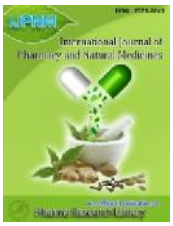
International Journal of Pharmacy and Natural Medicines

Journal Home Page: www.pharmaresearchlibrary.com/ijpnm



Research Article **Open Access**

UV Spectroscopic Method for Estimation of Enalapril Maleate in Bulk and in its Tablets

B. Mohammed Ishaq*, S. Muneer, S. Praveena, B. Famida, Hindustan Abdul Ahad

Department of Pharmaceutical Analysis, Balaji College of Pharmacy, Anantapur, A.P, India.

A B S T R A C T

A simple, rapid and sensitive UV spectrophotometric method was developed for the estimation of Enalapril maleate (EMT) in pharmaceutical dosage forms. This method employs solving of % assay based on the measurement of absorbance in distilled water at the λ max values of EMT. Calibration curve was linear in the range of 5-40 µg/ml for EMT. A recovery study for EMT was performed and the mean percentage recovery for the drug was obtained in the range of 99-101%. The method showed good reproducibility and recovery with % RSD less than 2. The proposed method can be successfully applied for the determination of EMT in pharmaceutical formulations and is validated according to ICH guidelines. The proposed method can be used successfully for routine analysis of the drug in bulk and combined pharmaceutical dosage forms.

Keywords: Enalapril maleate, UV spectrophotometric method, distilled water, ICH guidelines

A R T I C L E I N F O

CONTENTS

Article History: Received 10 December 2014, **Accepted** 12 February 2014, **Available Online** 15 June 2015

***Corresponding Author**
B. Mohammed Ishaq
Dept. of Pharmaceutical Analysis,
Balaji College of Pharmacy,
Anantapur, AP, India.
Manuscript ID: IJPNM2145

PAPER-QR CODE

Citation: B. Mohammed Ishaq, *et al.* UV Spectroscopic Method for Estimation of Enalapril Maleate in Bulk and in its Tablets. *Int. J. Pharm. Natural Med.*, 2015, 3(1): 209-212.

1. Introduction

Chemically Enalapril is ((2S) -1- [(2S)- 2- {[(2S)- 1-ethoxy -1- oxo- 4- phenyl butan-2- yl] amino} propanoyl] pyrrolidine-2-carboxylic acid). Figure 1 show the chemical structure of EMT. It is Antihypertensive agent and angiotensin Converting Enzyme Inhibitor. Mechanism of action of Enalapril Maleate is in following way: ACE inhibitors bind to and inhibit the activity of both functionally active domains, N and C, which arise from tandem gene duplication Enalaprilat, the principle active metabolite of Enalapril, competes with ATI (Angiotensin 1) for binding to ACE and inhibits and enzymatic proteolysis of ATI to ATII. Decreasing ATII (Angiotensin 2) levels in the body decreases blood pressure by inhibiting the presser effects of ATII. Enalapril also causes an increase in plasma renin activity likely due to a loss of feedback inhibition mediated by ATII on the release of renin. [1 and 2]

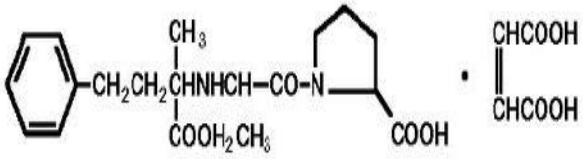


Figure 1: Chemical structure of Enalapril Maleate

The few reported methods in the literature for the determination of Enalapril were high-performance liquid chromatography (HPLC) [3,-8], FT-IR spectroscopy [9 and 10], capillary electrophoresis [11 and 12], nuclear magnetic resonance spectroscopy (NMR) [13 and 14] and gas chromatography [15]. The aim of the present investigation was to develop accurate, rapid and reproducible method for determination of Enalaprilat in pharmaceutical preparations.

