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DEVELOPMENT AND VALIDATION OF UV SPECTROPHOTOMETRIC METHOD FOR THE ESTIMATION OF QUINAPRIL HYDROCHLORIDE IN BULK AND IN ITS FORMULATION

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ABSTRACT

A simple, precise and accurate difference spectroscopic method has been developed for the estimation of Quinapril Hydrochloride in bulk drug form by difference spectrophotometric method. Quinapril Hydrochloride has exhibited maximum absorbance at about 207nm and 222nm in acidic and basic solution respectively. Beer's law was obeyed in the concentration range of 2-10 µg/ml in both the cases. The regression of coefficient was found to be r^2=0.996. The LOD and LOQ value were found to be 0.766 ppm and 2.324 ppm respectively. The proposed method was successfully applied for the determination of Quinapril Hydrochloride in bulk drug. As per ICH guidelines the result of the analysis were validated statistically and were found to be satisfactory.

KEWORDS: Quinapril Hydrochloride, Validation, Hypertension, Spectrophotometer.

INTRODUCTION

Quinapril Hydrochloride, [3S-[2[R*(R*)],3R*]]-2-[2-[[1(ethoxycarbonyl)-3phenylpropyl] amino] -1oxopropyl]1,2,3,4 tetra hydro3isoquino-linecarboxylic acid, monohydrochloride. It is (ACE) inhibitor class of medications acting on cardiovascular system and used as an antihypertensive drug. It is a ACE inhibitor and indicated in treatment of symptomatic treatment of high blood pressure and used with some other drugs in combination therapy[1].

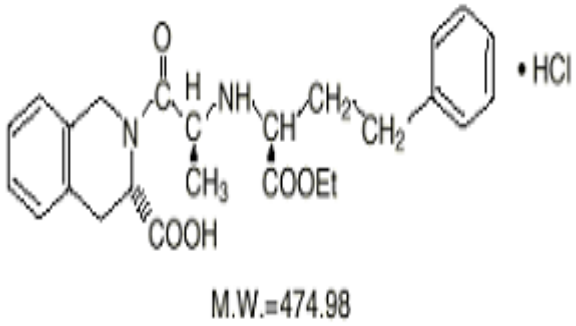

Figure 1:- The structural formula of quinapril hydrochloride.

Chemical name: 2-(S)-[N-[[1-ethoxycarbonyl]-3-phenylpropyl]-(S)-alanyl]-1,2,3,4 tetrahydro-3-(S)-isoquinoline carboxylic acid, monohydrochloride.

Molecular formula: C25H30N2O5.HCl.

Molecular weight: 474.98.

Objective

Quinapril hydrochloride shows improved absorbing interference by the technique of different spectrophotometry. Thus the objective of the present study was to develop new analytical difference spectrophotometry method and its validation parameters for the proposed method according to ICH guidelines for the estimation of Quinapril hydrochloride bulk drug.[2, 3, 4]

MATERIALS AND METHODS

Chemical and reagents

Quinapril hydrochloride [bulk drug] used were of analytical reagent grade purchased from research lab fine chem. industries Mumbai, India, NaOH and HCL were purchased from Poona chemical laboratory and double distilled water was used throughout the analysis.

Instrumentation

A shimadzu 1800 UV/VIS double beam spectrophotometer with 1cm matched quartz cells was used for all spectral measurements.

Selection of common solvents

1N HCL and 1N NaOH were selected as a common solvent for developing spectral characteristics of drug.

Preparation of solution

Standard stock solution containing Quinapril hydrochloride was prepared by dissolving 10mg in 100ml Then take 1ml of that and dissolve in 10ml of Water and then diluted with 1N NaOH and 1N HCL separately to get series of dilution ranging from 2-10 µg/ml and then absorbance recorded at 222 nm and 207 nm respectively against reagent blank. Calibration curve was prepared by plotting concentration versus difference in absorbance and found to be linear in the concentration range of 2-10 µg/ml.[2, 3, 4]

