Asian Journal of Chemistry Vol. 17, No. 2 (2005), 1211–1215

Qualitative Analysis of Adrenaline Using UV-Visible Spectral Measurements

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A systematic approach has been employed to study the variation in the absorption activity of λ_{max} of adrenaline with varying concentrations. Adrenaline was stored under different storage conditions to check whether any degradation takes place. Further, the interaction of adrenaline with some trace elemental constituents such as iron and zinc ions is also studied.

Key Words: Qualitative analysis, Adrenaline, UV-Visible spectrometry.

INTRODUCTION

Modern spectroscopic techniques find wide application in the field of pharmaceutical science. In the recent past, the structure and quality analysis of some pharmaceutical and biologically active compounds has been carried out using sophisticated instrumental techniques like UV-Visible, FTIR, FTR, etc. An exhaustive work has been done in the quantitative and structural elucidation of some pharmaceutical and biological important compounds by previous workers[1-7]. Adrenaline (m.f. $C_9H_{13}NO_3$) is also called as epinephrine. It is widely used to enhance the activity of heart, blood pressure, by vasoconstriction and the rate of glycogenolysis in liver and muscles. In the present investigation, quality analysis has been carried out by UV-Visible spectroscopy.

EXPERIMENTAL

A pure sample of adrenaline was procured from Sigma-Aldrich Company, USA and was used as such. Saturated solutions of adrenaline were prepared in the laboratory by dissolving 5 μg of the drug in 25 mL of HCl (0.01 M). From this stock solution (200 μg/mL), 175, 150, 125, 100 and 50 μg/mL solutions were prepared. Using an Elico SL 164-UV-Visible double spectrophotometer and HCl as reference, the spectra for each of these concentrations of adrenaline were recorded. The absorbance values corresponding to these concentrations are given in Table-1.

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TABLE-1
VARIATION OF ABSORBANCE OF λ_{max} (279 nm)
WITH DIFFERENT CONCENTRATIONS OF ADRENALINE

Concentration (μg/mL)	λ_{max} (nm)	Absorbance
50	279	0.747
100	279	1.425
125	279	1.530
150	279	1.981
175	279	2.303
200	279	2.400

RESULTS AND DISCUSSION

Light absorption characteristics of adrenaline

The UV-Visible spectrum of adrenaline shows the wavelength maxima (*i.e.*, λ_{max}) only at 279 nm. A graph of concentration *vs.* absorption of λ_{max} was shown in Fig. 1. The linearity of the graph obeyed Beer Lambert's law, which can be

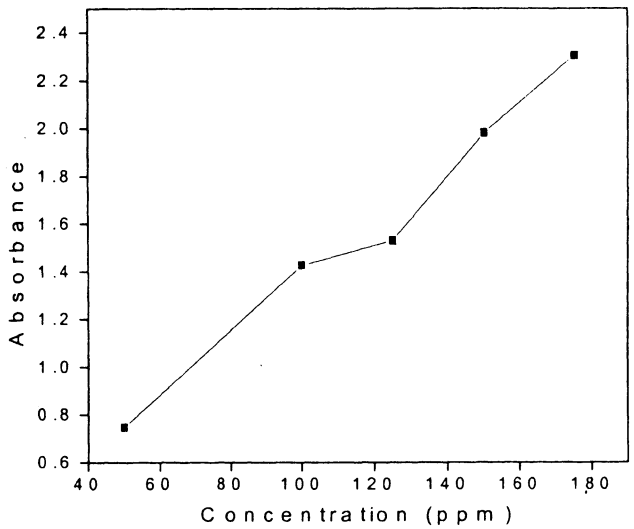

Fig. 1. Verification of Beer's law

used to find the concentration of the drug, knowing the absorbance. A comparative study on the UV-Visible spectra of adrenaline at different concentrations is shown in Fig. 2.

