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Derivative Zero and First order UV spectrophotometric method for quantification of Losartan Potassium

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Abstract: *Losartan potassium (LOS) consistently lowers blood pressure and tolerably reduces blood pressure. It lowers blood pressure by blocking the angiotensin II hormone's action at the AT1 receptor, which narrows blood vessels and reduces the amount of water the kidneys can excrete. Many methods have been developed to date for the purpose of measuring Losartan in pharmaceutical dose form and in bulk. Among the analytical methods employed in the pharmaceutical industry is visible spectrophotometry. One analytical method utilised in the pharmaceutical industry is spectrophotometry. Losartan potassium has been measured with extreme precision and sensitivity using a fast, ultraviolet spectrophotometry, which has been developed and verified in this study. Using distilled water and 0.1N sodium hydroxide in a 3:7 ratio as a diluent, the λmax for the working standards was found to be 205 nm for Losartan Potassium (LOS) for zero order and 250 nm for first order derivative methods. The parameters were judged to be satisfactory. The results of the analysis were checked for LOD, LOQ, accuracy, and precision. The method that was developed can be applied to regular analysis.*

Keywords: *Losartan Potassium (LOS), Derivative spectroscopy, Zero order and First order.*

Introduction

The chemical name for Losartan Potassium is [2-butyl-5-chloro-3-[[4-[2-(1, 2, 3-triaza-4-azanidacyclopenta-2, 5-dien-5-yl) phenyl] phenyl] methyl] imidazole-4-yl] methanol and its molecular weight 461 g.

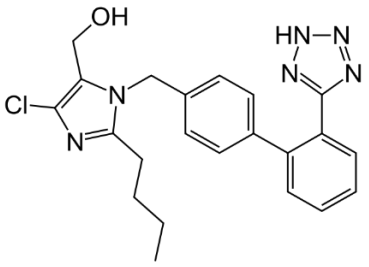

Fig 1: Structure of Losartan potassium

It is used either on its own or in conjunction with other drugs to treat excessive blood pressure. It lowers blood pressure, which reduces, chance of cardiovascular deaths, nonfatal heart attacks events, notably strokes and myocardial infarctions. These drugs lowers blood pressure by inhibiting Angiotensin-II at AT1 receptor, a hormone that contracts blood vessels and reduces water excretion through the kidneys. Adverse effects include Nausea, Hypotension/orthostatic hypotension, Asthenia, Fatigue, Muscle spasm, Dizziness and Cough.

The scope of present investigation were to develop[1] and validate[2] derivative (Zero & first order) [3] spectroscopy method for qualitative and qualification of Losartan Potassium in pharmaceutical dosage form. Literature survey reveals,

Losartan Potassium can be estimated by, RP-HPLC[9-12], LC-MS[13,14] and few Spectroscopic[4-8] methods. However, to the best of our knowledge, no derivative UV-spectrophotometric methods were reported for estimation of Losartan Potassium using.

MATERIAL AND METHODS

Materials

The reference standard of Losartan Potassium API were procured from local market. Sodium hydroxide and water are used as reagents were of analytical grade. 0.1N Sodium hydroxide and distilled water in a ratio of 3:7 as a diluent.

Instruments

Shimadzu UV-1800 double beam spectrophotometer connected to a computer loaded with Shimadzu UV Probe 2.34 software was used for all the spectrophotometric measurements. In 1cm quartz cells, absorbance spectra of reference and test solutions, measured over the 200–400 nm range.

Preparation of stock solution

Standard stock solution LOS (1000µg/ml) were prepared by dissolving 25 mg of drug in 3ml of 0.1N NaOH and make up to 25 ml with distilled water individually. Working standard solution: 100µg/ml was prepared by transferring 2.5 ml from stock solution to a 25 ml volumetric flask and dilute up to 25 ml with distilled water individually. Appropriate and Stock solution aliquots with precise volumes were transferred to 10-milliliter calibrated flasks and filled to capacity with distilled water.

Preparation of sample solution

Weigh20 tablets, LOS with label claim of 40 mg and 50 mg and powdered each drug individually. Then transfer the analyte equivalent to 25 mg into 25 ml volumetric flask and add 3 ml of 0.1 N sodium hydroxide add 7 ml of distilled water and sonicate for 5 minutes. Filter through 0.45µ Whatmann filter paper and make up to 25 ml with distilled water. Secondary stock solution was prepared by taking 2.5 ml solution from primary stock solution in to the 25 ml volumetric flask and made up to the mark with water to produce 100 µg/ml. From this 12 µg/ml and 5 µg/ml were prepared by transferring 1.2 ml and 0.5 ml from secondary stock solution to a 10 ml volumetric flask and dilute up to 10 ml with distilled water respectively.