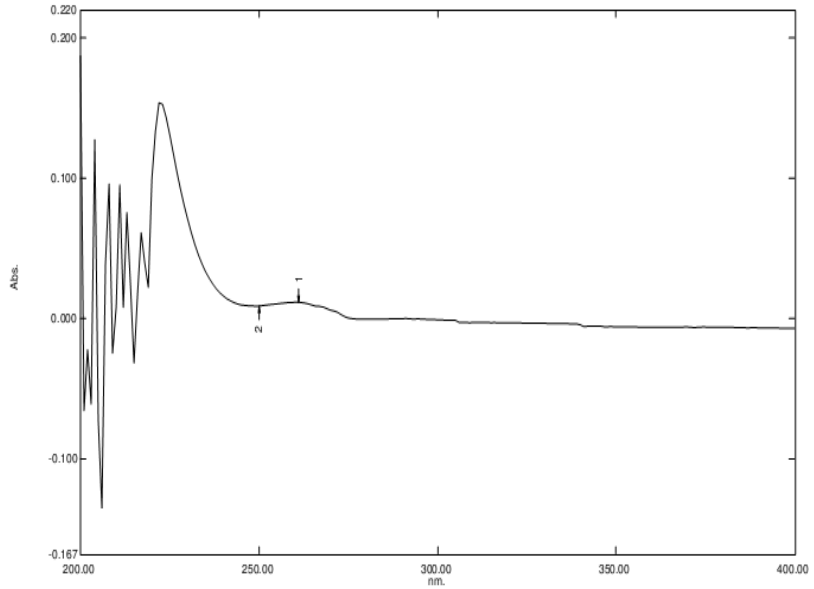

Figure 2:- 1N NaOH with λMax 222nm.

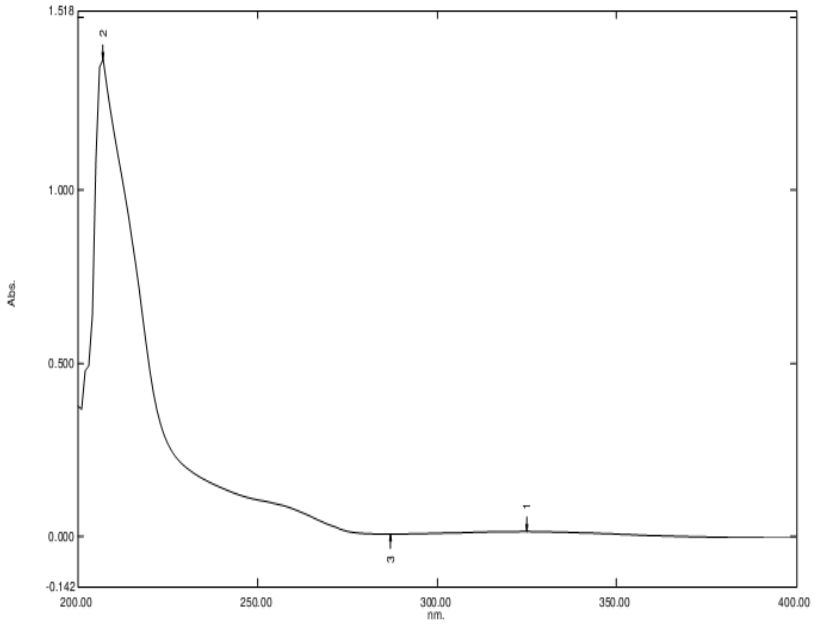

Figure 3:- 1N HCL with λMax 207nm.

Validation[2, 5, 6, 7, 8, 9]

The proposed method was validated according to ICH (Q2) R1 guidelines for validation of analytical procedures. As per the ICH guidelinesthe method validation parameters checked were Selectivity, linearity, precision and accuracy.

Table 1:-Validation Parameter for Quinapril.

Parameter	Quinapril
Measured wavelength	222nm
Linearity range	2-10 µg/ml
Slope	0.011
Intercept	0.003
Method Precision % RSD	0.4168
Correlation coefficient	0.996

Selectivity

The selectivity of the method was assessed by analysing standard drug, and pharmaceutical product, comparing the maxima and minima of the standard with that of the sample to determine whether the pharmaceutical product and excipient lead to interfere in the estimation.

Limit of Detection and Limit of Quantification

The Limit of Detection (LOD) is the smallest concentration of the analyte that gives the measurable response. LOD was calculated using the following formula LOD = 3.3 σ /S.

The Limit of Quantification (LOQ) is the smallest concentration of the analyte, which gives response that can be accurately quantified. LOQ was calculated using the following formula LOQ = 10 σ/S.

Where, σ is standard deviation of the response and S is the slope of the calibration curve.

LOD& LOQ of Quinapril hydrochloride was found to be 0.7669µg/ml & 2.324µg/ml respectively.

