaneous estimation of bisoprolol fumarate and hydrochlorothiazide in tablet formulation. J Pharm Biomed Anal 2010;52:362-71.
19. Huang T, He Z, Yang B, Shao L, Zheng X, Duan G. Simultaneous determination of captopril and hydrochlorothiazide in human plasma by reverse-phase HPLC from linear gradient elution. J Pharm Biomed Anal 2006;41:644-8.
20. Erk N. Simultaneous determination of irbesartan and hydrochlorothiazide in human plasma by liquid chromatography. J Chromatogr B Analyt Technol Biomed Life Sci 2003;784:195-201.
21. Nagavalli D, Vaidhyalingam V, Santha A, Sankar AS, Divya O. Simultaneous spectrophotometric determination of losartan potassium, amlodipine besilate and hydrochlorothiazide in pharmaceuticals by chemometric methods. Acta Pharm 2010;60:141-52.
22. Wankhede SB, Raka KC, Wadkar SB, Chitlange SS. Spectrophotometric and HPLC methods for simultaneous estimation of amlodipine besilate, losartan potassium and hydrochlorothiazide in tablets. Indian J Pharm Sci 2010;72:136-40.
23. Sathe SR, Bari SB. Simultaneous analysis of losartan potassium, atenolol and hydrochlorothiazide in bulk and in tablets by high-performance thin-layer chromatography with UV absorption densitometry. Acta chromatogr 2007;19:270-8.
24. Erk N. Analysis of binary mixtures of losartan potassium and hydrochlorothiazide by using high performance liquid chromatography, ratio derivative spectrophotometric and compensation technique. J Pharm Biomed Anal 2001;24:603-11.
25. Carlucci G, Michel C, Jens T, Rainer P. Simultaneous determination of Losartan potassium and hydrochlorothiazide in tablet by high performance liquid chromatography. J Chromatogr B 2008;865:74-80.
26. Hertzog D, Richard G, Stopher DA. Development and validation of a stability indicating HPLC method for simultaneous determination of Losartan potassium and Hydrochlorothiazide. J Pharm Biomed Anal 1998; 17:1449-53.
27. Patel LJ, Suhagia BN, Shah PB, Shah RR. Simultaneous determination of Losartan potassium and hydrochlorothiazide in tablet dosage forms by RP-HPLC method. Indian J Pharm Sci 2006;68:631-5.
28. Suhagia BN, Shah RR, Pate DM. Development of RP-HPLC method for Losartan potassium and Hydrochlorothiazide. Indian J Pharm Sci 2005;67:37-42.
29. Suhagia BN, Srinubabu G, Ch Raju AI, Sarath N, Kumar PK, Rao JS. Development of a RP-HPLC method for evaluating Losartan potassium and hydrochlorothiazide tablets in pharmaceutical formulation using an experimental design. Talanta 2007;71:1424-9.
30. Suhagia G, Patel BH, Patel RJ. Determination of Losartan potassium, captopril, hydrochlorothiazide in pharmaceutical products by reversed phase liquid chromatography using single mobile phase. Chromatogr 2004;65;743-8.
31. Gandhimathi G, Vikram K, Baskaran A, Ravi TK. Simultaneous estimation of losartan potassium and hydrochlorthiazide in combination. Indian J Pharm Sci 2001;63:165-6.
32. Shankar MB, Mehta FA, Bhatt KK, Mehta RS, Geetha M. Simultaneous spectrophotometric determination of Losartan potassium and hydrochlorothiazide in tablets. Indian J Pharm Sci 2003;65:167-70.

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