Zero order UV derivative spectroscopic method[3]

Prepare a series of dilutions in the concentration range of 4-20 and 1-9 µg/ml were scanned in the wavelength range of 200-400 nm using distilled water as blank. The UV spectrum of LOS showed their λmax at 205 nm.

Preparation of calibration curve

Absorbance 205 nm was plotted against the respective concentration. The method shows good linearity range 1-9 µg/ml for LOS.

First-order UV derivative spectroscopic method[3]

It involves the conversion of the normal spectrum into first derivative spectrum. Spectra were derivatized using first order, delta lambda 16000 and scaling factor 10. The first order derivative spectrum of (LOS) showed a sharp peak at 250 nm respectively. The absorbance difference at n = 1 (dA/dλ) was calculated. The amplitudes were measured for all the solutions and plotted against concentration to get calibration curve. Laboratory prepared mixtures and pharmaceutical formulations were successfully analyzed using the developed method.

Preparation of calibration curve

The amplitudes at 250 nm were plotted against the respective concentration LOS. The method shows good linearity range of 1-9 µg/ml for LOS.

RESULTS

Linearity and Range

LOS showed linearity within the range of concentration for 1-9 µg/ml with correlation co-efficient, slope and intercept 0.0151, 0.0906, 0.0053 and 0.9996 for Zero order, 0.0056, 0.0017 and 0.9995 for first order derivative method.

Precision

Inter-day and intra-day precision for Zero and First-order Derivative Spectroscopic Method were calculated in terms of %RSD. Three times a day, the experiment was conducted again. for intra-day and on 3 different days for inter-day precision.

Accuracy

Accuracy of the method was confirmed by recovery study form marketed formulation at three levels of concentration i.e. 50%, 100%, and 150% of label claim by standard addition technique. Recovery greater than 90% with low SD justified the accuracy of the method.

LOD and LOQ

Calibration study was repeated for 5 times and standard deviation (SD) of the intercepts was calculated.

LOD =3.3*SD/slope of calibration curve

LOQ= 10*SD/ slope of calibration curve

SD= standard deviation of intercepts.

Analysis of marketed formulation

Applicability of the suggested technique was examined by analyzing the commercially available samples.