Linearity

Different volumes of stock solutions were suitably diluted with corresponding medium (2, 4, 6, 8, and 10 µg/ml) to get the desired concentrations. Each solution was analysed in triplicate. The amplitude values were plotted against the corresponding concentrations to obtain the linear calibration curve.[10, 11]

Table 2:- Linearity of Quinapril hydrochloride by difference spectrophotometry.

S. No	Concentration Of Quinapril hydrochloride (µg/ml)	Absorbance at 222 nm (1N NaOH)	Absorbance at 207 nm (1N HCl)	Difference in absorbance
1	2	0.098	0.127	0.029
2	4	0.123	0.172	0.049
3	6	0.159	0.228	0.069
4	8	0.187	0.278	0.091
5	10	0.223	0.338	0.115

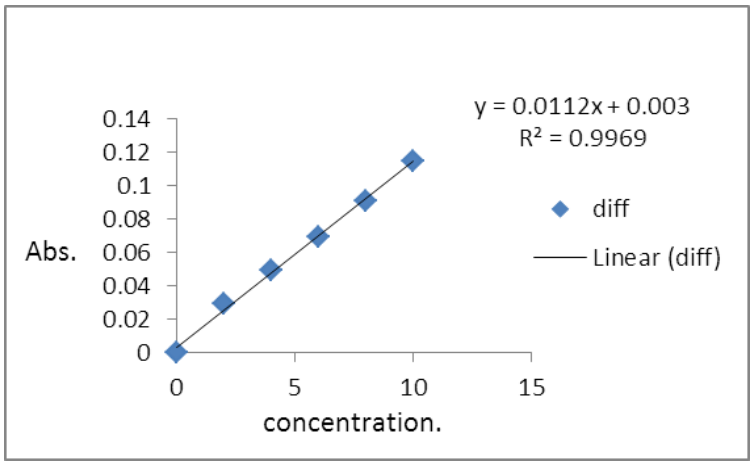

Figure 4:- Showing linearity of Quinapril hydrochloride.

Range: 2-10 µg/ml.

Precision

Precision of analytical methods were expressed in relative standard deviation (RSD) of a series of measurements. The intra-day and inter-day precisions of the proposed methods were determined by estimating the corresponding responses (i.e. three concentrations / three replicates each) of the sample solution on the same day and on three different days respectively. Precision was calculated as inter-day and intra-day coefficient of variation [11].

Table 3:- Precision study of 1N HCL.

Drug	Conc. [µg/mL]	Trial	Trial	Trial	SD	%RSD
Quinapril	4	0.172	0.189	0.178	0.008622	4.81658
Quinapril	6	0.228	0.221	0.239	0.009074	3.962346
Quinapril	8	0.278	0.276	0.278	0.001155	0.416859

Table 4:- Precision study of 1N NaOH.

Drug	Conc. [µg/mL]	Trial	Trial	Trial	SD	%RSD
Quinapril	2	0.123	0.131	0.128	0.004041	3.182246
Quinapril	4	0.159	0.15	0.162	0.006245	3.977706
Quinapril	8	0.187	0.182	0.191	0.004509	2.424328

Accuracy

The accuracy of the method was determined by recovery experiments. A known amount of standard Quinapril hydrochloride corresponding to 2, 4, 6 and 8, 10% of the label claim (standard addition method) was added to reanalysed sample of tablet. The recovery studies were carried out in triplicate at each level [11].

Table 5:- Accuracy study.

Standard concentration [µg/mL]	Difference in Abs $\times 10^2$	found concentration [µg/mL]	Recovery %
2	0.029	2.321429	116.0714
4	0.049	4.107143	102.6786
6	0.069	5.892857	98.21429
8	0.091	7.857143	98.21429
10	0.115	10	100

Ruggedness

The ruggedness of an analytical method is degree of reproducibility of test results obtained by the analysis of the same samples under a variety of normal test conditions, such as different laboratories, different analysts, different instruments, different lots of reagents, different elapsed assay times, different assay temperatures, different days etc.[11]

Table 6:- Ruggedness study.