2. Materials and Methods

PG instruments, T60 UV-Vis spectrophotometer with quartz cells (l=1 cm) was used for all absorbance measurements. A vibration shaker IKA-Werke type VX2 and ultrasonic bath were also used.

Chemicals and reagents:

Pharmaceutical grade Enalapril was supplied as a gift sample byMSN Laboratories Hyderabad, India. Distilled water was prepared inhouse using Milli-Q water filtration system. Sodium hydroxide, HCl and H_2O_2 was purchased from SD Fine chem., Mumbai. All the reagents were used AR grade.

Preparation of stock solution:

100 mg of pharmaceutical grade EMT was weighed and dissolved in distilled water in a 100 ml volumetric flask. The final volume was made upto the mark with the same to get 1 mg/ml primary stock solution. The resulting solution was slightly acidified with a drop of concentrated HCl. From the above stock solution 2 ml was further diluted with water in a 100 ml volumetric flask. The final volume was made upto the mark with the same. The required working standards for linearity were prepared from the primary stock solution.

Preparation of working standards (Assay of dosage forms):

200.0 mg of tablet powder was dissolved in 10 ml of mobile phase in a 10 ml volumetric flask. The solution was sonicated for 5 min and filtered if necessary. 0.2 ml aliquot was further diluted to 10 ml with the same to get 20µg/ml concentration.

Validation of method:

The proposed UV method was validated as per ICH guidelines.

3. Results and Discussion

Physico Method development:

In the present work the drug Enalapril maleate was scanned in 200-400 nm. The λ_{max} was found to be 229 nm. A representative spectrum of λ_{max} of EMT was shown in Fig. 2. The developed method was validated as per ICH guidelines.

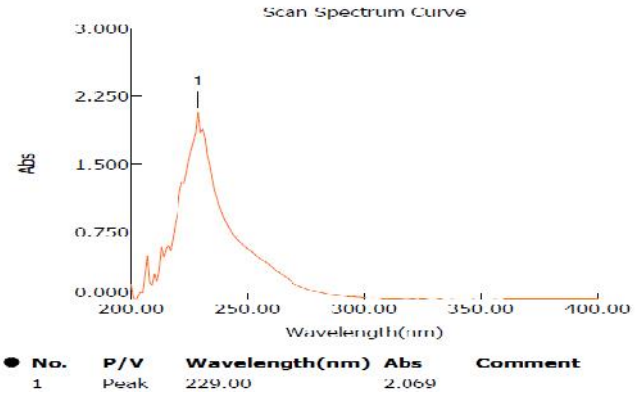


Figure 2: Representative spectrum of λ_{max} of EMT

Method validation:

To confirm the suitability of the method for its intended purpose, the method was validated in accordance with ICH guidelines [16 and 17], for linearity, limit of detection (LOD), limit of quantification (LOQ), accuracy, precision, and specificity.

Linearity:

EMT showed linearity in the concentration range of5–40µg/mL. The regression equation obtained was Y=0.0217x+0.0465 and R^2 = 0.9974. Figure 3 shows the calibration curve of EMT.

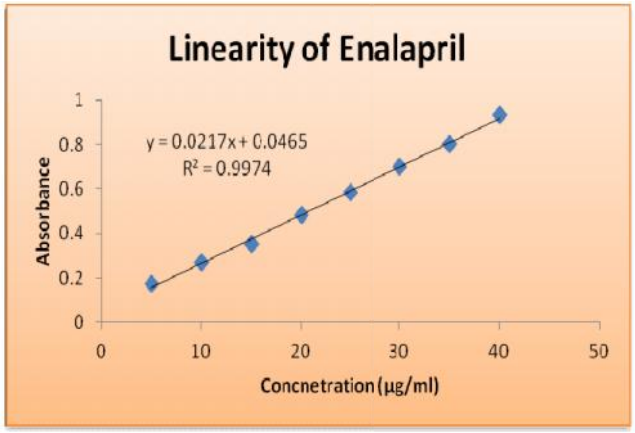


Figure 3: Calibration curve of Enalapril

Limits of detection and quantification:

The LOD was defined as the lowest concentration of EMT resulting in a signal-to-noise ratio of 3:1 and LOQ was expressed as a signal-to-noise ratio of 10:1. The LOD and LOQ obtained were 0.537 and1.790 µg/ml, respectively.