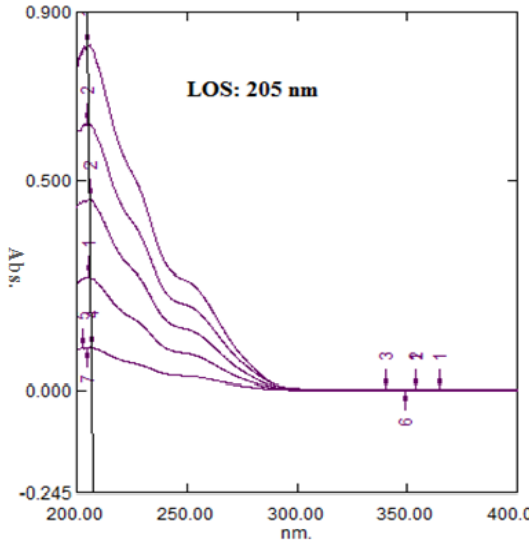

Figure 2: Zero order absorption spectra of Losartan

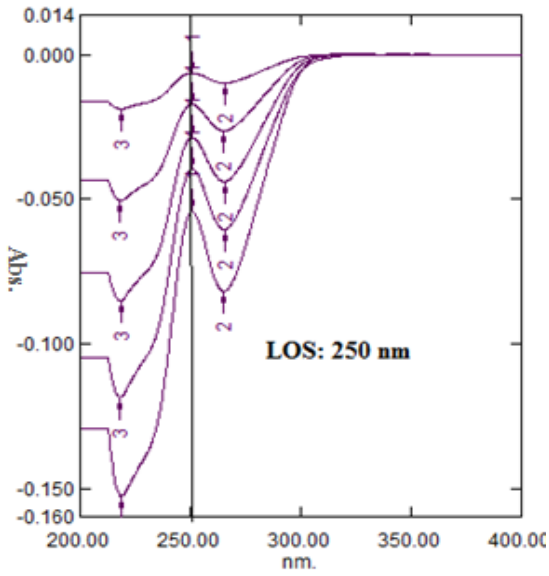

Figure 3: First order absorption spectra of Losartan

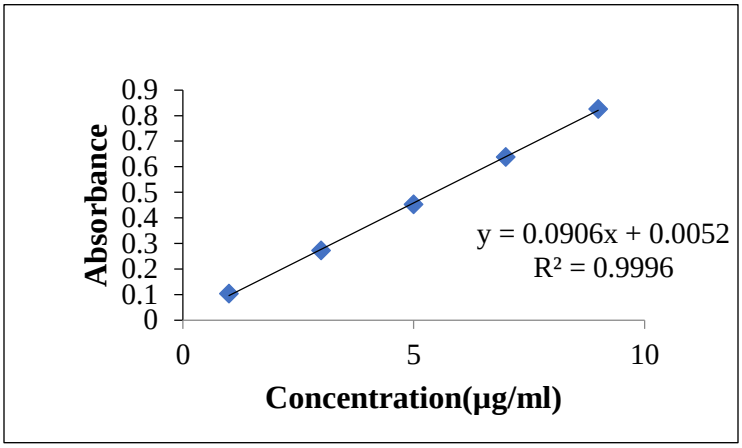

Figure 4: Calibration curve of LOS (Zero order)

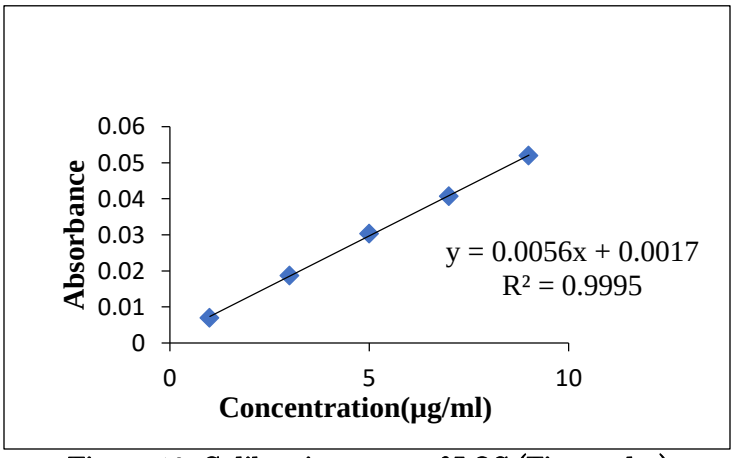

Figure 10: Calibration curve of LOS (First order)

Table 1: Zero and First order derivative spectroscopic methods Validation parameters

Parameters assessed	Zero order	First order
	LOS	LOS
Beer's law range (µg /ml)	1-9	1-9
Wavelength (nm)	205	250
Correlation Coefficient (r^2)	0.0906	0.0056
Slope	0.0053	0.0017
Intercept	0.9996	0.9995
LOD	0.06	0.51
LOQ	0.20	1.45
Intra-day precision(%RSD)	0.48	1.03
Inter-day precision(%RSD)	0.67	1.56

Table 2: Recovery studies

Derivative spectroscopic method	% addition of label claimed	Amount of standard added (µg/ml)	Obtained amount (µg/ml)	Recovery%±SD
Zero order LOS	50	1	6.21	103.5±0.26
	100	2	7.23	103.38±0.32
	150	3	8.109	101.36±0.25
First order LOS	50	1	6.243	104.05±0.26
	100	2	7.302	104.315±0.15
	150	3	8.344	104.31±0.30

*Amount of LOS in the pre-analyzed samples is 5 µg/mL.

Table 3: Results of Assay of formulation by Zero and First derivative spectroscopic methods

Method	Drug	Labeled claim	Amount obtained	% Found*±SD
Zero order	LOS	50 mg	50.62	101.24±0.32
First order	LOS	50 mg	50.65	101.3±0.15

*Average of three experiment

Conclusion

The analysis of Losartan Potassium (LOS) in each dosage form was accomplished through the development and validation of Derivative Spectrophotometric (Zero & First order) techniques. Losartan potassium (LOS) can be routinely analysed in quality control laboratories using the developed spectrophotometric methods, which were validated in accordance with ICH criteria and were found to be accurate, precise, and cost-effective. The study's findings demonstrate how various solvents affect the spectrum properties of significant organic compounds used in pharmaceuticals. The method selectivity and reproducibility for the analysis are demonstrated by statistical analysis. Common solvents were used in this work to validate a UV spectrometric approach for the determination. The outcomes showed that the procedures are reliable, fast, affordable, fast, accurate, and exact when it comes to the assay of losartan potassium (LOS).

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