Sr. No	Parameter	Set 1	Set 2
1	System	Shimadzu 1800	Shimadzu 1800
2	Sample	Batch No-X	Batch No-Y
3	Day	Friday	Saturday
4	Date	19/12/2014	20/12/2014
5	Time	2.30pm	2.30pm
6	Lab	Analysis	Chemistry
7	Analyst	01/07	12/07
8	Sample	10ppm	10ppm
9	Absorbance	0.459	0.454
10	Assay	100.43%w/w	100.44%w/w

Robustness

The evaluation of robustness should be considered during the development and development is on the type of procedure under study. Robustness of the method was checked by making slight deliberate changes in selected conditions like change in wavelength. It was observed that there were no marked changes in chromatograms, which

demonstrated that the developed method is robust. Instruments are susceptible to variations in analytical conditions, should be suitability controlled or a precautionary statement should be including in the procedure.[11]

Table 7:- Robustness study.

Sr No	Concentration	Wavelength	Absorbance	Result
1	10ppm	212	0.459 0.456 0.462	Mean= 0.459 S.D=0.003 %RSD=0.65
2	10ppm	220	0.468 0.482 0.471	Mean=0.473 S.D=0.007 %RSD=1.479

RESULT AND DISCUSSION

The optical characteristics such as Beer's law limits, percent relative standard deviation and percent range of error were found to be within the limit and satisfactory. All of the analytical validation parameter for the proposed method was determined according to ICH guidelines. The method was found to provide high degree of precision and reproducibility.

The recovery studies showed that the result were within the limit indicating no interference. The proposed method is simple, sensitive, accurate and precise and can be successfully employed for the routine analysis of the Quinapril hydrochloride in bulk drug.

CONCLUSION

UV method is developed for the Quinapril hydrochloride by using UV Spectrophotometer Shimadzu 1800 UV/VIS double beam spectrophotometer with 1cm matched quartz cells The developed method is applied for the Quinapril hydrochloride from tablet form. The assay is within the limit. The developed method is validated with various parameters as per ICH guidelines like accuracy, precision, linearity, ruggedness and robustness. All the results obtained are within the acceptance criteria. Hence the developed method is found to be satisfactory and would be used for the routine analysis in the laboratory for Quinapril hydrochloride in pharmaceutical formulation.

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REFERENCES

1. Reema Jaiswal, Pinak patel development and validation of rp-hplc method for simultaneous estimation of quinapril Hcl and hydrochlorthiazide in combined pharmaceutical formulation Int, Jou. of Pharma Research & Dvt, September 2013; 5(07): (045 – 056) 45.
2. Jin Y, Chen H, Gu S, Zeng F.; Determination of aceclofenac in human plasma by reversed-phase high performance liquid chromatography. Chinese J. Chromatography, 2004; 22(3): 252 – 254.
3. Srinivasan KK, Shirwaikar A., Joseph A., Jacob S., Prabu SL. Simultaneous estimation of aceclofenac and paracetamol in solid dosage form by ultraviolet spectrophotometry. Indian Drugs, 2006; 43(2): 141 – 145.
4. Shanmugam S., Cednil Kumar A., Vetrichelvan T., Manavalan R., Venkappyya D., Pandey VP. Spectrophotometric method for estimation of aceclofenac in tablets. Indian Drugs, 2005; 42(2): 106 – 107.
5. Validation of analytical procedure: text and methodology, ICH Harmonized Tripartite Guideline, Q2 (R1), 2005; 1-3.
6. N. sultana, M.S. Arayne, S.Shamim, M. Akhtar and S.Gul., J. Braj Chem Soc., 2011; 22(5): 987.
7. Practical pharmaceutical chemistry by A.H. Beckett, J.B. Stenlake. Fourth edition Part-second 293-296.
8. International Conference on Harmonisation. Draft Guideline on Validation of Analytical Procedures: Definitions and Terminology, Federal Register, 1995; 60: 11260.
9. SB. Jadhav*, NA. Patil, AM. Tamboli, SM. More and SA. Shaikh Difference Spectroscopic Method for the Estimation of Amlodipine Besylate in Bulk and in Formulation. Inter. Journal. of Pharm. & Chem. Sciences, Jul-Sep 2013; 2(3): 1213-1217.
10. Baokar Shrikrishna, Pawar Vinod, Sonawane S.H., High Performance Liquid Chromatographic Method Development and Validation of Cholesterol Inhibitor Drug. Journal of Pharmacy Research, 2011; 4(7): 2313-2316.
11. Shrikrishna B. Baokar, B. Shirke, V. Sivanand, G.K. Pratheesh, Analytical method development and validation for esteemation of sildenafil citrate from tablet dosage form by RP-HPLC, Int. J. Res. Phar.Sci, 2011; 2(2): 130-136.