Study of storage condition of the drug

The effectiveness of the drug depends upon the different storage conditions The samples of adrenaline of equal volume and of two different concentrations (50 and 125 μg/mL) are exposed to different storage conditions *viz.*, ice point,

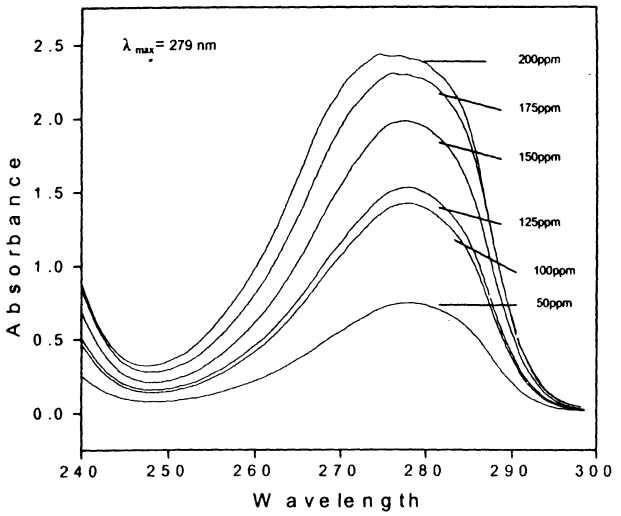

Fig.2. Comparative study on the UV-Visible spectra of adrenaline at different concentrations

sunlight, IR radiation and light resistance container (LRC). The variations of the absorbance of λ_{max} in the UV-Visible spectra are measured and presented in Table-2.

TABLE-2
VARIATION OF ABSORBANCE OF λ_{max} UNDER DIFFERENT STORAGE CONDITIONS OF ADRENALINE

Conditions of exposure	Concentration (μg/mL)	Absorbance (A) λ_{max} (279 nm)
LRC	50	0.747
Ice point	50	0.768
IR exposed	50	0.780
Sunlight exposed	50	0.788
LRC	125	1.530
Ice point	125	1.784
IR exposed	125	1.873
Sunlight Exposed	125	1.731

It is observed from Table-2 that the absorbance of the drug kept under sunlight, IR radiation and ice point shows changes to a maximum extent when compared to the absorbance at light resistance container. Hence it can be concluded that the drug under study is to be stored at LRC to retain its pharmaceutical properties.

Interaction of adrenaline with trace elements

The ferric solution was prepared in the laboratory by dissolving 50 mg of salt in 50 mL of HCl (0.01 M). Then it was diluted to obtain 50 ppm, 100 ppm etc. upto 400 ppm with the adrenaline solution (100 μg/mL). Using UV-Visible

spectrophotometer, the spectra for each of these concentrations were recorded and are shown in Fig. 3. The absorbance values corresponding to these concentrations are given in Table-3. The same procedure was adopted for zinc sulphate. The results show that the values of absorbance change with the concentrations of the above mentioned trace elements, proving the changes in the interaction of drug with trace elements.

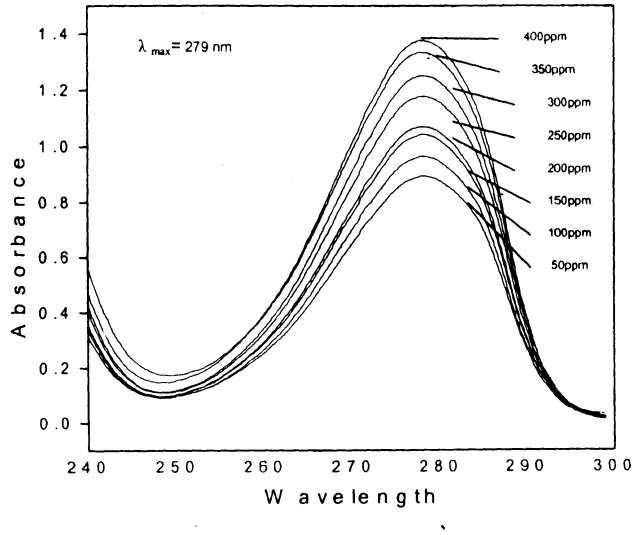

Fig.3. UV-Visible spectra of adrenaline with different concentrations of iron element

TABLE-3
VARIATION OF ABSORBANCE OF λ_{max} WITH DIFFERENT TRACE ELEMENTAL CONCENTRATIONS OF ADRENALINE

Trace elemental concentrations (ppm)	Absorbance for trace elemental ions (λ_{max} = 279 nm)	
	Iron	Zinc
50	1.378	1.370
100	1.333	1.251
150	1.253	1.180
200	1.180	1.127
250	1.069	1.043
300	1.042	0.977
350	0.963	0.895
400	0.894	0.831

ACKNOWLEDGEMENT

One of the authors R. Thilak Kumar expresses his sincere thanks to Rev. Fr. A.J. Lawrence, Principal and Secretary, St. Joseph's College, Cuddalore, for his constant support and encouragement to carry out this investigation.

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(*Received:* 14 August 2004; *Accepted:* 19 January 2005) AJC-4068