Accuracy:

Accuracy of the method was determined by performing the recovery experiments. Known amount of the standard at 50%, 100% and 150% levels was fortified to the degradation sample. Peak area of the standards was calculated by the difference of peak area between fortified and unfortified samples. Six replicate samples of each concentration level were prepared and the percentage recovery at each level (n=6) was determined For EMT, the results obtained are in good agreement with the added amounts. The results were shown in table 1.

Precision:

Intraday and interday precision was evaluated by injecting six different replications of 20 µg/mL of EMT. For intra-day variation, sets of six replicates of the optimized concentrations was analyzed on the same day; for inter- day variation, six replicates was analyzed on six different days. The intra-day and inter-day precision (% RSD) was found to be less than 2%. The results was shown in table 3, indicating that the method was precise.

Table 1: Results of Precision

S. No	Absorbance
1	0.478
2	0.469
3	0.469
4	0.475
5	0.477
6	0.473
Average	0.4735
SD	0.003886
%RSD	0.82067

Specificity:

Specificity is the ability to measure accurately and specifically the analyte of interest in the presence of other components that may be expected to be present in the sample matrix. The λmaxspectrum of specificity for the method is illustrated in figure 2, which shows that the method was specific.

Assay:

The Developed UV method was applied for the analysis of EMT in tablet dosage form.The mean % purity of the tablets was found to be 100.0 %.The results of Assay were shown in table 3.

Table 2: Results of the Assay

S. No	Absorbance	Assay
1	0.478	100.9504
2	0.469	99.04963
3	0.469	99.04963
4	0.475	100.3168
5	0.477	100.7392
6	0.473	99.8944
Average		100
SD		0.82067
%RSD		0.82067

Table 3: Results of Accuracy

% Concentration	Absorbance	µg/ml added	µg/ml found	Recovery	Mean Recovery	% Mean Recovery
50	0.245	10	10.35	103.48	101.65	100.43
	0.239	10	10.10	100.95		
	0.24	10	10.14	101.37		
	0.244	10	10.31	103.06		
	0.247	10	10.43	104.33		
	0.229	10	9.67	96.73		
100	0.473	20	19.98	99.89	100.25	
	0.475	20	20.06	100.32		
	0.476	20	20.11	100.53		
150	0.69	30	29.14	97.15	99.40	
	0.751	30	31.72	105.74		
	0.677	30	28.60	95.32		
	0.678	30	28.64	95.46		
	0.679	30	28.68	95.60		
	0.761	30	32.14	107.15		

4. Conclusion

The proposed UV method was proved to be simple, accurate, precise, specific and selective for quantitative analysis of EMT. Hence this can be useful as anassay method for the determination of Enalapril in bulk and pharmaceutical dosage forms.

5. Acknowledgement

Authors were thankful to MSN laboratories, Hyderabad, AP for providing the API of MET as a gift sample. Authors were also thankful to management of Balaji College of Pharmacy, Anantapur AP for providing the necessary facilities to carry out this research project.

