INNOVARE JOURNAL OF MEDICAL SCIENCES

Vol 6, Issue 1, 2018

ISSN - 2321-4406

Research Article

CONDUCTOMETRIC DETERMINATION OF THE TWO ANGIOTENSIN-CONVERTING ENZYME INHIBITORS, RAMIPRIL AND ENALAPRIL MALEATE IN PURE FORM AND IN TABLETS USING PHOSPHOTUNGSTIC ACID

AFAFABOUL-KHIER ABDEL-MONEM, EMAN AHMED BAHGAT ASSAF*

Department of Analytical chemistry, Faculty of Pharmacy, Zagazig University, 44519 Egypt. Email: eman_ahmad3332@yahoo.com

Received: 21 March 2018, Revised and Accepted: 22 April 2018

ABSTRACT

Simple and sensitive conductometric method has been developed for the determination of ramipril and enalapril maleate using phosphotungstic acid (PTA) in pure form and in tablets. The proposed method is based on the conductometric determination of 5–20 mg and 7–20 mg of ramipril and enalapril maleate by titration with PTA in aqueous solution. All the reaction conditions for the proposed methods have been studied. The proposed methods were applied successfully for the determination of ramipril and enalapril maleate in tablets; the relative standard deviation values were not exceeding two for both drugs. The results obtained were compared statistically with those obtained by the reference method and showed no significant differences regarding accuracy and precision.

Keywords: Ramipril, Enalapril maleate, Conductometric titration, Phosphotungstic acid, Tablets dosage forms.

INTRODUCTION

Ramipril is (2S,3aS,6aS)-1-[(S)-2-[[(S)-1-(ethoxycarbonyl)-3-phenylpropyl] amino]propanoyl]octahydrocyclopenta[b]pyrrole-2-carboxylic acid [1], chemical structure is shown in Fig. 1. It is an angiotensin-converting enzyme (ACE) inhibitor used in the treatment of hypertension, heart failure, and after myocardial infarction to improve survival in patients with clinical evidence of heart failure [2].

The **B** P [1] proposes a potentiometric titration technique for the determination of Ramipril. Titration was done using 0.1 M sodium hydroxide. The volume added was recorded at the second point of inflection. The USP [3], however, describes a more complicated chromatographic procedure.

Many methods have been described for the determination of ramipril. Concerning the chromatographic methods, it has been determined in pharmaceutical preparations or biological fluids either alone or combination with other drugs by high-performance liquid chromatography (HPLC) [4-7]. Furthermore, HPTLC methods have been reported [8,9].

Literature described different spectroscopic methods for determination of ramipril including spectrophotometric methods [10-17], and also derivative spectrophotometric methods [18,19], and chemometric methods [20] have been reported.

Other reported techniques were voltammetry [21,22], potentiometry [23], conductometry [24], and capillary electrophoresis methods [25] have been applied for the determination of ramipril.

Enalapril maleate is ((S)-1-{N-[1-(ethoxy carbonyl)-3-phenylpropyl]-L-alanyl}-L-proline, (Z)-2-butenedioate), chemical structure is shown in Fig. 2. It is a prodrug that **is** hydrolyzed in the body to enalapril at which is an inhibitor of ACE.

The USP 24 describes HPLC method for its quantitative estimation [3]. Quantitative determination of enalapril maleate can be carried out by various reported methods such as HPLC [26-30], capillary zone **ele**ctrophoresis method [31], polarography [32], atomic absorption spectroscopy [12], and membrane selective electrodes [33]. Some spectrophotometric methods have also been reported for quantitative estimation of enalapril maleate in bulk and dosage forms [12,34-39]. Different spectrophotometric method [40] has also been reported.

Precipitimetry conductometric titrations using phosphotungstic acid (PTA) as titrant are commonly used for the quantitative determination of different compounds, e.g. reproterol HCl, pipazethate HCl, salbutamol sulfate [41], papaverine hydrochloride [42], and dextromethorphan [43].

Phosphotungstic acid was also used in the spectrophotometric estimation of mebikar [44].

In this study, a simple and accurate conductometric method **h**as been proposed for determining ramipril and enalapril maleate, based on the conductometric titration with PTA. The proposed methods have been applied to the assay of ramipril and enalapril maleate in tablets.

METHODS

Materials and reagents

- All solvents and reagents were of analytical grade, and double distilled water was used throughout the work.
- Ramipril and enalapril maleate (Egyptian group for pharmaceutical industries Co., El-Obour city, Egypt).
- PTA (scientific limited, Northampton, UK)

Pharmaceutical preparation

- Tritace protect tablets (Sanofi-aventis Egypt s.a.e., El Sawah El Amiriya, Egypt) labeled to contain 10 mg ramipril per tablet.
- Enalapril maleate tablets (October Pharma S.A.E, 6 October City, Egypt) labeled to contain 20 mg enalapril maleate per tablet.

Instrumentation

- JENWAY model 470 conductivity/TDS meter (470 201), with Conductivity/temperature probe (027 298) was used.

General procedures

Preparation of stock and standard working solutions

1) Ramipril

Working standard solution of 1 mg/ml (2.4×10^{-3} M) was prepared by dissolving 100 mg of the pure drug in the least amount of methanol then completing to 100 ml with double distilled water.