6. References

1. Bhaumik C Patel;Method Development and Validation for Simultaneous Estimation of Enalapril Maleate and Losartan Potassium in Bulk and Pharmaceutical Dosage Form, Indo American Journal of Pharm Research.**2013**:3(5).
2. The Merck Index, 14thEdition, Merck & Co., INC., Whitehouse station, NJ, **2006**; 368-374; 386-397.
3. Gikas S; Tsopelas et al., J. Pharm. Biomed. Anal., Chromatographic behaviour of zwitterionic enalapril –Exploring the condition for lipophilicity assessment, 48 (3), **2008**, p. 739.
4. Lima DM; Dos santos ID; Lima EM. J. Pharm. Biomed. Anal., Stability and in vitro release profile of enalapril maleate from different commercially available tablets: Possible therapeutic implication, 47 (4-5), **2008**, p. 934.
5. Thongnopnua P; Poeaknapo C; J. Pharm. Biomed. Anal., High performance liquid chromatographic determination of enalapril in human plasma by enzyme kinetic analytical method, 37 (4), **2005**, p. 763.
6. LuS; Jiang K; Qin F; Lu X; Li F; J. Pharm. Biomed. Anal., Simultaneous quantification of enalapril and enalaprilat in human plasma by high-performance liquid chromatography -tandem mass spectrometry and its application in a pharmacokinetic study, 49 (1), **2009**: 163.
7. Bhardwaj SP; Singh S; J. Pharm. Biomed. Anal., Study of forced degradation behavior of enalapril maleate by LC and LC – MS and development of a validated stability – indicating assay method, 46 (1), **2008**, pp. 113.
8. GuChen X; Zhong D; WangY; J. Chrom. B., Simulaneous determination of enalapril and enalaprilat in human plasma by liquid chromatography – tandem mass spectrometry, 813 (1-2), **2004**, pp. 337.
9. Widjaja E., et. Al; Eur. J. Pharm. Sci., Multivariate data analysis as a tool to investigate the reaction kinetics of intramolecular cyclization of enalapril maleate studied by isothermal and non - isothermal FT – IR microscopy, 32 (4-5), **2007**: 349.
10. Lin SY et al., Eur. J. Pharm. Biopharm., Intermolecular cyclization of diketopiperazine formation in solid – state enalapril maleate studied by thermal FT – IR microscopic system, 54 (2), **2002**, p. 249.
11. Qin X.Z; et. al., J. Chrom. A., Determination and rotamer separation of enalapril maleate by capillary electrophoresis, 626 (2), **1992**, p. 251.
12. HillaertS; Vander HeydenY; Van Den BosscheW; J. Chrom. A., Optimisation by experimental design of a capillary electrophoretic method for the separation of several inhibitors of angiotensin – converting enzyme using alkylsulphonates, 978 (1-2), **2002**, p. 231.
13. Zoppi A; QuevedoMA; LonghiMR; Bioorg. Med. Chem., Specific binding capacity of â – cyclodextrin with cis and trans enalapril: Physicochemical characterization and structural studies by molecular modeling, 16 (18), **2008**, p. 8403.
14. Zoppi A; Linares M; Longhi M; J. Pharm. Biomed. Anal., Quantitative analysis of enalapril by 1H RMN spectroscopy in tablets, 37(3), **2005**: 627.
15. ShioyaH; Shimojo M; Kawahara Y; Biomed. Chromatogr., Determination of enalapril and its active metabolite enalaprilat in plasma and urine by gas chromatography –mass spectrometry, 6 (2), **1992**: 59.
16. ICH, Q2 (R1) Validation of Analytical Procedure, Test and Methodology, International Conference on Harmonization, Geneva, **2005**.
17. B. Mohammed Ishaq; H. Abdul Ahad; Shaik Muneer; S. Parveen; B. Famida. Analytical Method Development and Validation for the Estimation for Temozolomide in Phsophate Buffer pH 2.0 as a solvent by UV Spectroscopy, Int. Res. J. Pharm,5(1), **2014**.
18. V. Motilal Naik; D. Shiva kumar Naik; P. Sathya Sowmya; B. Mohammed Ishaq; Hindustan Abdul Ahad; Ramesh Dhani; Simple and Economical Method for, the Determination of Metformin in the Bulk and its Tablets, IJRPLS, **2014**, 2(1): 161-164.